

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:)
)
WATER QUALITY STANDARDS AND)
EFFLUENT LIMITATIONS FOR THE) R08-9
CHICAGO AREA WATERWAY SYSTEM) (Rulemaking – Water)
AND THE LOWER DES PLAINES RIVER:)
PROPOSED AMENDMENTS TO 35 III.)
Adm. Code Parts 301, 302, 303 and 304)

NOTICE OF FILING

TO: See Attached Service List

PLEASE TAKE NOTICE that on the 4th day of August, 2008, I filed with the Office of the Clerk of the Illinois Pollution Control Board the attached Pre-filed Testimony of Kevin J. Boyle, Ph.D., on behalf of the People of the State of Illinois, a copy of which is hereby served upon you.

Respectfully submitted,

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IN THE MATTER OF:)
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WATER QUALITY STANDARDS)
AND EFFLUENT LIMITATIONS FOR) R08-9
THE CHICAGO AREA WATERWAY) (Rulemaking – Water)
SYSTEM AND THE LOWER)
DES PLAINES RIVER: PROPOSED)
AMENDMENTS TO 35 Ill. Adm. Code)
Parts 301, 302, 303 and 304)

Testimony of

Kevin J. Boyle, Ph.D.

On behalf of

The People of the State of Illinois

August 4, 2008

1 **Q. What is your name and address?**

2 **A.** Kevin J. Boyle, 275 Orchard Hill Lane, Newport, VA 24128.

3 **Q. On whose behalf are you testifying?**

4 **A.** I am testifying on behalf of the People of the State of Illinois.

5 **Q. What is the purpose of your testimony?**

6 **A.** The purpose of this testimony is to present the results of my analysis of the
7 economic benefits of water quality improvements associated with the new
8 recreational use designations proposed for the Chicago Area Waterway System
9 (CAWS).

10 Based on this analysis I conclude that the total, present value of these
11 economic benefits is, conservatively, \$1.05 billion, or \$47 per household per year.
12 These benefits reflect the amount that Cook County households are willing to pay
13 to achieve the proposed water quality improvements and associated recreational
14 use designations. Willingness to pay is based on preferences for recreational
15 opportunities, concern about health risks, and a sense of responsibility and
16 stewardship toward ecosystems and water resources.

17 **Q. Would you please summarize your qualifications and experience?**

18 **A.** I am Professor and Head of the Department of Agricultural and Applied
19 Economics at Virginia Polytechnic University. My area of expertise is non-
20 market valuation methods that are used to compute monetary values for natural
21 resources and changes in environmental quality. My research includes
22 applications of these methods to value changes in surface water and groundwater
23 quality.

1 I am co-editor of a book that is a basic reference on the state-of-the-art in
2 non-market valuation methods, *A Primer on Nonmarket Valuation*. This book
3 provides a guide for the conduct of each of the basic methods of valuing changes
4 in environmental quality. I have published over 70 peer-reviewed journal articles
5 on public preferences and values for changes in environmental quality, including
6 changes in water quality.

7 I have many years of experience with the valuation method I use in this
8 testimony: benefit transfer. I co-authored an article titled *Benefit Transfer*
9 *Studies: Myths, Pragmatism and Idealism*, that is one of the most cited papers on
10 benefit transfer in the economics literature.

11 I also have extensive experience leading studies that value improvements
12 in water quality. I have conducted studies that investigate the economic benefits
13 of reducing eutrophication in surface waters, protecting households from arsenic
14 in drinking water, and protecting groundwater from contamination.

15 I have an extensive record of public service relating to the valuation of
16 natural resources and environmental quality. I served as a peer reviewer for an
17 EPA study of the benefits of water quality improvements in coastal states, as well
18 as a report that computed economic benefits attributable to the first 25 years of the
19 Clean Water Act.

20 In addition, I have provided expert support in several natural resource
21 damage assessments for federal and state Trustees that have involved injuries to
22 surface water and associated impacts to recreation and ecological services. I have
23 also provided testimony in State rulemakings on a variety of environmental

1 issues, including reductions in dioxin emissions from paper mills and fish-
2 consumption advisories.

3 A copy of my Vitae is attached as Exhibit 1.

4 **I. SUMMARY OF TESTIMONY**

5 **Q. Would you please summarize your testimony?**

6 **A.** I follow a general framework for estimating economic benefits that is
7 consistent with EPA's 1995 *Interim Economic Guidance for Water Quality*
8 *Standards* ("Interim Guidance"), which was appended to IEPA's initial filing in
9 this docket. IEPA *Statement of Reasons*, Attachment C. Specifically, I examine
10 total benefits to households, which include "use" and "intrinsic" benefits
11 (Appendix C, Sections C.1 and C.2). Use benefits arise from peoples' direct use
12 of a resource (for example, water-based recreation on the CAWS). "Intrinsic" or
13 nonuse benefits arise when people value a change in water quality even if they
14 will never use the CAWS.

15 My approach is also consistent with EPA's 2000 *Guidelines for Preparing*
16 *Economic Analyses*. The guidelines are general and can be applied to all types of
17 environmental improvements, including improvements in water quality.
18 Specifically, I conduct a 'benefit-transfer' analysis, where information from
19 existing economic studies is combined with local, site-specific information.
20 Benefit transfer is an established economic procedure that uses existing
21 economic-benefit information to develop a specific economic benefit that is
22 customized for a new application. Benefit transfer can be used to develop

1 economic benefits for a variety of changes in environmental quality and a change
2 in water quality is a common application.

3 My analysis indicates that improved water quality associated with the
4 proposed recreational use designation changes will result in economic benefits
5 that, conservatively, have a present value of \$1.05 billion over 20 years, or \$47
6 per household per year.

7 **II. SCOPE OF TESTIMONY**

8 **Q. What is the scope of your testimony?**

9 **A.** My testimony focuses on the economic benefits of improvements in
10 CAWS water quality associated with the upgraded recreational use designations
11 proposed by IEPA. IEPA *Statement of Reasons*, Attachment H. The water
12 quality improvements will occur with the implementation of wastewater
13 disinfection at the North Side, Stickney and Calumet wastewater treatment plants.

14 Water quality is an environmental asset that provides flows of services to
15 society. The economic benefits of improved services to society from enhanced
16 CAWS water quality can be measured in terms of what households are willing to
17 pay to obtain the improvement in water quality. This type of economic-benefit
18 analysis is routinely used to support public decision-making, environmental rule-
19 makings and to compute monetary damages (that is, compensation payments) in
20 natural resource damage cases.

21 The economic benefits I report reflect the amounts that local households
22 are willing to pay for the proposed water quality improvements and upgraded
23 recreational use designations. I compute a total economic benefit that includes

1 use and non-use benefits. Use benefits occur when households enjoy recreational
2 use of the improved water resource. Non-use benefits occur when households
3 enjoy improved water quality even if they will never use the waters for recreation
4 or any other purpose.

5 The analysis presented in this testimony calculates a customized economic
6 benefit using information from 18 existing studies to develop a value applicable to
7 the CAWS and Cook County households.

8 **III. APPROACH TO ESTIMATING ECONOMIC BENEFITS**

9 **Q. What is the approach you followed to compute economic benefits?**

10 **A.** I use the benefit-transfer method to analyze economic benefits. The
11 benefit-transfer method is formally recognized in EPA's 2000 *Guidelines for*
12 *Preparing Economic Analyses* and Office of Management and Budget's ("OMB")
13 *2003 Guidance on Development of Regulatory Analysis*. Specifically, my
14 analysis involves five steps that are consistent with EPA's guidelines.

15 I use results from a 2007 study by Van Houtven, Powers, and Pattanayak
16 that summarizes the results of 18 existing studies that measure the economic
17 benefits of water quality improvements. This summary of economic benefits is
18 based on water quality index values and several equations, which I adapt to
19 develop an economic-benefit measure that is customized to households in Cook
20 County.

21 First, I describe the policy case. The policy case is the proposed change in
22 use designation for the CAWS and associated water quality improvements arising

1 from wastewater disinfection. This includes the identification of current water
2 quality conditions and the improved level of water quality.

3 Second, I identified relevant studies. The Van Houtven study I cite above
4 used a Meta-analysis to statistically summarize the results from 18 existing
5 studies valuing changes in water quality. The statistical summary includes an
6 equation that I use to compute an economic benefit for improved water quality in
7 the CAWS.

8 Third, I reviewed the study for quality and applicability to the policy-case
9 rulemaking. With respect to quality, the Van Houtven study was published in the
10 peer-reviewed journal *Resource and Energy Economics*. The Meta-analysis
11 equation provides the basis for a benefit-function transfer, which has been
12 demonstrated to be the most accurate type of benefit-transfer analysis. The study
13 is also applicable to the policy-case rulemaking. First, the 18 studies used in the
14 Meta-analysis all measured the economic benefits for changes in surface water
15 quality. Second, the Meta-analysis equation includes variables that allow
16 measures of the current (baseline) and improved (change) in CAWS water quality
17 to be included in the analysis using a 10-point water quality index. Third, the
18 affected populations are similar. The Meta-analysis equation also includes
19 variables that reflect population characteristics, household income and percent of
20 population that are users of the water resource. This allows me to customize the
21 economic benefit to Cook County households.

22 Fourth, I transfer the economic benefit. The Meta-analysis equation is
23 used to conduct a benefit-function transfer that computes an economic benefit that

1 is specific to the proposed CAWS water quality change and customized to
2 households in Cook County.

3 Finally I address uncertainty in two ways. First, lower and upper bounds
4 are calculated to develop a range of economic benefits. This range of benefits
5 reflects alternative modeling assumptions that could lead to error in the computed
6 economic benefit. Second, I apply an adjustment to address potential
7 overstatement of economic benefits. The 18 existing studies used a survey-based
8 method that is commonly referred to as the stated-preference method. A concern
9 with the stated-preference method is that survey respondents answer hypothetical
10 valuation questions and their responses may indicate values that are higher than
11 they would actually pay. To address this potential overstatement I reduce the
12 benefit-function transfer result by 33 percent. This adjustment is based on
13 research which shows that willingness to pay using cash transactions is about two-
14 thirds that of willingness to pay from hypothetical, stated-preference questions.

15 **IV. CALCULATION OF ECONOMIC BENEFITS**

16 **Q. How did you calculate the economic benefits of water quality improvements**
17 **associated with the proposed changes to recreational use designations?**

18 **A.** I used an equation that includes variables and coefficients that are defined
19 in Exhibit 2.

20 Key variables in the equation measure changes in water quality on a ten-
21 point index scale. This water quality index includes nine measures of water
22 quality: dissolved oxygen, fecal coliform density, pH, biochemical oxygen
23 demand, nitrates, phosphates, temperature, turbidity, and total solids.

1 Metropolitan Water Reclamation District (MWRD) monitoring data were
2 used to compute a current water-quality index value of 6.1 on the 10-point scale.
3 The expected improvement in CAWS water quality was based on a range of
4 values for fecal coliform reductions provided in the testimony of Scott Twait of
5 IEPA (29 January, p. 190-192), resulting in a change of 0.7 in the water quality
6 index, or an increase in the index value from 6.1 to 6.8 on the 10-point scale.

7 Additional variables in the equation reflect average household income for
8 Cook County (\$62,488, according to the 1999 Census), and the percentage of
9 Cook County households that are users of the river. Here, I used data from a 1986
10 survey of Chicago and surrounding community residents that found that 10
11 percent of households were CAWS users (including water-based recreation and
12 "outings" such as picnicking, hiking and photography). This percentage is likely
13 an underestimate because recreational use and quality of the CAWS has increased
14 over time.

15 The remaining variables in the equation reflect characteristics of
16 economic-benefit study designs and implementation. Here, I apply values that
17 represent best-practice in stated-preference valuation. One variable indicates
18 whether the value was published in a peer-reviewed book or journal. I assign this
19 variable a value of one to indicate a study that has been peer reviewed for quality.
20 Another variable is a measure of the response rate to the survey used to collect the
21 economic-benefit data. I assign this variable a value of 80 percent because it is
22 the response rate recommended in OMB's 2006 *Standards and Guidelines for*
23 *Statistical Surveys*. The third variable indicates whether the value was derived

1 from a survey that was administered through an in-person interview (as opposed
2 to mail or phone administration). I assign this variable a value of one, which is
3 consistent with the National Oceanic and Atmospheric Administration's Blue
4 Ribbon Panel recommendations for administration of stated-preference studies via
5 in-person interviews. The final variable reflects the year in which the study that
6 produced the economic benefit was published, less 1973. I assign this variable a
7 value of 27, which reflects the date of the most recent study (from 2000) from the
8 18 studies used in the Meta-analysis.

9 I use a linear equation model where all variables are statistically
10 significant to compute the household economic benefit. To address potential error
11 in my benefit-transfer analysis, I calculate a range of per-household annual
12 economic benefits based on alternative equations. One equation is linear and
13 includes variables that are statistically significant in explaining changes in
14 economic benefits and variables that are not statistically significant. The other
15 equation is log-linear and includes the same variables as the linear equation.

16 I then reduce the economic-benefit value by 33 percent to account for
17 potential over-statement in stated-preference data.

18 **V. ECONOMIC BENEFITS**

19 **Q. What is the result of your analysis?**

20 **A.** Based on my analysis of the economic benefits of water quality
21 improvements associated with the proposed changes to recreational use
22 designations, I conclude that the total, present value of economic benefits to

1 households in Cook County over a 20-year period beginning in 2010 are,
2 conservatively, \$1.05 billion.

3 **Q. How did you calculate the per-household economic benefit?**

4 **A.** The computed annual household economic benefit is approximately \$57 in
5 year 2000 dollars. Applying the adjustment for potential over-statement,
6 discussed above, the annual economic benefit is reduced to \$39 per household in
7 2000 dollars. I further adjust the economic-benefit measure to 2008 dollars using
8 the Consumer Price Index and arrive at a value of \$47 per household per year.

9 Using alternative specifications of the benefit-transfer function I calculate
10 a lower bound of \$23 per household per year and an upper bound of \$57 per
11 household per year.

12 **Q. How many households will experience the benefit?**

13 **A.** Most households in Cook County will benefit from the improvement in
14 CAWS water quality (see Figure 1, Exhibit 3). The affected waters are major
15 waterways in Cook County and are easily accessible to Cook County residents.
16 I used a survey response rate of 80 percent to compute the household economic-
17 benefit measure. I follow common practice and assign an economic benefit of \$0
18 to households who would not have answered the survey. Thus, I conservatively
19 include only 80-percent of Cook County households when calculating total annual
20 economic benefits from the CAWS water-quality improvement.

21 The 2006 Census data indicate that there are approximately 1.9 million
22 households in Cook County. After applying the 80-percent adjustment, total

1 annual economic benefits are approximately \$73 million, with a range of \$36 to
2 \$87 million.

3 **Q. How long will Cook County households experience the benefits of improved**
4 **water quality?**

5 **A.** The improved water quality in the CAWS can be expected to continue to
6 perpetuity. The present value of total household economic benefits is \$1.05
7 billion, with a range of \$513 million to \$1.26 billion. This present value of
8 economic benefits is based on a three-percent discount rate, a 20 year time
9 horizon that begins in 2010, and a constant number of households (using 2006
10 levels).

11 **Q. Is your economic-benefit measure conservative?**

12 **A.** My economic-benefit analysis is conservative in the sense that it most
13 likely understates the true economic benefits of the proposed water quality
14 improvement and associated changes in recreational use designations. The
15 analysis is conservative for the following reasons:

- 16 1) The benefits of improved water quality are likely to extend well beyond 20
17 years.
- 18 2) Households outside of Cook County may be willing to pay for improved water
19 quality in the CAWS.
- 20 3) The use of 10 percent in the benefit-function transfer to reflect the portion of
21 population that are CAWS users is likely understated because recreational
22 activity has increased significantly since 1986.

1 4) Research indicates that a 33% adjustment for hypothetical bias may be too
2 large. I co-authored a 2008 study entitled *Provision Rules and the Incentive*
3 *Compatibility of Choice Surveys* that found that it is only necessary to reduce
4 economic benefit by 18 percent.

5 5) Some of the households who do not respond to a stated-preference survey will
6 still hold value for the water quality improvements.

7 **Q. Are there other economic studies that demonstrate that households are**
8 **willing to pay for water quality improvements?**

9 **A.** Yes, there are numerous economic studies that have examined the effect of
10 water quality on prices of nearby residential properties. Studies that I have
11 conducted indicate that improvements in water clarity increase sale prices of
12 waterfront properties. Of particular relevance, Brashares found in her 1985
13 dissertation *Estimating the Instream Value of Lake Water Quality in Southeast*
14 *Michigan* that increases in fecal coliform levels reduce prices of lakefront
15 properties near Detroit, Michigan. More recently, Leggett and Bockstael report in
16 their 2000 article *Evidence of the Effects of Water Quality on Residential Land*
17 *Prices* in the *Journal of Environmental Economics and Management* that a 100-
18 count reduction in fecal coliform increases property values by roughly \$5,000 to
19 \$10,000 along the Chesapeake Bay in Maryland. These property-value studies
20 clearly indicate that the public will pay for improved water quality.

21 **VI. CONCLUSION**

22 **Q. Does this conclude your testimony?**

23 **A.** Yes.

EXHIBIT 1

VITA

KEVIN J. BOYLE

(January 2008)

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September 2004 to August 2005.

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August 1999 to August 2000.

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Research Assistant, University of Maine, Orono, ME. October 1975 - May 1978.

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Session Chair, Annual Meeting of the Northeastern Association of Agricultural and Resource Economics,
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Organizing Committee and Host, Association of Environmental and Resource Economists Workshop,
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Session Chair, "Valuation Issues III," European Association of Environmental and Resource Economists,
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Past President (1999/00), President (1998/99), President Elect (1997/98), Northeastern Agricultural and Resource Economics Association.

Associate Editor, Journal of Environmental Economics and Management, 1996-1999.

Associate Editor, Marine Resource Economics, 1997-99.

Reviewer of Selected Papers, Annual Meeting of the American Agricultural Economics Association, 1989, 1990, 1991, 1992, 1994, 1995, 1997, 1998.

Session Chair, Annual Meetings of the American Agricultural Economics Association, 1989, 1990, 1991, 1992, 1996, 1999.

Board of Directors, Northeastern Agricultural and Resource Economics Association, 1992-1996.

Editorial Council, Journal of Environmental Economics and Management, 1989-91, 1994-95.

Nominating Committee, Association of Environmental and Resource Economists, 1992-93.

Organizer and Moderator, Invited Paper Session, "Natural Resource Damage Assessments and Academic Research: Implications for Future Nonmarket Benefit and Cost Estimation." Joint meetings of the Association of Environmental and Resource Economists and the American Agricultural Economics Association, 1992.

Session Chair, annual meeting of Western Regional Project W-133 (Benefits and Costs in Natural Resources Planning), 1989, 1992.

Chair 1989, Co-Chair 1992, Annual Meeting of Western Regional Project W-133 (Benefits and Costs in Natural Resources Planning).

Selected Papers Committee, Annual Meeting of the Northeastern Agricultural and Resource Economics Association, 1991-92.

Recharter Committee, Western Regional Project W-133 (Benefits and Costs in Natural Resources Planning), 1991-92.

President 1989, Secretary 1988 Western Regional Project W-133, "Benefits and Costs in Natural Resource Planning".

Program Committee Twenty-Eighth Annual Meeting of the Western Regional Science Association, 1989.

Research Participant, National Academy of Sciences Review of the Glen Canyon Environmental Studies, November 1986.

Journal Reviewer:

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Scientific Review Panel, "Nonuse Benefits Analysis for 316b Phase II Rule," Office of Water, U. S. Environmental Protection Agency, 2005.

Member, "Committee on Assessing and Valuing Services of Aquatic and Related Terrestrial Ecosystems," National Research Council, 2002-04.

Resource Expert, "Governor's Blaine House Conference on Natural Resource-based Industries: Charting a New Course," State of Maine, 2003.

Reviewer, "Willingness to Pay for Coastal Water Quality Improvements." U.S. Environmental Protection Agency, Office of Water, 2000-01.

Reviewer, "Assessing Benefits of Drinking Water Regulations: A Guidance Manual." U.S. Environmental Protection Agency, Office of Policy and Office of Ground Water and Drinking Water, 1999.

Member, "Groundwater Disinfection Regulations Benefits Group," U.S. EPA and National Water Research Institute. 1997.

Member, "Interagency Work Group on Ecosystem Valuation," Economic Research Service, U.S. Department of Agriculture, 1997.

Reviewer, "National Benefit Estimates for 25 Years of the Clean Water Act." U.S. EPA, 1997.

Reviewer, "Ecosystem Valuation Framework." U.S. EPA, 1997.

Technical Advisor, "Study Commission on Property Rights and The Public Health, Safety and Welfare",
Maine Legislature 1995.

Member, "Recreational Fishing License Task Force," Maine Department of Marine Resources 1993/94.

Member, "Interoffice Groundwater Valuation Group," U.S. Environmental Protection Agency 1993.

Expert Testimony, "National Estimates of Values for Protecting Groundwater Resources," U.S.
Environmental Protection Agency, Economics Science Advisory Board, 1993.

Member, Design Team, "Maine Conservation Fund License Plate," Department of Inland Fisheries,
1992/93.

Technical Advisor, "Subcommittee on National Survey of Fishing, Hunting and Wildlife-Associated
Recreation regarding continuation of their National Survey of Hunting, Fishing and Wildlife
Associated Recreation," U.S. Fish and Wildlife Service, 1992.

Technical Advisor, "Commission to Study the Impact of Game and Nongame Species on Maine's
Economy," Maine Legislature 1988-90.

AWARDS:

Carnegie Foundation for the Advancement of Teaching and Council for Advancement and Support of
Education, "U.S. Professor of the Year, Maine," 2004

"Distinguished Maine Professor." University of Maine, 2003.

ESCO/ACOP Leadership Development Program Certificate, 2003.

"Distinguished Member," Northeastern Agricultural and Resource Economics Association, 2002.

"2001 Presidential Research and Creative Achievement Award." University of Maine.

"Post-Tenure Merit Award." University of Maine, 2001.

"Outstanding Research Award." College of Natural Sciences, Forestry and Agriculture, University of
Maine, 1999.

Research Publication Award for Best Academic Publication, James Madison University, 1993/94.

Milliman, Scott R., Barry L. Johnson, Richard C. Bishop, James Kitchell, and Kevin J. Boyle.

1992. "The Bioeconomics of Resource Rehabilitation: A Commercial-Sport Analysis for a Great
Lakes Fishery." Land Economics Vol. 68, No. 2:191-210.

U.S.D.A. Certificate of Merit as an Economist, Land Management Planning Department, Siuslaw National Forest, U.S. Forest Service, 1981.

Best Master's Thesis, Department of Agricultural and Resource Economics, Oregon State University, 1981.

Savery Master's Student of Excellence as the Outstanding Master's Student in the School of Agriculture, Oregon State University, 1980/81.

Carlton E. Crossland Scholarship for Outstanding Academic Achievement in Economics, College of Liberal Arts, University of Maine, 1976.

HONORARY SOCIETIES:

Gamma Sigma Delta--National Honor Society of Agriculture

Phi Kappa Phi--Society to Recognize Superior Scholarship

Sigma Xi--Scientific Research Society

Who's Who in the East

Who's Who in Emerging Leaders in America

Who's Who in the America

Who's Who in the World

SELECTED CONSULTING:

Association for the Environmental Health of Soils

Bangor Hydro Electric Company

Central Maine Power Company

Exxon USA

Harvard Institute of International Development

Health Canada

Illinois Department of Conservation

Industrial Economics

Maine Department of Inland Fisheries and Wildlife

Maine Paper Industry Information Office (Maine Paper Mills)

Minnesota Forest Resources Council

New Jersey Attorney General

New Jersey Department of Environmental Protection

New York Attorney General

New York Department of Environmental Conservation

Oak Ridge National Laboratory

Ohio Chapter, Nature Conservancy

Oklahoma Attorney General

Pacific Gas and Electric

Triangle Economic Research

U.S. Bureau of Reclamation

U. S. Department of Justice

U. S. Department of the Interior, National Park Service

U.S. Environmental Protection Agency

U.S. Fish and Wildlife Service, Division of Economics

U. S. Fish and Wildlife Service, Office of Federal Aid
Vermont Attorney General
Vermont Department of Fish and Wildlife
Wyoming Fish and Game Department

GRANTS:

“Farm Credit of Armenia.” Investigators: Boyle, Kevin and Douglas Flory. Sponsor: USDA, Foreign Agricultural Service Duration: 2007-2008. Amount: 184,173.

“Validation of Benefit-Transfer Functions.” Investigators: Boyle, Kevin, Christopher Parmeter, Nicolai Kuminoff, and Jaren Pope. Sponsor: U. S. Environmental Protection Agency, EPA-G2006-STAR-G-1. Duration: 2007-2008. Amount: \$199,986.

“Assessing the Regional Economic Impact of Protected Lands Adjacent to the 100 Mile Wilderness Section of the Appalachian Trail.” Investigators: Kevin J. Boyle and Kathleen P. Bell. Sponsor: Maine Department of Conservation. Duration: 2004-05. Amount: \$35,547.

“Risk Assessment of Fish Consumption by Pregnant Women.” Investigator: Kevin J. Boyle, Sponsor: Maine Department of Human Services. Duration: 2003-04. Amount: \$12,650

“GK12 Sensors.” Investigators: John Vetelino, Kevin J. Boyle, and Constance Holden. Sponsor: National Science Foundation. Duration: 2004-05. Amount: \$536,566.

“Economic Valuation of Avoiding Arsenic Exposure in Drinking Water.” Investigators: Kevin J. Boyle, and Kathleen P. Bell. Sponsor: U.S. EPA. Duration: 2002-04. Amount: \$259,825.

“Measuring the Economic Damages from Oil Spills to Maine’s Marine Economy.” Investigators: Jonathan Rubin, Kevin J. Boyle, and Deirdre Mageean. Sponsor: Maine/New Hampshire Sea Grant Program. Duration: 2003-05. Amount: \$149,514.

“Experimental Tests of Provision Rules in Conjoint Analysis for Environmental Valuation.” Investigators: Laura Taylor, and Kevin J. Boyle. Sponsor: U.S. EPA. Duration: 2002-03. Amount: \$120,479.

“Economic Impacts of Hemlock Woolly Adelgid on Residential Forest Landscapes.” Investigators: Kathleen P. Bell, and Kevin J. Boyle. Sponsor: USDA Forest Service. Duration: 2002-03. Amount: \$75,024.

“Urban Regeneration through Environmental Remediation: Valuing Market-Based Incentives for Brownfields Development.” Investigators: Peter Meyer, Kris Wernstedt, Anna Alberini, and Kevin J. Boyle. Sponsor: U.S. EPA. Duration: 2002-04. Amount: \$277,388.

“Understanding Public Values Produced by Private Forests in the Southern U.S.” Investigator: Kevin J. Boyle. Sponsor: Forest Service, U.S. Department of Agriculture. Duration: 2001-03. Amount: \$57,350.

“National Policy Implications of the Demand for Open Space.” Investigator: Kevin J. Boyle. Sponsor: Economic Research Service, U.S. Department of Agriculture. Duration: 1999-04. Amount: \$105,445.

- "Formulation Non-market Research Objective." Investigator: Kevin J. Boyle. Sponsor: Rocky Mountain Research Station, U.S. Forest Service. Duration: 2000-01. Amount: \$19,110.
- "Improved Information in Support of a National Strategy for Open Land Policies." Investigators: Kevin J. Boyle, Larry Libby, Mary Ahearn, Anna Alberini, and John Bergstrom. Sponsor: National Research Initiative Competitive Grants Program, U.S. Department of Agriculture. Duration: 1999-2001. Amount: \$207,000.
- "Cooperative Agreement to Study the Demand for Food Safety." Investigators: Nancy Bockstael, Kevin Boyle, Alan Levy, Mario Teisl (Principal), Alan Randall, and Brian Roe. Sponsor: Center for Disease Control and Prevention. Duration: 1998-03. Amount: \$946,447.
- "Ice Fishing and Open Water Fishing Survey of Angler Effort and Preferences." Investigator: Kevin J. Boyle. Sponsor: Maine Department of Inland Fisheries and Wildlife. Duration: 1999-00. Amount: \$107,861.
- "The Effect of National Wildlife Refuge Proximity on Property Prices." Investigator: Kevin J. Boyle. Sponsor: U.S. Fish and Wildlife Service. Duration: 1998-00. Amount: \$145,770.
- "Assessing Public Perceptions and Evaluating Public Preferences for Ecosystem Management and Forest Health." Investigators: Kevin J. Boyle, and Daniel McCollum. Sponsor: U.S. Forest Service, Rocky Mountain Research Station. Duration: 1998-00. Amount: \$59,400.
- "The Economic Impacts of Hunting, Fishing and Wildlife-Watching in Maine." Investigators: Mario F. Teisl and Kevin J. Boyle. Sponsor: Maine Department of Inland Fisheries and Wildlife. Duration: 1998. Amount: \$7,724.
- "A Study of the Effect of Lake-Water Quality on the Prices of Lake-Front Property in Maine, New Hampshire and Vermont." Investigators: Kevin J. Boyle, and John Halstead. Sponsor: U.S. Geological Service. Duration: 1997-99. Amount: \$182,471
- "1998 Wildlife Survey." Investigators: Kevin J. Boyle, Brian Roach, and Mario F. Teisl. Sponsor: Maine Department of Inland Fisheries and Wildlife. Duration: 1997-98. Amount: \$122,462
- "An Investigation of the Economic Value of Maine's Great Ponds." Investigator: Kevin J. Boyle. Sponsor: Maine Department of Environmental Protection. Duration: 1997. Amount: \$32,872.
- "Do Interest Group Preferences Differ from Preferences of the General Public for Managed and Unmanaged Forest Ecosystems." Investigators: Kevin J. Boyle, and Thomas P. Holmes. Sponsor: U.S. Forest Service, Southeastern Forest Experiment Station. Duration: 1996-98. Amount" \$17,000.
- "1996 Survey of Hunter Effort and Preferences." Investigator: Kevin J. Boyle. Sponsor: Maine Department of Inland Fisheries and Wildlife. Duration: 1996-97. Amount: \$105,899.
- "The Effects of Agriculture on Wildlife: A Study of Nonuse Values." Investigators: Kevin J. Boyle, and Richard C. Bishop. Sponsor: U.S. Department of Agriculture, Economic Research Service. Duration: 1995-97. Amount: \$280,000.

- “Public Preferences for Managed and Unmanaged Forest Ecosystems.” Investigators: Kevin J. Boyle, and Thomas P. Holmes. Sponsor: U.S. Forest Service, Southeastern Forest Experiment Station. Duration: 1995-97. Amount: \$9,000.
- “A Hedonic Property Value Study of the Economic Value of Protecting Water Quality in Maine Lakes.” Investigator: Kevin J. Boyle. Sponsor: U.S. Geological Service. Duration: 1995-96. Amount: \$57,120.
- “Open Water Fishing Survey of Angler Effort and Preferences.” Investigator: Kevin J. Boyle. Sponsor: Maine Department of Inland Fisheries and Wildlife. Duration: 1994-95. Amount: \$83,322.
- “Hedonic-Price Study of Water Quality in Maine's Lakes.” Investigator: Kevin J. Boyle. Sponsor: Maine Department of Environmental Protection and Water Resources Institute, University of Maine. Duration 1994-95. Amount: \$25,093.
- “Meta Analysis of Response Rates to Contingent-Valuation Surveys.” Investigators: Kevin J. Boyle, V. Kerry Smith, and Donald Epp. Sponsor: U.S. Forest Service, Rocky Mountain Forest and Range Experiment Station. Duration: 1994-95. Amount: \$39,000.
- “The Effects of Substitutes on Economic Value Estimates of Forest Ecosystem Health.” Investigators: Kevin J. Boyle, and Thomas P. Holmes. Sponsor: U.S. Forest Service, Southeastern Forest Experiment Station. Duration: 1993-95. Amount: \$25,000.
- “Ice Fishing Survey of Angler Effort and Preferences.” Investigator: Kevin J. Boyle. Sponsor: Maine Department of Inland Fisheries and Wildlife. Duration: 1994. Amount: \$86,485.
- “Economic Valuation of Groundwater Resources by the U.S. Environmental Protection Agency.” Investigators: Kevin J. Boyle, and John C. Bergstrom. Sponsor: U.S. Environmental Protection Agency, Cooperative Agreement CR818760-01-0. Duration: 1993-94. Amount: \$24,637.
- “Review of Contingent-Valuation Studies of the Benefits of Groundwater Protection.” Investigator: Kevin J. Boyle. Sponsor: U.S. Environmental Protection Agency, Cooperative Agreement CR818760-01-0. Duration: 1993-94. Amount: \$7,550.
- “Analysis of Contingent-Valuation Data from the 1991/92 National Survey of Hunting, Fishing and Wildlife Associated Recreation.” Investigator: Kevin J. Boyle. Sponsor: U.S. Fish and Wildlife Service. Duration: 1992-94. Amount: \$25,000.
- “Benefit-Cost Analysis of Atlantic Salmon Restoration on the Penobscot River.” Investigators: Kevin J. Boyle, Stephen D. Reiling, and Mario F. Teisl. Sponsor: Bangor Hydro-Electric, Co. Duration 1991-92. Amount: \$98,378.
- “An Economic Evaluation of Consumptive and Nonconsumptive Uses of Maine's Fish and Wildlife Resources: Addendum.” Investigators: Kevin J. Boyle, Stephen D. Reiling, and Mario Teisl. Sponsor: Maine Department of Inland Fisheries and Wildlife. Duration: 1990-1991. Amount: \$46,666.
- “Developing Statistical Models to Update State Level Data Collected by the National Survey of Fishing, Hunting and Wildlife-Associated Recreation. Investigator: Kevin J. Boyle. Sponsor: U.S. Fish and Wildlife Service. Duration: 1990-1991. Amount: \$7,000.

- “Economic Impacts of Improved Sport Fisheries on the Lower Kennebec River Watershed.”
Investigators: Kevin J. Boyle, John R. Moring, and Stephen D. Reiling. Sponsor: Maine
Department of Marine Resources. Duration: 1989-1991. Amount: \$46,000.
- “Economic Benefits of Big-Game Hunting.” Investigators: Kevin J. Boyle, and Stephen D. Reiling.
Sponsor: U.S. Forest Service, Rocky Mountain Forest and Range Experiment Station. Duration:
1989-91. Amount: \$22,660.
- “Sustainable Crop and Livestock Production.” Investigators: Faculty of Sustainable Agriculture,
University of Maine. Sponsor: Jessie Smith Noyes Foundation. Duration: 1988-1991. Amount:
\$60,000.
- “Analysis and Reporting of Data from a Comprehensive Survey of Marine, Sport Fishing in Maine.”
Investigators: Kevin J. Boyle, and Stephen D. Reiling. Sponsor: University of Maine Sea Grant
Program. Duration: 1990. Amount: \$9,950.
- “An Economic Evaluation of Consumptive and Nonconsumptive Uses of Maine's Fish and Wildlife
Resources.” Investigators: Kevin J. Boyle, and Stephen D. Reiling. Sponsors: Maine
Legislative Commission to Study the Impact of Game and Nongame Species on Maine's
Economy, Maine Department of Inland Fisheries and Wildlife, and Maine Department of Marine
Resources. Duration: 1988-1990. Amount: \$396,267.
- “Design of Contingent-Valuation Questions for the 1990 National Survey of Fishing, Hunting, and
Wildlife-Associated Recreation.” Investigator: Kevin J. Boyle. Sponsor: U.S. Fish and Wildlife
Service. Duration: 1989-90. Amount: \$9,272.
- “An Examination of the Economic Value and Use of Maine's Fish and Wildlife Resources.” Investigator:
Kevin J. Boyle. Sponsors: Maine Department of Inland Fisheries and Wildlife, and Forests for
the Future Program, Maine Department of Conservation. Duration: 1987. Amount: \$16,060.

PUBLICATIONS AND REPORTS:

A. Articles in Professional Journals

- Scrogin, David, Richard Hofler, Kevin J. Boyle and J. Walter Milon. 2008. “An Efficiency Approach to
Choice set Formation: Theory and Application to Recreational Destination Choice.” *Applied
Economics* (forthcoming).
- Paterson, Robert W., Kevin J. Boyle, Christopher F. Parmeter, James E. Neuman and Paul De Civita.
2008. “Heterogeneity in Preferences for Smoking Cessation.” *Health Economics* (forthcoming).
- Nquyen, N., W. Douglass Shaw, Richard T. Woodward, Robert Paterson and Kevin J. Boyle. 2007.
“An Empirical Study at Option Prices for Hunting Permits.” *Ecological Economics*, Vol. 63
(2&3): 476-484.
- Moeltner, Klaus, Kevin J. Boyle and Robert W. Paterson. 2007. “Meta-Analysis and Benefit Transfer for
Resource Valuation: Addressing Classical Challenges with Bayesian Modeling.” *Journal of
Environmental Economics and Management*, Vol. 53 (2): 250-269.

- Nelson, Marcy L., James R. Gilbert and Kevin J. Boyle. 2006. "The Influence of Siting and Deterrence Methods on Seal predation at Atlantic Salmon (*Salmo salar*) Farms in Maine, 2001-2003." *Canadian Journal of Fisheries and Aquatic Sciences*, Vol. 63 (July): 1710-1721.
- Aziz Sonia N., Kevin J. Boyle, and Mahfuzar Rahman. 2006. "Knowledge of Arsenic in Drinking-water: Risks and Avoidance in Matlab, Bangladesh." *Journal of Health, Population and Nutrition*, Vol. 24 (3): 327-335.
- Sargent-Michaud, Jessica, Kevin J. Boyle, and Andrew E. Smith. 2006. "Cost Effective Arsenic Reductions in Private Wells." *Water Resources Bulletin*. Vol. 42 (5): 237-245.
- Holmes, Thomas D., and Kevin J. Boyle. 2005. "Dynamic Learning and Context-Dependence in Sequential, Attribute-Based, Stated-Preference Valuation Questions." *Land Economics*, Vol. 81 (1): 114-126.
- McCollum, Daniel W., and Kevin J. Boyle. 2005. "The Effect of Respondent Experience/Knowledge in the Elicitation of Contingent Values: An Investigation of Convergent Validity, Procedural Invariance and Reliability." *Environmental and Resource Economics*, Vol. 30 (1): 23-33.
- Scrogin, David, Kevin Boyle, George Parsons, and Andrew Plantinga. 2004. "Effects of Regulations on Expected Catch, Expected Harvest, and Site Choice of Recreational Anglers." *American Journal of Agricultural Economics*, Vol. 86 (4): 963-974.
- Bergstrom, John C., Kevin J. Boyle, and Mitsuyasu Yabe. 2004. "Trading Taxes vs. Paying Taxes to Value and Finance Public Environmental Goods." *Environmental and Resource Economics*, Vol. 28 (4): 533-549.
- Boyle, Kevin, and Roy Bouchard. 2003. "Water Quality Effects on Property Prices in Northern New England." *Lakelines*, Vol. 23 (3): 24-27.
- Evaris, Mary F., Nicholas E. Flores, and Kevin J. Boyle. 2003. "Multiple Bounded Uncertainty Choice Data as Probabilistic Intentions." *Land Economics*, Vol. 79 (4): 549-560.
- Leggett, Christopher G., Naomi S. Kleckner, Kevin J. Boyle, John W. Duffield, and Robert Cameron Mitchell. 2003. "Social Desirability Bias in Contingent Valuation Surveys Administered Through In-Person Interviews." *Land Economics*, Vol. 79 (4): 561-575.
- Alberini, Anna, Kevin Boyle, and Michael Welsh. 2003. "Analysis of Contingent Valuation Data with Multiple Bids and Response Options Allowing Respondents to Express Uncertainty." *Journal of Environmental Economics and Management*, Vol. 45 (1): 40-62.
- Sargent-Michaud, Jessica, and Kevin J. Boyle. 2002. "Public Perceptions of Wildlife Management in Maine." *Human Dimensions of Wildlife*, Vol. 7: 163-178.
- Holmes, Thomas P., Kevin J. Boyle, Mario F. Teisl, and Brian Roe. 2002. "A Comparison of Conjoint Analysis Response Formats: Reply." *American Journal of Agricultural Economics*, Vol. 84 (4): 1172-1175.
- Paterson, Robert W., and Kevin J. Boyle. 2002. "Out of Sight, Out of Mind? Using GIS to Incorporate Visibility in Hedonic Property Value Models." *Land Economics*, Vol. 78 (3): 417-425.

Gibbs, Julie P., John M. Halstead, Kevin J. Boyle, and Ju-Chin Huang. 2002. "An Hedonic Analysis of the Effects of Lake Water Clarity on New Hampshire Lakefront Properties." *Agricultural and Resource Economics Review*, Vol. 31 (11): 39-46.

Roach, Brian, Kevin J. Boyle, and Michael Welsh. 2002. "Testing Bid Design Effects in Multiple Bounded, Contingent-Valuation Questions." *Land Economics*, Vol. 78 (1): 121-131.

Poor, P. Joan, Kevin J. Boyle, Laura O. Taylor, and Roy Bouchard. 2001. "Objective versus Subjective Measures of Water Clarity in Hedonic Property Value Models." *Land Economics*, Vol. 77 (4): 482-493.

Reprinted in *Revealed Copy Approaches to Environmental Valuation: Volume II*, J. Herriges and C. Kling (eds.), 2008. Ashgate Publishing: Aldershot, UK.

Roe, Brian, Mario F. Teisl, Alan S. Levy, Kevin Boyle, Mark L. Messonier, T. Lynn Riggs, Melissa J. Herrmann, and Felicia M. Newman. 2001. "Consumers' Assessment of the Food Safety Problem for Meals Prepared at Home and Reactions to Food Safety Labeling." *Journal of Food Product Retailing*, Vol. 6 (4): 9-26.

Boyle, Kevin J., and Laura O. Taylor. 2001. "Does the Measurement of Property and Structural Characteristics Affect Estimated Implicit Prices for Environmental Amenities in a Hedonic Model?" *Journal of Real Estate Finance and Economics*, Vol. 23 (2/3): 303-318.

Boyle, Kevin J., Thomas P. Holmes, Mario F. Teisl, and Brian Roe. 2001. "A Comparison of Conjoint Analysis Response Formats." *American Journal of Agricultural Economics*, Vol. 83 (2): 441-454.

Michael, Holly, J., Kevin J. Boyle, and Roy Bouchard. 2000. "Does the Measurement of Environmental Quality Affect Implicit Prices Estimated from Hedonic Models?" *Land Economics*, Vol. 76 (2): 283-298.

Parsons, George R., Andrew J. Plantinga, and Kevin J. Boyle. 2000. "Narrow Choice Sets in a Random Utility Model of Recreation Demand." *Land Economics*, Vol. 76 (1): 86-99.

Boyle, Kevin J., P. Joan Poor, and Laura O. Taylor. 1999. "Estimating the Demand for Protecting Freshwater Lakes from Eutrophication." *American Journal of Agricultural Economics* Vol. 81 (5): 1118-1122.

Reprinted in *Revealed Preference Approaches to Environmental Valuation: Volume II*, J. Herriges and C. Kling (eds.), 2008. Ashgate Publishing: Aldershot, UK.

Teisl, Mario F., Kevin J. Boyle, and Richard E. Record, Jr. 1999. "License-Sales Revenues: Understanding Angler and Hunter Reactions to Changes in License Prices." *Human Dimensions of Wildlife*, Vol. 4 (4): 1-17.

Roach, Brian, Kevin Boyle, John Bergstrom, and Stephen Reiling. 1999. "The Effect of Instream Flows on Whitewater Visitation and Consumer Surplus: A Contingent Valuation Application to the Dead River, Maine." *Rivers*, Vol. 7 (1): 11-20.

- Roach, Brian, Joan Trail, and Kevin Boyle. 1999. "Comparing 1994 Angler Catch and Harvest Rates from On-Site and Mail Surveys on Selected Maine Lakes." *North American Journal of Fisheries Management*, Vol. 19 (1): 203-208.
- Phillips, Marcia L., Kevin J. Boyle, and Alan G. Clark. 1998. "A Comparison of Opinions of Wildlife Managers and the Public on Endangered Species Management." *Wildlife Society Bulletin*, Vol. 26 (3): 605-613.
- Phillips, Marcia L., Kevin J. Boyle, and Alan G. Clark. 1998. "Are There Differences Between Subgroups of Wildlife Managers? Ask the Right Whales." *Human Dimensions of Wildlife*, Vol. 3 (4): 18-28.
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- Boyle, Kevin J., Hugh F. MacDonald, Hsiang-tai Cheng, and Daniel W. McCollum. 1998. "Bid Design and Yea Saying in Single-Bounded, Dichotomous-Choice Questions." *Land Economics*, Vol. 74 (1): 49-64.
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- MacDonald, Hugh F., and Kevin J. Boyle. 1997. "The Effect of a Statewide Sportfish Consumption Advisory on Open Water Fishing in Maine." *North American Journal of Fisheries Management*, Vol. 17 (3): 687-695.
- Teisl, Mario, F., and Kevin J. Boyle. 1997. "Needles in a Haystack: Cost-Effective Sampling of Marine Sport Anglers." *Marine Resource Economics*, Vol.12 (1): 1-10.
- Teisl, Mario F., Kevin J. Boyle, and Brian Roe. 1996. "Conjoint Analysis of Angler Evaluations of Atlantic Salmon Restoration on the Penobscot River, Maine." *North American Journal of Fisheries Management*, Vol. 16 (4): 861-871.
- Boyle, Kevin J., F. Reed Johnson, Daniel W. McCollum, William H. Desvousges, Richard W. Dunford, and Sara P. Hudson. 1996. "Valuing Public Goods: Discrete Versus Continuous Contingent-Valuation Responses." *Land Economics*, Vol. 72 (3): 381-396.
- Bergstrom, John C., Kevin J. Boyle, Charles A. Job, and Mary Jo Kealy. 1996. "Assessing the Economic Benefits of Ground Water for Environmental Policy Decisions." *Journal of the American Water Resources Association*, Vol. 32 (2): 279-291.
- Bergstrom, John C., Kevin J. Boyle, Charles A. Job, and Mary Jo Kealy. 1996. "Assessing the Economic Benefits of Ground Water for Environmental Policy Decisions." *Water Resources Bulletin*, Vol. 32 (2): 1-12.
- Roe, Brian, Kevin J. Boyle, and Mario F. Teisl. 1996. "Using Conjoint Analysis to Derive Estimates of Compensating Variation." *Journal of Environmental Economics and Management*, Vol. 31 (2): 145-159.

Reprinted in, *Environmental Valuation*, K.G. Willis, K.J. Button, and P. Nijkamp (eds.), 1998. Edward Elgar Publishing Limited:UK.

Mazurkiewicz, Stuart M., Kevin J. Boyle, Mario F. Teisl, Karen I. Morris, and Alan G. Clark. 1996. "Recall Bias and Reliability in Survey Data: Moose Hunting in Maine." *Wildlife Society Bulletin*, Vol. 24 (1): 140-148.

Boyle, Kevin J., Michael P. Welsh, Richard C. Bishop, and Robert M. Baumgartner. 1995. "Validating Contingent Valuation Estimates with Surveys of Experts." *Agricultural and Resource Economics Review*, Vol. 24 (2): 247-254.

Teisl, Mario F., Kevin J. Boyle, Daniel W. McCollum, and Stephen D. Reiling. 1995. "Test-Retest Reliability of Contingent Valuation with Independent Sample Pretest and Post-Test Control Groups." *American Journal of Agricultural Economics*, Vol. 77 (3): 613-619.

Reprinted in *The Stated Preference Approach to Environmental Valuation, Vol. III*, R.T. Carson (ed.), Chapter 35, 2007. Ashgate Publishing: Aldershot, UK.

Westra, John V., Kevin J. Boyle, and Gregory L. Porter. 1995. "Net Revenues of Potatoes Rotated with Alternative Crops." *American Potato Journal*, Vol. 72: 99-117.

Boyle, Kevin J., Gregory L. Poe, and John C. Bergstrom. 1994. "What Do We Know About Groundwater Values? Preliminary Implications from a Meta Analysis of Contingent-Valuation Studies." *American Journal of Agricultural Economics*, Vol. 76 (5): 1055-1061.

Reprinted in *The Stated Preference Approach to Environmental Valuation, Volume III*, R. T. Carson (ed.), Chapter 11, 2007. Ashgate Publishing: Aldershot, UK.

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Boyle, Kevin J., William H. Desvousges, F. Reed Johnson, Richard W. Dunford, and Sara P. Hudson. 1994. "An Investigation of Part-Whole Biases in Contingent-Valuation Studies." *Journal of Environmental Economics and Management*, Vol. 27 (1): 64-83.

Boyle, Kevin J., and Alan G. Clark. 1993. "Does Getting a Bull Significantly Increase Value? The Net Economic Value of Moose Hunting in Maine." *Alces*, Vol. 29: 201-211.

Boyle, Kevin J., Richard L. Dressler, Alan G. Clark, and Mario F. Teisl. 1993. "Moose Hunter Preferences and Setting Season Timing." *Wildlife Society Bulletin*, Vol. 21 (4): 498-504.

Ebert, Ellen S., Natalie W. Harrington, Kevin J. Boyle, James W. Knight, and Russell E. Keenan. 1993. "Estimating Consumption of Freshwater Fish Among Maine Anglers." *North American Journal of Fisheries Management*, Vol. 13 (4): 737-745.

Teisl, Mario F., Kevin J. Boyle, and Owen Fenderson. 1993. "Angler Opinions Regarding Management Options to Balance Open-Water and Ice Fishing Effort in Maine." *North American Journal of Fisheries Management*, Vol. 13 (3): 353-359.

Boyle, Kevin J. 1993. "Ecosystem Valuation as an Approach to Valuing Biological Diversity." *Scandinavian Forest Economics*, No. 34: 18-37.

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- Boyle, Kevin J., and John C. Bergstrom. 1992. "Benefit Transfer Studies: Myths, Pragmatism and Idealism." *Water Resources Research*, Vol. 28 (3): 657-663.
- Boyle, Kevin J. 1990. "Dichotomous-Choice, Contingent-Valuation Questions: Functional Form is Important." *Northeastern Journal of Agricultural and Resource Economics*, Vol. 19 (2): 125-131.
- Boyle, Kevin J., Stephen D. Reiling, and Marcia L. Phillips. 1990. "Species Substitution and Question Sequencing in Contingent-Valuation Surveys Evaluating the Hunting of Several Types of Wildlife." *Leisure Sciences*, 12 (1): 103-118.
- Reiling, Stephen D., Kevin J. Boyle, Marcia L. Phillips, and Mark W. Anderson. 1990. "Temporal Reliability of Contingent Values." *Land Economics*, Vol. 66 (2): 128-134.
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- Phillips, Marcia L., Kevin J. Boyle, and Stephen D. Reiling. 1989. "Highlights from the Survey of Hunters Holding a 1987 Maine Hunting License." Staff Paper ARE 397, Department of Agricultural and Resource Economics, University of Maine.
- Boyle, Kevin J., Stephen D. Reiling, and Marcia L. Phillips. 1989. "Highlights From the Survey of 1988 Moose Hunters." Staff Paper ARE 392, Department of Agricultural and Resource Economics, University of Maine.
- Boyle, Kevin J., Marcia L. Phillips, Stephen D. Reiling, and Lawrence K. Demirelli. 1989. "Economic Values and Economic Impacts Associated with Consumptive Uses of Maine's Fish and Wildlife Resources." Staff Paper ARE 391, Department of Agricultural and Resource Economics, University of Maine.
- Baumgartner, Robert M., and Kevin J. Boyle. 1987. "Customer Acceptance of the Cycle-to-Shed Conversion for PG&E's Residential Peak Load Reduction Program." Report to Pacific Gas and Electric Company, HBRS.
- Bishop, Richard C., Kevin J. Boyle, Michael P. Welsh, Robert M. Baumgartner, and Pamela R. Rathbun. 1987. "Glen Canyon Dam Releases and Downstream Recreation: An Analysis of User Preferences and Economic Values." Report to the U.S. Bureau of Reclamation.
- Bishop, Richard C., and Kevin J. Boyle. 1985. "The Economic Value of Illinois Beach State Nature Preserve." Final report to the Illinois Department of Conservation.
- Boyle, Kevin J., and Richard C. Bishop. 1984. "A Comparison of Contingent Valuation Techniques." Staff Paper No. 222, Department of Agricultural Economics, University of Wisconsin-Madison.
- Boyle, Kevin J., and Richard C. Bishop. 1984. "Lower Wisconsin River Recreation: Economic Impacts and Scenic Values." Staff Paper 216, Department of Agricultural Economics, University of Wisconsin.
- Boyle, Kevin J., and Richard C. Bishop. 1984. "Economic Benefits Associated with Boating and Canoeing on the Lower Wisconsin River." Economic Issues, No. 84, Department of Agricultural Economics, University of Wisconsin.

- Boyle, Kevin J., Ronald A. Oliveira, and James K. Whittaker. 1982. "An Econometric Model of Barley Acreage Response to Changes in Prices and Wheat Acreage in the Northwest." Special Report No. 647, Agricultural Experiment Station, Oregon State University.
- Boyle, Kevin J., and Frederick W. Obermiller. 1982. "Modifying Static Input-Output Models to Incorporate New Sectors." Technical Paper No. 6444, Agricultural Experiment Station, Oregon State University.
- Obermiller, Frederick W., Kevin J. Boyle, and David Lambert. 1981. "Final Report: Morrow County Input-Output Model." Department of Agricultural and Resource Economics, Oregon State University.
- Wilson, James A., Wayne Meserve, Everett Maxim, and Kevin J. Boyle. 1977. "The Economic Feasibility of the Installation of Chilled and Refrigerated Seawater Systems in New England (Herring) Carrier Vessels." Social Science Research Institute, University of Maine.

PRESENTATIONS:

- Boyle, Kevin J. 2006. "Economics of Emerging Diseases." Keynote Presentation, *Bangladesh Society of Microbiologists 22nd Annual Conference*. Dhaka, Bangladesh.
- Boyle, Kevin J. 2006. "The Economist as the Voice of Biological and Physical Systems in Natural Resource Damage Assessments." Invited Lecture, Department of Economics and Department of Coastal and Marine Studies, East Carolina University.
- Taylor, Laura O., Mark M. Morrison, and Kevin J. Boyle. 2006. "Provision Rules and the Incentive Compatibility of Choice Surveys." Invited Lecture, Department of Economics, East Carolina University.
- Boyle, Kevin J., Sonia Aziz, and V. Kerry Smith. 2006. "Meta-analysis of Response Rates to Contingent-Valuation Studies Conducted by Mail." Keynote Presentation. Resources for the Future, Washington, DC. *Implications for Administering and Testing Representativeness Workshop*.
- Boyle, Kevin J. 2006. "Negotiation Talking Points: Seeking Your First Academic Position." Invited Lecture, *Transforming the Professoriate: Preparing Women for careers in Science and Engineering*, Advance Virginia Tech.
- Taylor, Laura O., Mark M. Morrison, and Kevin J. Boyle. 2006. "Provision Rules and the Incentive Compatibility of Choice Surveys." Invited Presentation, *Third World Congress of Environmental and Resource Economist*. Kyoto, Japan.
- Boyle, Kevin J. 2006. "Economic Benefit Estimation of Health Outcomes." Invited Presentation, International Center for Diarrheal Research. Dhaka, Bangladesh.
- Taylor, Laura O., Mark M. Morrison, and Kevin J. Boyle. 2006. "Provision Rules and the Incentive Compatibility of Choice Surveys." Invited Lecture, School of Marine Resources and Department of Food and Resource Economics, University of Delaware.

- Boyle, Kevin J. and Kathleen P. Bell. 2006. "Economic Valuation of Avoiding Exposure to Arsenic in Drinking Water." Invited Presentation, U.S. EPA NCER/NCEE Workshop, *Morbidity and Mortality: How Do We Value Risk of Illness and Death*.
- Boyle, Kevin J. 2006. "Chaos or Organized Confusion: Structural Models, Policy Relevance and Validity in Nonmarket Valuation." Keynote lecture, *Frontiers in Natural Resource Economics: A Symposium Honoring the Career of Richard C. Bishop*, University of Wisconsin.
- Jaqueline Garcia-Yi, Deirdre Mageean, Kevin Boyle and Mario Teisl. 2006. "Evaluating users' responses to differential entrance fee policies using contingent behavior for Paracas National Reserve in Ica, Peru." Selected paper. *Annual BIOECON Conference on the Economic Analysis of Ecology and Biodiversity*. Kings College Cambridge, August 29-30.
- Boyle, Kevin J. 2005. "Economic Modeling of Natural Resource Damages." Invited presentation, Natural Resource Damages Litigation, Law Seminars International, Newark, New Jersey.
- Holmes, Thomas P. and Kevin J. Boyle. 2003. "Dynamic Bid Anchoring in Sequential, Attribute-Based Contingent Valuation." Selected paper, European Association of Environmental and Resource Economists, Twelfth Annual Conference, Bilbao, Spain.
- Boyle, Kevin J., Mark M. Morrison, and Laura O. Taylor. 2003. "Provision Rules and the Incentive Compatibility of Conjoint Surveys." Selected paper, European Association of Environmental and Resource Economists, Twelfth Annual Conference, Bilbao, Spain.
- Teisl, Mario F., Kevin J. Boyle, Richard Record, and Rob Southwick. 2001. "Optimizing License Revenues." CMBA conference, New Orleans, Aug. 28th.
- Teisl, Mario F., Brian Roe, Kevin Boyle, T. Lynn Riggs, Mark L. Messonnier, Melissa J. Herrmann. 2001. "Understanding how respondents view food safety risks: Implications to the design of willingness-to-pay experiments." Annual Workshop, Association of Environmental and Resource Economists, Bar Harbor, ME.
- Boyle, Kevin J., and Tommy Hsu. 2001. "Effect of Aquatic Weeds on Lakefront Property Values." Maine Water Conference. Augusta, Maine.
- Boyle, Kevin J. 2001. "Stated Preference Estimation of Hicksian Surplus Using Conjoint Analysis." Department of Economics. University of Colorado, Boulder, CO.
- Boyle, Kevin J. 2001. "Including Regulations and Angler Characteristics in RUM Models: Preliminary Thoughts and Estimates." Benefit Transfer workshop, North Carolina.
- Boyle, Kevin J. 2001. "Meta Analysis of Sport Fishing Values." Benefit Transfer workshop, North Carolina.
- Boyle, Kevin J. 2001. "A Comparison of Rank and Choice Data In Eliciting Stated Preferences: An Application to the Maquarie Marshes, NSW, AU," Department of Economics, University of Central, Orlando, Florida.
- Boyle, Kevin J. 2001. "Stated Preference Estimation of Hicksian Surplus Using Conjoint Analysis." Department of Economics. University of New Hampshire, Durham, New Hampshire.

- Paterson, Robert, and Kevin J. Boyle. 2001. "Out of Sight, Out of Mind? Using GIS to Incorporate Topography in Hedonic Property Value Models." Northeastern Agricultural and Resource Economics Association annual meetings, Bar Harbor, Maine.
- Scrogin, David, Kevin J. Boyle, Andrew Plantinga, and George Parsons. 2001. "Regulated Recreationists: Case and Angler Catch, Harvest and Destination Choice." Northeastern Agricultural and Resource Economics Association annual meetings, Bar Harbor, Maine.
- Paterson, Robert, Kevin J. Boyle, Mary Ahearn, Anna Alberini, John Bergstrom, Larry Libby, and Michael P. Welsh. 2001. "Attributes of Farmland in the Provision of Open Space: It is Not a Black and White Issue." Northeastern Agricultural and Resource Economics Association annual meetings, Bar Harbor, Maine.
- Boyle, Kevin J. 2001. "Stated Preference Estimation of Hicksian Surplus Using Conjoint Analysis." University of New Hampshire, Durham, NH.
- Boyle, Kevin J., and Thomas P. Holmes. 2001. "Anchoring in Conjoint Choice Experiments." Selected paper, European Association of Environmental and Resource Economists, Eleventh Annual Conference, South Hampton, England.
- Poor, P. Joan, and Kevin J. Boyle. 2000. "The Value of Publicly protected National Wildlife Refuges, Using A Hedonic property-Value Model." Annual meeting of the American Agricultural Economics Association, Tampa, Florida.
- Alberini, Anna, Kevin J. Boyle, and Michael P. Welsh. 2000. "Analysis of Contingent Valuation Data with Multiple Bids and Response Options Allowing Respondents to Express Uncertainty." Selected paper, European Association of Environmental and Resource Economists, Tenth Annual Conference, Crete, Greece.
- Poe, Gregory L., Kevin J. Boyle, and John C. Bergstrom. 2000. "A Meta Analysis of Contingent Values for Groundwater Quality in the United States." Selected paper, European Association of Environmental and Resource Economists, Tenth Annual Conference, Crete, Greece.
- Poor, P. Joan, and Kevin J. Boyle. 2000. "A Hedonic Property-Value Model of the Value of Open space Provided by the Great Meadows National Wildlife Refuge." Northeastern Agricultural and Resource Economics Association annual meeting, Rhode Island.
- Boyle, Kevin J., and Laura O. Taylor. 2000. "Estimating the Demand for Lake Water Quality with a Hedonic Property-Value Model: Objective versus Subjective Measures of Quality." Department of Economics, University of New Mexico.
- Boyle, Kevin J. 2000. "New Frontiers in Environmental Policy in the United States." Department of Environmental Protection, New South Wales, Australia.
- Boyle, Kevin J., and Laura O. Taylor. 2000. "Estimating the Demand for Lake Water Quality with a Hedonic Property-Value Model: Objective versus Subjective Measures of Quality." Department of Environmental Protection, New South Wales, Australia.
- Boyle, Kevin J., Thomas P. Holmes, Mario F. Teisl, and Brian Roe. 2000. "Assessing Public Preferences for Timber Harvesting Using Conjoint Analysis: A Comparison of Response Formats." Charles Stuart University, Bathurst, Australia.

- Boyle, Kevin J., Daniel Hellerstein, Richard C. Bishop, Michael P. Welsh, Mary Ahearn, Andrew Laughland, and John Charbonneau. 2000. "Tests of Scope in Contingent-Valuation Studies: Are the Numbers for the Birds?" Australian National University and the Australian Agricultural Economics Association, Canberra, Australia.
- Poor, P. Joan, Kevin J. Boyle, and Laura Taylor. 2000. "Objective Verses Subjective Measures of Environmental Quality in Hedonic Property-Value Models." Annual meeting of Regional Project W-133, Benefits and Costs Transfer in Natural Resources Planning, Kauai, Hawaii.
- Boyle, Kevin J., Thomas P. Holmes, Mario F. Teisl, and Brian Roe. 2000. "Assessing Public Preferences for Timber Harvesting Using Conjoint Analysis: A Comparison of Response Formats." Department of Agricultural and Resource Economics, Colorado State University, Fort Collins, CO.
- Boyle, Kevin J., Daniel Hellerstein, Richard C. Bishop, Michael P. Welsh, Mary Ahearn, Andrew Laughland, and John Charbonneau. 2000. "Tests of Scope in Contingent-Valuation Studies: Are the Numbers for the Birds?" Selected paper, Association of Environmental and Resource Economists' session on "Advances in Valuation Methods," Allied Social Science Meetings, Boston, MA.
- Alberini, Anna, Kevin J. Boyle, and Michael P. Welsh. 1999. "Analysis of Non-Market Valuation Data with Multiple Bids and Response Options that Allow Respondents to Indicate They Are Uncertain." Department of Agricultural and Resource Economics, Colorado State University, Fort Collins, CO.
- Boyle, Kevin J. 1999. "Estimating the Demand for Lake Water Quality with a Hedonic, Property-Value Model: Objective versus Subjective Measures of Quality." Department of Economics, University of Wyoming, Laramie, Wyoming.
- Taylor, Laura O., Kevin J. Boyle, and P. Joan Poor. 1999. "Subjective versus Objective Quality Measures in Hedonic Demand Models: Implication for Valuing Water Quality." Selected paper, annual meeting of the Southern Economic Association, New Orleans, LA.
- Holmes, Thomas P., and Kevin J. Boyle. 1999. "Response Bias in Conjoint Analysis." Selected paper, annual meeting of the Southern Economic Association, New Orleans, LA.
- Taylor, Laura O., Kevin J. Boyle, and P. Joan Poor. 1999. "Subjective versus Objective Quality Measures in Hedonic Demand Models: Implication for Valuing Water Quality." 7th Annual Triangle Camp Resources, Wilmington, NC.
- Boyle, Kevin J., P. Joan Poor, and Laura O. Taylor. 1999. "Estimating the Demand for Protecting Freshwater Lakes from Eutrophication." Invited paper, Association of Environmental and Resource Economics session on "Frontiers of Applications of Hedonics to Environmental Issues," annual meeting of the American Agricultural Economics Association. Nashville, TN.
- Poor, P. Joan, Kevin J. Boyle, and Laura O. Taylor. 1999. "Objective versus Subjective Measures of Environmental Quality in Hedonic Property Value Models." Selected paper, annual meeting of the Northeastern Agricultural and Resource Economics Association, Morgantown, WV.

- Boyle, Kevin J., Roy Bouchard, and Jennifer Schuetz. 1999. "Economic Values and Economic Impacts of Nonresidential Users of Maine's Lakes." 12th Annual National Conference Enhancing the States' Lake Management Programs, Chicago, Illinois.
- Boyle, Kevin J. 1999. "The Effect of Lake Water Clarity on Recreational Uses of Maine's Lakes." Annual New England Lakes Conference "Promoting Awareness & Action for our Lakes' Future," Auburn, Maine.
- Boyle, Kevin J., Thomas P. Holmes, Mario F. Teisl, and Brian Roe. 1999. "Assessing Public Preferences for Timber Harvesting Using Conjoint Analysis: A Comparison of Response Formats." Department of Agricultural and Resource Economics, University of Georgia.
- Boyle, Kevin J., Richard C. Bishop, Daniel Hellerstein, Michael P. Welsh, Mary C. Ahearn, Andrew Laughland, John Charbonneau, Raymond O'Connor, and Anna Alberini. 1999. "Tests of Scope in Contingent-Valuation Studies: Are the Numbers for the Birds?" Department of Economics, Georgia State University, Atlanta, GA.
- Boyle, Kevin. 1998. "Experimental Designs Affect Preference Measures." National Science Foundation Workshop on Alternatives to Traditional Contingent Valuation Techniques, Nashville, TN.
- Boyle, Kevin J. 1998. "Valuation of Ecosystems and Biological Diversity." The Nature Conservancy, International Leadership Council, Emerging Issues Forum, Charleston, SC.
- Yabe, Mitsuyasu, John C. Bergstrom, and Kevin J. Boyle. 1998. "Political Meaning of Contingent Valuation Estimates: Comparison of Economic Value Between Tax Reallocation and Special Tax." Annual meeting of the Society for Environmental Economics and Policy Studies, Tokyo, Japan.
- Boyle, Kevin J., Richard C. Bishop, Daniel Hellerstein, Michael P. Welsh, Mary C. Ahearn, Andrew Laughland, John Charbonneau, and Raymond O'Connor. 1998. "Tests of Scope in Contingent-Valuation Studies: Are the Numbers for the Birds?" World Congress of Environmental and Resource Economists, Venice, Italy.
- Boyle, Kevin J., Thomas P. Holmes, Mario F. Teisl, Brian Roe, Shelley Phillips, and Genevieve Pullis. 1998. "Assessing Public Preferences for Timber Harvesting Using Conjoint Analysis: A Comparison of Response Formats." World congress of Environmental Economists, Venice, Italy.
- Boyle, Kevin J., Thomas P. Holmes, Mario F. Teisl, Brian Roe, Shelley Phillips, and Genevieve Pullis. 1998. "Assessing Public Preferences for Timber Harvesting Using Conjoint Analysis." Annual meeting of the Northeastern Forest Economics Association, Fredericton, New Brunswick, Canada.
- Schuetz, Jennifer, and Kevin J. Boyle. 1998. "The Effects of Water Quality on Recreational Benefits of Maine's Great Ponds." Presented at Our New England Waters: Watershed Stewardship for the Next Millennium, Durham, New Hampshire. Hosted by the New Hampshire Lakes Lay Monitoring Program, New Hampshire Lakes Association and the New England Chapter of the North American Lake Management Society.
- Boyle, Kevin J. 1998. "Biodiversity, Valuation and Trade-Offs." Social Science Research Needs in Forestry: The Human Dimensions of Forest Management, Montreal, Canada. Sponsored by the Canadian Forest Service.

- Boyle, Kevin J., and Steven R. Lawson. 1998. "Hedonic Demand for Lake Water Clarity." Annual meeting of Regional Project W-133, Benefits and Costs Transfer in Natural Resources Planning, Colorado Springs, CO.
- Boyle, Kevin J., and Steven R. Lawson. 1998. "Hedonic Demand for Lake Water Clarity." Invited Alumni Lecture, Department of Agricultural Economics, University of Wisconsin.
- Boyle, Kevin J., Jennifer Schuetz, and Jeffrey S. Kahl. 1997. "Great Ponds Play an Integral Role in Maine's Economy." 17th International Symposium of the North American Lake Management Society, Houston, TX.
- Boyle, Kevin J. 1997. "Protecting Water Quality Makes Sense for Maine Businesses." Keynote address, Maine Water Conference, Augusta, ME. Hosted by the Water Research Institute, University of Maine.
- Bergstrom, John C., Kevin J. Boyle, and M. Yabe. 1997. "Comparison of Economic Value for Protecting Ground Water Quality in Maine and Georgia Using Tax Reallocation and Special Tax Payment Vehicles". Annual meeting of Regional Project W-133, Benefits and Costs Transfer in Natural Resources Planning.
- Alberini, Anna, Kevin J. Boyle, and M.P. Welsh. 1997. "Using Multiple-Bounded Questions to Incorporate Preference Uncertainty in Non-Market Valuation". Annual meeting of Regional Project W-133, Benefits and Costs Transfer in Natural Resources Planning.
- Boyle, Kevin J., Margaret Schneemann, V.K. Smith, and Donald Epp. 1997. "Meta Analysis of Response Rates to Contingent-Valuation Studies Conducted by Mail". Annual meeting of Regional Project W-133, Benefits and Costs Transfer in Natural Resources Planning.
- Boyle, Kevin J., Jennifer Schuetz, and J. Steve Kahl. 1997. "Great Ponds Play an Integral Role in Maine's Economy. National Conference on Enhancing the States' Lake Management Programs". U.S. Environmental Protection Agency and the Northeastern Illinois Planning Commission.
- Boyle, Kevin J., Jennifer Schuetz, and J. Steve Kahl. 1997. "Great Ponds Play an Integral Role in Maine's Economy. Maine Water Conference". Augusta, ME. Hosted by the Water Research Institute, University of Maine.
- Boyle, Kevin J., Jennifer Schuetz, and J. Steve Kahl. 1997. "Great Ponds Play an Integral Role in Maine's Economy". Our New England Waters Conference. Kingston, RI. Hosted by University of Rhode Island (URI) cooperative Extension Water Quality Programs; US EPA, New England Region; RI Department of Environmental Management; New England Chapter of the North American Lake Management Society; URI Department of Natural Resources.
- Boyle, Kevin J. 1996. "Valuing the Invaluable: Economic Values for Natural Resources." Invited plenary presentation, International Conference on Integrated Management and Sustainable Development in Coastal Zones, Rimouski, Quebec, Canada.
- James, Holly L., Kevin J. Boyle, Roy Bouchard, and Steven Lawson. 1996. "The Relationship Between Lake Water Quality and Property Values." Invited presentation, Bridging the Gulf of Maine: A Watershed of Watersheds, sponsored by the Collaboration of Community Foundations for the Gulf of Maine, Portland, ME.

- James, Holly L., Kevin J. Boyle, Roy Bouchard, and Steven Lawson. 1996. "The Relationship Between Lake Water Quality and Property Values." Invited presentation, New England Lake Conference, Ashland, MA.
- Boyle, Kevin J., Hugh F. MacDonald, Hsiang-tai Cheng, and Daniel W. McCollum. 1996. "Bid Design and Yea Saying in Single-Bounded, Dichotomous-Choice Questions." Selected paper, annual meeting of the Northeastern Agricultural and Resource Economics Association, Atlantic City, N.J.
- Boyle, Kevin J. 1996. "Water Quality and Property Values." Invited presentation, Maine Lakes Conference, Auburn, ME.
- Boyle, Kevin J., Hugh F. MacDonald, Hsiang-tai Cheng, and Daniel W. McCollum. 1996. "Bid Design and Yea Saying in Single-Bounded, Dichotomous-Choice Questions." Selected paper, annual meeting of Regional Project W-133 (Benefits and Costs in Natural Resources Planning), Jekyll Island, GA.
- James, Holly L., Kevin J. Boyle, Roy Bouchard, and Steven Lawson. 1995. "The Relationship Between Lake Water Quality and Property Values." Invited presentation, Fish River Lakes Water Quality Association Annual Conference, Sinclair, ME.
- James, Holly L., Kevin J. Boyle, and Roy Bouchard. 1995. "The Relationship Between Lake Water Quality and Property Values." Invited paper, North American Lake Society Annual Symposium, Toronto, Canada.
- Boyle, Kevin J., Holly L. James, and Roy Bouchard. 1995. "The Economic Value of Maine's Great Ponds." Invited paper, Maine Coalition of Lake Associations, Maine Lake Conference, Colby College, Waterville, Maine.
- James, Holly L., Kevin J. Boyle, and Roy Bouchard. 1995. "A Hedonic Property Value Study of Water Quality in Maine's Lakes." Selected paper, annual meeting of the Northeastern Agricultural and Resource Economics Association.
- MacDonald, Hugh F., and Kevin J. Boyle. 1995. "Zero Bidders and Payment Vehicles in Dichotomous-Choice, Contingent-Valuation Studies: A Bivariate Probit Analysis." Selected paper annual meeting of the Northeastern Agricultural and Resource Economics Association.
- James, Holly L., Kevin J. Boyle, and Roy Bouchard. 1995. "Measuring the Economic Benefits to Property Owners of Lake Water Quality Protection." Selected paper, annual conference of The Universities Council on Water Resources.
- Boyle, Kevin J. 1995. "Substitution Between Natural Spawning and Hatchery Stocking in the Value of Atlantic Salmon Fishing: Implications for Restoration Efforts." Invited paper, 22nd Annual Conference of the Water Resources Planning and Management Division, American Society of Civil Engineers.
- Bergstrom, John C., and Kevin J. Boyle. 1995. "How Do People Perceive Ground Water Resources and Problems? Recent Focus Group Results." Presentation, annual meeting of Regional Project W-133 (Benefits and Costs in Natural Resources Planning).

- Boyle, Kevin J., Gregory Poe, and John C. Bergstrom. 1995. "What We Know About Ground Water Valuation: Results and Implications from Contingent-Valuation Studies." Selected paper, annual meeting of Regional Project W-133 (Benefits and Costs in Natural Resources Planning).
- James, Holly L., Kevin J. Boyle, and Roy Bouchard. 1995. "The Effect of Lake Water Quality on Property Values." Keynote address, A National Conference on Enhancing the States' Lake Management Programs, U.S. Environmental Protection Agency and the Northeastern Illinois Planning Commission.
- Teisl, Mario F., Kevin J. Boyle, and Brian Roe. 1994. "Conflicts Between Atlantic Salmon Restoration and Recreational Angling." Invited paper, 1994 meeting of the American Fisheries Society.
- Boyle, Kevin J., Gregory Poe, and John C. Bergstrom. 1994. "What We Know About Ground Water Valuation: Results and Implications from Contingent-Valuation Studies." Invited paper, joint meetings of the Association of Environmental and Resource Economists and the American Agricultural Economics Association.
- Roe, Brian, Kevin J. Boyle, and Mario F. Teisl. 1994. "Deriving Compensating Variation from Conjoint Data Sets: A Theoretical Model and Empirical Issues." Submitted paper, annual meeting of the American Agricultural Economics Association.
- Boyle, Kevin J. 1994. "The Practical Implications of Accomplishing an Ideal Benefits Transfer with Limited Data Availability." Invited paper, Workshop on Valuation of Environmental Damages, Bialowieza, Poland.
- Boyle, Kevin J., V. Kerry Smith, and Donald Epp. 1994. "Do Contingent-Valuation Survey Response Rates Have a Story to Tell?" Selected paper, annual meeting of Regional Project W-133. (Benefits and Costs Transfer in Natural Resources Planning.)
- Boyle, Kevin J., F. Reed Johnson, Daniel W. McCollum, William H. Desvousges, Richard W. Dunford, and Sara P. Hudson. 1993. "Valuing Public Goods: Discrete Versus Continuous Contingent-Valuation Responses." Invited seminar, Department of Agricultural Economics, Colorado State University.
- Bergstrom, John C., and Kevin J. Boyle. 1993. "Benefit Transfer Case Study: Benefits of Groundwater Protection in Dougherty County, Georgia." Invited paper, annual meetings of the American Agricultural Economics Association July.
- Boyle, Kevin J. et al. "Valuing Public Goods: Discrete versus Continuous Contingent-Valuation Responses." Selected paper, annual meetings of the American Agricultural Economics Association, July 1993.
- Teisl, Mario, Kevin J. Boyle, Daniel W. McCollum, and Stephen D. Reiling. "Reliability of Dichotomous Choice Contingent Valuation: An Application of Full Panel Design." Selected paper, annual meeting of the Northeastern Agricultural and Resource Economics Association, June 1993.
- Boyle, Kevin J., and Alan G. Clark. "The Economic Value of Moose Hunting: Does Getting a Bull Significantly Increase Value?" Selected paper, 29th North American Moose Conference, May 1993.

- Boyle, Kevin J. "Review of Contingent-Valuation Studies of Groundwater Protection." Invited presentation, U.S. Environmental Protection Agency's Science Advisory Board, Environmental Economics Advisory Committee, April 1993.
- Boyle, Kevin J. "Are Economic Values Sensitive to Changes in Environmental Conditions?" Invited seminar, University of Quebec at Rimouski, April 1993.
- Boyle, Kevin J. et al. "Valuing Public Goods: Discrete versus Continuous Contingent-Valuation Responses." Selected paper, annual meeting of Regional Project W-133 (Benefits and Costs in Natural Resources Planning), March 1993.
- Boyle, Kevin J. "Freshwater Fish Consumption and Dioxin Rule Making for Maine Rivers." Seminar, Resource and Environmental Economics Program, Department of Economics, North Carolina State University, October 1992.
- Boyle, Kevin J. 1992. "Economic Research of Fish and Wildlife Resources." Invited paper, Maine Agricultural and Forest Experiment Station Research Conference, University of Maine.
- Boyle, Kevin J. "Total Valuation of Complex Ecosystems." Keynote address, Scandinavian Society of Forest Economics Workshop on "Valuing Biodiversity." Helsinki, Finland. October 1992.
- Boyle, Kevin J. "Benefits and Costs of Atlantic Salmon Restoration." Keynote address, Scandinavian Society of Forest Economics Workshop on "Valuing Biodiversity." Helsinki, Finland. October 1992.
- Boyle, Kevin J. "Natural Resource Damage Assessments and The Cambridge Economics Symposium on Nonuse Values." Invited seminar, joint with Alan Randall of Ohio State University, Stockholm School of Economics, Stockholm, Sweden. October 1992.
- Johnson, F. Reed, William H. Desvousges, Richard W. Dunford, Kevin J. Boyle, and Sara P. Hudson. "The Validity of Expressed Nonuse Values for Environmental Commodities." Invited paper, Annual meeting of the American Agricultural Economics Association and the Association of Environmental and Resource Economists, August 1992.
- Bergstrom, John C., and Kevin J. Boyle. "Benefit Transfer Case Study: Benefits of Groundwater Protection in Dougherty County, Georgia." AERE workshop on Benefit Transfer: Procedures, Problems and Research Needs, June 1992.
- Desvousges, William H., F. Reed Johnson, Richard W. Dunford, Kevin J. Boyle, Sara P. Hudson, and K. Nicole Wilson. "Measuring Natural Resource Damages with Contingent Valuation: Tests of Validity and Reliability." Cambridge Economics Symposium on Contingent Valuation: A Critical Assessment, April 1992.
- Boyle, Kevin J., Daniel McCollum, and Mario F. Teisl. 1992. "The Sign and Size of Option Value." Invited seminar, Resource and Environmental Economics Program, Department of Economics, North Carolina State University, March 1992.
- Boyle, Kevin J., Daniel McCollum, and Mario F. Teisl. 1992. "Empirical Evidence on the Sign and Size of Option Value." Invited paper, Thirty-First Annual Meeting of the Western Regional Science Association, February 1992.

- Boyle, Kevin J., and Marcia L. Phillips. "Contingent Valuation of Endangered Species: How Should Valuation Estimates be Interpreted?" Invited seminar, Department of Resource Economics, University of Rhode Island, November 1991.
- Boyle, Kevin J., Mario F. Teisl, and Stephen D. Reiling. "Managing Maine's Atlantic Salmon Resource: Qualitative and Economic Evaluations of Atlantic Salmon Fishing on the Penobscot River." Selected paper, Northeast Fish and Wildlife Conference, May 1991.
- Teisl, Mario F., Kevin J. Boyle, Stephen D. Reiling, and Owen Fenderson. "Angler Opinions Regarding the Allocation of Harvest Between Open Water Fishing and Ice Fishing." Selected paper, Northeast Fish and Wildlife Conference, May 1991.
- Boyle, Kevin J., Daniel W. McCollum, Mario F. Teisl, and Stephen D. Reiling. "Test-Retest Reliability of Contingent Values Using a Complete, Experimental Panel Design." Selected paper, annual meeting of Regional Project W-133 (Benefits and Costs in Natural Resources Planning), February 1991.
- Boyle, Kevin J., and Stephen D. Reiling. 1989. "Economic Benefits of Fishing, Hunting, and Wildlife-Associated Recreation." Invited seminar, Rocky Mountain Range and Forest Experiment Station, U.S. Forest Service, Fort Collins, CO.
- Reiling, Stephen D., Kevin J. Boyle, Hsiang-Tai Cheng, and Marcia L. Phillips. "Contingent Valuation of a Public Program to Control Black Flies." Selected paper, annual meeting of the Northeastern Agricultural and Resource Economics Association, June 1989.
- Boyle, Kevin J., Marcia L. Phillips, and Stephen D. Reiling. "Comprehensive Evaluation of a State's Fishing and Hunting Resources: A Case Study of Maine." Invited paper, annual meeting of the Western Forest Economists Association, May 1989.
- Boyle, Kevin J. "The Role of Property Rights in Creating Economic Incentives for Wildlife Management on Private Timberland." Invited paper, joint meeting of the New England Society of American Foresters, Maine Chapter of the Wildlife Society, and Atlantic International Chapter of the American Fisheries Society, March 1989.
- Bishop, Richard C., Curtis Brown, Michael P. Welsh, and Kevin J. Boyle. "Grand Canyon Recreation and Glen Canyon Dam Operations: An Economic Evaluation." Invited paper, Twenty-Eighth Annual Meeting of the Western Regional Science Association, February 1989.
- Boyle, Kevin J., Stephen D. Reiling, and Marcia L. Phillips. "Prices of Substitutes: Implicit vs. Explicit Assumptions in Contingent-Valuation Questions." Invited paper, annual meeting of Regional Project W-133, February 1989.
- Boyle, Kevin J. "Commodity Specification and the Framing of Contingent-Valuation Questions." Selected paper, annual meeting of the Northeastern Agricultural and Resource Economics Association, June 1988.
- Bishop, Richard C., Scott R. Milliman, Barry L. Johnson, and Kevin J. Boyle. "Economic Evaluation of Fishery Rehabilitation Projects: Theoretical Principles and a Case Study." Invited paper, The Second Symposium on Social Science in Resource Management, June 1988.

- Boyle, Kevin J., Michael P. Welsh, Richard C. Bishop, and Robert M. Baumgartner. "Contingent Valuation of Unexperienced Environmental Conditions." Invited paper, annual meeting of Regional Project W-133, January 1988.
- Boyle, Kevin J. 1987. "Economic Valuation of Endangered Species of Wildlife." Invited seminar, Unity College, Unity, ME.
- Boyle, Kevin J. 1987. "Welfare Measurements Using Contingent Valuation: A Comparison of Techniques." Invited presentation, Department of Agricultural Economics, Stillwater, OK.
- Boyle, Kevin J., Michael P. Welsh, Richard C. Bishop, and Robert M. Baumgartner. "Analyzing the Effects of Glen Canyon Dam Releases on Colorado River Recreation Using Scenarios of Unexperienced Flow Conditions." Selected paper, annual meeting of the American Agricultural Economics Association, August 1987.
- Boyle, Kevin J., and Richard C. Bishop. "The Economic Value of Endangered Species of Wildlife." Selected paper, 51st North American Wildlife and Natural Resources Conferences, March 1986.
- Bishop, Richard C., Kevin J. Boyle, and Michael P. Welsh. "Toward Total Valuation of Great Lakes Fishery Resources." Invited paper, Symposium on Social Assessment of Fishery Resources, September 1985. Conference sponsored by the Great Lakes Fishery Commission.
- Boyle, Kevin J., and Richard C. Bishop. "The Total Value of Wildlife: A Case Study Involving Endangered Species." Selected paper, annual meeting of the American Agricultural Economics Association, August 1985.
- Boyle, Kevin J., and Richard C. Bishop. "The Total Value of Wildlife Resources: Conceptual and Empirical Issues." Invited paper, Association of Environmental and Resource Economists Workshop on Recreational Demand Modeling, May 1985.
- Boyle, Kevin J., Richard C. Bishop, and Michael P. Welsh. "Testing for Starting Point Bias in the Iterative Bidding Format of Contingent Valuation Studies." Selected paper, annual meeting of the American Agricultural Economics Association, August 1984.
- Obermiller, Frederick W., and Kevin J. Boyle. "The Local Economic Effects of Wilderness Area Additions: Distributive Equity Implications." Discussion paper presented at the 1981 Western Forest Economists Meeting, May 1981.
- Boyle, Kevin J. "Subsidies to the New England Fishing Industry." In Harold J. Kyte and Wayne H. Meserve, "The Impact of Subsidies on Canadian-American Fisheries: An Obstacle to Joint Management." A paper presented at the Conference on Canadian-American Relations, April 1976.

DISCUSSANT:

Discussant, "Is an Ounce of Prevention Worth a Pound of Cure?" U.S. EPA NCER/NCEE Workshop, *Morbidity and Mortality: How Do We Value the Risk of Illness and Death*. Washington, DC, 2006.

Discussant, "Altruism and Environmental Risks to Health of Parents and Their Children." U.S. EPA NCER/NCEE Workshop, *Morbidity and Mortality: How Do We Value the Risk of Illness and Death*. Washington, DC, 2006.

Discussant, "A Bayesian Simultaneous Equation Approach to Anchoring Effects in Multiple Bounded Dichotomous Data," European Association of Environmental and Resource Economists, 12th Annual Conference, 2003.

Discussant, "Incentive Compatibility in Environmental Valuation: Some Positive Results," European Association of Environmental and Resource Economists, 12th Annual Conference, 2003.

Discussant, "Some Economics of Child Health and Environmental Tobacco Smoke," University of Central Florida/CentER International Conference on Environmental Economics and Policy, 2000.

Discussant, "On Overcoming Informational Deficiencies in Estimating Willingness to Pay Distributions," European Association of Environmental and Resource Economists, Tenth Annual Conference, 2000.

Discussant, "Contingent Valuation and International Applications," Annual Meeting of the American Agricultural Economics Association, 1998.

Discussant, "Environmental Valuation in the Federal Government: Current Activities and Future Research Needs." Allied Social Science Association meetings, 1996.

Discussant, "Role of Economics in Decisions About Endangered Species," Thirty-Third Annual Meeting of the Western Regional Science Association, February 1994.

Discussant, "Benefit Transfer Studies: Myths, Pragmatism and Idealism," Twenty-Ninth Annual Meeting of the Western Regional Science Association, February 1990.

TEACHING ACTIVITIES:

Advanced Environmental Economics, REP 471. (Spring 1987/88, Fall 01/02/03)

Senior Seminar, REP 489. (Spring 03)

Research Methods in Agricultural and Resource Economics, ARE 517.(Fall 1987/88/89/90/94/95/96/97/98)

Advanced Resource Economics, ARE 571. (Fall 1987/88/89/90/91/94/96/97/98, Spring 01/03/05)

Sophomore Seminar in Natural Resources, NRC 200. (Fall 1990/91/93)

Junior Seminar in Natural Resources, NRC 300. (Fall 1994/95/96)

Critical Issues in Natural Resources, NRC 489. (Fall 97/98/00)

Mathematical Economics Short Course. (Fall 1989)

MASTERS THESES SUPERVISED:

Reed, Scott. 2006. "Perception and Preference in Random Utility Models: An Applied Analysis of Lake Water Quality and Site Choice.

Ozdemir, Semra. 2003. "Convergent Validity of Conjoint Values for Farmland Conservation Easement Programs." Current position: Research Associate, Department of Resource Economics and Policy, University of Maine, Orono, ME. (The Norris Charles Clements Graduate Award for outstanding graduate student research, Maine Agricultural and Forest Experiment Station Research Council, 2003.)

Sargent-Michaud, Jessica. 2002. "Arsenic in Drinking Water and Public Opinion on Wildlife Management as Case Studies of Natural Resource Policy." Current position: Senior Research Associate, The Trust for Public Land

Paterson, Robert. 2001. "Nonmarket Valuation and Land Use: Two Essays." Current position: Principal, Industrial Economics, Cambridge, MA

Hsu, Tommy I. 2000. "A Hedonic Study of the Effects of Lake-Water Clarity and Aquatic Plants on Lakefront Property Prices in Vermont." Current position: Analyst, California Department of Transportation, Los Angeles, CA.

Pullis, Genevieve. 1998. "Public Perceptions of Forest Ecosystem Attributes and Economic Values for Small, Private Woodlots With and Without Alternative Timber Harvesting." Current position: Economist, Division of Federal Aid, U.S. Fish and Wildlife Service, Washington, DC.

Schuetz, Jennifer. 1998. "Economic Values and Impacts Associated with Access Users' Recreational Use of Maine's Great Ponds." Current position: Research Assistant, Department of Biology, University of New Mexico.

Harris, Brian. 1998. "Highlights from the 1996 Maine Ice Fishing Follow-Up Survey." (Nonthesis) Current position: Analyst, University of Kansas.

Phillips, Shelley. 1997. "Public Preferences for Timber Harvesting." (Nonthesis) Current position: Manager, MBNA, Belfast, ME.

Lawson, Steven R. 1997. "Estimating the Benefits of Water Quality in Maine's Lakes: A Hedonic Property Value Model." Current position: Assistant Professor, West Virginia University.

Schneemann, Margaret. 1997. "A Meta-Analysis of Response Rates to Contingent Valuation Studies Conducted by Mail." First position: Economist, Eastern Research Group, Lexington, MA.

James, Holly L.. 1995. "A Hedonic Property Value Study of Water Quality in Maine Lakes." First position: Economist, Triangle Economic Research, Durham, North Carolina. (Dow-Griffie Award for the best graduate student research, Maine Agricultural and Forest Experiment Station, 1994. Thesis nominated for the NEARA Best Masters Thesis award.)

Phillips, Marcia L.. 1994. "Understanding Users' and Wildlife Managers Perceptions of Wildlife Management." Current position: Economist, Kleinschmidt Associates, Pittsfield, Maine. (Thesis nominated for the NEARA Best Masters Thesis award.)

James E. Anderson. 1994. "Who Contributes to the Chickadee Checkoff?" First position: Policy Analyst, National Center for Food and Agricultural Policy, Washington, DC.

Ramona ElHamzoui. 1993. "Black Bear Hunting in Maine: Do Hunter Characteristics Affect Opinions Regarding hunting Regulations?" First position: Peace Corp Supervisor for Parks and Recreation, Morocco.

Deanna Potter. 1991. "Benefit-Cost Analysis for Wildlife Reintroductions." Current position: Assistant Extension Educator, University of Maine Cooperative Extension, Fort Kent, ME.

John V. Westra. 1991. "Net Revenue Maximizing Crop Rotations for Maine's Potato Farmers." Current position: Assistant Professor, Louisiana State University. (Thesis nominated for the NEARA Best Masters Thesis award.)

PH.D. DISSERTATIONS SUPERVISED:

Aziz, Sonia. 2006. "Valuation of Avoiding Arsenic in Drinking Water in Rural Bangladesh: An Averting Behavior Analysis."

POST-DOCTORAL:

Scrogin, David O. Project: Random utility modeling of sport fishing with varying regulations. 1999-00. Current position: Assistant Professor, Department of Economics, University of Central Florida.

Poor, P. Joan. Project: Hedonic modeling of the effects of National Wildlife Refuges on property prices in urban and rural areas. 1998-00. Current position: Assistant Professor, St. Mary's College, Maryland.

Roach, Brian. Project: Issues in the management of nongame wildlife. 1996-98. Current position: Research Assistant Professor, Tufts University.

EXHIBIT 2

SUMMARY OF ECONOMIC-BENEFIT CALCULATIONS

The Meta-analysis results are from:

Van Houtven, G., Powers, J., and S. Pattanayak, "Valuing Water Quality Improvements in the United States Using Meta-analysis: Is the Glass Half-Full or Half-Empty for National Policy Analysis?," *Resource and Energy Economics*, 29, 206-227 (2007).

The adjustment for potentially over-stated values is from:

Champ, P.A., and R.C. Bishop. "Donation Payment Mechanisms and Contingent Valuation: An empirical study of hypothetical bias." *Environmental and Resource Economics* 19, 383-402 (2001).

The procedures for calculating the water quality index are from:

McClelland, N.I., *Water Quality Index Application in the Kansas River Basin*. Prepared for the U.S. EPA- Region 7. EPA-907/9-74-001, 1974.

The percent of CAWS user value is from:

Croke, K., Fabian, R., and G. Brenniman. "Estimating the Value of Improved Water Quality in an Urban River System." *Journal of Environmental Systems* 16 (1) (1986-1987).

Benefit-Transfer Equation

Variable	Definition	Min	Mean	Max
<i>WTP2000</i>	Economic benefit for water quality change in 2000 dollars	\$4	\$83	\$336
<i>WQI₁₀CHANGE</i>	Water quality change on 10-point scale	1	3.39	8.9
<i>WQ_REC_USE</i>	Assigned 1 if study references recreational use of water	0	0.68	1
<i>WQI₁₀BASE</i>	Current water quality on 10-point scale	0.1	2.80	10
<i>INCOME2000</i>	Average household income in 2000 dollars	37.0	50.26	120.7
<i>PERCENT_USER</i>	Percent of sample that are water resource users	0	62.74	100
<i>PUBLISHED</i>	Assigned 1 if published in peer-reviewed book or journal	0	0.51	1
<i>RESPONSE_RATE</i>	Response rate for survey	14.0	58.02	86.6
<i>IN_PERSON</i>	Assigned 1 if in-person interviews	0	0.31	1
<i>STUDY_YR73</i>	Year survey was conducted less 1973	0	11.63	27

Assigned Variable Values for Benefit-Function Computation of Annual Economic Benefit per Household

Variable	Assigned Value	Comment
<i>WQI₁₀CHANGE</i>	0.7	Calculated from MWRD data
<i>WQ_REC_USE</i>	.68	Average across 18 existing studies
<i>WQI₁₀BASE</i>	6.1	Calculated from MWRD data
<i>INCOME2000</i>	62,488	Average household income for Cook County from 1999 U.S. Census
<i>PERCENT_USER</i>	10	Result of survey conducted by Croke, Fabian, Brenniman (1986)
<i>PUBLISHED</i>	1	Peer-reviewed results
<i>RESPONSE_RATE</i>	80	OMB benchmark
<i>IN_PERSON</i>	1	NOAA Blue Ribbon Panel recommendation
<i>STUDY_YR73</i>	27	2000 is year of most recent existing study
<i>CONSTANT</i>	1	By definition

Linear Benefit-Function Transfer Computations

Variable	(1) Variable Coefficient	(2) Assigned Value	(3) Product [(1) x (2)]
<i>WQI₁₀CHANGE</i>	4.44	0.7	3.11
<i>WQI₁₀CHANGE x WQ_REC_USE</i>	10.39	0.476	4.95
<i>WQI₁₀BASE</i>	1.93	6.1	11.77
<i>INCOME2000</i>	1.29	62.488	80.61
<i>PERCENT_USER</i>	0.55	10	5.50
<i>PUBLISHED</i>	58.94	1	58.94
<i>RESPONSE_RATE</i>	-1.32	80	-105.60
<i>IN_PERSON</i>	46.04	1	46.04
<i>STUDY_YR73</i>	-2.83	27	-76.41
<i>CONSTANT</i>	28.55	1	28.55
Annual Household Economic Benefit in 2000 Dollars [Column 3 Sum]:			\$57

Calculation of Over Statement Adjustment and Conversion to 2008 Dollars for the Economic Benefit/Household/Year

$$Benefit / HH / Year = (Overstatement Adjustment)(CPI2008 / CPI2007)(HHWTP\$2000)$$

$$Benefit / HH / Year_{linear\ restricted} = (2/3)(212.1/172.2)(57.46) = \$47$$

Aggregation to Cook County Population

$$AnnualBenefits = (Non - response Adjustment)(\# Cook County Households)(Benefit / HH / Year)$$

$$AnnualBenefits_{linear\ restricted} = (.8)(1,932,197)(47.42) = \$73\ million$$

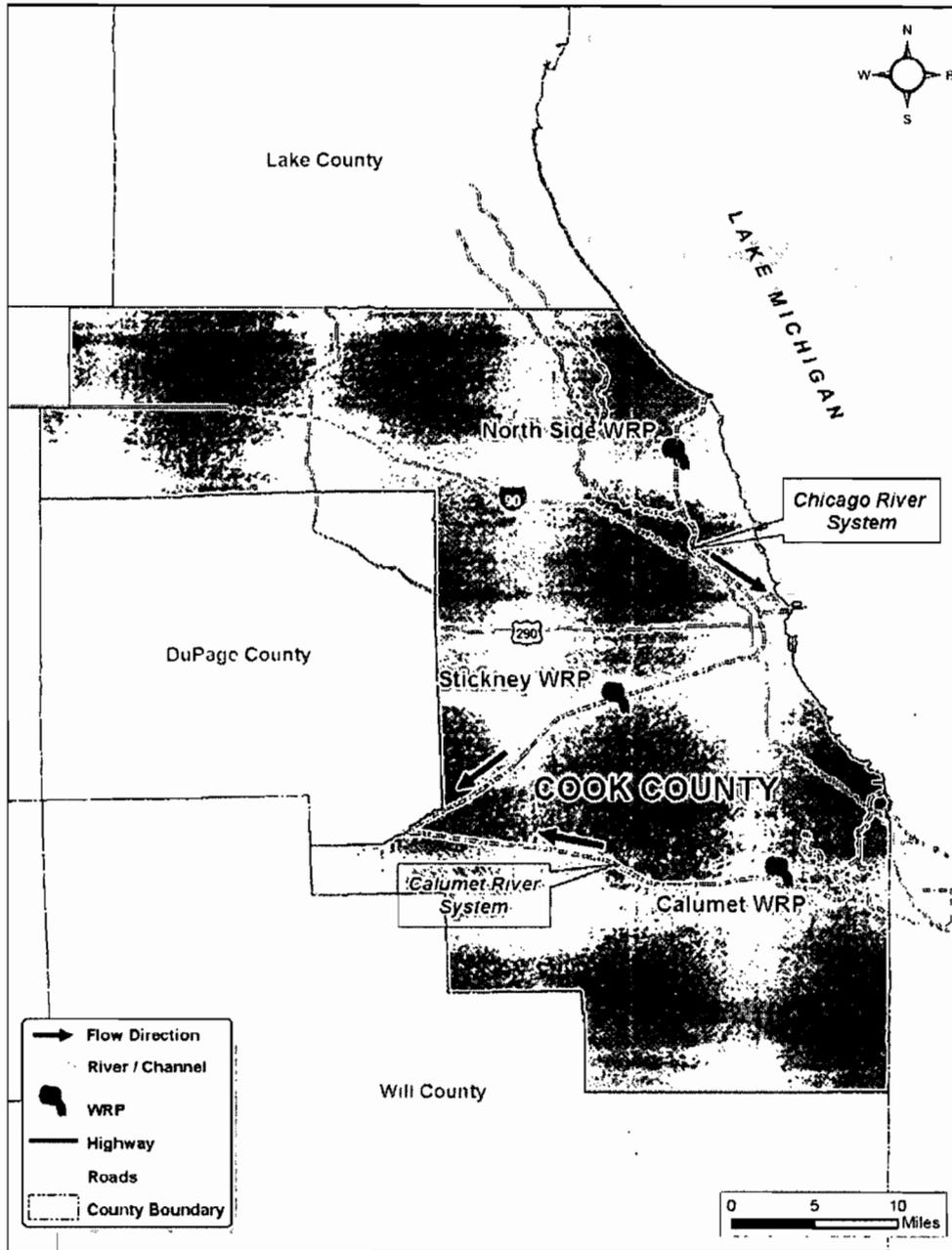
PV of Benefits over 20-year Time Horizon (2010-2029)

$$PV\ Benefits = \sum_{X=2010}^{2029} (AnnualBenefits) / ((1 + Interest\ Rate)^{(X - 2008)})$$

$$PV\ Benefits_{linear\ restricted} = \sum_{X=2010}^{2029} (\$73.3\ million) / ((1.03)^{(X - 2008)}) = \$1,058\ million$$

EXHIBIT 3

FIGURE 1



CERTIFICATE OF SERVICE

I, ANDREW ARMSTRONG, do certify that I filed electronically with the Office of the Clerk of the Illinois Pollution Control Board the foregoing Notice of Filing and Pre-filed Testimony of Kevin J. Boyle, Ph.D., on behalf of the People of the State of Illinois, and caused them to be served this 4th day of August, 2008 upon the persons listed on the attached Service List by depositing true and correct copies of same in an envelope, first class postage prepaid, with the United States Postal Service at 69 West Washington Street, Chicago, Illinois, unless otherwise noted on the Service List.


ANDREW ARMSTRONG