

Proceedings of
Drinking Water 2001:
The Issues Concerning
Delaware's Most Precious
Natural Resource

A Delaware Public Policy Forum

held Thursday, October 11, 2001, on the
University of Delaware's Newark campus

sponsored by
Institute for Public Administration
College of Human Services, Education & Public Policy
University of Delaware

in cooperation with the
Delaware Department of Natural Resources and
Environmental Control



June 1, 2002

Dear Friends of the UD Institute for Public Administration:

We are pleased to present the proceedings of the *Delaware Policy Forum, Drinking Water 2001: The Issues Concerning Delaware's Most Precious Natural Resource* held on Thursday October 11, 2001 at Clayton Hall on the University of Delaware campus in Newark, Delaware. The University of Delaware, Institute for Public Administration cosponsored this event with the Delaware Department of Natural Resources and Environmental Control.

Over 150 attendees heard speakers from the public and private sector and academia discuss the challenges in delivering safe and plentiful supplies of drinking water to Delaware residents and businesses. Drinking water is delivered to Delaware customers through a network of public and private purveyors in a coordinated fashion. Recent events such as droughts and groundwater contamination have emphasized the fragile nature of the water resource. The policy forum discussed the technical, governance, economic, and policy issues concerning drinking water in Delaware.

The program featured keynote speaker Dr. McKay Jenkins, journalist, and author of "The White Death: Tragedy and Heroism in an Avalanche Zone", from the University of Delaware English Department who spoke about the permeability of watersheds and national boundaries. His remarks emphasized the fragility of borders both manmade and natural - a timely topic considering the tragedies of September 11. Dr. Jenkins reminded us about the *"potentially destabilizing notion of political boundaries when it comes to the flow and distribution of water. What does a county line mean to an aquifer? What does a state line mean to a rain cloud? What does a national border mean to a river?"* These thoughts remind us that water ought to be managed on a natural watershed basis since rivers and aquifers know no political boundaries.

We would like to thank the speakers and attendees that committed their time to participate in this event. Special thanks are offered to the water policy forum organizing committee namely, Bernard Dworsky, Ruth Fallis, Stacy Lapasnick, Jerome Lewis, Gerald Kauffman, and Martin Wollaston.

Based on the response from the attendees, our aim is to sponsor future policy forums that explore the various facets and complexities of water policy and management in Delaware.

We hope you'll join us for future discussions regarding water - our most precious natural resource.

Regards;

Dr. Jerome Lewis, Director
University of Delaware
Institute for Public Administration

Gerald J. Kauffman, State Water Coordinator
University of Delaware
Institute for Public Administration

AGENDA

- 8:30 - 9:00 Registration and Continental Breakfast
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- 9:00 - 9:15 Welcome to the Delaware Policy Forum Series
Dr. Jerome Lewis, Director, UD Institute for Public Administration
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- 9:15 - 9:30 The "Livable Delaware" Initiative: What it means for Clean Drinking Water in Delaware.
Lee Ann Walling, Senior Advisor to Governor Ruth Ann Minner
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- 9:30 - 9:45 The Delaware Water Supply Coordinating Council: A Public/Private Forum for Water Policy
Kevin Donnelly, Director, DNREC Division of Water Resources
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- 9:45 - 10:15 Water as the Blue Gold for the 21st Century - How Much Will There Be to Drink?
Gerald Kauffman PE, State Water Coordinator, UD Institute for Public Administration, WRA
-
- 10:15 - 10:30 BREAK (Poster Session)
-
- 10:30 - 12:00 Parallel Session A: Water Supply - Issues to Ensure Clean and Plentiful Water
Moderator: Kevin Donnelly, Director, DNREC Division of Water Resources
- ◆ The Delaware Drinking Water Task Force.
State Representative Richard Cathcart
 - ◆ SWAPP - Going to the Source to Protect Delaware Drinking Water Quality.
Martin Wollaston, Senior Planner, UD Institute for Public Administration, WRA
 - ◆ Global Climate Change - Will it Mean More Droughts for Delaware?
Dr. Dan Leathers, Delaware State Climatologist, UD Geography Department
 - ◆ Streams and Aquifers - The Water Supply Framework in Delaware
John Talley, Associate Director, Delaware Geological Survey
 - ◆ Drinking Water Regulations - Where are we headed?"
Edward G. Hallock, Administrator, DE Office of Drinking Water
- 10:30 - 12:00 Parallel Session B: Water Demand - What are the Economic and Demographic Aspects?
Moderator: Professor Eric Jacobsen, UD Institute for Public Administration
- ◆ What does Drinking Water Cost?
Bruce Burcat, Director, Delaware Public Service Commission (PSC)
 - ◆ Water Rate Policies - How to Encourage Supply and High Quality
David B. Spacht, VP, Chief Financial Officer, Artesian Water Company, Inc.
 - ◆ An Efficient Pricing Mechanism to Manage Water Quantity in New Castle County, Delaware.
Dr. Joshua Duke, Dr. J. Mackenzie, R. Ehemann, UD Dept. of Food & Resource Economics
 - ◆ The 2000 Census Results: Implications for Future Water Demand Forecasts.
Edward Ratledge, UD Center for Applied Demography and Survey Research
 - ◆ Designing Revenue Neutral and Equitable Water Conservation-Oriented Rates for Use during Drought Summer Months: A Case Study of Northern Delaware.
Young-doo Wang, John Byrne, Govind Gopakumar, William J. Smith, Jr., Amy Roe and Jyoti S. Kulkarni
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- 12:00 - 1:30 LUNCH
- ◆ Keynote Speaker - Water Borders
Dr. McKay Jenkins, UD Department of English, Journalist and Author.
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- 1:30 - 3:00 Parallel Session C: Water Supply Governance: The Public -Private Universe
Moderator: Dr. Robert Warren, UD School of Urban Affairs and Public Policy
- ◆ The DRBC - Practicing Regional Watershed Management since 1961.
Carol Collier, Executive Director, Delaware River Basin Commission
 - ◆ The Municipal Purveyor - Affordable Water to Provide Basic Needs for All.
Kash Srinivasan, Commissioner, City of Wilmington Dept. of Public Works.
 - ◆ Newark's Experience in Designing Delaware's First Major Reservoir in 70 years.

- Mayor Harold Godwin, City of Newark
- ◆ The Investor-Owned Purveyor - Providing a Quality Supply as a Tax Paying Company in a Rate Regulated World
Anthony Langley, General Manager, United Water Delaware, National Assn. of Water Companies, DE Chapter
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- 1:30 - 3:00 Parallel Session D: The Value of Water to the Citizen, the Consumer, and to Commerce.
Moderator: Dr. Thomas Sims, Director, DE Water Resources Center, UD Dept of Plant & Soil Sciences
- ◆ Water: A Commodity for Business and Commerce
Rob Propes, Business Development Specialist, Delaware Economic Development Office
 - ◆ Water: Minimum Stream Flows to Sustain Recreation and the Environment
Roy Miller, Fisheries Program Manager, DE Division of Fish and Wildlife
 - ◆ The Value of Water for Agriculture, Delaware's Largest Industry
Michael McGrath, Delaware Department of Agriculture
 - ◆ The Absolute Imperative of Communication
Susan Frank, VP Customer/Community Relations, Artesian Water Co.
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- 3:00 - 3:30 Discussion and Wrap-up
Moderator: Gerald Kauffman, State Water Coordinator, UD IPA-WRA
- ◆ Poster Session
 - ◆ Community Soapbox - The Value of Water to Citizens of Delaware
Jack Harrison

Drinking Water 2001: The Issues Concerning Delaware's Most Precious Natural Resource
University of Delaware, Clayton Hall
October 11, 2001

Plenary Session

Welcome to the Delaware Policy Forum Series

Dr. Jerome Lewis, Director, University of Delaware, Institute for Public Administration

Abstract: Dr. Lewis welcomed over 150 attendees to the first Delaware Policy Forum addressing drinking water issues. He reminded the audience that this is one in a series of policy forums scheduled throughout the year by the University of Delaware, Institute for Public Administration. Dr. Lewis asked the attendees to consider whether an annual forum should be hosted to examine the wide assortment of water quantity and quality issues that face Delaware residents and businesses.

Biography: Dr. Lewis is the first Director of the University of Delaware, Institute for Public Administration. Jerome is a member of the faculty in the School of Urban Affairs and Public Policy and teaches graduate courses in public administration and public policy. The UD Institute for Public Administration links the research and resources of the University of Delaware with the management, information, and leadership needs of schools and local, state, and regional governments in the Delaware Valley. IPA provides assistance to agencies and local governments through direct staff assistance and research projects as well as training programs and policy forums.

The "Livable Delaware" Initiative: What it means for Clean Drinking Water in Delaware.

Lee Ann Walling, Senior Advisor to Governor Ruth Ann Minner

Abstract: Livable Delaware focuses on land use and the efficient use of infrastructure. The first phase of Livable Delaware did not address the water supply infrastructure, although Governor Minner did support successful legislation to strengthen reporting requirements for public drinking water systems. What are the Minner Administration's options, within the parameters of Livable Delaware, to address growth and its effect on drinking water supply and quality?

Biography: Since January 2001, Senior Adviser to Governor Minner. Functions as chief of staff in charge of policy, constituent relations, boards and commissions, Washington DC office, and support staff. Governor's liaison to Cabinet. Developed Livable Delaware policy and legislative agenda after chairing Governor's transition team on transportation/state planning issues. Spent 13 years in broadcast and print journalism before she was asked to run Ruth Ann Minner's 1992 campaign for lieutenant governor. Joined her staff as executive assistant and staffed the Minner Commission and other reinventing government efforts. Left after 1996 re-election to work in Department of Finance as executive assistant to the Secretary. Earned her MBA from University of Delaware and joined newly elected State Treasurer Jack Markell as Deputy State Treasurer in February 1999. Came to Delaware from Dallas, Texas in October 1981. Earned a Bachelor of Journalism (BJ) degree from the University of Texas at Austin.

The Delaware Water Supply Coordinating Council: A Public/Private Forum for Water Policy

Kevin C. Donnelly, Director, DNREC Division of Water Resources

Abstract: I have been asked to spend a few minutes talking about the Delaware Water Supply Coordinating Council. Let me first clarify the Council's name; the area that the Water Supply Coordinating Council focuses

on is not the entire state of Delaware – it is New Castle County, and almost exclusively northern New Castle County. The Council is composed of representatives from numerous state agencies and organizations – the Governor’s Office, state geologic survey, natural resources and environmental control, public health, utility commission, emergency management, agriculture, and others. The council’s public composition is furthered with the participation of the University of Delaware, three municipal governments, and the Delaware River Basin Commission. The private component comes from the three investor-owned utilities along with several business organizations, primarily the Green Industry interests, and all rounded out with civic leaders, environmental organizations, and other interested individuals. In total the Council has 25 appointed members with a total of over 30 participants. With an organization this diverse and large is there any chance it can actually accomplish anything? So far the Council has made creditable progress acting upon the recommendations it presented to then Governor Carper 22 months ago - December 2, 1999. The members of the Council have finally brought sharp focus to a long-standing problem of water supply adequacy in the First State and they have a clear plan of how to solve this problem. I must stress however, that the Council is more than just a policy forum despite the title for this part of the agenda. It serves as a forum where the members can discuss relevant water supply issues but more significantly the Council serves as the action team overseeing the implementation of over 1 billion gallons of water supply projects to (December 99 report) “close the gap between supply and demand in Northern New Castle County by the year 2020.”

Biography: Donnelly, the director of the Department of Natural Resources and Environmental Control’s (DNREC) Division of Water Resources since September 1999, is responsible for overseeing the state’s environmental laboratory, monitoring and assessment of the state’s ground and surface water quality, the Total Maximum Daily Load program, the use and management of the state’s water supplies, and the regulation of discharges into surface waters and underwater lands and tidal wetlands. Donnelly has been active on the Delaware Nutrient Management Commission, the Governor’s Environmental Advisory Council, and the Inland Bays Board of Directors. In addition, he serves as an alternate on the Delaware River Basin Commission (DRBC) and a member of the Estuary Implementation Committee (EIC) for the Delaware Estuary Program. Prior to his present appointment, Donnelly was an environmental program administrator in DNREC’s Division of Soil and Water Conservation for eight years. In that capacity he administered the Delaware Nonpoint Source Management Program under the Clean Water Act and the Sediment and Stormwater Management Program. His responsibilities included serving as departmental liaison with the three county conservation districts, the agricultural community and Division representative on DNREC’s Environmental Indicator, Whole Basin and DNREC-EPA Performance Agreement workgroups. Donnelly received a Bachelor of Science degree in Forestry with a minor in Land Use Planning from the University of Maine in Orono. Prior to joining DNREC, he was a senior resource planner and forester with the Delaware Department of Agriculture. He resides in Wyoming with his wife Dot.

Water as the Blue Gold for the 21st Century - How Much Will There be to Drink?

Gerald Kauffman PE, State Water Coordinator, UD Institute for Public Administration, WRA

Abstract: Globally, the United Nations has stated that water will be the "blue-gold" of the 21st century. Locally in Delaware, drinking water is arguably the First State's most precious natural resource. Drinking water is delivered to Delaware customers through a network of public and private purveyors in a semi-coordinated fashion. Recent events such as the droughts of 1995 and 1999 and groundwater contamination have emphasized the fragile nature of the water resource. This policy forum will discuss the technical, governance, economic, and policy issues concerning drinking water in Delaware. Technical studies forecast a 17- mgd deficit in water supplies in northern Delaware by the year 2020. In 2000, the Governor and General Assembly appointed the Delaware Water Supply Coordinating Council as a governance structure to develop water supply projects to meet this deficit by 2003. Water demand is affected by the relatively inexpensive price of water, which ranges from \$ 100 to \$ 300 dollars per year for the average customer. The largest challenge is the issue

of "hydro-politics" whereby municipal and investor-owned purveyors and Federal, State, county, and municipal governments must collaborate in delivering safe and plentiful drinking water to Delaware residents in a public-private partnership.

Biography: Gerald Kauffman is the State Water Coordinator with the University of Delaware, College of Human Services, Education, and Public Policy, Institute for Public Administration, Water Resources Agency. Along with the staff at the WRA, Mr. Kauffman is responsible for providing regional water resources technical and policy assistance to state and local governments in Delaware and the Delaware Valley through the University's public service, education, and research role. These responsibilities include appointment as the State Water Coordinator, serving as the local watershed coordinator for the Christina Basin Water Quality Strategy, teaching courses in Regional Watershed Management and Water Resources Engineering, and establishing the University of Delaware's first Experimental Watershed. He is the author of "The Anatomy of a Drought" in the 1998 book edited by Robert Reimold: *Watershed Management Practice, Policies, and Coordination*, McGraw Hill. Gerald received the Bachelor of Science degree in Civil and Environmental Engineering from Rutgers University (concentration in water resources) and is a Certified Public Manager (Level III) awarded by the Rutgers University Graduate Program in Public Administration. He is a Master of Public Administration (MPA) candidate at the University of Delaware (2002). Mr. Kauffman has been registered as a professional engineer (PE) in 4 states and has 20 year's experience in water supply, water resources and watershed management.

Parallel Session A

Water Supply - Issues to Ensure Clean and Plentiful Water

Moderator: Kevin Donnelly, Director, DNREC Division of Water Resources

The Delaware Drinking Water Task Force.

State Representative Richard Cathcart, Delaware House of Representatives, 9th District

Abstract: Representative Cathcart detailed the issues surrounding the creation of the Delaware Drinking Water Task Force, and discussed the impetus behind its formation. Concerns over interconnections, public notification, water quality testing and interagency cooperation lead to this initiative. The Task force, comprised of representatives from the state, the counties, local municipalities, relevant utilities and agencies, and assorted interests, was charged with a series of tasks. They were to examine and recommend strategies to increase interagency cooperation, refine public notification procedures, analyze primary and secondary water quality standards, help the public test private wells, and various other water related issues. To do so, the Task Force assembled 3 subcommittees: primary and secondary standards, private well testing and interagency cooperation/coordination.

The primary and secondary standards committee examined issues ranging from the extent and validity of existing water quality standards to fluoridation and public notification. The private well testing committee worked to overcome the barriers to private well testing, including the lack of mandatory testing, general information, and disclosure requirements. The interagency cooperation/coordination committee worked to increase cooperation among the related agencies, streamlining communication protocols, and defining roles.

The final recommendations of the Task Force included: new legislation, centralization of complaints, mandatory and improved cooperation protocols between agencies, additions and changes to water quality standards, public water education, testing for private wells, disclosure requirements for property transfer,

changes to comprehensive plan requirements, new requirements regarding agricultural, golf, and SIRB sites, and mandatory interconnections.

Biography: Dick Cathcart was first elected to represent the 9th District in the House of Representatives in 1997. Representing one of the fastest growing areas in the state, Dick has dedicated much of his legislative career to land use management and quality of life issues. In fact, on his first day in office, Dick introduced legislation aimed at improving the quality of drinking water in his District, as well as statewide. Residents in the 9th District had bitterly complained about discolored and odorous water, and once elected, Dick sponsored legislation that now requires the State Health Department to establish and enforce secondary water quality standards. These standards would include such items as chlorides, copper, iron, manganese, sulfate and total dissolved solids. The Speaker of the House, Rep. Terry Spence also selected Dick, to chair a legislative task force on water quality. The Water Quality Task, which has been meeting since the early part of this year, has been examining the problems concerning Delaware's drinking water, and will make recommendations on improvements with regard to how the process is regulated. "I care about the community that I serve, especially when it comes to quality of life issues," Rep. Cathcart said. "I also am concerned about the sprawl that has encroached upon our community and our way of life," he also said. During the 2001 General Assembly, Dick was the lead sponsor of legislation aimed at addressing uncontrolled growth in Delaware. As one of the main sponsors of the Governor's comprehensive land use agenda called "Livable Delaware," Dick worked hard in the General Assembly to approve legislation that plans growth in a responsible and thoughtful manner. Controlling sprawl and directing new development to areas where the state, county and local governments are most prepared for that growth will be the primary goals of the plan, which is now law. Delaware State University currently employs Dick as Director of Purchasing and General Services. He and his wife Linda reside in Middletown, and they have three daughters and five grandchildren.

SWAPP - Going to the Source to Protect Delaware Drinking Water Quality.

Martin Wollaston, Senior Planner, UD Institute for Public Administration, Water Resources Agency

Abstract: In 1996 the U.S. Congress amended the Safe Drinking Water Act (SDWA) establishing a Source Water Assessment and Protection Program (SWAPP). The program, coordinated nationally by the U.S. Environmental Protection Agency (EPA), requires all states to develop a plan for evaluating public drinking water supply sources in their state and to conduct source water susceptibility assessments. Susceptibility assessments must include a determination of the area that has the greatest affect on the quality of each public drinking water source and an inventory of the potential contaminants within the designated area. The ultimate goal of the SWAPP is to provide local government with the information it needs to improve the protection of public drinking water sources through its land management authority.

In October 1999 the U.S. EPA formally approved Delaware's Source Water Assessment Plan which outlined the methodology Delaware will follow to determine the susceptibility of the 582 public water systems in the state. All assessments will follow the same general approach, although the details may vary depending on the size of the water system. Susceptibility will be reported for the following eight categories of contaminants:

- Nutrients (nitrogen, etc.)
- Pathogens (bacteria, etc.)
- Petroleum Hydrocarbons (gas, etc.)
- Pesticides (lindane, etc.)
- Polychlorinated biphenyls (PCBs)
- Other Organics (benzene, etc.)
- Metals (lead, zinc, etc.)
- Other Inorganics (chlorides, etc.)

The Delaware Department of Natural Resources and Environmental Control (DNREC) has the lead role in developing the assessments for Delaware. The WRA is assisting the DNREC by developing the assessments for the water systems that use surface water as their supply source.

Biography: Martin is the Senior Planner for the Water Resources Agency, (WRA - a Project in the Institute for Public Administration), College of Human Services, Education and Public Policy at the University of Delaware. He has worked with the WRA since 1983 providing water resources management assistance to state and local governments in Delaware and surrounding states. He received his BA and MPA degrees from the University of Delaware and currently divides his time between water management projects and local government assistance projects.

Water, Water Everywhere? Climate Change in Delaware

Dr. Dan Leathers, Delaware State Climatologist, University of Delaware Geography Department

Abstract: Because Northern Delaware utilizes surface streams for such a large percentage of consumable water, the climate of the region is a very important factor in the issue of water availability. Although Delaware receives 43 inches of liquid precipitation distributed homogeneously throughout the year, it is not immune to rather lengthy drought periods that can cause disruptions in drinking water supplies. This talk will focus on the precipitation and climatology of the state and its variability over the last 105 years. It will attempt to answer questions concerning the temporal and spatial nature of Delaware droughts, and the influence of climate variability on the state's water availability.

Dr. Leathers examined the implications of climate change, and its possible impact on drought conditions. The extreme variability of precipitation in the Delmarva area was cited as a significant source of drought problems. While temperature varies as well, it was found to do so to a much lesser degree.

Two types of drought situations were presented. A soil moisture drought is characterized by a relatively short period of time (days or weeks) in which a decrease in precipitation is often accompanied by an increase in evapotranspiration and primarily affects agriculture and lawns. Brief dry spells are often soil moisture droughts. A hydrologic drought is longer in time span, lasting months, and is characterized by a long-term lack of precipitation and lowered streamflows. This type of drought can affect human usage, water supplies, and aquatic communities.

Droughts are often compounded by trends in human water use during their respective seasons. During the May-September water season, there is a potential moisture deficit, as evapotranspiration exceeds precipitation input. This is the time of lowest availability of water resources, but conversely is also the time of greatest draw on the system by human use. While usage is relatively constant and growing for the greater part of the year, unpredictable patterns of precipitation may vary greatly. The increasing summer temperatures of recent years is representative of climate change, and has severe implications for drought situations in the future. Higher temperatures will accentuate drought conditions, and increase human use of water resources.

Biography: Dr. Daniel Leathers grew up in north central Pennsylvania. He attended Lycoming College where he earned a BA in physics in 1982. He continued his education at the Pennsylvania State University earning an MS in Meteorology in 1986 and a Ph.D. in Geography in 1988. He came to the University of Delaware in 1991 and was appointed Delaware State Climatologist in 1993. He is currently chairperson of the Department of Geography.

Streams and Aquifers - The Water Supply Framework in Delaware

John H. Talley, Associate Director/Stefanie Baxter, Research Associate, Delaware Geological Survey

Abstract: John Talley presented an overview of the hydrologic status of Delaware water sources. Our hydrologic budget revolves around 44 inches of precipitation a year, of which 26 inches is lost to evapotranspiration, and 4 inches to direct runoff. In geologic terms, our state is 6% hilly, rocky, piedmont area and 94% coastal plain, the former being comprised primarily of metamorphic formations, and the latter by underlying sands and gravels.

The majority of the Christina River Basin (71%) is within Pennsylvania, while 28% is within Delaware, and 1% is in Maryland. Our surface water supplies are fed by sources in Pennsylvania. The coastal plain is characterized by a series of aquifers. The primary first layer is the Columbia aquifer, which can store and transmit large amounts of water, but it is also most susceptible to pollution/contamination. However, this aquifer is the primary public drinking water source for the coastal plain in Delaware.

Delaware has ten major aquifer systems, which are unequally distributed. The overall water quality is variable, but relatively good. However, other aquifer systems are susceptible to contamination from the Columbia aquifer. Mr. Talley reviewed the status of the aquifers for each county/area.

Biography: John H. Talley is Associate Director of the Delaware Geological Survey at the University of Delaware. He has been with the Survey for 28 years and has served as Associate Director for nine years. Prior to joining the Survey he was an engineering geologist with a soil and foundation consultant. He holds a B.A degree from the University of Delaware and an MS degree from Franklin and Marshall College. He is author or co-author of more than 50 publications and reports pertaining primarily to applied geology, hydrology, and geologic hazards in the Atlantic Coastal Plain and Piedmont. Mr. Talley is a registered geologist in Delaware and Pennsylvania, and a Certified Professional Geologist of the American Institute of Professional Geologists.

Drinking Water Regulations - Where are we headed?

Edward G. Hallock, Program Administrator, Delaware Office of Drinking Water

Abstract: This talk will cover the evolution of the Safe Drinking Water Act from its inception in 1974, through re-authorization in 1986 and 1996. I will discuss early requirements, why Congress felt the need to require the US Environmental Protection Agency to regulate specific numbers of contaminants and what changes were brought about by the 1996 re-authorization. Finally, I will cover the current regulatory process and review the new approach the EPA is using to regulate drinking water.

Ed Hallock presented a comprehensive examination of the changes in the Safe Drinking Water Act and the current status of regulatory procedures. The Safe Drinking Water Act initially regulated a small number of contaminants in systems serving 25 or more citizens, relying on the states as the primary enforcer. In 1986 Congress reauthorized the SDWA, indicating that the EPA must designate 25 new contaminants for regulation every three years, and set new restrictions for lead, copper, solid waste treatment. In 1996, Congress reauthorized the SDWA again, removing the 25 contaminant every 3 years, resulting in greater control for the states, greater say in regulation for the National Drinking Water Advisory Council and mandatory public participation.

Currently, new contaminants are being monitored, the lead/copper rule for plumbing is being used, and a testing database is being created to categorize and store new data. In addition, Customer Confidence Reports are required, and there are new rules for radon, sanitary survey requirements, and a greater emphasis on looking at how systems operate and involve the public. Delaware has responded with legislation regarding public

notification, increased secondary standards, creation of SDWIS data management systems, and Internet initiatives.

Biography: Mr. Hallock is a life-long resident of Delaware and:

- Graduated from Lake Forest High School in Felton in 1975.
- Received a Bachelors Degree in Biology from the University of Delaware in 1980
- Worked in the Division of Public Health for 18 years.
- Began public health career in the Division of Public Health, Office of Food Protection in 1983.
- In 1986, accepted the job in the Office of Sanitary Engineering, drinking water program.
- Became Program Manager for the Office of Drinking Water in 1991 and Program Administrator in 1999.
- Participated on the National Drinking Water Advisory Committee workgroup that developed the Consumer Confidence Report Rule and represented Delaware on an EPA/State workgroup revising the Public Notification Requirements of the Safe Drinking Water Act.
- Is an active member of the Chesapeake Section, American Water Works Association where I am a Trustee and the Association of State Drinking Water Administrators where I am the Chairman of the Consumer Awareness Ad Hoc Committee. I am also a past Treasurer of the Delaware Public Health Association.

Parallel Session B

Water Demand - What are the Economic and Demographic Aspects?

Moderator: Professor Eric Jacobson, UD School of Urban Affairs and Public Policy

What does Drinking Water Cost?

Bruce Burcat, Director, Delaware Public Service Commission (PSC)

Abstract: As Director of the Public Service Commission, Mr. Burcat outlined the commission's role as a regulatory agency for public utilities in Delaware. The commission has executive jurisdiction over utilities' rates and service that is dictated by current state statute (72 Delaware Laws Ch. 402, 26 Del. C. §209(a), and 29 Del. C. §§ 10111 et seq.). The goal of the organization is to balance the interest of ratepayers and utilities and serve as public advocates in dealing with these natural monopolies. The commission strives to ensure customers have just and reasonable rates, while maintaining the viability of the utility to attract investment opportunities. The method of obtaining these goals include analysis of detailed and complex financial documentation, supporting written testimony from utility professionals, and explanations of rate base additions, for example, investments made in utility capital, expense of the utility, and its revenue.

The role of the Public Service Commission in regulating water utility rates and services will be addressed. This discussion will include the need for such regulation and a brief overview of the Commission. The presentation will also include discussion of the concept of cost based ratemaking for water utilities, which are utilized in Delaware and most jurisdictions in the U.S. The presentation will also include an update on new developments in Delaware with some discussion on important national issues that may have an impact on ratemaking. In addition to performing these analyses, other factors effecting the cost of water are also assessed, include Federal and State environmental laws, the cost of replacing aging water supply infrastructure, and the consideration that water infrastructure is generally more capital intensive than other types of utilities.

The commission has also identified added water costs in the wake of the September 11, 2001 attacks which include cost of extra security precautions taken by water utilities, commission pressure to improve quality of utility's service and Senate Bills 370 & 212

Biography: Bruce Burcat has been the Executive Director of the Delaware Public Service Commission since October 1995. In that capacity, Mr. Burcat has been involved in all facets of utility regulation, including the oversight and review of water utilities rates and services. He is currently a member of the Delaware Water Supply Coordination Council and the Delaware House of Representatives Drinking Water Task Force. Prior to coming to the Delaware Commission, Mr. Burcat was an attorney for the New Jersey Division of the Ratepayer Advocate where he managed the Division's water utility cases and also represented the Advocate in a number of energy cases. Before the position he was a Senior Rate Attorney for General Waterworks Management and Service Company, where he was involved in proceedings in a number of different jurisdictions concerning all aspects of utility rate making pertaining to water utilities. Mr. Burcat is a graduate of the University of Delaware. He received his law degree from Rutgers University School of Law-Camden and a Masters of Law in Taxation from the Villanova University School of Law.

Water Rate Policies - How to Encourage Supply and High Quality

David B. Spacht, VP, Chief Financial Officer and Treasurer, Artesian Water Company, Inc.

Abstract: Why is it better (and truly less expensive) to pay me now rather than pay me later? A review of industry standard cost of service rate setting principles will be presented, as well as discussion of the benefits and risks of conservation-oriented rates. The application and benefits of unique rate setting practices, such as a distribution service improvement charge in order to encourage the timely replacement of aged infrastructure, will be reviewed.

Mr. Spacht identified the function of public water utility companies, as acting to re-route and decontaminate state owned water supplies. Mr. Spacht indicated customers are paying for these services and not the actual water. The public utility service incurs three types of costs for water utility companies: administrative, maintenance, and investment.

Mr. Spacht described Artesian's "cost of service" approach in an effort to capture some of the public utility costs. The "cost of service" approach identifies the value of delivering water services to customers and estimates the cost water users pay. Ideally, Artesian would like to develop a rate determination approach that accounts for all water costs and users. This type of approach will accurately identify and determine types of service (customer service, fire hydrants, type of demands, etc.) the nature of cost (supply, transmission and distribution, storage, etc.), and the design method for calculating and allocating costs (meter reading, service charge rate, etc).

Mr. Spacht also acknowledged Artesian's efforts in encouraging water supply and high quality. He noted Artesian's comprehensive educational conservation program for adult users, water audits to control leaks and other water infrastructure problems, school conservation programs, conservation kit giveaways and low toilet flush rebate programs. Artesian however, has no real financial incentive to promote conservation because its effect lowers company profits.

Biography: David B. Spacht, Vice President, Treasurer and Chief Financial Office of Artesian Resources Corporation and subsidiaries joined Artesian Water Company as a Plant Accountant after graduating from Goldey Beacom College in 1980. He has served in his present capacity since 1995. Mr. Spacht oversees the accounting and regulatory functions of the Company. He is primarily responsible for financial regulatory matters that include the presentation of extensive testimony before the Delaware Public Service Commission

regarding water and other regulatory matters. In addition, he is responsible for treasury functions of the Company, which include the issuance of long-term debt and equity in capital markets.

An Efficient Pricing Mechanism to Manage Water Quantity in New Castle County, Delaware.

Dr. Joshua Duke, Dr. J. Mackenzie, R. Ehemann, UD Department of Food and Resource Economics

Abstract: A common contention is that water pricing is inequitable. This is based on the argument that everyone, rich or poor, has to have water, yet the same amount of water will constitute a larger portion of the income of the poor. As such, conservation through water scarcity pricing tends to be dismissed early in political debates. Our study shows that the equity effects of water pricing, as applied to New Castle County, appear to be quite the opposite of the conventional wisdom. Indeed, urban users appear to be subsidizing suburban users. Given that Census data show that urban residents tend to have lower median incomes than suburban residents, we conclude that current water conservation policy is not only inefficient but also inequitable. We propose that water pricing (with a threshold for indoor use of water) will achieve conservation goals in times of deficit efficiently and equitably.

Another provocative finding comes from an application of our model to Newark, Delaware, where a recent reservoir has been approved to address deficits. Water pricing in Newark would achieve a 25-percent conservation goal at an additional cost to consumers of approximately \$567,000 per month, money which can be used to lower rates during nondeficit periods. Such costs would only be borne by those who use “outdoor” water, during droughts—water bills would not change for residents who conserve during times of drought. When compared to the \$24,000,000 Newark has already targeted for reservoir construction, it seems that pricing offers a less expensive path to sustainability than traditional supply-side solutions.

Dr. Duke examined three pricing scenarios and determined the effect each had on changes in water supply. The first scenario referred to as “pricing” assumed a 48-gallon threshold and inelastic elasticity on the first 48 gallons. Upon consumption above 48-gallons, a 591 percent increase in price (numerically solved) above the threshold would be applied. This pricing would allow water utilities to reduce overall rates in subsequent quarters by increasing the cost to the greatest users of water above 48-gallons. The second scenario, “Rationing,” describes a 25 percent reduction that is forced on every household. This benefit entails greater conservation and cost recovery for water utilities through increased rates in subsequent quarters, however, rates would also increase for those who conserve during a drought. The final scenario “Mandatory Restrictions” illustrates an entire cost burden that is absorbed by block groups with an average parcel size over 0.10 acres in an effort to achieve decreased consumption and utility cost recovery.

As a case study Dr. Duke examined the projected Newark reservoir showing both dynamics of supply-side solutions and demand side solutions relative to one another. A supply-side solution to increased Newark water demand and possible drought conditions costs \$8,000,000 for land via property tax increases \$16,000,000 for construction via bonds and marginal water rate increases from \$1.82 to \$3.34 per 1000 gallons. By comparison, demand-side solutions offer a 591 percent increase in price above the 48-gallon threshold, the quantity demand decreases by 25 percent, additional consumer spending per month of drought equals \$567,000 for consumption above 48-gallons.

Biography: Dr. Joshua Duke has been an assistant professor in Food and Resource Economics at the University of Delaware since 1998. Josh received his Ph.D. in Agricultural and Applied Economic, with a minor in Law, from the University of Wisconsin-Madison. His research focuses on natural resource economics, particularly land-use conflict resolution, farmland preservation, and recently, waters quantity management. Josh teaches courses in agricultural economics, environmental law, and natural resource economics.

The 2000 Census Results: Implications for Future Water Demand Forecasts.

Edward Ratledge, Director, UD Center for Applied Demography and Survey Research

Abstract: Mr. Ratledge examined the recent census results for the state of Delaware as they apply to the future costs and demands on water consumption. The population is estimated to grow to 200,000 for Delaware within the next 30 years, approaching 1 million residents by 2030. The current highest concentration of residents is currently between 40 and 65 years old. The total population will use approximately 4,000,000 gallons of water per day by 2030. Ratledge noted that 20 percent of the current population was not here in 1990. Migration and worker commuting account for a large number of users of water resources rather than native birth or death rate fluctuations. Lastly, he concluded a study was needed to compare water consumption and age groups. This study will enable water supply issues to be accurately addressed and compared to the population of age groups and water consumption in Delaware.

Designing Revenue Neutral and Equitable Water Conservation-Oriented Rates for Use During Drought Summer Months: A Case Study of Northern Delaware

Young-doo Wang, John Byrne, Govind Gopakumar, William J. Smith Jr., Amy Roe, and Jyoti S. Kulkarni, University of Delaware, Center for Energy and Environmental Policy

Abstract: Dr. Wang and his team developed a test case to show the impact of water rate changes across income levels and its effect on water conservation. To obtain this data the team conducted 17 interviews with state utility commissions focusing on public policy and planning issues related to WCORs (water conservation-orientated rates). They also held 43 interviews with public and private utilities focusing on their experiences implementing WCORs. The team attempted to capture the major issues of WCORs such as utility revenues, equity as it pertains to customers and contribution to water conservation. The method the team used to study the major issues of WCOR involved selecting a panel of 500 households as a hypothetical water utility/water jurisdiction. The team then used state projected water supply and demand conditions during a drought between 2000 and 2010. Income categories were determined and the elasticity for water of each group was estimated.

The team then showed the effects of price increases of water on each income group, beyond benchmark consumption, i.e., 20,000 and 30,000 gpd. From their scenarios, the group inferred that price increases would have implications such as a reduction in residential water consumption by 10.5%, total water savings of 5.8%, and reduced water demand from 88 mgd to 82.9 mgd versus a 85 mgd supply under the current 7Q10 condition in 2010. Conclusions from their study included improving efficiency, providing revenue neutrality, assuring distribution equity and guaranteeing the conservation of water.

Keynote Speaker

Water Boundaries

Dr. McKay Jenkins, UD Department of English, Journalist and Author

Abstract: A couple of years ago, I asked my environmental journalism students here at the university what they considered to be the most pressing environmental issues in the state of Delaware. The clanging response: "Environment? There is no environment in Delaware." Living in a world in which the only running water they may contemplate runs through a fake "waterfall" inside a shopping mall -- and where drinking water is something you buy in a plastic bottle -- today's young people find themselves increasingly alienated from the natural world. As they become adults, their behavior -- from their health to their choice of professions to their spiritual lives -- is substantially affected by their fractured sense of how and where they live. This talk will

explore how the ways in which we conceive of the environment, and with watersheds in particular, sharply (and sometimes painfully) reflect our culture, and ourselves.

Biography: An associate professor of English and journalism, McKay Jenkins is the author, most recently, of "The White Death: Tragedy and Heroism in an Avalanche Zone," a nonfiction account of five boys who were killed in an avalanche in Montana that is also a meditation on snow, wilderness and high mountains. He is also the author of "The South in Black and White," a book about the civil rights movement, and the editor of "The Peter Matthiessen Reader," a collection of the natural history writer's nonfiction. Jenkins is currently writing two books: a narrative history of the 10th Mountain Division, a group of World War II soldiers that fought the Germans in the mountains of Italy; and an account of two French Catholic priests who were murdered by Inuits near the Arctic Ocean near the turn of the last century. At Princeton University, he studied with John McPhee, a Pulitzer Prize winning author, who wrote about the relationships between humans and their water resources. His family - wife Katherine and son Steedman, joined Dr Jenkins at the forum.

Water Boundaries Mckay Jenkins

I think I am here not because of what I know about water, but because of what I know about snow. A book I wrote a couple of years ago called *The White Death* tells the story of five boys who were killed in an avalanche in Montana, and, tangentially, describes the remarkable properties of snow. Along with its parent -- water -- snow is one of the most unusual substances on earth. Snow, for example, is one of the only substances on earth that can flow like a liquid and break like a solid. Snow crystals form in the upper troposphere, where water molecules come together around tiny nuclei, made up of bits of dust, pollen or bacteria; these nuclei are quite small: it may take ten million of them to form a single water droplet, and a million frozen ice crystals to form one snowflake. The flakes that fall in a snowstorm are legion: in a single 10-inch snowfall, as many as a million billion flakes may fall on a single acre of land. Enough snow has fallen on the earth since the first flakes fell to cover the globe to a depth of 50 feet.

In addition to being, in its most delicate form, the stuff of poetry, snow can also be deadly. Hannibal lost 18,000 men, 2,000 horses and several elephants to Alpine avalanches in 218 BC; in World War One, some 80,000 Italian and Austrian soldiers were killed by avalanches in the Alps. Knowing some of these facts led the United States Army, in the early 1940s, to create the country's first elite unit of mountain soldiers, the 10th Mountain Division, a remarkable group of men that are the subject of my next book. As we now know, the 10th Mountain Division is in the news for one of the first times in the last 60 years -- a thousand of them have just moved to the mountains of Uzbekistan to help figure out how to fight terrorists in the Hindu Kush. With 20,000 foot mountains as their battlefield, we can only trust that their training has been adequate to the task at hand.

Indeed, it may not surprise you that my thoughts for this talk -- like everything else -- changed dramatically after September 11, and what I would like to do today is try and expand our notion of the importance of watersheds to talk about borders and flow in a larger context. Ecologists and drinking water experts have long acknowledged the silliness -- not to say utterly counterproductive, and potentially destabilizing -- notion of political boundaries when it comes to the flow and distribution of water.

What does a county line mean to an aquifer? What does a state line mean to a raincloud? What does a national border mean to a river? As world populations continue to grow and shift, we have begun to witness the outright danger of this sort of thinking: In the Middle East, as Israelis and Palestinians and Syrians and Lebanese and Jordanians continue to haggle and shed blood over territorial boundaries, the flow and availability of drinking water looms as an unresolved and potentially explosive issue. Since 1967, Israel has controlled all the water sources from the Mediterranean to the Jordan River. Even the recent Oslo accords have not shifted the balance

of control, and Israelis still oversee the amount of water flowing to the West Bank and Gaza. Jordan and Israel have competing interests in freshwater, as do Israel and Lebanon, Israel and Syria, Syria and Turkey, Syria and Egypt. As these sources continue to suffer from drought, religion and culture may take a back seat to dehydration as the major source of conflict.

As we know, the last month has witnessed a remarkable change in the way people are thinking about boundaries of all kinds. Suddenly, the American public is all too aware of the permeability of national boundaries, especially those of open democracies like the United States, Israel and the European Union. A month ago, terrorists who had crossed our national boundaries unnoticed and then lived in our country for years used our own commercial airliners to kill 6,000 people. As we now know, those 6,000 people were from some 80 different countries. The nations of the world have condemned these attacks, and not only because they are terrified of attacks themselves on their own countries -- many of them lost hundreds of their own citizens in the World Trade Centers. It's not that the world is "shrinking," as so many say, it's that the world has become more fluid. Human populations have always tended to migrate, or flow; today's high-speed travel and a global economy has only made fulfilling this impulse that much easier.

The idea of boundaries applies, of course, to the human condition as well, and is particularly relevant in light of our historical moment. I heard a psychiatrist on the radio the other day talking about the psychological roots of fundamentalist extremism. It was his argument that not all fundamentalists are extremist, and not all extremists are given to violence. The critical psychological jump takes place when someone with extreme views has so separated himself from the flow of human society -- in other words, has so reinforced the borders of his own personality -- that he no longer sees himself as made up of disparate parts, nor his place in the world as just one part in a exceedingly complex social context. In other words, a man living among like-minded zealots in a cave in Afghanistan doesn't see himself as also a father, a husband, a businessman, a musician and a poet but as a one-dimensional character with one way -- and one way only -- to express himself. By blinding himself to the value of other points of view, possibly in competition with his own, he also is able to see his place in the world as uniquely worthwhile, and the place of others in opposition to him as pathological and worthy only of violence and death. The psychological ability of a terrorist -- or any murderer -- to kill another human being seems to require primarily that their pathological attachment to an idea overwhelms their ability to see their victims as fragile, textured, complicated human beings. In essence, murder -- especially this kind of murder -- represents a complete breakdown in the murderer's ability to understand or accommodate complexity.

The point I want to make here is that any effort to reject the permeability and flow of boundaries, be they natural or psychological, runs against the natural way of things. Water wants to flow -- it's in the nature of water. People want to flow -- it's in the nature of people. Culture wants to flow -- it's in the nature of culture. Dam a river, and the dam, one day, will crack. Isolate a person, and the person will crack. Isolate a culture, and the culture will find a way to make violence seem legitimate, even holy.

The great poet and philosopher Gary Snyder has written at length about the danger of enforcing unnatural boundaries on ourselves, our culture, and our environment. "The science of ecology, with its demonstrations of co-evolution, symbiosis, mutual aid and support, interrelationship, interdependence throughout natural systems, has taught us modesty in regard to human specialness," he writes. It is only when these principles are applied to our relationships with the natural world -- and with each other -- that we can remain in balance.

One of our pioneering ecologists, Rachel Carson, writing in 1962 at height of Cold War, wrote of a dilemma similar to our own that had led the world to the brink of a nuclear war. "Man has long talked somewhat arrogantly about the conquest of nature; now he has the power to achieve his boast. It is our misfortune -- it may well be our final tragedy -- that this power has not been tempered with wisdom, but has been marked by irresponsibility. I wish I could stand before you and say that my own generation had brought strength and meaning to man's relation to nature, that we had looked upon the majesty and beauty and terror of the earth we

inhabit and learned wisdom and humility. Alas, this cannot be said, for it is we who have brought into being a fateful and destructive power."

As this war goes on, it is becoming apparent to more and more Americans, of course, that we are not innocent of this mindset, this failure to acknowledge the unfathomably complex nature of the world that biologists and ethnographers alike call "diversity." Our national tendency toward economic self-interest in our international relations has led us to a deep ignorance -- or worse, indifference -- to horrendous world poverty, which, as we can now see, is the seedbed in which murderous rage against American culture can find root. One of the most remarkable, and I would say, encouraging results of the September 11 attacks has been the remarkable response of my students. In addition to their paralyzing grief and confusion, my students have been angry - and not just at Osama bin Laden.

They have also been angry, I have been surprised to see, at themselves. Angry at their ignorance, primarily -- plainly, a lot had been going along in the world about which they had gone on blissfully unaware. How could they, as our country's educated elite, be so completely unaware of that the great material wealth of the United States was not shared -- or applauded -- by huge populations in the rest of the world? How could they have made it this far and not grappled with the deeply complex flow of world politics, economics, and culture? Like their parents and Americans nationwide, they have crashed, with a great clatter, into an awareness that the United States can never again consider itself as an island somehow outside the historical influence of the rest of the world. They seem to have suddenly understood an ancient truth, that the world has always been filled with great levels of distress and imbalance; it's just that some people are uninterested.

As I tried to figure out a way for my students in my Literature and the Environment class to process the terrible shock of September 11, I asked them to take their writing journals into the woods, and sit by a moving body of water. My intention was for them to take solace from the reassuring consistency of natural processes at work, to remind themselves that not everything in the world had been turned upside down, or darkened. The flow of water, as it has for the great spiritual texts of all world religions, worked its magic. Students found serenity, they found a conduit for their anxieties, they found release. But again, they wondered at their own lack of understanding about even this most basic element of their lives.

Sarah Young, a sophomore: " I compare the stream sprawled out in front of me to the burning blood that pulses strongly through my veins-a blood that screams out with the same vivacity as the water lapping at the stream bank. They both involve themselves in this never-ending cycle of flow and rejuvenation that sloshes, meanders, and sometimes races rapidly through a larger entity. It is water which constitutes the veins of the earth, feeding nature's body, carrying her necessities, keeping her alive-much like the blood of human and animal does. When thought of in that weird and wonderful metaphoric way, it becomes baffling to me as to why we as a human race seem so quick to devastate nature, hiding and casting her away as if she were some sort of bad disease, sure to wipe out all life in a quick and sudden outbreak. In doing this, we are in fact the real hosts of such a malicious sickness, reaching deep into earth's veins with vicious little hands who are all too eager to suck out of the water the serenity and calmness that keeps us sane in times of unrest and inner turmoil."

Sarah's last comment, about forcing the flow of water from our daily view, reflected the message from a Robert Frost poem we had read in class the week before, entitled "A Brook in the City," which describes what happens when a creek is forced underground to make way for human development.

How else dispose of an immortal force
No longer needed? Staunch it at its source
With cinder loads dumped down? The brook was thrown
Deep in a sewer dungeon under stone
In fetid darkness still to live and run --

And all for nothing it had ever done,
Except forget to go in fear perhaps
No one would ever know except for ancient maps
That such a brook ran water. But I wonder
If from its being kept forever under,
The thoughts may not have risen that so keep
This new-built city from work and sleep. (1923)

What is the subtle damage done when a creek is forced underground? It is simply this: it represents another distance between people and the natural world. When a creek is forced underground -- shut off from the world it would naturally occupy -- people don't even have the choice to explore it or not explore it. Shut off from a source of water, they have no way to become intimate with its power, or its mystery. They also, I am here to tell you, become quickly and deeply ignorant of its ways. Ask a University of Delaware student where their drinking water comes from, and they are almost universally unable to answer. Or worse, they may say something like: my drinking water comes from a bottle of Dasani. There is a reason for this.

For those of you who haven't tried it, Dasani is Coca-Cola's entrant in the race to profit from a national obsession with bottled water. A few years back, a Coke website featured an article entitled "Olive Garden Targets Tap Water and WINS!" Since most people visiting Olive Garden drank "free" water with meals, restaurant managers decided this was a wasted income opportunity. In an effort to increase sales of bottled drinks, they asked Coke for help -- and got in return a plan called "H2No" -- a strategy for marketing and selling drinks other than tap water. Since 20 percent of casual diners drink (free) tapwater Coke advocated pushing instead its own brand of water called "Dasani," which has no etymology; its a word its inventors hoped would imply "pureness and replenishment." Dasani is not spring water, its tap water. Purified tap water. The Oliver Garden started a plan they called "Just Say No to H2O," and rewarded people selling the most bottled Coke products with free tickets to Atlanta - presumably to visit the Coca-Cola museum -- and free Coke products. Coca Cola, for its part, has offered \$5,000 to anyone who can come up with a plan to get MORE water drunk -- just not the free kind.

This is not the end of that story. One of the other drawbacks to pushing bottled tap water instead of regular tapwater is, of course, the immense waste that is created by the bottles themselves. Despite a pledge to use recycled plastic bottles in 1990, Coke stopped using them four years ago, citing costs. Not coincidentally, during that period recycling rates for PET bottles dropped from 50 percent to 35 percent -- the largest drop for any plastic bottling material. Coke has 45 percent of US market and 50 percent of world market. Coke alone sells 25 million bottles of drinks a day; about two-thirds of those bottles, more than 16 million bottles a day, from Coke alone, end up in landfills.

So if Coke can convince students that their water comes from Dana bottles, we are once again moving toward a position of imbalance. Once again we are moving away from the critical understanding of natural systems. In recent years, we have become increasingly familiar with the results of this tendency. In Oregon's Klamath River basin, 100 years of intensive farming led this summer to such dangerously low water levels that the Federal Bureau of Reclamation shut off irrigation water to save endangered suckerfish and threatened salmon, even though there had been a terrible drought hammering 200,000 acres of local farms. Enraged farmers opened up irrigation lines illegally, even as local cops and the FBI stood by and watched. In Texas, farmers are furious at local governments in Mexico for refusing to release an agreed-upon annual 350,000 acre/ft of water from the Rio Grande. American jobs, they say, are moving to Mexico, along with \$3 billion a year in revenue. "They're using our own water against us," the farmers say.

In the West, Los Angeles's Metro Water District has for decades been using far more water from the Colorado River than they were allotted; for years, this was OK because other states upriver -- Nevada, Utah, Arizona,

Colorado, New Mexico and Wyoming -- were using less. Now, with massive development all across the Southwest, these states are demanding their fair share. Southern California also relies on aqueducts passing through the San Joaquin Valley from Northern CA, but Northern CA has begun tiring of this deal - the San Francisco Bay Delta ecosystem is sick from being so chronically deprived of fresh water. Think of the what has happened to the Everglades and you will understand this problem. Some in CA want to dam the American River flowing out of the Sierras to help the problem -- David Brower, a native Californian and former Sierra Club leader whose most tragic environmental loss was over the Colorado River's Glen Canyon Dam, must be turning in his grave.

This is not only water problem in southern California -- on border with Mexico, engineers planning to save water by lining canal with concrete, thereby saving millions of gallons from being lost through the porous ground. Trouble is, this will deprive underground water flow to Mexican farmers in Baja California.

Again -- what do local, state, or national borders mean in these cases? The only viable answers to these problems -- and by viable I do not include the ideas put forth by some entrepreneurs, like calving off icebergs in Alaska and shipping them to LA to provide more boutique drinking water -- lie in the adherence to the laws of natural systems -- thinking not in terms of politics but in terms of watersheds. The Chesapeake Bay, once one of the country's most damaged ecosystems and now one of its encouraging success stories, is being revived because all but one of the states in its watershed -- Maryland, Pennsylvania and Virginia -- have agreed to monitor their tributaries, limit development, and reforest buffer zones to limit the amount of nitrogen-producing farm runoff. After 30 years of struggle, White Clay Creek has finally been named Delaware's first nationally-protected Wild and Scenic River, indicating that perhaps we too are beginning to become aware of the interconnectedness of water systems, and perhaps interconnections more broadly conceived. As Joe Biden remarked last week, the river is 191 miles long. "My state isn't even that long."

That, it seems to me, is exactly the point. Finally, at least in some places in the country, we are beginning to think in terms not of boundaries, but in terms of watersheds, and flow. Again, to quote Gary Snyder: "The lessons we learn from the wild become the etiquette of freedom. We can enjoy our humanity with its flashy brains and sexual buzz, its social cravings and stubborn tantrums, and take ourselves no more and no less than another being in the Big Watershed. We can accept each other all as barefoot equals sleeping on the same ground. We can give up hoping to be eternal and quit fighting dirt. We can chase off mosquitoes and fence out varmints without hating them. No expectations, alert and sufficient, grateful and careful, generous and direct. A calm and clarity attends us in the moment we are wiping the grease off our hands between tasks and glancing up at the passing clouds. Another joy is finally sitting down to have coffee with a friend. The wild requires that we learn the terrain, nod to all the plants and animals and birds, ford the streams and cross the ridges, and tell a good story when we get back home."

Parallel Session C

Water Supply Governance: The Public -Private Universe

Moderator: Dr. Robert Warren, UD School of Urban Affairs and Public Policy

The DRBC - Practicing Regional Watershed Management since 1961.

Carol R. Collier, Executive Director, Delaware River Basin Commission

Abstract: The DRBC was found in 1961 and includes 5 key members, the governors of New Jersey, New York, Pennsylvania and Delaware and a presidential appointed representative. The DRBC was created to manage the

Basin across state lines. The DRBC manages water resources on a watershed basis, sets water quality standards, permits withdraws, directs fair distribution of water, monitors and establishes computer models, sets water quality standards and sets TMDLs and wasteload and load allocations.

The DRBC is a highly valuable tool in Delaware. The DRBC reviews dockets (or permits) for withdraws and discharges, establishes TMDLs for the White Clay Creek and Christina and estuary PCBs, monitors salinity and conducts monitoring and modeling (with the University of Delaware) in the mainstem and tributaries.

The DRBC monitors the supply and ensures adequate water supply for the remaining users and the biological components in the Basin. The DRBC manages the supply through drought operation plans (good faith agent), water conservation programs, consumptive use/water changes, withdrawal dockets (permits) and hydrological research. In Delaware, the DRBC addresses quantity issues through docket review, interstate impact considerations, long-term and regional views that look at regional water supply, integrated resource plans (IRP) and cost effectiveness, and finally creative solutions.

The DRBC manages the Basin in a goal-based watershed management approach. This approach is an integrated water resources approach that sets environmental standards (chemical, biology, flow, and stability) and enables the counties and/or municipalities to set control strategies. Currently, the DRBC is working on completing a Basin-wide comprehensive plan. The plan is a way to employ direction setting with goals that are not only DRBC directed goals but also measurable targets determined by the watershed advisory council. The building blocks for the Basin-wide plan are the IRP, goal-based watershed management, TMDLs for PCBs and the flow needs strategy.

Ms. Collier discussed the significance of resource integration in watershed management in the Delaware River Basin. She suggests the best way to obtain resource integration is through an integrated watershed approach, which addresses quantity and quality issues in addition to looking at groundwater and surface water as well as stormwater as a resource. Addressing water resource issues is a complex task. The DRBC has found many challenges to the governance of the Basin and the following issues are challenges the DRBC is currently facing: the need for data, establishing fair and equitable allocations, incorporating a systems approach, disseminating information to the public and other water resource agencies, coordination among groups and determining and implementing small-scale solutions.

Biography: Ms. Collier was appointed Executive Director of the Delaware River Basin Commission (DRBC) on August 31, 1998. The DRBC is an interstate/federal commission that provides a unified approach to water resource management without regard to political boundaries. Before joining DRBC Ms. Collier was Executive Director of Pennsylvania's 21st Century Environment Commission. Governor Tom Ridge formed the Environment Commission in 1997 to establish the Commonwealth's environmental priorities and to recommend a course of action for the next century. At the time Governor Ridge asked Ms. Collier to serve as executive director for the 21st Century Environment Commission, she was Regional Director of the Pennsylvania Department of Environmental Protection (PADEP's) Southeast Region. Prior to PADEP, Ms. Collier served 19 years with BCM Environmental Engineers, Inc., Plymouth Meeting, Pa., beginning as a student intern and ultimately becoming Vice President of Environmental Planning, Science and Risk.

Ms. Collier has a BA in Environmental Biology from Smith College and a Masters in Regional Planning from the University of Pennsylvania. She is a Professional Planner licensed in the State of New Jersey, a member of the American Institute of Certified Planners (AICP) and a Certified Senior Ecologist by the Ecological Society of America. In 1997 she was presented the Touchstone Award from the Society of Women Environmental Professionals and in 1998 the Woman of Distinction Award from the Philadelphia Business Journal. She has also published widely on environmental and water-related topics and is a frequent lecturer on a variety of

environmental issues. Ms. Collier resides in Ft. Washington, Pa., with her husband, Richard, and their two sons.

The Municipal Purveyor - Affordable Water to Provide Basic Needs for All

Kash Srinivasan, Commissioner, City of Wilmington Dept. of Public Works

Abstract: This presentation addressed the challenge of the public water purveyor in maintaining low rates while supplying a high quality product to the customers. Mr. Srinivasan emphasized it is important to remember “cheap is good” and an affordable, high quality product is important but involves many challenges.

The City of Wilmington has been providing water for over 200 years; it initially began as a private water provider. The City of Wilmington system serves over 28,000 customers within the City limits and 12,000 customers outside the City, which has been a recent addition. The City is completely dependent on the Brandywine River for water supply. The City of Wilmington must be cognizant that this source is not inexhaustible and is highly susceptible.

The rate structure for the water supply system is a differential rate structure similar to the City of Newark. The differential rate system establishes higher rates outside the City limits. The elevated costs outside the City limits are a result of additional costs due to additional infrastructure and energy needs.

The City’s demographics are a key factor in providing a high quality product at an affordable rate. The City of Wilmington has significantly lower rates due to the demographics. The system has the capacity to serve 150,000 middle-class customers and it is currently serving 70,000 middle to low-class population, making it imperative to provide affordable water.

There are many challenges to providing an affordable, high quality product. The value of service is based on reliability. In order to achieve reliability the City must maintain and upgrade they system while maintaining affordability. As the national and state standards become more stringent it becomes increasingly difficult to provide both. There are many things you must invest in as a provider, the treatment technology needs to be changed/upgraded, the Cool Springs Reservoir needs to be upgraded, the system is 150 years old and needs replacement.

The private utility has the ability to make investments as compared to the rate setting in municipalities, which are subject to politics and budget cycles. The challenge is to create a sound future for water systems while addressing the demographics, politics and finances. The reality is the investment needs are large and growing and you must think of innovative ways to provide a high quality and affordable product.

Biography: Mr. Srinivasan is the Wilmington Commisioner of Public Works, a position appointed by the mayor and council. His office oversees the Water and Wastewater Department in Delaware's largest city. The City of Wilmington draws drinking water from the Brandywine Creek, Delaware's largest drinking water supply.

Newark's Experience in Designing Delaware's First Major Reservoir in 70 years.

Mayor Harold Godwin, City of Newark, Delaware

Abstract: Mayor Godwin addressed the complex issue of creating additional water supplies for the City of Newark. Godwin discussed the history of Newark’s water supply issues and emphasized inadequate supplies are not a new problem for Newark and they have been addressing this issue since the dawn of Newark’s water supply system.

One of the most significant points in the development of the reservoir was the drought of 1995. During the drought it became clear that Newark needed to address supply issues and create an alternative source in cases of drought and emergency. During drought, water restrictions are placed on the allowable withdrawals from the White Clay Creek. Once the need was established a number of sites were assessed for a potential reservoir site. The sight that has been chosen was slated for a housing development. In 1999 another drought proved that a solution to the supply problem was urgent and public support poured in for the reservoir. The City of Newark received \$3.4 million dollars from the State of Delaware and the total cost of the site was \$7.9 million. The City originally determined the reservoir would be 300 million gallons but it has been expanded to 317 million gallons.

The reservoir has had an impact on the rates of the Newark residents. There has been an 83% raise in rates. Godwin noted that this raise in rates has been a long time coming. The City has had extremely low rates for many years and raising the rates was a necessary move to provide the City with a stable supply for droughts and emergencies while providing a quality service for the customer.

Biography: Mayor Godwin is a native of Newark and was recently reelected for a second term as mayor of Delaware's second largest city.

The Investor-Owned Purveyor - Providing a Quality Supply as a Tax Paying Company in a Rate Regulated World

Anthony Langley, General Manager and Vice President, United Water Delaware

Abstract: A discussion of the sometimes hidden benefits of the investor-owned water utility model. Investor-owned water utilities provide quality water service at competitive prices while returning over 40% of their revenues to the community in the form of income and property taxes. In addition, the rates and levels of service provided by investor-owned water utilities are subjected to regulation by the State, so that **all** customers have an ability to voice any concerns

Mr. Langley summarized the importance of investor interest and ownership in public water supplies. Mr. Langley emphasized the importance of the private investor in Delaware's economy. Through the private companies involvement in public water supplies a business-oriented approach can be applied to the service of providing water. This business approach is a profit-driven, service oriented, tax-paying business approach, which provides employment opportunities and gives the industry competition.

The investor-owned purveyors are able to meet the needs of the public through technology and innovation advancements. The technology can be used to provide innovative solutions to supply problems. For example, United's tidal capture structure captures 720 million gallons of additional water supply at a cost of \$2.5 million as a result of the company's innovative techniques. United is also involved with automation, research and development, innovative rate making and privatization and municipalization.

The investor-owned purveyors are an integral part of the public utilities in the State. The State economy receives several benefits from the involvement and the public benefits from the business oriented approach that the private companies can provide. Biographical Sketch: Anthony (Tony) A. Langley is the General Manager and Vice President of United Water Delaware, an investor-owned water utility providing service to approximately 100,000 people in Northern New Castle County, DE. Tony has been working in the investor-owned water utility industry for the past 14 years previously holding various management positions in the States of Pennsylvania and Indiana. He is the 2001 Chairman for the Delaware Chapter of National Association of Water Companies (NAWC) and active in the American Water Works Association (AWWA). Tony has a

Bachelor of Science degree in Electrical Engineering Technology from Purdue University and an MBA from the University of Indianapolis. Tony is married and has three children.

Biography: Anthony (Tony) A. Langley is the General Manager and Vice President of United Water Delaware, an investor-owned water utility providing service to approximately 100,000 people in Northern New Castle County, DE. Tony has been working in the investor-owned water utility industry for the past 14 years previously holding various management positions in the States of Pennsylvania and Indiana. He is the 2001 Chairman for the Delaware Chapter of National Association of Water Companies (NAWC) and active in the American Water Works Association (AWWA). Tony has a Bachelor of Science degree in Electrical Engineering Technology from Purdue University, and an M.B.A. from the University of Indianapolis. Tony is married and has three children.

Parallel Session D

The Value of Water to the Citizen, the Consumer, and to Commerce.

Moderator: Dr. Thomas Sims, Professor of Soil and Environmental Chemistry

Dept. of Plant and Soil Sciences, University of Delaware and Director, DE Water Resources Center,

Academic Record:

B.S.	1975	University of Georgia (Agronomy)
M.S.	1978	University of Georgia (Soil Fertility and Plant Nutrition)
Ph.D.	1982	Michigan State University (Soil Chemistry)

Professional Positions:

Professor of Soil & Environmental Chemistry (1993-Present), Associate Professor (1987-1993), Assistant Professor (1982-1987), University of Delaware

- Director, Delaware Water Resources Center, University of Delaware (1997-Present)
- Director, University of Delaware Soil Testing Program (1984-2000)
- Assistant Chairman, Department of Plant and Soil Sciences (1988-1989)

Professional Accomplishments in Brief: Research, teaching, and outreach activities in the area of soil fertility, nutrient management and water quality. Primary research areas have been the cycling, fate, and transport of phosphorus and nitrogen in soils and the development of profitable, environmentally sound agricultural nutrient management practices. Other research has included the development of environmental soil tests for P and N, effects of dietary modification or chemical amendment on P availability in manures and biosolids, the use of municipal and industrial by-products (biosolids, coal fly ash water treatment residuals) as beneficial soil amendments, and trace metal fate and cycling in soils. Authored/co-authored 65 refereed publications, 22 book chapters, a textbook on *Soils and Environmental Quality*, 75+ technical papers and conference proceedings, 30+ fact sheets and notes on soil testing and nutrient management, including the *Nutrient Management Handbook for Delaware*, and more than 120 volunteered presentations at ASA/CSSA/SSSA national meetings. Taught undergraduate and graduate courses in soil fertility and environmental soil science for 18 years, advisor to 24 graduate students and post-docs, directed the University of Delaware soil testing program for 16 years, chaired Mid-Atlantic and Northeastern regional soil testing committees, and currently serve as director of the Delaware Water Resources Center. Organized and/or participated as invited speaker in 11 symposia at ASA/CSSA/SSSA national meetings and 22 symposia in international meetings and for other professional societies. Technical advisor at state, regional, national, and international levels for agencies responsible for water quality protection

(Cooperative Extension, local soil Conservation Districts, USDA-NRCS, USGS, USEPA) on development and implementation of nutrient management strategies and environmental policies that prevent nonpoint source pollution of surface and ground waters.

Water: A Commodity for Business and Commerce

Rob Propes, Business Development Specialist, Delaware Economic Development Office

Abstract: Water is widely used throughout Delaware. Water is used in agriculture, industry, and recreation. Water is of great value to the New Castle County business community, especially in “green industries” such as golf courses and greenhouses. The Port of Wilmington serves over 400 ships per year, creating 5,800 hundred jobs and \$22 million in tax revenue. Fishing, boating and other recreation activities bring thousands of dollars to local economies.

There are few incentives for conserving water, however, and we often take it for granted. New Castle County is now faced with possible shortages, as supplies have not kept pace with demands. The amount of water held in County reserves is not enough to combat a drought.

Bottled water consumption has increased dramatically over the last decade. Between 1992 and 1997, bottled water consumption rose 25% per year. Analysts project that bottled water market will surpass the soft drink market by the year 2010.

The Water Supply Coordinating Council needs to outreach to commercial groups to find ways to reduce and reuse water. Public awareness campaigns must stress the importance of conservation planting and xeriscaping.

Biography: Rob Propes serves as a business development specialist for the Delaware Economic Development Office. In his present position, Propes has worked on commercial recycling, renewable energy promotion, and brownfields redevelopment. Prior to joining DEDO, Propes worked for PECO Energy, where he was responsible for keeping PECO's employees and customers informed as Pennsylvania deregulated its electric market. Propes began his career with Booz-Allen & Hamilton, a Washington-based consulting firm, where he specialized in Resource Conservation & Recovery Act (RCRA) regulations. Propes holds a master's degree in Environmental Policy from the Indiana University School of Public & Environmental Affairs and a bachelor's degree from Loyola College.

Water: Minimum Stream Flows to Sustain Recreation and the Environment

Roy Miller, Fisheries Program Manager, DE Division of Fish and Wildlife

Abstract: Freshwater fishing is very important to Delaware. In 1996, there were 66,000 licensed anglers who fished the equivalent of 227,000 days on streams and rivers, and fed \$54 million into local economies. According to Mr. Miller, 56% of Delaware citizens believe that more money should be spent on managing and minimizing the effects of growth and development. Unfortunately, there is not a single guide to the volume of water that should be in a stream. The volume of water for any life stage can be critical. It is important to recognize the importance of the volume of water in a stream for biological and recreational purposes. In 1994, The Delaware River Basin Commission imposed a “7Q10” standard. The literature on fish needs and local data on fish habitat is insufficient to evaluate the adequacy of the 7Q10 measure. Kent and Sussex counties have a somewhat different in their measurement of “low flows”. In Kent and Sussex Country there is enough water to withdraw for public and private use if water is flowing over the dam of a state-owned pond.

Biography: Roy Miller has served for 26 years in the Fish and Wildlife Division of the Delaware Department of Natural Resources and Environmental Control.

The Value of Water for Agriculture, Delaware's Largest Industry

Michael McGrath, Chief of Planning, Delaware Department of Agriculture

Abstract: Water is the lifeblood of agriculture, yet Delaware faces several complex water and agriculture related challenges in the coming years:

- Water competition: Agriculture competes with other users at critical times for supply, and agriculture may not fare well with the current allocation rules.
- Scattered development: Farmers “lose” when there is a battle for water without clear policies, especially when scattered, rural residential developments breed friction with their rural neighbors.
- Margins and profits: Irrigation has steadily increased over the last decades, as it has become an insurance policy for slim margins.
- Changing agriculture: More water will be required as the development of vegetable, nursery, organic, and other high-intensity farming increases.
- Processing: There will be more processing of farm products as demands increase, water will be needed for washing, cooling, and packing.

There must be a coherent, statewide policy for water allocation. This policy must clearly recognize the critical role of agriculture in the economy and well being of the state. The policy must recognize the necessity of water for the advancement of agriculture.

Biography: Mr. McGrath is the Chief of Planning for the Delaware Department of Agriculture. Agriculture is one of Delaware's largest economic sectors and serves to preserve open space in the First State.

The Absolute Imperative of Communication

Susan Frank, VP Customer and Community Relations, Artesian Water Company

Abstract: Regular communication with the customer and the community should be a standard practice for any water provider. Bill inserts and annual water quality reports (aka: the CCR, or Consumer Confidence Report) are only a base for such efforts. In unique circumstances, such as any time water supply to the customer is affected, the water utility must be open and responsive in addressing the situation with the public in a timely and thorough manner. Artesian’s experience with and commitment to open and thorough communication will be reviewed as an example. Regular communication with the customer and the community should be a standard practice for any water provider. Bill inserts and annual water quality reports are only a base for such efforts. In unique circumstances, such as any time water supply to the customer is effected the water utility must be open and responsive in addressing the situation with the public in a timely and thorough manner.

Why should water providers communicate with customers and the community?

- Customers deserve and want regular communication
- Communication helps us to convey our message
- Law requires communication

When should we communicate?

- When law requires
- Through an annual consumer confidence report

- When common sense dictates: main breaks, station upgrades, and service interruptions

Who should we communicate with?

- Customers, civic leaders, government officials, other water utilities, media, employees

How should we communicate?

Bill inserts, consumer confidence reports, special mailings, door hangers, door-to-door, phone calls, e-mail, outbound emergency calls, website, community events, media.

Biography: Ms. Frank oversees the departments dealing directly with customers—Customer Service, Billing, Payment Processing, Collections and the Meter Shop—and directs community relation activities and strategies of the company. In this capacity, she is dedicated to making sure Artesian provides superior service to approximately 66,000 customers throughout the State. Before joining Artesian last November, Ms. Frank served as Director of the Delaware State Housing Authority.

Discussion and Wrap-up

Moderator: Gerald Kauffman, State Water Coordinator, UD Institute for Public Administration - WRA

Community Soapbox - The Value of Water to Citizens of Delaware

Jack Harrison, Resident and Engineer, Hockessin, Delaware

Abstract: This presentation describes the challenges faced by the State of Delaware, and particularly Northern New Castle County, in providing adequate, economically affordable supply of water while simultaneously protecting the water resource system. It will include a brief description of the hydrologic cycle and the current state of our water resource system and water supply facilities. The overall water system procedures employed by Delaware will be compared to practices elsewhere. The costs of water to consumers in Delaware will be compared to costs in the other areas. Alternate methods proposed for resolving Delaware's water related problems will be reviewed in the form of a feasibility analysis. This will include a concise description of successes and failures in other locations suffering from similar problems.

Biography: Jack Harrison, a Hockessin resident, was born and grew up in Yorklyn, Delaware. Except for overseas duty in the U.S. Navy in World War II and assignments in Virginia, Michigan and Great Britain for Hercules, Inc. he has been a lifelong resident of the Yorklyn-Hockessin area. Harrison is an environment/chemical engineer with 40 years experience in environmental engineering and 10 years of experience in chemical engineering. He has been responsible for engineering projects in water supply and treatment as well as wastewater treatment. He also served as project manger for evaluation of hazardous water sites involving characterization of geological and hydro-geological characteristics of aquifers. Harrison has been on the Environmental Protection Agency's peer review panel since 1981. The panel reviews and researches proposals in the fields of water supply and treatment, wastewater, air pollution, and solid and hazardous waste. He has twice been selected by the National Academy of Science to represent the U.S. in environmental engineering technology exchange programs with the Soviet Union. He has also served as a consultant to the World Bank, the Department of Energy and the U.S. Army. Environmentalist – Environmental/Chemical Engineer

- ◆ Delaware native – 70 year perspective on Delaware's water resource system
- ◆ Born – Snuff Mill Co. House – Drinking water from shallow hand pumped wells – now dry
- ◆ Comments based on direct experience – substantiated by old photographs – review of reports.

Drinking Water 2001: The Issues Concerning Delaware's Most Precious Natural Resource
A Delaware Policy Forum
 Thursday, October 11, 2001

EVALUATION FORM

We would like your feedback and ideas on this forum.

Please rate the following topics on a scale of one to five, with five representing the highest value.

REGISTRATION AND CONTINENTAL BREAKFAST	1	2	3	4	5
Welcome to the Delaware Policy Forum Series, Dr. Jerome Lewis	1	2	3	4	5
The "Livable Delaware" Initiative: What It Means for Clean Drinking Water in Delaware, Lee Ann Walling	1	2	3	4	5
The Delaware Water Supply Coordinating Council: A Public/Private Forum for Water Policy, Kevin Donnelly	1	2	3	4	5
Water as the Blue Gold for the 21 st Century: How Much Will There Be to Drink? Gerald Kauffman	1	2	3	4	5
SESSION A: Water Supply Issues to Ensure Clean and Plentiful Water, Kevin Donnelly	1	2	3	4	5
The Delaware Drinking Water Task Force, Richard Cathcart	1	2	3	4	5
SWAPP – Going to the Source to Protect Delaware Drinking Water Quality, Martin Wollaston	1	2	3	4	5
Global Climate Change – Will it Mean More Droughts for Delaware? Dr. Dan Leathers	1	2	3	4	5
Streams and Aquifers – The Water Supply Framework in Delaware, John Talley	1	2	3	4	5
Drinking Water Regulations – Where Are We Headed? Edward Hallock	1	2	3	4	5
SESSION B: Water Demand – What are the Economic and Demographic Aspects? Eric Jacobson	1	2	3	4	5
What Does Drinking Water Cost? Bruce Burcat	1	2	3	4	5
Water Rate Policies – How to Encourage Supply and High Quality, David Spacht	1	2	3	4	5
An Efficient Pricing Mechanism to Manage Water Quantity in New Castle County, Delaware, Dr. Joshua Duke, et. al.	1	2	3	4	5
Designing Revenue Neutral and Equitable Water Conservation-Oriented Rates for Use During Summer, Young-doo Wang, et. al.	1	2	3	4	5
LUNCH, Speaker: Dr. McKay Jenkins	1	2	3	4	5
SESSION C: Water Supply Governance: The Public-Private	1	2	3	4	5

Universe, Dr. Robert Warren

The DRBC – Practicing Regional Watershed Management Since 1961, Carol Collier	1	2	3	4	5
The Municipal Purveyor – Affordable Water to Provide Basic Needs for All, Kash Srinivasan	1	2	3	4	5
Newark’s Experience in Designing Delaware’s First Major Reservoir in 70 Years, Harold Godwin	1	2	3	4	5
The Investor-Owned Purveyor – Providing a Quality Supply as a Tax-Paying Company in a Rate-Regulated World, Anthony Langley	1	2	3	4	5
SESSION D: The Value of Water to the Citizen, the Consumer, and Commerce, Dr. Thomas Sims	1	2	3	4	5
Water: A Commodity for Business and Commerce, Rob Propes	1	2	3	4	5
Water: Minimum Stream Flows to Sustain Recreation and the Environment, Roy Miller	1	2	3	4	5
The Value of Water for Agriculture, Delaware’s Largest Industry, Michael McGrath	1	2	3	4	5
The Absolute Imperative of Communication, Susan Frank	1	2	3	4	5
COMMUNITY SOAPBOX, Jack Harrison and others	1	2	3	4	5

What did you like best about the forum?

What can be done to improve future Delaware Policy Forums?

What topics would you like to see covered in a future Delaware Policy Forum?

Comments (including facility and food):

Thank you for taking the time to complete this evaluation form.

Evaluation Form Question Responses

What did you like best about the forum?

- Food, accommodations, quality presentations
- I thought the forum covered a variety of important topics
- The interdisciplinary nature of the speakers
- The realities presented in a digestive fashion keeping specifics and technical jargon to a minimum is good. I enjoyed the lunch speaker as well.
- The variety of topics, presentation styles; covered the real broad range of issues
- Variety of topics and speakers, accessibility to students
- Session on conservation rates
- Good mix of ideas

- That you organized it
- Diverse ideas; well-rounded coverage of various topics
- The decision to hold it and the diversity of the speakers
- Research reinforcing a lot of statements and conclusions
- Mix of audience, good technical level, lunch speaker
- Getting the variation with water purveyors and government folks together
- Very thorough and broad in scope
- Broad coverage, excellent, authoritative talks
- Interaction with others in the field
- Jack Harrison – need alternate points of view
- Diversity of speakers
- Very good speakers, free for students
- Well organized – stuck to schedule – very knowledgeable people as speakers
- The diverse speakers represented
- Good speakers, exhibits, chance to reflect on water policy with other interested people
- Having the opportunity to discuss water issues with other people in the field
- Interesting topics – most speakers were interesting
- Opportunity to interface with folks who ultimately make the decisions, to get them to think – on the spot – about things they haven't gotten around to thinking about yet
-

What can be done to improve future Delaware Policy Forums?

- I would like to see more panels – less individual speakers – panels allow more flow of conversation with audience
- Possibly smaller breakout session, more time for speakers and questions
- Better lunch. The conclusion session, speaker specifically, could have been a little more of a wrap up and overview, I didn't think the final speaker did the forum justice.
- Stick to the planned presentation order. I was disappointed to miss some lectures because the order was change
- Continue to hold them often
- Turn down the air conditioning – it is freezing!
- Adhere to timely issues that are important to the public; this was an excellent example.
- Morning breakouts had one too many speakers for the available time – even with the extension.
- The variety of topics; the presentation times of 15-20 minutes
- Have speakers minimize reading directly from visuals
- Allow time for discussion – session B had no discussion time
- Question should come after each speaker – not at the end
- Delete lunchtime speaker
- Strict observation of various time limits and leave room for lively discussion
- Excellent – no change needed
- Hold them more often

- Breakout sessions could be even smaller groups – more specific topics. Instead of 5 speakers at each session, have five choices with only two speakers and more time for discussion.
- Wastewater
- Smaller breakout sessions
- More comfortable chairs
- Provide can and bottle recycling, fewer presentations with more times for questions and discussion, roundtable discussions
- This was well done – a portable microphone for people who have questions would help
- More time for discussion – some speakers ran late in session B
- Not much – the forum was well-organized and covered many excellent topics
- Get a list of questions from the audience during session, so they could be answered at the conclusion, especially for those sessions that ran over and did not permit questions and answers
- More interaction time

What topics would you like to see covered in a future Delaware Policy Forum?

- Latest developments to handle poultry waste
- A presentation from the Delaware Nutrient Management Agency
- Water, land use, etc.
- Possibly speakers from nonprofit organizations
- Watershed management, hold forum series annually
- Stormwater management techniques that are implemented for development and their effect on our water supply and quality
- Effects of bad water on humans, animals, etc. The degeneration that occurs from poor quality water.
- Protecting Delaware's living resources (biodiversity) in an increasing population; increasingly land-developed state
- Contamination reports; pros and cons of dual water systems, desalinization
- Water reuse / recycling
- Demand forecasting, use of data
- Land use, beach development
- A few highly technical discussions
- Wastewater, downstate water planning
- All topics were applicable and great for discussion
- Electric restructuring
- Nutrient loading of coastal plain aquifers
- Similar to present agenda, plus a need is still there for a large county reservoir, and this needs to be addressed
- Land use, open space preservation, agricultural presentation
- Desalinization, pollution issues / quality
- Wilmington rivers, brownfields / water quality
- Have check-off if you would prefer your name, address, and phone number not be listed

- Wastewater management was not covered, it seems that it is an important component to overall water management
- More of the same
- Brownfields redevelopment
- A similar forum on wastewater of a 2-day forum on water and wastewater
- Allow more time with questions and answers and discussion with audience
- More thoughtful exploration of conservation-oriented rates

Comments:

- Ability to be with others in agreement about need to evaluate our water needs / demands
- Good facility, fresh turkey would be better in sandwiches
- Juice for breakfast, hot lunch
- I think also a few comments on the water quality compared to other nations – or more appropriately, other U.S. states. This would give perspective.
- Breakfast a good way to start the day – and leaving it out was good – for the necessary caffeine, sugar
- Convenient, highly hospitable
- Outstanding arrangements
- Facilities and food – great, very well organized
- Excellent
- Food and facility were excellent; overall, impressive conference
- Do not end the session with the community soapbox
- Box lunch worked well
- Facility and food are wonderful
- Very informative
- I consider every five years to be about right for future meetings
- Well done first effort, time constrains and lack of recycling only negatives
- Good job – thanks!
- Facilities and food were both good
- Clayton Hall is a good place for this type of conference

SESSION	AVG	HIGH	LOW	N
REGISTRATION AND CONTINENTAL BREAKFAST	4.24	5	2	38
Welcome to the Delaware Policy Forum Series, <i>Dr. Jerome Lewis</i>	3.54	5	2	35
The “Livable Delaware” Initiative: What It Means for Clean Drinking Water in Delaware, <i>Lee Ann Walling</i>	4.08	5	2	40
The Delaware Water Supply Coordinating Council: A Public/Private Forum for Water Policy, <i>Kevin Donnelly</i>	4.05	5	3	40
Water as the Blue Gold for the 21st Century: How Much Will There Be to Drink? <i>Gerald Kauffman</i>	4.41	5	3	41
SESSION A: Water Supply Issues to Ensure Clean and Plentiful Water, <i>Kevin Donnelly</i>	4.07	5	3	15
The Delaware Drinking Water Task Force, <i>Richard Cathcart</i>	3.19	5	2	21
SWAPP – Going to the Source to Protect Delaware Drinking Water Quality, <i>Martin Wollaston</i>	3.91	5	2	23
Global Climate Change – Will it Mean More Droughts for Delaware? <i>Dr. Dan Leathers</i>	4.04	5	2	24
Streams and Aquifers – The Water Supply Framework in Delaware, <i>John Talley</i>	4.32	5	3	22
Drinking Water Regulations – Where Are We Headed? <i>Edward Hallock</i>	3.81	5	1	21
SESSION B: Water Demand – What are the Economic and Demographic Aspects? <i>Eric Jacobson</i>	3.82	5	3	11
What Does Drinking Water Cost? <i>Bruce Burcat</i>	3.75	5	2	20
Water Rate Policies – How to Encourage Supply and High Quality, <i>David Spacht</i>	3.95	5	2	20
An Efficient Pricing Mechanism to Manage Water Quantity in New Castle County, Delaware, <i>Dr. Joshua Duke, et. al.</i>	4.00	5	1	20
Designing Revenue Neutral and Equitable Water Conservation-Oriented Rates for Use During Summer, <i>Young-doo Wang, et. al.</i>	3.05	5	1	20
LUNCH, Speaker: <i>Dr. McKay Jenkins</i>	4.02	5	1	23
SESSION C: Water Supply Governance: The Public-Private Universe, <i>Dr. Robert Warren</i>	4.00	5	3	13
The DRBC – Practicing Regional Watershed Management Since 1961, <i>Carol Collier</i>	4.19	5	3	21
The Municipal Purveyor – Affordable Water to Provide Basic Needs for All, <i>Kash Srinivasan</i>	3.71	5	2	21
Newark’s Experience in Designing Delaware’s First Major Reservoir in 70 Years, <i>Harold Godwin</i>	4.00	5	2	22
The Investor-Owned Purveyor – Providing a Quality Supply as a Tax-Paying Company in a Rate-Regulated World, <i>Anthony Langley</i>	3.68	5	2	22
SESSION D: The Value of Water to the Citizen, the Consumer, and Commerce, <i>Dr. Thomas Sims</i>	4.29	5	4	7
Water: A Commodity for Business and Commerce, <i>Rob Propes</i>	3.40	5	2	20
Water: Minimum Stream Flows to Sustain Recreation and the Environment, <i>Roy Miller</i>	3.70	5	2	20
The Value of Water for Agriculture, Delaware’s Largest Industry, <i>Michael McGrath</i>	4.35	5	3	17
The Absolute Imperative of Communication, <i>Susan Frank</i>	3.69	5	3	13
COMMUNITY SOAPBOX, <i>Jack Harrison and others</i>	3.15	5	1	13

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The Institute for Public Administration (IPA) links the research and resources of the University of Delaware with the management, information, and leadership needs of schools and local, state, and regional governments in the Delaware Valley. IPA provides assistance to agencies and local governments through direct staff assistance and research projects as well as training programs and policy forums. IPA's wide range of program areas includes civic education, conflict resolution, health-care policy, land-use planning, local, state and international government, school leadership, water resources, and women's leadership. IPA's main office is on the University's Newark campus in 180 Graham Hall. Jerome Lewis is the Director of the Institute and can be reached at 302-831-8971.



The Delaware Department of Natural Resources and Environmental Control (DNREC) is the guardian of water resources in Delaware and is responsible for the regulation and allocation of public drinking water supplies through the Division of Water Resources. Mr. Nicholas DiPasquale is the Secretary of DNREC and the Chair of the Delaware Water Supply Coordinating Council.



For information on water-related issues, contact:



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