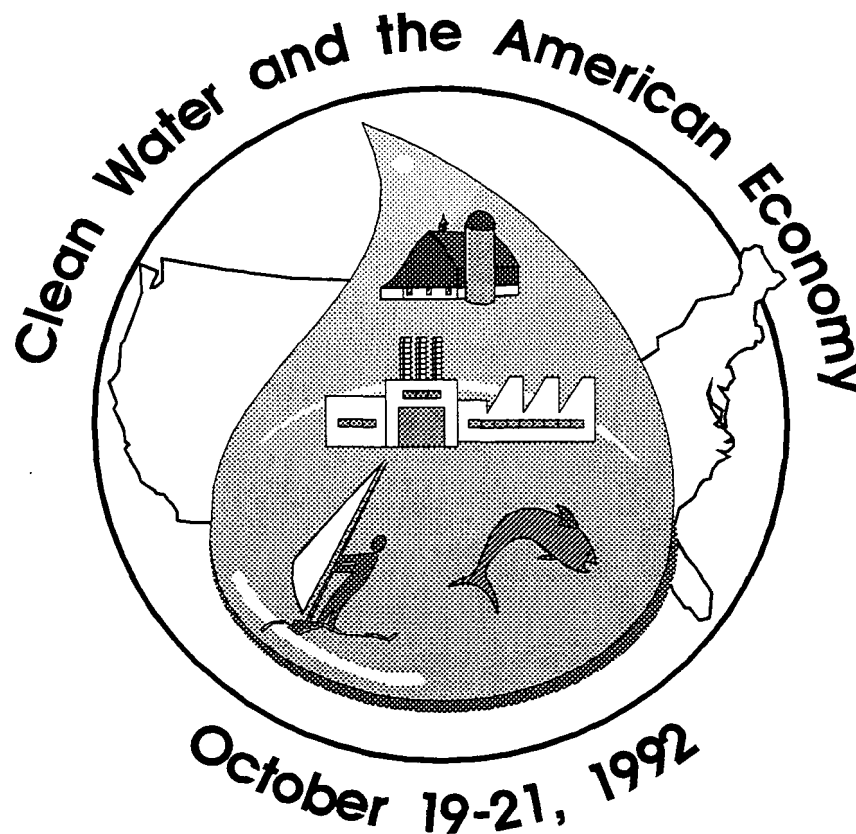


CLEAN WATER AND THE AMERICAN ECONOMY

October 19-21, 1992

**Stouffer Concourse Hotel
Arlington, Virginia**



**Sponsored by the Office of Water, U.S. Environmental Protection Agency
and Resources for the Future**

Agenda

Agenda At A Glance

MONDAY, October 19

8:00 a.m.
On-Site Registration

8:00-9:00 a.m.
Coffee and Danish

8:00-9:00 a.m.
Speakers' Meeting
(Monday Speakers Only)

9:00 a.m.
Conference Overview
Mark A. Lutner
U.S. EPA
Paul Portney
Resources for the Future

9:15 a.m.
Welcome Address
LaJuana S. Wilcher
Assistant Administrator
Office of Water, U.S. EPA

10:00-10:15 a.m.
Break

10:15 a.m.
Session 1: The Water
Infrastructure and Economic
Development

12:45 p.m.
Luncheon
Address by
Anne Meagher Northup
State Representative
Kentucky General Assembly

2:30 p.m.
Session 2: Balancing Water
Demand in Agriculture and
Other Economic Sectors

4:45 p.m.
Poster Session and Informal
Reception

6:00 p.m.
Dinner
Address by Fred Krupp
Executive Director
Environmental Defense Fund

TUESDAY, October 20

7:30-8:30 a.m.
Coffee and Danish

7:30-8:30 a.m.
Speakers' Meeting
(Tuesday Speakers Only)

8:30 a.m.
Session 3: Recreation and Tourism*

8:30 a.m.
Session 4: Commercial Fisheries*

10:15-10:30 a.m.
Break

10:30 a.m.
Session 5: Export Opportunities in
Water Technologies and Services

12:30 p.m.
Luncheon
Address by Donald H. DeMeuse,
Chairman and CEO,
Fort Howard Corporation

2:30 p.m.
Session 6: Pollution Prevention in
Water-Intensive Industries

Groundwater Valuation Program

8:30 a.m.
Session GW-1: Ground Water
Valuation Overview

9:15 a.m.
Session GW-2: Methods and Case
Studies - Recent Work

11:00-11:15 a.m.
Break

11:15 a.m.
Session GW-3: Policy and
Regulatory Considerations

12:30 p.m.
Luncheon
Address by Donald H. DeMeuse,
Chairman and CEO,
Fort Howard Corporation

2:30 p.m.
Session GW-3 (Continued)

3:45 p.m.
Session GW-4: Issues and Research
Needs in Valuing Ground Water

*concurrent session

WEDNESDAY, October 21

7:30-8:30 a.m.
Coffee and Danish

7:30-8:30 a.m.
Speakers' Meeting
(Wednesday Speakers Only)

8:30 a.m.
Session 7: Economic
Incentives—Future Role in
Clean Water Programs

10:15-10:30 a.m.
Break

10:30 a.m.
Session 8: Clean Water:
Worth the Cost?

12:30 p.m.
Luncheon
Address by F. Henry Habicht II,
Deputy Administrator, U.S. EPA

2:00 p.m.
Concluding Remarks
LaJuana S. Wilcher
Assistant Administrator
Office of Water, U.S. EPA

REGISTRATION

Sunday
6:00-8:00 p.m.

Monday-Tuesday
8:00 a.m.-5:30 p.m.

Wednesday
8:00 a.m.-12:00 noon



EPA recognizes the GWPC for
its help in supporting this
conference.

Monday, October 19, 1992

Abstract:

Water Infrastructure, Productivity, and Economic Development

This paper will survey recent work in the economics literature relating investment in infrastructure, in general, and in water and sewer infrastructure, in particular, to productivity and economic development. Water and sewer infrastructure is viewed as an input to firm production technologies which has the capability of increasing the productivity of labor and/or physical capital or, equivalently, of reducing firm costs of production. The paper will conclude with thoughts about appropriate directions for future research.

Gerry Dorfman

President

Dorfman Construction Company

Gerry Dorfman is the President of Dorfman Construction Company. He has been a Project Supervisor, Manager of Northwest Operations, and Vice-President/General Manager of Dorfman Construction Company.

Mr. Dorfman has served as a member of the Board of Directors and a Regional Vice-President of the National Utility Contractors Association. He currently chairs the Executive Committee, and serves on the Water/Sewer Funding Task Force, Government Relations Committee, and Safety Committee of the Association. Mr. Dorfman has a B.S. from the University of California, Los Angeles.

Abstract:

Daily, utility contractors across the country unearth decaying and failed sewer lines and domestic water systems. Out of sight and out of mind in the absence of crisis, our wastewater and drinking water infrastructure crumbles while the documented need for new facilities and increased maintenance skyrockets. Meanwhile, the construction companies that build clean water facilities operate with skeleton crews or simply close their doors, not because they are obsolete or inefficient, but because society is unwilling to increase its investment in necessary and expensive projects that pay dividends in the long run, as well as the immediate future. The problem is exacerbated by an ailing private-sector economy. The first part of this paper is comprised of short narratives that describe the state of our nation's clean water infrastructure through the eyes of contractors in the field. These eyes can see that our clean water infrastructure is in terrible condition. The second part of the paper includes real-world stories that illustrate the relationship between clean water capital investment and economic health. These stories demonstrate that investment in clean water infrastructure creates employment and strengthens the economy by increasing private-sector profitability, labor productivity, and private investment in plant and equipment.

Douglas B. MacDonald

Executive Director

Massachusetts Water Resources Authority

Douglas B. MacDonald is the Executive Director of the Massachusetts Water Resources Authority. Previously, Mr. MacDonald served as Interim General Counsel for the Authority, as Special Counsel for negotiating Clean Water Act permits with federal regulators, as General Counsel for the Massachusetts Port Authority, as a partner of the law firm of Palmer and Dodge; as an associate with Jenner and Brock; and as an employee of a variety of public-sector associations. He is a member of the New England Water Pollution Control Association and the American Water Works Association. Mr. MacDonald has a B.S. and a J.D. from Harvard Law School.

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Heather L. Ruth

President

Public Securities Association

Heather L. Ruth is currently the President of the Public Securities Association. Previously, she was the Executive Director of the New York City Municipal Assistance Corporation, a Senior Officer of Mathematical Policy Research, and the head of her own economic consulting firm. Ms. Ruth continues to serve as a private member of the Financial Control Board for the City of New York, and is active in other public affairs on a *pro bono* basis. She has a degree from Duke University, and an M.S. in Public Affairs from the Woodrow Wilson School at Princeton University.

William Stelle

Legal Counsel

Subcommittee on Fisheries, Wildlife Conservation, and the Environment

U.S. House of Representatives

William Stelle is Counsel to the Subcommittee on Fisheries, Wildlife Conservation, and the Environment of the U.S. House of Representatives. Previously, Mr. Stelle was Counsel to the Committee on Oversight of Government Management of the U.S. Senate, and was an Attorney/Advisor for EPA's Offices of Pesticides and Toxic Substances, and Planning and Management. He is a member of the Massachusetts, Maine, and Washington Bar Associations. He has been involved in the development of several major pieces of legislation dealing with water and pollution control. Mr. Stelle has a B.A. in Philosophy from Boston University, a J.D. from the University of Maine School of Law, and an LL.M. in natural resource law from the University of Washington School of Law.

Luncheon Address by Keynote Speaker—12:45 p.m.

Anne Meagher Northup

State Representative

Kentucky General Assembly

Anne Meagher Northup has been the State Representative of Jefferson County, Kentucky since 1987. She is a member of the Legislative Committee on Education and Transportation; the National Conference of State Legislators; the National Organization of Women Legislators; and the National Republican Legislative Conference. She is currently a member of EPA's Environmental Financial Advisory Board. Previously, Ms. Northup has served as a mathematics, economics, and computer programming teacher, and has worked for the Ford Motor Company. She has a B.A. in Economics and Business from Saint Mary's College.

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**Session 2: Balancing Water Demand in Agricultural and
Other Economic Sectors—2:30 p.m.**

MODERATOR:

Alan M. Fox

*Associate Assistant Administrator
Office of Water
U.S. Environmental Protection Agency*

Alan M. Fox is the Associate Assistant Administrator for the Office of Water of the U.S. Environmental Protection Agency. Previously, Mr. Fox was the Special Assistant to the Assistant Administrator for the Office of Water. In these positions, he has focused on coordination of Congressional relations, agricultural issues, wetlands policies, and privatization of environmental services. Mr. Fox was also the Executive Assistant to the Mayor of Cleveland, which involved overseeing health, safety, and service department activities, and was the Mayor's Deputy Campaign Manager in his U.S. Senate campaign.

Kenneth Cook

*Vice President
Center for Resource Economics*

Kenneth Cook is the Vice President for Policy at the Center for Resource Economics. Previously, Mr. Cook was Director of Congressional Affairs and Director of Press Relations for the World Wildlife Fund and The Conservation Foundation. He has also provided consulting services to clients such as: USDA, National Research Council, Office of Technology Assessment, Soil and Water Conservation Society, American Farmland Trust, National Audubon Society, Sierra Club, Institute for Alternative Agriculture, and Roosevelt Center for American Policy Studies. He has authored numerous articles on policy matters. Mr. Cook has a B.S. in Agriculture, a B.A. in History, and an M.S. in Soil Science from the University of Missouri, Columbia.

Kenneth D. Frederick

*Senior Fellow
Resources for the Future*

Kenneth D. Frederick is a Senior Fellow at Resources for the Future. He has been a member of the research staff since 1971 and served as the Director of the Renewable Resources Division from 1977 to 1988. Dr. Frederick was an Economic Advisor in Brazil for the U.S. Agency for International Development, and an Assistant Professor of Economics at the California Institute of Technology. He is a member of the Water Science and Technology Board of the National Research Council. Dr. Frederick has a B.A. from Amherst College, and a Ph.D. in Economics from the Massachusetts Institute of Technology.

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Abstract:

Irrigation Under Increasing Water Scarcity and Growing Environmental Concerns

Encouraged by the availability of inexpensive water, federal subsidies, and lax environmental standards, more than 20 million hectares had come under irrigation by the late 1970s. More recently, the area irrigated has declined as a consequence of the increasing competition for scarce water supplies, declining ground water tables, rising costs of developing new supplies, and increasing values placed on protecting instream flows and water quality. The future depends on the farmer's ability to adjust from an environment where growth was based on expanding the use of water to one where success depends on increasing the returns to water in environmentally-benign ways. As ground water stocks decline and some water is transferred to other uses, just maintaining former production levels requires improving irrigation efficiencies and increasing the value of the output produced per unit of water. Market forces can introduce incentives to develop and adopt water-saving and yield-increasing technologies and to allocate water to high-value crops. And the complementarity between irrigation practices that conserve water and those that reduce the resulting environmental damage suggests that future irrigation development can be compatible with improved water quality and instream flow.

John K. Hosemann

Chief Economist

American Farm Bureau Federation

John K. Hosemann is the Chief Economist and Director of Economic Research at the American Farm Bureau Federation. Previously, Mr. Hosemann worked in transportation market research for a major Chicago corporation. He is a member of the National Association of Business Economists, the International Association of Agricultural Economists, and the American Agricultural Economics Association, and he was President of the Chicago Agricultural Economists Club. Mr. Hosemann has an M.S. in Agricultural Economics with a minor in Business Economics from Mississippi State University.

Abstract:

Economic Issues for Farmers in the Rewrite of the Clean Water Act

This paper discusses the central economic issues farmers and ranchers will face in the reauthorization of the Clean Water Act. Given the wide variation among farm types, farm regions, farm cultural practices and weather, generalized rules and centralized controls for dealing with nonpoint source contamination are likely to be very costly and produce limited real environmental gains for the money spent. The paper discusses the distribution of the cost of solutions of nonpoint source contamination and the implications of these costs burdens for the family farm competitive structure, U.S. farmer international competitiveness, farm income and asset values, rural development, and the impact on new entrants. A lack of farm-level data on nonpoint source contamination is a major obstacle to evolving real solutions to real nonpoint source agricultural problems if and where these do exist. The conflicting farm and nonfarm economic and environmental interests and the lack of farm-level scientific data on nonpoint source contamination makes a case for bold new approaches to marry the incentives of private ownership and the efficiency of private resource management with the discipline of the market to solve nonpoint source problems where they do exist.

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Katherine Reichelderfer

*Associate Administrator
Economic Research Service
U.S. Department of Agriculture*

Katherine Reichelderfer is the Associate Administrator of the USDA's Economic Research Service. She has held various positions with the USDA, including: Economic Researcher, Chief of the Agency's former Western Hemisphere Branch, and Associate Director of the Agency's Resources and Technology Division. Previously, she was a Senior Fellow with the National Center for Food and Agriculture Policy at Resources for the Future. Dr. Reichelderfer is an elected Director of the American Agricultural Economics Association. She has a B.S. in Biological Sciences, and an M.S. and a Ph.D. in Agricultural and Resource Economics from the University of Maryland.

Abstract:

Voluntary, Incentive-Based Strategies for Agriculturally-Related Water Quality

Traditionally, federal policy aimed at reducing potential, nonpoint agricultural-source contributions to water quality problems has relied upon the use of positive incentives to induce voluntary behavioral change by agricultural producers. Such incentives, mainly direct financial subsidies and provision of technical assistance for change in agricultural practices, have had a variable record of success in achieving environmental quality goals. Analysis suggests the success of voluntary, incentive-based strategies for agriculturally-related water quality is dependant upon the degree to which general economic and market conditions, site-specific aspects of the problem, and coincentives or counterincentives offered by state and local legislation or programs are used to calibrate monetary incentives' levels. Evidence is provided by the USDA's Conservation Reserve Program, the environmental benefits and cost-effectiveness of which were enhanced by making the program's land rental incentive payment rates a function of both market rates and site-specific soil and water characteristics. Further evidence arises from findings that participation in environmentally-beneficial agricultural conservation programs is influenced by how incentive rates relate to prevailing interest and inflation rates. A primary practical implication is that voluntary, incentive-based programs can consciously be designed for maximum effectiveness as alternatives to command-and-control regulation.

Poster Session and Informal Reception—4:45 p.m.

Dinner Address by Keynote Speaker—6:00 p.m.

Fred Krupp

*Executive Director
Environmental Defense Fund*

Fred Krupp is the Executive Director of the Environmental Defense Fund. Previously, he worked for a private law firm in New Haven, and in 1978 he helped found the Connecticut Fund for the Environment, for which he served as General Counsel. He is currently a member of President Bush's Commission on Environmental Quality and Governor Cuomo's Environmental Advisory Board, and serves on the boards of the Recycling Advisory Council, Resources for the Future, and the Connecticut Fund for the Environment. Mr. Krupp is a graduate of Yale, with a J.D. from the University of Michigan.

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Session GW-1: Ground Water Valuation Overview—8:30 a.m.

James R. Elder

Director

*Office of Ground Water and Drinking Water
U.S. Environmental Protection Agency*

James R. Elder is the Director of EPA's Office of Ground Water and Drinking Water. Previously, Mr. Elder was the Deputy Director, and Director, of EPA's Office of Water Enforcement and Permits; the Acting Deputy Regional Administrator of EPA Region X; the Deputy Director of EPA's Office of International Activities; and worked for the Potomac Electric Power Company under the President's Executive Exchange Program. He was also Director of the Management Division of EPA Region III and was a Management Analyst for EPA Headquarters and the Office of Management and Budget. Mr. Elder has a B.A. degree from Johns Hopkins University.

Abstract:

Perspective on Ground Water Value

Fifty percent of the nation's population rely on ground water for drinking water. Forty percent of average annual streamflow in the United States is baseflow maintained by ground water discharge. While ground water supplies many uses in addition to drinking water, it also has ecological value, such as maintained streamflow for wildlife. Ground water value will impact significantly on EPA's regulatory process. As EPA moves ahead with its Comprehensive State Ground Water Protection Program, valuing ground water, even in non-monetary terms, will be critical to states' decisions for protecting this vast resource. This conference will provide EPA with expert views and perspectives on issues and research related to ground water value that it should consider in its regulatory and non-regulatory programs.

V. Kerry Smith

*Department of Economics
North Carolina State University*

V. Kerry Smith is a professor of Resource and Environmental Economics and Econometrics at North Carolina State University. Previously, Dr. Smith has been the President of the Southern Economic Association and the Association of Environmental and Resource Economists, and a University Fellow for the Quality of the Environment Division at Resources for the Future. He has served as an advisor to a number of private and public agencies, including: EPA, the Department of Justice, the National Academy of Sciences, the Gas Research Institute, the Department of Energy's Oak Ridge National Laboratories, and Woods Hole Oceanographic Institute. Dr. Smith is an active member in a number of professional groups, is an editor for various journals relating to economics and risk, and has authored several publications in his field. Dr. Smith has a Ph.D. in Economics from Rutgers University.

Abstract:

Valuing Ground Water Resources: A Conceptual Overview

Ground water resources have economic value because people are willing to pay for the services they provide. This paper outlines a general framework for deriving measures of these values. After describing how the

Day 1

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Conference Overview—9:00 a.m.

Mark A. Luttner

*Special Assistant
Office of Water
U.S. Environmental Protection Agency*

Mark A. Luttner is a Special Assistant to the Assistant Administrator for Water at EPA. Mr. Luttner has been an Economist and a Supervisor for EPA in the Office of Pesticide Programs, the Office of Toxic Substances, and the Office of Water. He is the Executive Director of EPA's Pulp and Paper Cluster. Previously, Mr. Luttner worked for the Ralston Purina Company. He has a B.S. and an M.S. in Economics from Ohio State University.

Paul Portney

*Vice President
Resources for the Future*

Paul Portney, Vice President and Senior Fellow at Resources for the Future, is a Visiting Lecturer at Princeton University's Woodrow Wilson School of Public and International Affairs, and is a member of the National Oceanographic and Atmospheric Administration's Panel on Contingent Valuation. Previously, he served as the Director of the Princeton Risk Management Center, and its Quality of the Environment Division; as a Visiting Professor at the Graduate School of Public Policy at the University of California at Berkeley; as a member of the Board on Environmental Studies and Toxicology at the National Academy of Sciences; and as Chief Economist for the Council on Environmental Quality. Dr. Portney has been a consultant to EPA, DOI, OECD, private organizations, trade associations, and environmental groups. He has a Ph.D. in Economics from Northwestern University.

Welcome Address—9:15 a.m.

LaJuana S. Wilcher

*Assistant Administrator
Office of Water
U.S. Environmental Protection Agency*

LaJuana Wilcher is EPA's Assistant Administrator for the Office of Water. Under Ms. Wilcher's stewardship, the Office of Water has intensified its watershed management efforts; built administration support for providing nonpoint source pollution grants to states; developed a Memorandum of Agreement with the U.S. Army Corps of Engineers on mitigation requirements for development projects in wetlands; promulgated regulations to initiate the permitting of stormwater discharges; and launched a major outreach effort to accelerate drinking water enforcement and compliance activities. Previously, Ms. Wilcher was a partner in a D.C. law firm; a Special Assistant to the General Counsel and an Assistant to the Deputy Administrator at EPA; a Special Assistant to the

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General Counsel at the USDA; a litigation attorney; and a naturalist/interpreter at Mammoth Cave National Park. Ms. Wilcher has a B.S. in Biology from Western Kentucky University, and a J.D. from the Salmon P. Chase College of Law at Northern Kentucky University.

Break
10:00-10:15 a.m.

**Session 1: The Water Infrastructure and
Economic Development—10:15 a.m.**

MODERATOR:

Michael B. Cook

Director, Office of Wastewater Enforcement and Compliance
Office of Water
U.S. Environmental Protection Agency

Michael B. Cook is the Director of the Office of Wastewater Enforcement and Compliance at the U.S. Environmental Protection Agency. Previously, Mr. Cook served in the counterinsurgency program in Vietnam, was a Consul with the Foreign Service in Northeast Thailand, and worked for HUD in the Model Cities Program. His work at EPA has included planning of Municipal Treatment Works, managing EPA's Emergency Response program, directing the Office of Solid Waste, and directing the Office of Drinking Water. He has received numerous awards while in government service, including the Distinguished Executive Award from President Reagan. Mr. Cook received his education at Swarthmore College, Princeton University, and Oxford University.

David A. Aschauer

Professor of Economics
Bates College

David A. Aschauer currently holds the positions of Elmer W. Campbell Professor of Economics, Bates College, and Director of Productivity Studies, Apogee Research. He has served on the graduate faculties of economics and business of the University of Michigan, Northwestern University, the University of Chicago, and DePaul University. He was the Senior Economist at the Federal Reserve Bank of Chicago. In May 1992, he was appointed to the Public Infrastructure Subcouncil of the Competitiveness Policy Council. Currently, he is a member of two Transportation Research Board Panels, the Anthony Commission on Public Finance of the U.S. House of Representatives, and the Board of Governors of the Infrastructure Institute. Dr. Aschauer received a doctorate in Economics from the University of Rochester in 1983.

Day 2

Tuesday, October 20, 1992

Session 3: Recreation and Tourism—8:30 a.m.
(Concurrent with Session 4)

MODERATOR:

David G. Davis

Deputy Director

Office of Wetlands, Oceans, and Watersheds

Office of Water

U.S. Environmental Protection Agency

David G. Davis is Deputy Director of the Office of Wetlands, Oceans, and Watersheds at the U.S. Environmental Protection Agency. He has been Deputy Director of EPA's Office of Federal Activities; Director of the EPA Sludge Management Task Force; a Captain in the U.S. Air Force; and has held positions in the EPA Offices of Planning and Evaluation, and Water Planning and Standards. Mr. Davis has a B.S. and an M.S. in Microbiology from the University of Illinois, and an M.B.A. from Harvard Business School.

Charles F. Gauvin

Executive Director

Trout Unlimited

Charles F. Gauvin is currently the Executive Director of Trout Unlimited. Previously, he has served as a Legislative Coordinator of the Rhode Island Statewide Planning Program; a Teaching Assistant at Brown University; a Summer Associate at Goodwin, Proctor, and Hoar; an Associate with Pierce, Atwood, Scribner, Allen, Smith, and Lancaster; and an Associate with Beveridge and Diamond, P.C. Mr. Gauvin has an A.B. from Brown University, and a J.D. from the University of Pennsylvania.

Abstract:

Although its mission primarily focuses on coldwater fishery ecology and genetics, recreational fishing represents an important area of common ground among Trout Unlimited's members. Several potential issues in the Clean Water Act's reauthorization are of direct and immediate interest to TU's conservation mission and recreational fishing in the United States: (1) Instream Flows - Whether Congress will direct EPA and the states to begin addressing the flows that coldwater and other fish species need for the rearing, incubation, migration, and spawning phases of their life cycles; (2) Non-Point Sources - Whether Congress and the states will begin to address this most pervasive source of water pollution and fish habitat destruction; (3) Wetlands - Whether Congress will act to strengthen protection for the riparian areas that are critical to the integrity of much of North America's fish habitat; and (4) Biological Assessments - Whether Congress will approve and encourage EPA's efforts to use biological criteria as a basis for assessing the effects of and controlling pollutant loadings.

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Mary Jo Kealy

Senior Economist

Office of Policy, Planning, and Evaluation

U.S. Environmental Protection Agency

Mary Jo Kealy is a Senior Economist for the U.S. Environmental Protection Agency. Previously, Ms. Kealy has held the positions of Adjunct Professor of the Public Policy Program at Georgetown University, Associate and Assistant Professor of Economics at Colgate University, and Visiting Assistant Professor of Economics at the University of Wisconsin at Madison. Ms. Kealy is the Associate Editor for the *Journal of Environmental Economics and Management*; an EPA representative on the AERE Workshop and the National Recreational Survey Committees; a member of the EPA workgroups on Ecosystem Valuation, and Assessing the Aggregate Benefits of Water Quality Improvements; and a Reviewer for the Federal Trustees and for the USDA Resource Planning Act Assessment. Ms. Kealy is a member of the American Agricultural Economics Association, and the Association of Environmental and Resource Economists. She has a B.S. from the University of Delaware, and an M.S. and a Ph.D. from the University of Wisconsin at Madison.

Abstract:

Clean Water and Recreational Use Support: Has the Clean Water Act Made a Difference?

The nation's lakes, rivers, and ocean waters are frequented by Americans at leisure. When surveyed, citizens over 12 report annual participation rates of 76% in swimming, 59% in fishing, and 27% in motorboating, for example. Others simply enjoy viewing aesthetically-pleasing watersites. The language of the Clean Water Act (CWA) reflects the importance that Americans place on water-based recreation by expressing goals in terms of recreation use support. We attempt to demonstrate, albeit crudely, that the CWA has been good for recreation, and that there is still room for improvement. Values for three pollutants, Biochemical Oxygen Demand, Total Suspended Solids, and Fecal Coliform, are used as indicators of use support both with and without the CWA. Model results attribute substantial gains in use support to the CWA. However, model simulations suggest that further reductions in discharges by point sources would do relatively little to improve the quality of the nation's waters. In contrast, reductions in nonpoint sources could produce improvements that surpass past water quality achievements! These results paired with a survey of the nation's households advise using cost-effective means for attaining incremental improvements in national water quality.

W. Douglass Shaw

Senior Economist

RCG/Hagler, Bailly, Inc.

W. Douglass Shaw is an Environmental Economist with expertise in the areas of recreation demand modeling, benefits estimation, and water resource economics. He has consulted for the U.S. Environmental Protection Agency, the Montana State Department of Health and Environmental Services, the New Jersey Department of Environmental Protection, the Delaware Department of Natural Resources and Environmental Control, the U.S. National Park Service, and the National Oceanic and Atmospheric Administration. He has published numerous articles on outdoor recreation and the recreation-related benefits from water quality improvement and on the allocation of water resources in the West. Prior to joining RCG/Hagler, Bailly, Inc., Dr. Shaw served as a faculty member at Vassar College, Williams College, and the University of Colorado, where he taught environmental and natural resource economics, statistics, and econometrics. He received his Ph.D. in Economics from the University of Colorado in 1985.

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Abstract:

Recreation and Tourism in the Context of the Value of Clean Water: An Economist's Perspective

An economist's perspective of the value of clean water is probably different from the vantage point of just about everyone else. Although "recreational" values often dominate economic analyses of the benefits of water quality improvements, the concepts and values underlying those benefits are quite distinct from how non-economists may view them. In this paper, a brief overview is provided of the manner in which traditional economics recognizes the recreational value of clean water, and on how this conception of value may differ from the perspective of other professionals and the public at large. For example, regional planners and local officials often cite increased tourism and the related expenditures of visiting recreators as clean water benefits—providing economic stimulation in the form of jobs, income, and tax receipts. In contrast, standard economic theory focuses on the more obtuse notion of the increased "consumer surplus" enjoyed by those individuals whose recreational activity is enhanced. In this paper, the merits of both views are described, and empirical estimates are provided to indicate the potential magnitude of the recreation-related values associated with clean water.

R. Lawrence Swanson

Director

Waste Management Institute

Marine Sciences Research Center

State University of New York—Stony Brook

R. Lawrence Swanson is the Director of the Waste Management Institute in the Marine Sciences Research Center of the State University of New York. He has served in the National Oceanic and Atmospheric Administration as Project Manager of the Marine Ecosystems Analysis Programs for the New York Bight, as the Director of the Office of Marine Pollution Assessment, and as the Executive Director of the Office of Oceanic and Atmospheric Research. Dr. Swanson has a B.S. in Civil Engineering from Lehigh University and an M.S. and a Ph.D. in Physical Oceanography from Oregon State University.

Abstract:

The Costs of Marine Debris Wash-Ups On New York and New Jersey Beaches

The New York Bight is perhaps one of the most used and abused coastal areas in the world as a consequence of urbanization and the disposal of the waste of some 20 million people who reside by its shores and surrounding bays and estuaries. A variety of sources contaminate these coastal waters. Many of the stresses of excess population and industrialization as measured by pollutant loadings and ecosystem impacts can be crudely quantified in terms of use impairments—use impairments that have measurable social and economic relevance. Beach closures caused by floatable marine debris are a category of impairment that has caused significant economic losses. We have examined beach closures and how the public has avoided beaches at New York and New Jersey ocean beaches following the major floatable wash-ups of 1987 and 1988. Our measures were losses of user days and total expenditures. The methodologies used are not standard nor totally quantifiable. However, during years of major wash-ups, the losses to local economies for both states can be measured in billions of dollars. Corrective measures, while expensive, are necessary if area beaches are to continue to be a significant part of the tourist economies.

Tuesday, October 20, 1992

Session 4: Commercial Fisheries—8:30 a.m.
(Concurrent with Session 3)

MODERATOR:

Tudor T. Davies

Director

Office of Science and Technology

Office of Water

U.S. Environmental Protection Agency

Tudor T. Davies is the Director of the Office of Science and Technology of the U.S. Environmental Protection Agency. He has served as Director of the Office of Marine and Estuarine Protection, and as Director of the Office of Program Management Operations in the Office of Water, and has worked for the EPA Office of Research and Development. Dr. Davies has also served as the Deputy Laboratory Director of the Gulf Breeze Environmental Research Laboratory, the Director of the Narragansett Environmental Research Laboratory, and the Director of the EPA Chesapeake Bay Program. He has a B.S. in Geology, and received his doctorate in Geology from the University of Wales in Swansea. Dr. Davies was a Postdoctoral Fellow at Dalhousie University in Canada and an Associate Professor of Geology at the University of South Carolina.

Carlos Fetteroff

Executive Director

Great Lakes Fishery Commission

Carlos Fetteroff is currently the President of the American Fisheries Society. He has served as Science Coordinator for the National Academy of Science; Executive Secretary of the Canada-United States Great Lakes Fishery Commission; Chief Environmental Scientist for the state of Michigan; and President of the North American Benthological Society and the International Association for Greater Lakes Research. Mr. Fetteroff received a B.S. in Wildlife Management and Zoology from the University of Connecticut and his M.S. in Fisheries Biology from Michigan State University.

Abstract:

Water Quality and Great Lakes Fisheries

The world renowned fisheries of the Laurentian Great Lakes were devastated in the 1940s by a combination of overfishing and predation by sea lamprey, an invader from the Atlantic. Since the mid 1960s, the fisheries have been rebuilt. In 1988 the recreational fishery supported some 37,500-75,000 worker years and has an annual regional economic impact of between \$2 and \$4 billion. The fishery provided between 27 and 55 million angler days of recreation. The commercial fishery had total regional economic activity of \$270 million and provided some 9,000 worker years of employment. One hundred one million pounds of fish were commercially harvested. The current value and level of activity are signs that the fishery and environmental management and research programs of the eight Great Lakes states, the two tribal authorities, the Province of Ontario, the U.S. and Canadian federal governments, the Fishery Commission, and its partner commissions have been effective in

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rehabilitating the distressed ecosystems of the Great Lakes to a point. Much of the fishery management success to date has been bioengineered through sea lamprey control, artificial replenishment of native species by stocking, introduction of Pacific salmon, water quality and habitat improvement, and application of knowledgeable regulations controlling harvest. A Commission goal for the development and maintenance of sustainable fish communities support by natural reproduction is not yet attainable. Managers are handicapped by a variety of factors, including contaminants in fish; insufficient natural reproduction by some species; loss of habitat quality and a continuing loss of habitat quantity; undesirable fish community structure in several areas; extinction of some species; loss of genetic strains; inadequate control of harvest in some situations; changing forage bases; and diseases in both hatcheries and the wild.

Richard E. Marks

*Government Relations Representative
National Fisheries Institute, Inc.*

Richard E. Marks is the East Coast Government Relations Representative for the National Fisheries Institute, Inc. He has worked for the National Marine Fisheries Service as a Fishery Reporting Specialist and as a Benthic Technician. Mr. Marks also has experience in the food service industry as a Purchasing/Production Manager for the Marriott Corporation. He has an M.S. in Marine Environmental Science with an emphasis in Coastal Fish Ecology from Stony Brook University.

Abstract:

Clean Water: The Seafood Connection

People depend on the living resources of the oceans for a basic human need—food. For example, 90 million metric tons of fish and shellfish are being harvested annually on a global scale; 60% of the world's people receive more than 40% of their annual protein from fish; U.S. consumers pay in excess of \$26 billion for fish and fish products each year. Regardless of the numbers, it suffices to say products from the sea constitute significant economic benefit, but more important is the benefit as food. People have a need to eat. Fish harvest, as opposed to production of animals or crops, does not contribute to water or air pollution. Therefore, sustaining food from the sea is an important goal, and a healthy environment is a necessity. Chemical contamination and eutrophication threaten the productivity and usability of the resources. Inconsistent standards and risk assessments do nothing to focus our research needs. Unregulated point discharge and nonpoint additions are jeopardizing our coastal zones and inland lakes. A healthy, productive ocean environment is essential not only for the world's fishing industries, but for society as a whole. Because the oceans are shared among many nations, efforts to protect marine ecosystems require concerted international attention.

Andrew A. Rosenberg

*Senior Scientist
National Marine Fisheries Service*

Andrew A. Rosenberg works for the Office of the Senior Scientist of the National Marine Fisheries Service. Previously, Dr. Rosenberg was the Deputy Director of the Renewable Resources Assessment Group at Imperial College in London. He has a B.S. from the University of Massachusetts, an M.S. in Oceanography from Oregon State University, and a Ph.D. in Biology from Dalhousie University.

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Abstract:

U.S. Living Marine Resources: Current Status and Habitat-Related Issues

The long-term potential yield of the living marine resources of the United States is 9.2 million metric tons worth nearly \$7 billion in the first sale value. Recent annual yields have amounted to about 68% of this potential (6.3 million mt) worth around \$5 billion. Of 200 fish or shellfish stocks in federal waters, 57 are over-utilized, that is, there is more fishing effort operating than is needed to harvest the potential yield. In some of these fisheries, the stocks are depleted and yielding well below their potential, while others are economically inefficient or at high risk of depletion. Of the remaining stocks, 55 are fully-utilized and 28 are under-utilized. The status of 60 stocks cannot be determined. In nearshore, state waters, of 26 stocks whose fisheries have been evaluated, 10 are over-utilized, 6 are fully-utilized, and 20 are of unknown status. Recent yields from nearshore resources are over 200,000 mt. The commercial part of this yield is worth over \$375 million, and the recreational value is likely to be far higher. Most of the nearshore resources and several important stocks in federal waters are impacted by water quality or habitat changes. In some cases, this may reduce the long-term potential yield from the fishery and adversely affect the important recreational value of the resource. In other cases, poor habitat for the resource base increases industry costs, reduces marketability, or can destabilize the fishery. Management of our living marine resources is improving in recent years, to take advantage of their potential economic value to the nation. This could be undermined by adverse impacts on fish and shellfish habitats through water quality or other pollution-related problems, particularly in nearshore regions.

Ivar Strand

Professor

Department of Agricultural and Resource Economics

University of Maryland

Abstract:

Clean Water and Commercial Fisheries

A primary beneficiary of improved water quality in the United States may be the commercial fishing industry. The vast majority of commercial fisheries depend on the estuaries at some stage of their life history. Moreover, cleaner water improves consumers' actual and perceived quality of seafood. Unfortunately, there is little comprehensive research to value national gains to the industry from improved water quality. Reasons for the inadequate research are many but situations exist where water quality improvement has been an integral part of helping the industry. However, clean water is only one element in commercial fishery enhancement—diligent management of fisheries is equally important and gains from water quality improvement may be realized only with substantially greater management of commercial fisheries.

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Break
10:15-10:30 a.m.

**Session 5: Export Opportunities in Water
Technologies and Services—10:30 a.m.**

MODERATOR:

Daniel C. Esty

*Deputy Assistant Administrator
Office of Policy, Planning, and Evaluation
U.S. Environmental Protection Agency*

Daniel C. Esty is Deputy Assistant Administrator for the U.S. Environmental Protection Agency's Office of Policy, Planning, and Evaluation. Previously, he was a Special Assistant to the Administrator and the Deputy Chief of Staff of the Environmental Protection Agency, and has practiced law at the law firm of Arnold and Porter. Mr. Esty has an A.B. in Economics from Harvard College, a B.A. in Philosophy, Politics, and Economics from Oxford University, and a J.D. from Yale Law School.

Robert L. Chapman

*Vice President
Director of Water Supply and Treatment
CH₂M Hill*

Robert L. Chapman is the Director of Water Supply and Treatment Engineering for CH₂M Hill. He has 22 years of experience in the water supply, distribution, and treatment field, in the areas of project management, process development, design, quality control review, value engineering, construction, and startup and operations services. Mr. Chapman serves on the American Water Works Association Research Foundation (AWWARF) Research Advisory Council and is Co-Chairman of a joint AWWARF international committee. Mr. Chapman has a B.S. and an M.S. in Civil Engineering from Oregon State University.

Abstract:

This presentation will include a perspective of the current and prospective opportunities for providing both traditional and evolving consulting engineering services internationally. Insight will be provided as to trends in international competition which influence the ability of U.S. firms to compete. Actions will be discussed that would be supportive of U.S. practice in the overseas water and wastewater market.

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William T. Lorenz

President

William T. Lorenz & Company

William T. Lorenz is President of William T. Lorenz and Company. Previously, Mr. Lorenz was Vice President of Mitchell, Hutchins, Inc. He is an author or co-author of more than 20 published market research studies for air and water pollution and solid and hazardous waste control industry participants. Mr. Lorenz is a member of the Air and Waste Management Association, the Water Environment Federation, the American Water Works Association, and the Instrument Society of America. He has a B.S. in Mechanical Engineering from the University of Colorado, and a degree from the Program for Management Development at the Harvard University Graduate School of Business Administration.

Abstract:

Export Opportunities in Water Technologies and Services

It is estimated that the global market for environmental products and services exceeds \$200 billion, and is growing at 7% per year. OECD countries account for about 85% of the spending. The question of who pays for environmental activities is interesting. As a country moves from the role of being a less-developed country (LDC) to a NIC, and then to a mature industrial nation, the percentage of government spending declines. This is a move away from the *society pays* concept to the fully-developed *polluter pays* concept that we have in the U.S. One factor that tends to moderate this move is the state-owned enterprise in many of the regions. Definition becomes critical. The expenditure may be made in the industrial sector, but the industry may be state-owned. Woven into the fabric of new and proposed environmental legislation around the world is a shift to the polluter pays concept. There are always government expenditures due to public infrastructure requirements, but even these expenditures decline as a percentage of overall spending over time. Privatization and contract operations are the primary reasons. Industrial countries appear to have spent in the range of 0.8 to 1.7% of GDP on the environment. In the 1970s, the U.K. followed by the U.S., devoted the largest shares of GDP to pollution control. But the GDP share of environmental expenditures in the U.K. declined sharply in the 1980s, and in the U.S. only stabilized in the mid-1980s after declining for more than five years. Average annual U.S. environmental expenditures as a percentage of GNP, 1981 through 1990, were 1.4 percent. There has been some slowing in certain markets. The recent relegation of the environment to fourth place in a priorities list of the American people is a function of the recession and the rhetoric from the 1992 election campaign. In a slow economy, environmental spending suffers. Average annual Canadian environmental expenditures as a percentage of GNP, 1981 through 1990, were 1.2 percent. The market, not including services, totaled approximately \$1.4 billion in 1990. The market is about \$5 billion annually, including only tradable products and services, not non-purchased services (primarily O&M) which represent at least an equal amount annually. We estimate the total spending is more like \$10 billion. The growth is 5 to 7% per year. Between 1990 and 1995, the Mexican government plans to spend \$2.5 billion to fight pollution. The government plans to spend at least \$100 million on its pollution control program in Mexico City alone through 1992. Mexico City is considered one of the most contaminated cities in the world. Market demand has grown due to the liberization of trade policy, economic conditions, and the willingness of the federal government and the private sector to protect the environment. The European Community (EC), with 320 million people, includes Belgium, Denmark, France, Ireland, Italy, Luxembourg, the Netherlands, Germany, Greece, Portugal, Spain, and the United Kingdom. In 1990, environmental protection spending by EC countries was over \$50 billion. It is expected that EC spending for environmental protection will increase from about 1% of GNP in the 1980s, to 2 or 3% of GNP in the mid-1990s. The combination of Western and Eastern Europe will create a bloc of 25 nations and some 480 million people which could eventually outstrip the economies of the U.S. and Japan. Marked contrasts in environmental progress exist in Europe's three regions. Denmark, Luxembourg, the Netherlands, and West Germany are the most progressive EC members. Germany, France, and the U.K. are much like the U.S. In Southern Europe,

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fewer regulations have been enacted and enforcement of these laws has been weak. This has led many European companies to relocate to the South seeking to reduce costs. Eastern European countries have polluting industries, but lack healthy economies and environmental laws. For the few laws that do exist, enforcement is practically nonexistent. Norway, Sweden, and Switzerland have the toughest laws and most advanced regulatory systems outside the EC. In 1990, environmental protection spending by the U.K. was over \$8.8 billion. Average annual environmental expenditures as a percentage of GNP, 1981 through 1990, were 0.74 percent. Expenditures for water, electricity, and roads will total \$33 billion between 1989 and 1994. The investment in water is designed to comply with both EC and national directives. The U.K. discharges significant quantities of untreated sewage into the North Sea. Landfill capacity is rapidly declining while U.K. industry's annual output of hazardous wastes is 4 to 5 million metric tons. Surface and ground water in much of central England is polluted with nitrates. The U.K. has been Europe's largest environmental polluter on a total volume basis. EC legislation is forcing the U.K. to strengthen its commitment to environmental improvement. The government is supporting a 25-year plan to reduce water pollution.

Alfred Slatin

President

Zimpro Passavant Environmental Systems, Inc.

Alfred Slatin is President of Zimpro Passavant Environmental Systems. Previously, Mr. Slatin was Vice President of the Film Division and General Manager of Vinyl Intermediates at Exxon Chemical. He has also been President of Consolidated Thermoplastics and Rexene Polymers with joint ventures between El Paso Natural Gas and Dart Industries. He is a member of the Society of Plastic Engineers, the American Section of the Society of Chemical Industry, the Water Environment Federation, the Water and Wastewater Equipment Manufacturers Association Board of Directors, and the American Water Works Association. Mr. Slatin has a B.A. from Antioch College, and an M.S. from the University of Wisconsin at Madison.

Abstract:

Exporting Our Best Ideas: How the U.S. Can Capitalize on the Global Market for Innovative Waste Treatment Technologies

The worldwide market for water pollution control equipment is enormous, but the most profitable opportunities for U.S. supplies may lie in exporting innovative, non-conventional technologies. These are technologies designed to solve specialized waste treatment problems, where higher degrees of treatment are required, and where competition from local suppliers is not prohibitive. In the United Kingdom and European Community alone, it is estimated that as much as \$1.2 billion per year will be spent on innovative technologies by the end of this decade. Barriers to exporting innovative U.S. technologies are not unlike the barriers that block the adoption of innovative technology within our own country: conservative design favors conventional technology, even though this choice is obviously less effective and potentially more costly. The U.S. EPA can help facilitate the global acceptance of innovative U.S. technologies. EPA is well-respected around the world as a regulatory body, and should promote its innovative technology programs (such as SITE) as global models. Specifically, EPA might consider helping foreign countries establish databases on innovative technologies, and entering into pilot testing projects with foreign entities as methods of nurturing the adoption of U.S. technologies abroad. The payoff for U.S. firms can be significant. Zimpro Passavant Environmental Systems, Inc., a Wisconsin company whose proprietary wet air oxidation and PACT® systems are member technologies in the SITE program, is generating fully 50% of its revenues from overseas sales. Keys to success have been cooperation agreements with qualified local firms, commitment to full technical support, and above all—patience.

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Luncheon Address by Keynote Speaker—12:30 p.m.

Donald H. DeMeuse

*President and Chairman of the Board/Chief Executive Officer
Fort Howard Corporation*

Donald H. DeMeuse is Chairman of the Board and Chief Executive Officer of Fort Howard Corporation. He has also served as Vice President, Executive Vice President, and President, and as a member of the Board of Directors of Fort Howard Corporation. Mr. DeMeuse is a member of the Board of Directors of Sweetheart Holdings, Inc.; Associated Kellogg Bank; the Brown County Association of Retarded Citizens; and Competitive Wisconsin; and is a member of the Board of Trustees of Marian College of Fond du Lac, Wisconsin. Mr. DeMeuse also is a member of the Board of Directors and the Executive Committee of the American Paper Institute, Chairman of the Wisconsin Paper Council, and a member of the National Recycling Advisory Council. He has a degree in Electrical Engineering from the University of Wisconsin, and has worked for General Motors Corporation and Kimberly-Clark Corporation.

**Session 6: Pollution Prevention in Water-Intensive
Industries—2:30 p.m.**

MODERATOR:

Wendell (Ray) Cunningham

*Director
Water Management Division
Region 4
U.S. Environmental Protection Agency*

Ray Cunningham is the Director of the Water Management Division of U.S. EPA Region IV. Previously, he was the Director of Program Management Operations of the Office of Air and Radiation at EPA Headquarters; was a Special Assistant to the Associate Administrator for Air and Radiation at EPA Headquarters; and has held several positions with EPA Regions III and IV. Mr. Cunningham has also been an Environmental Engineer for the J.E. Sirrine Company, and the Tennessee Valley Authority. He has a B.S. in Civil Engineering from Purdue University, and an M.E. in Environmental Engineering from the University of Florida.

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Charles D. Malloch

Director

Regulatory Management

Monsanto Company

Charles D. Malloch is the Director of Regulatory Management for Environment, Safety, and Health at Monsanto Company. He has served as Monsanto's representative on the Environmental Management Committee of CMA, as the Chairman of the Environmental Quality Committee of SOCMA, and as a member of the Pretreatment Implementation Review Task Force of EPA, and is currently a member of the Clean Air Act Advisory Committee of EPA. Mr. Malloch is a member of the American Institute of Chemical Engineers, the Water Pollution Control Federation, and the Air and Waste Management Association. He has a B.S. and an M.S. in Chemical Engineering from the University of Michigan.

Abstract:

One Chemical Company's Views

Water resources can be viewed as a positive, important need as well as a significant concern for the chemical manufacturing industry. Industrial uses of water require varying levels of purity and availability necessitating an appropriate supply of this resource. The "flip side" of the coin directs that "used up" water resources be returned to, but cannot adversely impact, the environment. The chemical industry into the upcoming century will continue to have water resource needs and must also continue to find new economical and socially responsible means of meeting its water quality obligations. Pollution prevention and minimization of use are but two tools towards this end. Examples will be discussed underlining these important water resource issues.

W. Jeffrey Pardue

Manager for Environmental Programs

Florida Power Corporation

W. Jeffrey Pardue is the Manager of Environmental Programs at Florida Power Corporation. Previously, Mr. Pardue held positions as a Biologist, Environmental Engineer, and Project Manager with TVA. He represents Florida Power Corporation for numerous trade associations and is a member of various industrial advisory boards and a state citizens advisory committee on coastal resource issues. Mr. Pardue has been a Certified Ecologist of the Ecological Society of America, and is currently a member of the National Association of Environmental Professionals, and the Southern Appalachian Botanical Club. He has a B.S. and an M.S. in Biology, as well as an MBA.

Abstract:

Balancing Economics and the Environment: The Case for Retaining Section 316(a) of the Clean Water Act

The electric utility industry uses significant quantities of water in the process of producing electricity. In this process, heat, defined as a pollutant by the Clean Water Act, is rejected to the environment, primarily through discharge to a receiving body of water. Historically, the EPA and states have regulated the discharge of heat according to stringent technology and water quality-based limits established for heated water discharges. These limits did not take into account the unique characteristics of heat as a pollutant. Section 316(a) of the Clean Water Act provides an opportunity for a variance under which a discharger has the option to establish that an alternate thermal effluent limit is appropriate to ensure that a "balanced, indigenous population of shellfish, fish, and wildlife in and on the water body" can be maintained. Approximately 189,000 MW of the U.S. electric production (32%) currently operate with such alternate limits. Over the past 20 years many environmental impact studies, conducted pursuant to Section 316(a), have been conducted, and while some studies have demonstrated adverse impacts, the vast majority of the studies have established that technology or water quality-

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based thermal limits are more stringent than necessary to protect the indigenous flora and fauna in the receiving body of water. The Edison Electric Institute commissioned Stone & Webster to conduct an analysis of the cost if Section 316(a) was repealed. Based on the study, the capital cost estimate is a staggering \$28.1 billion. Including the cost of replacement power, the cost rises to \$41.3 billion in 1992 dollars. Another analysis, commission by the Department of Energy and written by John Vail from the Argonne National Laboratory concludes that the capital cost to the electric utility industry would be in the range of \$22.7-\$24.4 billion in 1992 dollars. While each of these studies has inherent limitations, in terms of accuracy, there can be no mistake that the cost is significant. In addition to the direct economic costs, retrofitting cooling towers to existing plants has additional costs, including the costs associated with negative environmental impacts. There would be a significant loss in generation capacity that would have to be replaced with new generation which would increase atmospheric emissions of SO₂, NO_x, CO₂, and particulate matter. Other impacts would include increased consumption of water, airborne drift from cooling towers, fogging and icing, and aesthetic impacts. Under Section 316(a), the appropriate balance between costs and benefits has been achieved. This section of the Clean Water Act should be preserved.

Deborah Sparks

*Program Development Coordinator
Environmental Health and Safety Department
Amoco Corporation*

Dennis R. Sasseville

*Associate Vice President
Environmental Science and Engineering, Inc.*

Dennis R. Sasseville is an Associate Vice President with Environmental Science and Engineering, Inc. He has served on numerous regulatory and legislative committees concerned with water quality and environmental impact issues. Presently, he serves on the Environmental Division Advisory Council of the Technical Association of the Pulp and Paper Industry and on the Board of Directors for the Business and Industry Association of New Hampshire.

Abstract:

Voluntary Pollution Prevention Initiatives Will Shape U.S. Industry's Regulatory Relationships and Economic Future

The environment of the United States remains among the best in the world. Environmental regulation of industry is pervasive and comprehensive but has been widely accepted as essential to protecting and maintaining our quality of life. There is a perspective that, at best, underestimates the costs of environmental requirements on our industries, and at worst, concludes that no price is too great to pay. As in Eastern Europe and elsewhere, events throughout the world have demonstrated that without a strong and prosperous economy, the environment as well as living standards suffer. Future water resource legislative actions and regulatory policies need to carefully consider: the significant environmental expenditures and accomplishments of water-intensive industries over the last 20 years; customer and market forces can share industry's actions and orientations as much or more than do environmental regulations; major industry has demonstrated a commitment to sound environmental management by instituting voluntary pollution prevention initiatives; and any additional regulation of water resources should recognize and incorporate the legitimate and historical use of surface water as an economic resource. For its part, U.S. industry needs to continue to demonstrate the effectiveness and soundness of voluntary pollution prevention initiatives by its willingness to adopt increasingly sophisticated and comprehensive measures as alternatives to regulatory command-and-control.

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services of ground water resources can be characterized in an economic model, we can identify how defining the total value depends on whether an *ex ante* or *ex post* perspective is adopted and on whether use and nonuse values are to be separated. This conceptual framework is used to summarize how hedonic pricing, household production, cost avoidance, and contingent valuation methods can be used to measure different components of the total value. The paper concludes by briefly appraising what we know about the performance of each method in measuring these components of the value for specific ground water resources.

Session GW-2: Methods and Case Studies - Recent Work—9:15 a.m.

MODERATOR:

V. Kerry Smith

*Department of Economics
North Carolina State University*

William Schulze

*Department of Economics
University of Colorado*

William Schulze is a Professor of Economics at the University of Colorado, Boulder. Previously, he has been a visiting Professor of Economics at Stanford University, a Co-Director of the Laboratory for Economics and Psychology at the University of Colorado, an Associate Professor and Professor of Economics at the University of Wyoming, an Associate Professor at the University of Southern California, and an Assistant and Associate Professor at the University of New Mexico. Dr. Schulze has authored numerous articles, publications, papers and reports on the subjects of economics and the environment and is a former Vice President of the Association of Environmental and Resource Economists. He has a B.A. degree from California State University at San Diego, and a Ph.D. from the University of California at Riverside.

Abstract:

Using Contingent Valuation to Measure Bequest and Existence Values for Ground Water Cleanup

The benefits of ground water cleanup are of interest to the U.S. Environmental Protection Agency in evaluating a variety of programs including Superfund (CERCLA) as well as the Resource Conservation and Recovery Act (RCRA). This paper summarizes a U.S.EPA-funded study of both use and non-use values of ground water cleanup. In addition, this paper focuses on: (1) what constitutes an acceptable contingent valuation study, and (2) under what conditions non-use values may be reliably measured. Since respondents to surveys evaluating non-use values are essentially uninformed about the commodity which they are asked to value, the survey instrument must provide the expert information necessary for value construction. To obtain non-use values, a cognitive approach was used in which, first, a full information/full context survey was designed and tested using verbal protocols to identify problems with comprehension, embedding and scenario rejection. Based on pre-tests the survey was redesigned into a mailable length retaining information and context necessary for value

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construction. The national ground water survey, developed using cognitive survey design, provided three methods of estimating non-use values for ground water which showed a remarkable degree of internal consistency. It is argued that inconsistencies reported by EXXON and others in measuring non-use values likely resulted from an insufficiency of information and context provided to respondents.

John Bergstrom

*Associate Professor
Department of Agricultural Economics
University of Georgia*

John Bergstrom is an Associate Professor in the Department of Agricultural Economics at the University of Georgia. Previously, Dr. Bergstrom has been an Assistant Professor in the Department of Agricultural Economics at the University of Georgia; a Research Assistant at Texas A&M University; a Research Assistant in the Department of Agricultural Economics and Rural Sociology at Clemson University; and a Research Assistant in the Department of Agricultural and Resource Economics at the University of Maryland. He has also worked as a Research Economist under an interpersonnel agreement with the U.S. Army Corps of Engineers/Texas A&M University and as an Environmental Education Instructor and a Conservation Work Group Leader for the National Park Service. Dr. Bergstrom has authored numerous publications, has received several grants, and has been recognized for outstanding achievements in economics. He has a B.S. from the University of Maryland, an M.S. from Clemson University, and a Ph.D. from Texas A&M University.

Abstract:

Benefits of Protecting Ground Water from Agricultural Chemical Contamination

The results and implications of a study designed to measure the benefits to the general public of protecting ground water from uncertain future agricultural chemical contamination are discussed in this paper. The theoretically appropriate measure of ground water protection benefits under demand and supply uncertainty is option price. Option price associated with ensuring the protection of ground water from agricultural chemical contamination was measured for Dougherty County, Georgia using the contingent valuation methodology. Mean option price was estimated at approximately \$640 per household. Significant determinants of option price included annual income, age, subjective concern over the effects of pollution on one's health, and subjective supply uncertainty.

Charles W. Abdalla

*Associate Professor
Department of Agricultural Economics
Pennsylvania State University*

Charles W. Abdalla is an Associate Professor in the Department of Agricultural Economics at Pennsylvania State University. Previously, he was the Director of the National Groundwater Policy Education Project. Dr. Abdalla is a member of the American Agricultural Economics Association, the Northwest Agricultural Economics Association, and the Soil and Water Conservation Society. He has a B.S. from Pennsylvania State University, an M.A. in Economics, an M.S. in Agricultural Economics, and a Ph.D. in Agricultural Economics from Michigan State University.

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Abstract:

Avoidance Costs and Ground Water Values: Results of Two Empirical Applications

The cost avoidance (or averting behavior) approach was applied to measure household-level economic losses resulting from ground water contamination in two communities. This approach is grounded in economic theory and, provided certain assumptions are met, can provide lower bound estimates of the value of environmental quality improvements. Mail surveys were used to collect data on avoidance actions and household characteristics in communities in central and southeastern Pennsylvania served by public wells containing volatile organic chemicals. Households' knowledge of contamination and avoidance expenditure levels varied significantly between the two study sites. In the central site, 96% of households were aware of water contamination and 76% of those with such knowledge undertook avoidance behaviors. Only 43% of households in the southeastern site were aware of contamination. Of those, about 44% undertook avoidance actions. Costs averaged \$5.25 (1987 dollars) and \$0.40 (1989 dollars) per week for each household that chose to avoid the contaminant in the central and southeast study sites, respectively. Common factors influencing the likelihood that a household would undertake avoidance actions included households' qualitative rating of the ground water contaminant's health risk, the amount of information acquired about the contaminant or its health risk, and presence of children within the household.

Erik Lichtenberg

*Associate Professor
Department of Agricultural Economics
University of Maryland*

Eric Lichtenberg is an Associate Professor in the Department of Agricultural Economics at the University of Maryland. Previously, he was the Director of Environmental Economics at the Western Consortium for Public Health, and a Fellow at the Institute for Public Health Policy at the University of California, San Francisco. Dr. Lichtenberg is a member of AERE, AAEA, and AEA. He has a B.S. in Linguistics from the University of Chicago, and a Ph.D. in Economics from the University of California at Berkeley.

Abstract:

Using Risk Assessment in Analyzing Ground Water Protection Policies

Analyzing policies for ground water protection typically requires evaluating tradeoffs between short- and long-term health risks and the cost of diverting resources from other sectors of the economy, which, in turn, requires quantitative estimation of health risks. Current methods of quantitative health risk estimation introduce a degree of error, or uncertainty, large enough that it must be taken into account in making decisions. A practical way of doing this is to combine probabilistic risk assessments with a safety-fixed decision criterion in deriving uncertainty-adjusted cost curves that relate cost simultaneously to the risk standard and the probability of a violation. This approach is illustrated using the case of drinking well water contamination in California by the pesticide DBCP. One important finding is that the marginal cost of health risk reduction falls substantially as the probability of a violation is made smaller, suggesting that decisions made on the basis of average risk can lead to underprotection of human health. These uncertainty-adjusted cost curves can be used in standard cost-benefit analyses, provided that the probability of violation is taken into account, either by specifying a level that corresponds to standard scientific notions or by estimating individuals' willingness to pay for different probabilities of violation.

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Gregory Michaels

Senior Economist

Abt Associates

Gregory Michaels is a Project Manager and Senior Economist at Abt Associates. Previously, Mr. Michaels has worked for the Office of Policy, Planning, and Evaluation of the U.S. Environmental Protection Agency, and the World Bank. He has been a Research Consultant for the International Food Policy Research Institute, an intern with the Morehead Foundation, and a Conference Organizer at the International Trade Center, University of North Carolina. Mr. Michaels is a member of the Association of Environmental and Resource Economists, the American Real Estate and Urban Economics Association, and the American Statistical Association. Mr. Michaels has a B.A. in Economics from the University of North Carolina at Chapel Hill, and a Ph.D. in Economics from Vanderbilt University.

Abstract:

When the Home is No Longer A Castle: Ignoring the Economic Value of Ground Water Contamination from Residential Property Values

Numerous incidences of hazardous contamination at sites around the country have generated strong reactions by citizens living in the vicinity of such sites. Public health risks are usually at the forefront of these concerns but other negative effects also get attention. One often expressed concern by households near a contaminated site is the effect that the site has on the values of their homes. Because of the apparent connection made by the public between observed economic behavior—the purchase of housing—and the onset or discovery of contamination at a site, residential property values have been seen as a source of information on the economic damages from ground water contamination. To generalize, the property value approach entails using statistical methods to disaggregate housing prices or price changes into different components—that part attributable to the influence of ground water contamination and all other parts attributable to other factors, such as housing attributes, community characteristics, and housing market conditions. This paper examines the experience to date with property value studies which have addressed ground water contamination, directly or indirectly, and presents insights on the potential applicability of this methodology to future studies of ground water valuation.

Break

11:00-11:15 a.m.

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**Session GW-3: Policy and Regulatory
Considerations—11:15 a.m.**

MODERATOR:

Martha G. Prothro

*Deputy Assistant Administrator
Office of Water
U.S. Environmental Protection Agency*

Martha Prothro is the Deputy Assistant Administrator for Water at the U.S. EPA. Previously, at EPA, she was an enforcement attorney in the air pollution control program, Head of the Noise and Radiation Enforcement Division, Director of the Permits Division of the water quality program, and the Director of the Office of Water Regulations and Standards. Ms. Prothro has a B.A. from the University of North Carolina, and a J.D. from George Washington University's National Law Center. She has been the recipient of numerous awards, including the Presidential award for meritorious service as a senior executive.

James A. Goodrich

*Executive Director
San Gabriel Basin Water Quality Authority*

James A. Goodrich is the Executive Director of the San Gabriel Basin Water Quality Authority. Previously, he has been an Adjunct Professor of Applied Physics at the California Polytechnic Institute, has served on the Board of Directors of the Irvine Ranch Water District and the Association of California Water Agencies, has worked in the private sector as a Hydrologist and as a REM II Contractor on several EPA Superfund projects, and has worked for the Orange County Water District as a District Geologist and Director of Basin Management. Mr. Goodrich is a member of the National Ground Water Association, the American Water Works Association, and the Association of California Water Agencies. He has a B.S. in Geology from the University of California, Los Angeles and an M.S. in Hydrogeology from the University of Southern California.

Abstract:

Ground Water Value in California

In California, water is free! Though a price can be affixed to the commodity due to transportation costs, its true value lies in the ability of the storage medium to hold sufficient water to meet demands through extended dry periods, such as those occurring today in California. Because surface water storage capacity is insufficient to meet demands through dry periods, many areas must rely on vast ground water storage basins. The significance of this has become painfully apparent to many who must rely solely on surface water during this sixth year of drought. The San Francisco Bay area, which receives most of its water from surface storage systems in the Sierras, must meet demands through rationing. On the other hand, if the Los Angeles Metropolitan area did not have huge underlying ground water reserves to successfully fend off the drought, it would have been forced to augment its dwindling surface water supplies with desalted sea water at a cost of \$2,000 per acre-foot. In

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California's Central Valley, the drought has forced farmers to switch from low-cost surface water to overdrafting their ground water basins by 12 million acre-feet in order to stay in business. Therefore, like an insurance policy, one only realizes the true value of ground water storage in times of dire need.

Velma Smith

*Director of the Ground Water Protection Project
Friends of the Earth*

Velma Smith is the Director of the Friends of the Earth Ground Water Protection Project. Ms. Smith has served as a Legislative Assistant on environmental and energy issues; has worked on farmland protection, land use, and water quality issues for the Piedmont Environmental Council; was a member of the Virginia Water Control Board; and was a founding member of Virginia's Toxics Roundtable. She has provided testimony to a variety of Congressional Committees, served as a member of the National Drinking Water Advisory Council, and was a member of an advisory group for the Office of Technology Assessment. Ms. Smith has an M.S. in Environmental Planning from the University of Virginia.

Bill Weisrock

*Director
Ground Water Management
Amoco Corporation*

Bill Weisrock joined Amoco Corporation's Environment, Health, and Safety Department in 1990 as a Supervisor in the Tulsa Groundwater Management Section (GMS), following a year as Coordinator of Environmental R&D for Amoco Production at the Tulsa Research Center. He assumed the position of Director of GMS in 1992. He has held technical and supervisory positions in the Amoco Oil, Amoco Chemical, and Amoco Production Research organizations, as well as in corporate research. Dr. Weisrock holds 11 patents on biological fermentation processes and enhanced oil recovery processes and has a Ph.D. in Bacteriology and Public Health from Washington State University.

Abstract:

Ground Water Valuation: An Industry Perspective

Industry recognizes the value of our nation's ground water resources and the need for their protection. Many corporations have adopted proactive ground water protection programs, and support advocacy efforts through trade associations such as CMA and API. Industry expenditures for pollution prevention and remediation of existing ground water contamination are steadily increasing. However, many in industry share a belief that ground water resources can and should be managed in a more cost-efficient manner. Only about 10% of total U.S. ground water withdrawals are used for industrial purposes, primarily for non-contact cooling. Given this relatively low usage, the overall cost to industry to obtain and to treat ground water is relatively small. More importantly, many industrial facilities are located over or adjacent to aquifers, and the costs associated with protecting these ground water supplies and restoring them through remediation can be substantial. Therefore, from a valuation standpoint, the costs of protection and restoration of ground water are of primary concern to industry. This paper raises a number of issues that should be, but often are not, considered when attempting to place a value on ground water in terms of protection and remediation. On the protection side, the paper discusses cost/benefit approaches, the need for sensible ground water classification standards, detection and monitoring costs, and the impact of local or site-specific conditions on costs and valuation. On the remediation side, ground water valuation is strongly affected by remediation costs, time requirements for aquifer restoration,

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and limitations of remedial technology. This, coupled with universally inherent financial resource limitations, suggests that risk-based approaches to remediation and cleanup level targets are needed. Risk-based approaches should consider protection of human health, the beneficial use of the impacted ground water supply, the cost of restoration to that beneficial use, and the cost to obtain or supply alternative sources of water.

Paul Jehn

Chief

Bureau of Monitoring and Technical Support

Idaho Department of Environmental Quality

Paul Jehn is the Chief of the Bureau of Monitoring and Technical Support for the Idaho DEQ, where he is responsible for statewide development, implementation, and enforcement of Ground Water Quality, Drinking Water, and UST Programs. Previously, he has worked for federal, state, and local governments; industry; and as a private consultant. Mr. Jehn has been working with EPA in the development of their guidance document Ground Water Protection Strategy for the 1990's. He currently chairs the Ground Water Task Force for the Association of State and Interstate Water Pollution Control Administrators and is a member of the State/EPA Subcommittee on Ground Water Quality.

Abstract:

The High Cost of Not Protecting Ground Water

The nation's ground water is a valuable natural resource which must be protected to preserve current and future beneficial uses. These beneficial uses include drinking water, industrial activities, agriculture, mining, food processing, and aquaculture. Protection of ground water for the many designated beneficial uses frequently requires protection to drinking water standards. In many of the western states, ground water is the major source of drinking water and forms the base flow of rivers and lakes. Over the past 10 years, it has been shown that practices designed to protect surface water have degraded ground water. In some cases, this degraded ground water is recharging, and now degrading, surface water. The cost of supplying drinking water from ground water increases dramatically if ground water quality is threatened or impacted, either by insufficient prevention activities, or up gradient contamination. The remediation of contaminated ground water is expensive and frequently impossible. Increased monitoring requirements can be cost prohibitive to a small water system. The treatment of contaminated drinking water can cost water purveyors, and therefore the consumer, hundreds of thousands of dollars. One new water supply well alone, if an uncontaminated source can be located, can easily cost \$500,000 or more. Ground water is also used as media for the discharge of water from consumptive uses. Virtually all land use activities such as septic systems, agriculture, and urban development, have the potential to, and do impact, ground water quality. Non-degradation of ground water is impossible. However, it is possible to manage land use activities to ensure that ground water remains of drinking water quality. This does not imply that ground water can be, or should be, degraded to drinking water standards.

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Keith N. Cole

Minority Counsel

Subcommittee on Oversight and Investigations

Committee on Energy and Commerce

U.S. House of Representatives

Keith N. Cole is Minority Counsel to the House Committee on Energy and Commerce. Mr. Cole was admitted to the Washington State Bar in 1988. He served as an Attorney with Foster, Pepper, and Shefelman, and as a Field Engineer with Schlumberger Overseas, S.A. He has a B.S. in Mechanical Engineering and Material Science from Duke University and a J.D. from the University of Virginia.

Jimmie Powell

Senate Staff

Committee on Environment and Public Works

U.S. Senate

Luncheon Address by Keynote Speaker—12:30 p.m.

Donald H. DeMeuse

President and CEO

Fort Howard Corporation

Donald H. DeMeuse is Chairman of the Board and Chief Executive Officer of Fort Howard Corporation. He has also served as Vice President, Executive Vice President, and President, and as a member of the Board of Directors of Fort Howard Corporation. Mr. DeMeuse is a member of the Board of Directors of Sweetheart Holdings, Inc.; Associated Kellogg Bank; the Brown County Association of Retarded Citizens; and Competitive Wisconsin; and is a member of the Board of Trustees of Marian College of Fond du Lac, Wisconsin. Mr. DeMeuse also is a member of the Board of Directors and the Executive Committee of the American Paper Institute, Chairman of the Wisconsin Paper Council, and a member of the National Recycling Advisory Council. He has a degree in Electrical Engineering from the University of Wisconsin, and has worked for General Motors Corporation and Kimberly-Clark Corporation.

**Session GW-3: Policy and Regulatory
Considerations (Continued)—2:30 p.m.**

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**Session GW-4: Issues and Research Needs in
Valuing Ground Water—3:45 p.m.**

MODERATOR:

Charles A. Job

*Ground Water Protection Division
Office of Groundwater and Drinking Water
U.S. Environmental Protection Agency*

Charles Job is the Acting Chief of the Technical and Regulatory Analysis Branch of the Ground Water Protection Division of EPA. Previously, Mr. Job has been a Water Resources Planner, a Hydrogeologist and a Program Manager at various agencies, including the Ohio Departments of Natural Resources and Transportation, the Great Lakes Basin Commission, and EPA Region V. He has also been a Financial Analyst, Manager, and Consultant with Ford Motor Company, Honeywell Corporation, the Gas Research Institute, and Twin City Testing Corporation. Mr. Job has a B.S. degree from Michigan State University, an M.E.S. in ground water geology from Miami University, and a Master of Applied Economics from the University of Michigan.

Marjorie M. Holland

*Director, Public Affairs Office
Ecological Society of America*

Marjorie M. Holland is the Director of the Public Affairs Office of the Ecological Society of America. She is also currently an Associate Professor of the Department of Biology at George Mason University. Previously, Ms. Holland has been a consultant for Man and the Biosphere (MAB), Division of Ecological Sciences, United Nations Educational, Scientific and Cultural Organization; an Associate Professor at the Department of Biology, College of New Rochelle; and the Executive Director of the Water Supply Citizens Advisory Committee. She has an A.B. in Botany from Connecticut College; an M.A. in Ecology from Smith College; and a Ph.D. in Botany from the University of Massachusetts, Amherst.

Abstract:

Issues and Research Needs In Valuing Ground Water: An Ecosystem Perspective

Members of the Ecological Society of America (ESA) recently set research priorities for the discipline of ecology, and summarized these priorities in a report entitled "The Sustainable Biosphere Initiative: Ecological Research Agenda." The topic of sustainable ecological systems was one of three priority areas identified in this report. It is in the context of this report that we seek to understand further ecological processes that determine the sustained functioning of natural and human-dominated ecosystems, and to provide relevant information on the connectivity between river channels and ground water systems. In many parts of the U.S.A, ground water systems determine the location of ecologically-important wetlands. Moreover, in healthy (higher valued) rivers, interstitial (subsurface) flow of water sustains unique aquatic food chains that enhance water quality. Thus, a

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greater understanding of the connectivity between river and ground water systems seems critical for improved management of our limited water resources.

Robert Costanza

President

Society for Ecological Economics

Chesapeake Biological Laboratory

Robert Costanza is a Professor in the Coastal and Environmental Policy Program of the Chesapeake Biological Laboratory at the University of Maryland Center for Environmental and Estuarine Studies. He is also the Director of the Maryland International Institute for Ecological Economics; an Adjunct Professor at the Institute for Philosophy and Public Policy; and an Associate Director for Research at the University of Maryland. Dr. Costanza is currently a Research Program Director at the Royal Swedish Academy of Sciences; an Associate Fellow at University College, London; and an Affiliate Professional Scientist at the University of Illinois. Dr. Costanza has authored over 100 scientific articles in journals, books, and technical reports and has received several awards and fellowships. He is a member of eight research panels and five governing boards, and has organized symposia and chaired professional meetings. Dr. Costanza has a B.A. in Architecture, an M.A. in Architecture/Urban and Regional Planning, and a Ph.D. in Systems Ecology, Environmental Engineering Sciences from the University of Florida.

Eric J. Harmon

HRS Water Consultants, Inc.

Eric J. Harmon is Vice President of HRS Water Consultants, Inc. He has testified as an expert witness in the fields of ground water development, water rights, water quality, water valuation, and ground water/surface water interaction. Mr. Harmon has lectured at the University of Colorado Natural Resources Center, the University of Denver College of Law, and the Department of Geology and Geological Engineering at the Colorado School of Mines, and has taught courses in ground water exploration and development. He has degrees in Geophysical Engineering and Hydrogeology from the Colorado School of Mines.

Abstract:

Liquid Assets and Paper Water: Valuation of Ground Water Under Colorado's Prior-Appropriation System Traditional Basis and New Issues

The traditional basis of ground water value under the prior-appropriation system of water rights in Colorado is the establishment of a property right to the water. This requires judicial and administrative approvals on the basis of demonstrated historic use of ground water (if tributary), ownership of overlying land (if nontributary), as well as proof of non-injury to existing water rights. These requirements help establish the value of the ground water right under the Colorado prior-appropriation doctrine. Traditional ground water valuation methods are analogous to those used in real estate appraisal. Methods used include income analysis, cost to replace the water supply, in-lieu or tap/commodity fees, and market comparison. Each of these has advantages and disadvantages, but all are premised on the prior-appropriation doctrine consequence of economic reward to development, consumption, and perceived stability of supply. New issues in ground water valuation result from many factors, including growth and urbanization in the West, new private-sector investment strategies, elimination of subsidies, resource depletion and contamination, technological advancement, and common-good motivations through increased public awareness. Future value and availability of ground water in the West will depend on consistent

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and long-term policy emphasis at State and Federal levels to minimize aquifer depletion, promote efficiency of use, encourage artificial recharge, and protect ground water quality.

Stephen Crutchfield

*Economic Research Service
U.S. Department of Agriculture*

Stephen Crutchfield has been the Leader of the Environmental Valuation Section of the Economic Research Service of the USDA since 1986 and has been responsible for research on the quantification and valuation of environmental effects associated with agricultural production. Previously, he was an Assistant Professor of Resource Economics at the University of Rhode Island. He holds undergraduate degrees in Economics and History from the University of Washington, and Masters and Doctoral degrees in Economics from Yale University.

Abstract:

Issues in Measurement of the Non-Use Value of Ground Water

Considerable public attention has focused lately on the need to protect the quality of ground water resources. The considerable public and private resource commitment to protecting ground water quality is evidence of the value society seems to place on this resource. One component of the total social value placed by society on clean ground water may be the values placed on the resource by non-users. This paper reviews the economic issues surrounding the measurement of non-use values of natural resources, including option, existence, and bequest values. These concepts are further explored in the context of valuing protection of ground water from chemical contamination. The factors that complicate the measurement of use value of ground water resources, particularly uncertainty about pollutant transport, environmental fates, and eventual human health effects also complicate efforts to specify and quantify non-use values. The paper concludes with some possible approaches to measuring non-use value in practice.

Maureen Cropper

Resources for the Future

Maureen Cropper is a Professor of Economics at the University of Maryland, and a Senior Fellow at Resources for the Future. She is currently the Treasurer of the Association of Environmental and Resource Economists, and has been an Associate Editor of the *Journal of Environmental Economics and Management*. Dr. Cropper has served on advisory panels to the National Science Foundation, U.S. EPA, Cornell University's Center for the Environment, and the University of Maryland's Center for Global Change. She has a B.A. from Bryn Mawr College, and a Ph.D. in Economics from Cornell University.

Abstract:

Research Needs in Valuing Ground Water

This talk will focus on the relationship between benefit estimates that would be useful to EPA in issuing ground water regulations and current research on the value of unpolluted ground water. The main problem concerns what is to be valued. In the area of use values, one approach would be to translate ground water pollution into health risks (e.g., number of cancer cases) and have consumers value these health endpoints. This approach could be implemented using contingent valuation, or using averting expenditures. In the latter case, it is important to know consumers' perceptions of the risk reduction they are achieving through averting behavior.

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Non-use values present a more difficult problem. If the commodity to be valued is a reduction in pollution concentrations, respondents may have difficulty in associating benefits that are meaningful to them with different concentrations. On the other hand, it seems difficult to define non-use benefits in more intuitive terms. The latter approach, however, may be necessary if one is to apply estimates of non-use values to a variety of specific substances (e.g., alachlor v. aldicarb).

Richard Howarth

*Energy and Environment Division
Lawrence Berkeley Laboratory
University of California at Berkeley*

Richard Howarth is a Staff Scientist in the Energy and Environment Division of Lawrence Berkeley Laboratory. He has a undergraduate degree and an M.S. from Cornell University and the University of Wisconsin at Madison, and a Ph.D. from the Energy and Resources Program at the University of California at Berkeley.

Abstract:

Environmental Risks and Future Generations: Issues for Public Policy

Approaching the policy challenges posed by long-term environmental problems such as toxic and radioactive waste disposal, stratospheric ozone depletion, and climate change is controversial both in theory and in practice. Some argue that policies should be designed to equate the marginal costs and benefits of pollution abatement, measured in monetary terms. Others argue that the imposition of long-term environmental risks is morally unacceptable because it threatens the welfare of future generations. This paper argues that the usefulness of cost-benefit analysis in understanding long-term environmental problems is constrained by two fundamental characteristics. First, the approach is blind to the distribution of impacts between social groups and between present and future generations. Second, cost-benefit techniques are poorly equipped to handle the substantial uncertainties that surround long-term environmental problems. The paper investigates the so-called "precautionary principle" as an approach to long-term environmental management under uncertainty. While this principle lacks the mathematical precision of cost-benefit analysis, its basic thrust is that policies should seek to reduce threats to future welfare if the costs of doing so would not significantly reduce the subjective well-being of present or future persons. The precautionary principle, like other normative criteria for use in policy analysis, rests on a particular value judgement. If one accepts this value judgement as reasonable, then one is left with a policy criterion that is operationally decisive under a wide array of circumstances.

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**Session 7: Economic Incentives—Future Role in
Clean Water Programs—8:30 a.m.**

MODERATOR:

Richard D. Morgenstern

*Acting Assistant Administrator
Office of Policy, Planning, and Evaluation
U.S. Environmental Protection Agency*

Richard D. Morgenstern is the Acting Assistant Administrator for the Office of Policy, Planning, and Evaluation of the U.S. Environmental Protection Agency. Previously, Dr. Morgenstern has been the Director of the Office of Policy Analysis at EPA and the Energy Program at the Urban Institute. He has served as the Legislative Assistant to U.S. Senator J. Bennett Johnston; as the Deputy Assistant Director for Energy, Natural Resources, and the Environment for the U.S. Congressional Budget Office; as an Assistant and Associate Professor of Economics at the City University of New York; as a Consultant to the U.S. Agency for International Development; and as an Instructor and Assistant Professor of Economics at American University. Dr. Morgenstern has authored numerous publications in the area of the environment and economics. He has an A.B. in Economics from Oberlin College, and a Ph.D. in Economics from the University of Michigan.

Claudia Copeland

*Specialist in Environmental Policy
Congressional Research Service*

Claudia Copeland is a Specialist in Environmental Policy in the Environmental and Natural Resources Policy Division of the Congressional Research Service, Library of Congress. She has served as Head of the Environmental Protection Section of the Environmental and Natural Resources Policy Division. She has also worked as a journalist and as a Research Assistant for the law firm of Hunton and Williams. Ms. Copeland has a B.A. from the University of Michigan and an M.S. in Special Studies from George Washington University.

Abstract:

Funding Water Quality Programs Using Toxicity-Based Discharge Fees

The question of how to fund and pay for government programs in an era of fiscal and budgetary constraints is being raised with greater frequency. Water quality programs are no exception. Some in Congress have recently discussed creating a new source of Federal funding to meet the needs of the Nation's clean water programs. The concept underlying this proposal is to impose fees or charges on discharges or products with potential for contaminating or degrading the aquatic environment and obtain revenue to support activities for abating or managing water pollution. One component of the proposal under review in Congress is a system of fees for industrial discharges of conventional and toxic water pollutants, with varying fees imposed according to the toxicity of particular chemicals.

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Scott Farrow

Professor

*H. John Heinz III School of Public Policy and Management
Carnegie Mellon University*

Scott Farrow is an Associate Professor of Economics at the H.J. Heinz III School of Public Policy and Management at Carnegie Mellon University. He has served as the Associate Director for Pollution Control and Prevention with the Council on Environmental Quality. Dr. Farrow is a member of the Science Committee of the Outer Continental Shelf Advisory Board, U.S. Department of the Interior; and the U.S. Man and the Biosphere, Marine and Coastal Ecosystems Directorate. Dr. Farrow is a member of the American Economic Society; the Association of Environmental and Resource Economists; and the Environmental Executives. Dr. Farrow has a B.A. from Whitman College, and an M.A. and a Ph.D. in Economics from Washington State University.

Abstract:

The Existing Basis and Potential for Damage Fees and Tradeable Allowances in the Clean Water Act

The potential for using damage fees and tradeable allowances is discussed as an extension of existing authority in the Clean Water Act. The importance of geographic targeting of economically-based policies is emphasized based on an index of fishable and swimmable water. Examples are given of the potential for cost savings and other beneficial environmental and economic results.

Ken Kirk

Executive Director

Association of Metropolitan Sewerage Agencies

Ken Kirk is the Executive Director of the Association of Metropolitan Sewerage Agencies. Previously, he has worked for a private consulting firm, for the Office of Legislation at EPA, and as the Public Affairs Manager for the Water Pollution Control Federation. Mr. Kirk is a member of the District of Columbia Bar, and serves on the Board of Control of the Water Environment Federation, representing the Federal Water Quality Association. He has degrees from New York University, the Georgetown University Law Center, and the George Washington University Law Center.

Abstract:

Over the past 20 years, the nation has made enormous progress in the achievement of water quality goals. The Clean Water Act's historic focus on technology-based standards and end-of-pipe treatment, framed by aggressive scheduling for compliance and supported by significant federal funding, has achieved enormous reductions in the pollutants discharged in the nation's water. These successes would not have been possible without the significant support provided through the Construction Grants Program. The fact of the matter is, the grants program worked. Federal, state, and local monies provided the impetus to improve and protect our nation's waters. Today our focus must shift to a more comprehensive, holistic approach, addressing the control of costly, more complex and diverse sources of pollution. AMSA's recent Needs Survey documents capital needs in excess of \$100 billion over the next 15 years and underscores the fact that local ratepayers are currently shouldering 90% of the burden of achieving water quality requirements. Fine-tuning the clean water program so that water quality decisions are made on a watershed-specific basis will ensure continued progress in the attainment of water quality objectives systematically and cost-effectively. Economic incentives, such as privatization, trading initiatives, and proposals to sustain continued federal funding support for the program must be viewed in the context of a comprehensive watershed approach.

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Raymond Squitieri

Senior Economist

U.S. Department of the Treasury

Raymond Squitieri is a Senior Economist at the U.S. Treasury. Previously, Dr. Squitieri was a Senior Staff Economist at the Council of Economic Advisors. He has also been a Project Manager and Planning Economist at EPRI; an Economist at Applied Forecasting and Analysis, Inc; an intern with RAND Corporation; and a Research Associate for Brookhaven National Laboratory's Biological and Environmental Assessment Division. Dr. Squitieri is a member of the American Economics Association and the Operations Research Society of America, and has publications on energy modeling, risk, forecasting, and environmental analysis. He has a B.A. in History and Literature from Harvard University, and an M.S. in Engineering and a Ph.D. in Economics from Stanford University.

Zach Willey

Senior Economist

Environmental Defense Fund

Zach Willey is an Economist for the Environmental Defense Fund. Dr. Willey is the author of over 40 published works on economic incentives and institutional problems associated with natural resource systems. He is Dean of Instruction, Environmental Management for Native American Leaders, American Indian Resources Institute Emeritus, Water Resources Center, University of California. Dr. Willey has frequently served as an advisor and consultant for state and federal governments in the U.S., as well as for several nations and corporations in the Middle East and Africa. He has a Ph.D. in Economics from the University of California, Berkeley.

Abstract:

Implementing Market-Based Instruments for Clean Water in America

American water quality policy does not prohibit the use of market-based instruments. Without explicit Congressional authorization of such instruments, however, many opportunities for both economic and water quality-related gains will not be realized. The Clean Water Act and an array of other federal statutes must contain clear language ordering the active design and implementation of markets for discharge permits, federal water rights, and other instruments affecting water quality. There is an array of difficult technical, institutional, and legal issues to be resolved in implementing these markets. While these issues are often cited as reasons why market-based systems would not work, they are not insurmountable. Congress can order the Environmental Protection Agency and related agencies, with public consultation, to resolve them. The alternative—continuing the existing underfunded reliance on state and federal command-based water programs, public subsidies, and litigation—is increasingly unproductive and ineffective. The EPA and other responsible federal agencies need a market-based mandate to achieve water quality goals in the 1990s and beyond. The first step toward making such a mandate politically feasible is probably underway already—declining federal funding will require local and regional entities to underwrite water quality improvements and protection themselves. The environmental gains, cost savings, and innovation associated with market-based systems should, therefore, become attractive to many current skeptics of shifts from command- to market-based approaches. Whether or not this will manifest itself in the political milieu of the next Congress, or in a subsequent one, will be determined by economic and environmental conditions in America's river basin communities during the next few years.

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Break
10:15-10:30 a.m.

Session 8: Clean Water: Worth the Cost?—10:30 a.m.

MODERATOR:

Martha G. Prothro

*Deputy Assistant Administrator
Office of Water
U.S. Environmental Protection Agency*

Martha G. Prothro is the Deputy Assistant Administrator for the Office of Water of the U.S. Environmental Protection Agency. Previously, at EPA, she was an Enforcement Attorney in the Air Pollution Control Program, Head of the Noise and Radiation Enforcement Division, Director of the Permits Division of the Water Quality Program, and the Director of the Office of Water Regulations and Standards. Ms. Prothro has a B.A. from the University of North Carolina, and a J.D. from George Washington University's National Law Center. She has been the recipient of numerous awards, including the Presidential Award for meritorious service as a senior executive.

Robert W. Adler

*Senior Attorney
Natural Resources Defense Council*

Robert W. Adler is a Senior Attorney with the Clean Water and Coastal Program of the Natural Resources Defense Council (NRDC). Mr. Adler specializes in the legal aspects of water pollution control, water quality protection, oil and gas development, and other issues regarding the protection of lands and waters in Alaska. Mr. Adler has served as the Executive Director of Trustees for Alaska and as an Assistant Counsel with the Pennsylvania Department of Environmental Resources. He also worked previously with the Environmental Defense Fund, the Environmental Law Institute, and the U.S. EPA. Mr. Adler is a graduate of Johns Hopkins University and the Georgetown University Law Center.

Abstract:

The Economic Value of Clean Water

This paper will identify some of the key economic benefits of clean water and health aquatic ecosystems in the United States. Benefits will include the value of commercial and recreational fisheries, hunting and other water-based recreation, and wetlands. The paper will also identify some existing economic losses due to water pollution and lost or degraded aquatic habitats. Losses will include declining or contaminated seafood supplies, flooding and erosion, and drinking water contamination. Finally, the paper will discuss the economic losses due

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to the contamination of potentially valuable renewable resources, such as reclaimed wastewater and sewage sludge.

Kenneth W. Chilton

Deputy Director

Center for the Study of American Business

Washington University

Kenneth W. Chilton is Deputy Director of the Center for the Study of American Business at Washington University, and is Co-Director of the center's two-year research project examining the factors shaping the organizational changes in American business. He has been an engineer, management science consultant, director of planning, and treasurer for private-sector industries. Mr. Chilton has a B.S. and an M.S. in Management Science from Northwestern University, and an M.S.B.A. from Washington University.

Abstract:

Determining the current quality of U.S. water resources is problematic at present. EPA's most recent water-quality assessment, reflecting data collected by the states in 1988 and 1989, is largely encouraging. Health and ecological effects of polluted water have not been adequately studied, however, making comparison of costs and benefits of clean water policy problematic. Point-sources have decreased their effluents substantially since 1970. Pollutants from agricultural and urban runoff (nonpoint-sources) have increased and, in some cases, have more than offset industrial and POTW improvements. According to the EPA, agricultural and urban runoff pose the same amount of risk to human health, and more risk to the environment, than does point-source pollution. Technology to control nonpoint-source pollution is available and, in general, is relatively low-cost. Implementing nonpoint programs will not necessarily be easy, however. Farmers and municipalities lack the "deep pockets" of private industry; thus, following a "polluter pays" principle may be politically difficult in these situations. Water-quality science must improve before Congress can responsibly enact added restrictions on industrial dischargers. Even without added requirements, future costs of water pollution abatement will be huge—nearly \$650 billion over the next ten years. At present, the objectives of the Clean Water Act are clear but needed policy changes, if any, are murky.

David Gibbons

Principal

EOP Group

James P. Joyce

Director

Department of Public Utilities

City of Columbus, Ohio

James P. Joyce is the Director of the Department of Public Utilities of the City of Columbus. He serves as the Executive Head of the department, and directs activities of the Division of Electricity, Division of Sewerage and Drainage, Division of Water, and the Solid Waste Reduction Facility. He also serves as Advisor to the Mayor, and as the Mayor's Liaison at City Council meetings. Previously, Mr. Joyce was a Traffic Engineering Associate in the Division of Traffic Engineering for the City of Los Angeles. He has a B.S. in Civil Engineering from Ohio State University.

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Abstract:

Local Government Perspective on Clean Water and the American Economy

To meet Clean Water Act requirements, Columbus, Ohio spent \$200 million (its largest capital project ever) in 1988 and is continuing to invest large sums to comply with legislative mandates. Local government revenues have not increased to match expenses and sewer ratepayers have been increasingly resistive to rate increases that have averaged 10-12% each year to pay for the improvements, many of which are required by environmental mandates. Understandably, city leaders were shocked to discover that they had only just scratched the surface of complying with costly federal environmental mandates (e.g., CWA, SDWA, CAA, CERCLA, SARA, FIFRA, AHERA, RCRA). It seemed that no one had adequately examined the overall financial or social impact on individual communities, communities that are having enough trouble funding traditional services. This paper will address legislative credibility issues and future costs identified for Columbus and eight other Ohio cities. It will discuss recommendations for improving allocating scarce resources more effectively at the local level before a backlash by voters develops against costly environmental regulations that often appear unnecessary.

Paul Portney

Vice President

Resources for the Future

Paul Portney, Vice President and Senior Fellow at Resources for the Future, is a Visiting Lecturer at Princeton University's Woodrow Wilson School of Public and International Affairs, and is a member of the National Oceanographic and Atmospheric Administration's Panel on Contingent Valuation. Previously, he served as the Director of the Princeton Risk Management Center, and its Quality of the Environment Division; as a Visiting Professor at the Graduate School of Public Policy at the University of California at Berkeley; as a member of the Board on Environmental Studies and Toxicology at the National Academy of Sciences; and as Chief Economist for the Council on Environmental Quality. Dr. Portney has been a consultant to EPA, DOI, OECD, private organizations, trade associations, and environmental groups. He has a Ph.D. in Economics from Northwestern University.

Luncheon Address by Keynote Speaker—12:30 p.m.

F. Henry Habicht, II

Deputy Administrator

U.S. Environmental Protection Agency

F. Henry Habicht II has been the Deputy Administrator for the U.S. EPA since May 18, 1989. Previously, Mr. Habicht served in the U.S. Department of Justice as the Assistant Attorney General; the Director of the Lands and Natural Resources Division; the Deputy Assistant Attorney General; and the Special Assistant to the Attorney General. He formed and chaired the National Environmental Enforcement Council. Mr. Habicht also served as Counsel to the law firm of Perkins Coie, and was Vice President of William D. Ruckelshaus Associates. Mr. Habicht served on the Board of Directors and Executive Committee of the Environmental Law Institute, and on a *pro bono* advisory panel for the Chesapeake Bay Foundation, and he chaired the American Bar Association Toxic and Environmental Tort Committee. He also advised then Vice-President Bush on

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environmental and conservation issues during the 1988 presidential campaign. He was an Associate with the law firm of Kirkland and Ellis from 1978 to 1981 and received his J.D. from the University of Virginia.

Closing Remarks—2:00 p.m.

LaJuana S. Wilcher

Assistant Administrator

Office of Water

U.S. Environmental Protection Agency

LaJuana Wilcher is EPA's Assistant Administrator for the Office of Water. Under Ms. Wilcher's stewardship, the Office of Water has intensified its watershed management efforts; built administration support for providing nonpoint source pollution grants to states; developed a Memorandum of Agreement with the U.S. Army Corps of Engineers on mitigation requirements for development projects in wetlands; promulgated regulations to initiate the permitting of stormwater discharges; and launched a major outreach effort to accelerate drinking water enforcement and compliance activities. Previously, Ms. Wilcher was a partner in a D.C. law firm; a Special Assistant to the General Counsel and an Assistant to the Deputy Administrator at EPA; a Special Assistant to the General Counsel at the USDA; a litigation attorney; and a naturalist/interpreter at Mammoth Cave National Park. Ms. Wilcher has a B.S. in Biology from Western Kentucky University, and a J.D. from the Salmon P. Chase College of Law at Northern Kentucky University.

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