Delaware Policy Forum Series No.4

PROCEEDINGS
THE HISTORIC CHRISTINA BASIN:
DELAWARE'S FIRST WATERSHED

co-sponsored by

Delaware Water Resources Center

Water Resources Agency, Institute for Public Administration, University of Delaware

Delaware Geological Survey

Delaware Department of Natural Resources and Environmental Control

held on the University of Delaware Newark Campus, Wednesday, October 13, 2004

DELAWARE WATER RESOURCES CENTER
AT THE UNIVERSITY OF DELAWARE

IPA

WRA water resources agency

DELAWARE GEOLOGICAL SURVEY

DELAWARE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL

February 18, 2005

Dear Friends:

We are pleased to deliver the proceedings of the Delaware Water Policy Forum titled: *The Historic Christina Basin: Delaware's First Watershed.* These proceedings and the presentations are also available online at *www.wr.udel.edu*. The forum was held on Wednesday, October 13, 2004, at Clayton Hall on the University of Delaware campus in Newark, Delaware. The Delaware Water Resources Center (DWRC); University of Delaware's Water Resources Agency (WRA) in the Institute for Public Administration (IPA) and Delaware Geological Survey (DGS); and Delaware Department of Natural Resources and Environmental Control (DNREC) co-sponsored the event. The proceedings are available online at *www.wr.udel.edu*.

This policy forum, the fourth in a series that examines statewide water policy issues, was designed to explore past, present, and future issues in the watershed that is the largest source of drinking water supply in the state of Delaware – the Christina Basin. Over 200 attendees heard the speakers discuss a list of firsts attributable to the Christina Basin. The Christina Basin is the home of the first permanent European settlement in 1638 at the mouth of the Christinakill, now the present day location of the City of Wilmington. The only Revolutionary War battle in Delaware was fought at Cooch's Bridge along the banks of the Christina River near Newark. The basin is an interstate watershed, the only one in Delaware, where the streams flow through three states. It is the home of the only six trout streams in Delaware as well as home to Wyeth and Winterthur and DuPont. The Brandywine Valley Association (BVA), formed in the late 1940s, was the first small watershed association in the United States. Accordingly, the Christina Basin holds a very special status for our small state.

We thank the speakers and participants who committed their time to attend this event. Special thanks are offered to the Water Policy Forum Organizing Committee for their contributions, namely Amy Boyd, Martha Corrozi, Ruth Fallis, Molly Hesson, Gerald Kauffman, Dr. Jerome Lewis, Nicole Minni, Dr. Tom Sims, and Kevin Vonck.

We urge you to mark you calendars for October 21, 2005, the probable date of the next annual Delaware Water Policy Forum. We are looking for ideas concerning topics and your favorite speakers, please provide any recommendations.

Regards,

Dr. Tom Sims
Director
Delaware Water Resources Center
University of Delaware

Gerald J. Kauffman
Director of Watershed Policy
Water Resources Agency
Institute for Public Administration
University of Delaware

Proceedings Editor: Martha B. Corrozi, Watershed Analyst, Water Resources Agency, Institute for Public Administration, University of Delaware

Agenda

8:30	Registration and Refreshments
8:50	Welcoming Remarks *Dr. Jerome R. Lewis, Director, IPA, UD* *Dr. J. Thomas Sims, Director, DWRC, UD*
9:00	The Christina – Delaware's Forgotten River *Kevin Donnelly, Director, Division of Water Resources, DNREC*
9:15	The Christina Basin – USEPA Watershed Initiative No.1 Ranked Watershed in the USA *Larry Merrill, Acting Chief, Watershed Restoration Branch, Office of Watersheds, USEPA Region 3 Office*
9:30	The Christina Basin Scorecard *Moderator: Edward J. O'Donnell, AICP, Senior Policy Advisor, IPA, UD* • Stream Bacteria DNA Analysis: Man or Fowl *Sam Myoda, Watershed Scientist, Division of Water Resources, DNREC* • At the Fall Line: Geology, Baseflows in the Christina Basin *John Talley, State Geologist and Director, DGS* • The Christina Basin Report Card *Sara Wozniak, Appoquinimink Watershed Coordinator, Appoquinimink River Association* • Trends in Watershed Imperviousness, 1995-2004 *Kevin J. Vonck, Senior Researcher, IPA-WRA, UD*
10:20	BREAK
10:30	"Smartyards" and Social Attitudes *Moderator: Dr. J. Thomas Sims, Director, DWRC, UD* • Christina Basin "Smartyards" Program *John Harrod, Backyard Habitat Coordinator, Delaware Nature Society* • Social Attitudes Towards Stream Buffers *Dr. Janet Johnson, Professor, Department of Political Science and International Relations, UD* • The Role of Nonprofit Organizations in the Management of the Christina Basin *Martha B. Corrozi, Watershed Analyst, IPA-WRA, UD*
11:15	Views from the Headwaters *Moderator: Martha B. Corrozi, Watershed Analyst, IPA-WRA, UD* • Playing the Hand You're Dealt: Optimizing the Utility of Analog Data – A Case Study *Andrew Homsey, GIS Services Manager, IPA-WRA, UD* • Chester County Agriculture Conservation Projects *Dan Greig, District Manager, Chester County Conservation District*

11:45	Hands Across the Watershed *Moderator: Gerald J. Kauffman, Director of Watershed Policy, IPA-WRA, UD* • Brandywine Valley Association *Bob Struble, Executive Direction, BVA* • Red Clay Valley Association *Jim Jordan, Deputy Director, Red Clay Valley Association* • White Clay Creek Wild and Scenic River Committee *Linda Stapleford, River Manager, White Clay Creek Watershed Management Committee* • Christina Conservancy *Ned Cooch, President, Christina Conservancy*
12:30	LUNCH The History of the Christina Basin – George Washington Slept Here *Gerald J. Kauffman, Director of Watershed Policy, IPA-WRA, UD*
1:30	Poster Session and Information Booths
2:00	ADJOURN

The Historic Christina Basin: Delaware's First Watershed
University of Delaware, Clayton Hall
October 13, 2004

Welcome to the Delaware Policy Forum Series

Dr. Jerome R. Lewis, Director, Institute for Public Administration, University of Delaware
Dr. J. Thomas Sims, Director, Delaware Water Resources Center, University of Delaware

Abstract:
Dr. Jerome Lewis welcomed over 200 attendees from government, academia, industry, nonprofit organizations, and the general public to the fourth annual Delaware Water Policy Forum addressing the historic Christina Basin, source of ecological and economic vitality in Delaware. Dr. Lewis welcomed the attendees on behalf of Institute for Pubic Administration. Dubbing the Christina River the "mother of rivers" in this region, Dr. Lewis continued, saying the Brandywine provides the largest source of drinking water in Delaware, economic revitalization is occurring throughout the Christina Riverfront, and the White Clay Creek has received national designation as a "Wild and Scenic River." Dr. Lewis asked, what are the economic costs and benefits of what we are calling Delaware's first watershed? Severe and recent floods have given a new meaning and respect to floodplains. What is the cost of the buyout of flooded homes? Can society afford to rebuild in the floodplain? How much is fresh drinking water worth? How much should we pay to protect it? What is the economic value of the natural areas and protected resources throughout the state? Dr. Lewis expressed his gratitude to the attendees for demonstrating interest in these important water resources issues and encouraged students and professionals to continue to research and explore the water resources discipline.

Following Dr. Lewis's welcome, Delaware Water Resources Center Director (DWRC) Dr. J. Thomas Sims thanked the 18 water resource advocates who would discuss various policy and research topics central to the social, economic, and historic conditions as well as the health of the Christina Watershed. Dr. Sims explained DWRC's student research and training program, which leverages federal and local cosponsor funds to find solutions to Delaware's priority water problems, and directed listeners to DWRC's website and publications for statewide water news.

Dr. Sims welcomes attendees to the Delaware Water Policy Forum, *The Historic Christina Basin: Delaware's First Watershed*.

Biography:
Dr. Jerome R. Lewis is the first Director of the University of Delaware's Institute for Public Administration (IPA). He 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. IPA links the research and resources of the University 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.

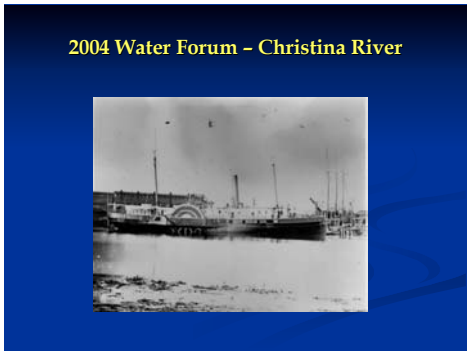
Dr. J. Thomas Sims is Associate Dean for Academic Programs and Research in the College of Agriculture and Natural Resources at the University of Delaware. He has served as Professor of Soil and Environmental Chemistry (1993-Present), Associate Professor (1987-1993), and Assistant Professor (1982-1987) at the University. Dr. Sims is also the University of Delaware's Director of the Institute of Soil and Environmental Quality (2002-Present) and the Director of Delaware Water Resources Center, University of Delaware (1997-Present). Dr. Sims' professional accomplishments include 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. Dr. Sims has authored/co-authored 75 refereed publications, 22 book chapters, a textbook on *Soils and Environmental Quality*, over 75 technical papers and conference proceedings, over 35 fact sheets and notes on soil testing and nutrient management, including the *Nutrient Management Handbook for Delaware*, and more than 190 volunteered presentations at national and regional meetings of the American Society of Agronomy - Crop Science Society of America - Soil Science Society of America (ASA/CSSA/SSSA). He has taught undergraduate and graduate courses in soil fertility and environmental soil science for 18 years, has served as an advisor to 24 graduate students and post-docs, directed the University of Delaware soil testing program for 16 years, and chaired Mid-Atlantic and Northeastern regional soil testing committees. Dr. Sims has organized and participated as an invited speaker in 12 symposia at ASA/CSSA/SSSA national meetings and 26 symposia in international meetings and for other professional societies. He has served as a 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.

The Christina – Delaware's Forgotten River

Kevin Donnelly, Director, Division of Water Resources, Delaware Department of Natural Resources and Environmental Control

Abstract:

The Christina River is an extremely important river in Delaware and the surrounding region. The history of the Christina River spans more than 360 years of development. The land was first settled by the Swedes in the 1630s at what is now Fort Christina Park. The Dutch, and eventually the British, settled the area in the late 18th century. The du Pont family came to fortune in this region making gun powder along the Brandywine River, while textile and paper mills began to prosper in the area. By the 1850s, a fully industrial economy in Wilmington gave rise to large ship building and rail car construction businesses. This industrial history, involving milling, ship-building, and manufacturing, has left a legacy of pollutants in the Christina River.



The Christina River has endured a legacy of heavy industrial uses that has resulted in a need for improved water quality. Mr. Donnelly stressed the need for cooperation within and among state and national agencies. In the 1990s "A Vision for the Rivers" charted a course for restoration and redevelopment that is being implemented. The City of Wilmington, which was built with an underlying sewer and storm drainage system, is in need of major infrastructure improvements to their existing system in order to curb the flow of pollutants into the River. These infrastructure improvements are a primary focus of the city. The city is spending $1 million in Brandywine Hundred alone. Several millions of dollars have been spent in several other locations to reduce the overflows of the outdated combined sewer system. The Christina River water quality is also being improved through the efforts of the Northern Delaware Wetland Rehabilitation Program. This program brings together various groups to develop strategies to restore 10,000 acres of degraded tidal wetlands along the Christina and Delaware Rivers in New Castle County. Additional efforts to improve the water quality include citizen monitoring and cleanup programs, multistate/USEPA PCB Total Maximum Daily Loads (TMDLs) for the Delaware Estuary, and many other federal, state, and local programs. These projects are being implemented throughout the Christina Watershed and, although there is a legacy of pollutants, stakeholders throughout the watershed are committed to improving the River.

Biography:
Kevin C. Donnelly has served as the Director of the Division of Water Resources at the Delaware Department of Natural Resources and Environmental Control since September 1999. As Director, Mr. Donnelly represents the state on the Delaware River Basin Commission (DRBC), the Statewide Labor Management Commission, several national estuary programs, the Association of State and Interstate Water Pollution Control Agencies, and various USEPA regional committees. Prior to becoming Director, Mr. Donnelly served eight years (1991-1999) as the Environmental Program Administrator for District Operations in DNREC's Division of Soil and Water Conservation. In March 2004, Mr. Donnelly was awarded the Water Resource Association Samuel S. Baxter Memorial Award. Mr. Donnelly also worked for the Delaware Department of Agriculture as a planner in the Aglands Preservation Section and as a Forester with the State Forest Service. From 1989-1990 Mr. Donnelly became the first Department of Agriculture employee in the Governor's Management Fellows Program. He lives in Wyoming, Delaware, with his wife Dot, where he served as Vice-Mayor and elected Member of the Wyoming Town Council from 1988-1992.

The Christina Basin – USEPA Watershed Initiative No.1 Ranked Watershed in the USA
Larry Merrill, Acting Chief, Watershed Restoration Branch, Office of Watersheds, Region 3 Office, United States Environmental Protection Agency

Abstract:
The Targeted Watersheds Grant Program was proposed in 2002 by the Bush Administration to encourage successful community-based approaches to protect and restore the nation's watersheds. This competitive grant program provides needed resources to those watershed organizations whose restoration plans set clear goals and objectives with special consideration given to water quality monitoring, innovation, a public education component, and strong community support. The Christina River Basin Clean Water Partnership is a wonderful example of partnerships in action working together to identify real problems in real places and then fixing them. In the 2003 selection process, the first year of funding in the Targeted Watersheds Grant Program, the Christina Basin application was the highest ranked application from over 170 submittals. This impressive milestone

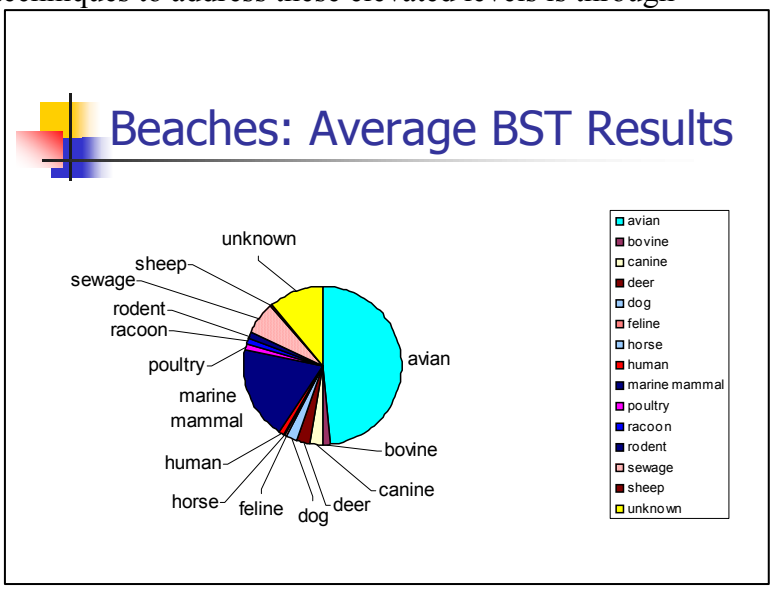
and the award of $1 million in federal grant funds was a testimony to the multi-state, multi-organizational effort that is working diligently to improve the water quality conditions in the Christina Basin. At stake is the health of an environmentally and economically significant residential, agricultural, and industrial watershed that provides numerous recreational opportunities and serves as a primary source of drinking water for many of its over 500,000 residents. However, there is no time to rest. With the implementation push provided by the Targeted Watershed Grant and the pending completion of the high flow TMDL study in early 2005, the partners and residents of the Christina Basin must have a renewed commitment to achieve the water quality management goals established for the Christina Basin.

Biography:
Larry Merrill is a 1973 graduate of the University of Maryland with a B.S. in Resource Conservation and Development. He continued his post-graduate studies at Drexel University in Philadelphia, Pennsylvania. Larry has over 30 years USEPA experience in Clean Water Act programs. He has been an USEPA Region III representative to the Christina River Basin Water Quality Management Committee from 2000 – 2004 and an USEPA Region III Coordinator whose work includes the Establishment of the Christina River Basin Low Flow TMDLs in January 2001 (revised October 2002). Larry Merrill was named Acting Branch Chief of the Watershed Restoration Branch in July 2004.

The Christina Basin Scorecard
Moderator: Edward J. O'Donnell, AICP, Senior Policy Advisor, Institute for Public Administration, University of Delaware

Stream Bacteria DNA Analysis: Man or Fowl
Sam Myoda, Watershed Scientist, Division of Water Resources, Delaware Department of Natural Resources and Environmental Control

Abstract:
The Christina Basin has shown elevated levels of bacteria in its water quality monitoring results. One way to plan specific management techniques to address these elevated levels is through bacteria source tracking (BST). The Delaware Department of Natural Resources and Environmental Control (DNREC) has amassed a large number of fecal bacteria samples that have undergone DNA signature mapping and have been organized into a library of signature samples. This library of signature samples is used to separate bacterial sources that can be managed such as pets, from those that cannot be managed, such as birds. For example, BST has shown that 25 percent of bacteria in the water in Pike Creek are from birds and 50



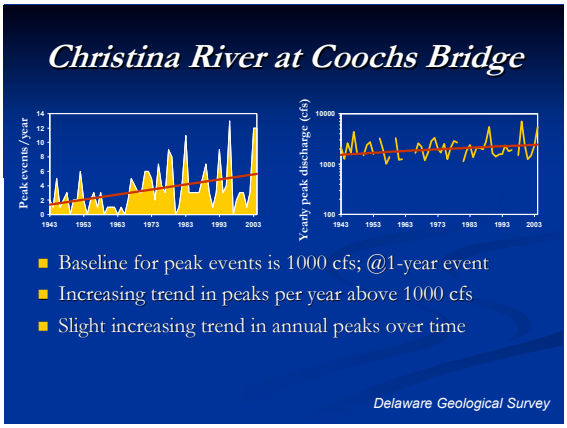
percent of bacteria in the water along the beaches originate from birds. Bacteria originating from human sources carry the largest health risks to consumers and BST is an effective management technique that can be used to locate areas of septic failure or inadequate treatment for remediation to help reduce public health risks related to water quality.

Biography:
Dr. Sam Myoda earned a bachelor's degree in environmental science/biology and a doctorate in environmental engineering at the University of Delaware. The primary focus of this research has been the enumeration and disinfection of pathogenic protozoa and bacteria. Dr. Myoda established a genetics lab at DNREC and currently focuses his efforts on BST and direct pathogen detection. With the ability to accurately determine the source of the bacteria in the State's waters, Dr. Myoda's work provides the foundation on which TMDLs, pollution control strategies, and public policy decisions can be based.

At the Fall Line: Geology, Baseflows in the Christina Basin
John Talley, State Geologist and Director, Delaware Geological Survey

Abstract:
The Delaware Geological Survey (DGS) maintains ten continuously recording stream gages in the Brandywine, three in the Red Clay, three in the White Clay, and one in the Christina. DGS also posts real time precipitation station and tide gage recorded levels at the Delaware Environmental Observation System at *www.deos.udel.edu/*.

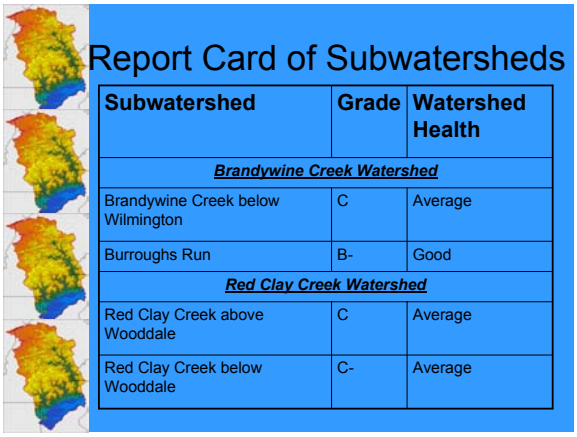
Over the past 50 years in Wilmington increased precipitation levels have been observed. While the mean precipitation level for that time period is 46.2 inches annually more than 49 inches have been recorded annually in the past five years. The greatest increase in precipitation dates back to between 1945 and 1965. The Porter Reservoir has seen an increase of nearly seven inches of precipitation due to hurricanes and large rain events between 1949 and 2003. The increased precipitation was correlated with peak flows, peak discharge baseflow, and impervious cover in the Shellpot Creek, the Christina Basin, and the Brandywine Creek. Starting in the mid 1960s more peak flows have been observed in Wilmington's Shellpot Creek due to homebuilding and increased impervious cover. The Shellpot Creek has shown increasing peak flows [greater than 1,000 cubic feet per second (cfs)], an increase in impervious cover, slight increases in peak discharge, and no drought trend or change in baseflow. The Christina Basin has shown an increase in both peak flows per year (greater than 1,000 cfs) and peak flows over time. The Brandywine Creek has shown low impervious cover comparatively, no trend in peak flows, declining annual minimum flow, and declining base flows. Mr. Talley concluded that the peak flows per year increase with high levels of impervious cover and those with lower levels of impervious cover do not show a trend in increased peak flows per year.



Biography:
John H. Talley has been with DGS for 32 years. Prior to joining DGS he was an engineering geologist with a soil and foundation consultant. He received his B.A. from the University of Delaware and his M.S. from Franklin and Marshall College. Mr. Talley has authored/coauthored more than 50 publications and reports pertaining primarily to applied geology, hydrology, and geologic hazards in the Atlantic Coastal Plain and Piedmont. He has lectured extensively on the geology and hydrology of Delaware. Mr. Talley is a licensed geologist in Delaware and Pennsylvania and a Certified Professional Geologist of the American Institute of Professional Geologists. He has served on dozens of boards, committees, and task forces for state, municipal, university, and federal agencies, and professional organizations. He served both as a professional member and president of the Delaware State Board of Professional Geologists.

The Christina Basin Report Card

Sara Wozniak, Appoquinimink Watershed Coordinator, Appoquinimink River Association



Abstract:
The Christina Basin contains six trout streams, endangered species, and almost half the state's population. The health of water bodies in the basin is significant to the state of Delaware and its residents. In order to determine the health of the Delaware portions of the Christina Basin using concrete data, a team from the Water Resources Agency developed a report card structure to grade each of the subwatersheds. The water quality indicators evaluated include total nitrogen and phosphorus, chlorophyll, copper, lead, zinc, dissolved oxygen, enterococci bacteria, total suspended solids, stream habitat aspects, and watershed health indicators based on population density and imperviousness. Drawing from existing water quality, watershed, and stream quality data, a water quality ladder approach was used to ensure ease of public understanding. In this approach, the top of the ladder (those with grades of "A") corresponds with those areas of best possible quality, while the bottom (those with grades of "F") represents the worst possible water quality rating. Nineteen various indicators were each graded on this scale for the 17 subwatersheds based on assigned criteria levels, and the mean of those grades were used to determine the overall grade for the subwatersheds and basin. This study showed that the overall grade for the Delaware portions of the Christina Basin was a "C", indicating that there is a need for improving watershed health.

Biography:
Sara Wozniak is the Appoquinimink Watershed Coordinator representing a new non-profit group, the Appoquinimink River Association (ARA). ARA is a group that formed to preserve, protect, and enhance the rivers and related natural resources of the Appoquinimink region, which includes Middletown, Odessa, and Townsend in southern New Castle County. Ms. Wozniak is no stranger to the University of Delaware community as she graduated in 2002 with a Bachelor of Arts degree in Biology and Political Science and again in 2004 with a Master of Energy and Environmental Policy with a specialization in Water Policy and Management. While working toward her master's degree, Ms. Wozniak was able to work for the Water Resources Agency in the Institute for Public

Administration and the Center for Energy and Environmental Policy (CEEP). This allowed her to participate in many projects and groups, including the Governor's Drought Advisory Committee, Water Supply Coordinating Council, Delaware Source Water Protection Program, and other countries such as Germany and South Korea.

Trends in Watershed Imperviousness, 1995-2004

Kevin J. Vonck, Senior Researcher, Water Resources Agency, Institute for Public Administration, University of Delaware

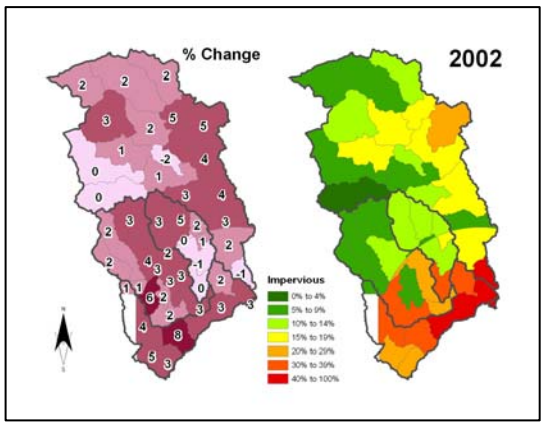
Abstract:

A reasonable body of literature exists that illustrates how the impervious surfaces of development (i.e., driveways, roads, rooftops, and sidewalks) cause hydrological, chemical, physical, and biological attributes of water bodies to become degraded as the percentage of impervious cover in their watershed increases. One of the difficulties in advancing watershed-based policies involves calculation of the percentage of impervious cover on larger scales. This presentation elaborated on the "Christina Method" technique that uses land use data and GIS technology to estimate the percentage of impervious cover contained within watersheds.

Kevin J. Vonck explains how GIS can be used to provide estimates and long term trends in impervious cover.

The steps in the method are:

1) Consolidate land use data into fourteen specific categories with similar attributes.
2) Assign an imperviousness coefficient to each land use as developed through analysis of aerial photos from representative tax parcels.
3) Calculate the total area (in meters) for each land use within the watershed of interest.
4) Multiply the land use area totals by their respective impervious coefficients to obtain the impervious surface area for each respective land use.
5) Add together the impervious surface area for all land uses within the watershed.
6) Divide this number by the total watershed area to obtain the impervious cover percentage.



The Christina Method is used to estimate the change in impervious cover within the subwatersheds of the Christina Basin between 1994 and 2004. Results have indicated an increase of approximately 5 percent in impervious cover. Most changes have occurred in the transition of agricultural land use to suburban land use.

Biography:

Kevin J. Vonck is a Senior Research Assistant with the Water Resources Agency in the Institute for Public Administration. He is a contributing author to several publications including the Source Water Protection Guidance Manual for the Local Governments of Delaware (2004), the Fifth and Sixth Reports to the Governor and General Assembly Regarding the

Progress of the Water Supply Coordinating Council (2003 and 2004), and A Watershed Restoration Action Strategy for the Delaware Portion of the Christina Basin (2003). Mr. Vonck holds a Bachelor of Arts degree in Geography and History and Certificate in Environmental Studies from the University of Wisconsin – Madison as well as a Master of Public Administration from the University of Delaware (UD). He is currently pursuing a Ph.D. in Urban Affairs and Public Policy from UD. Mr. Vonck served as the District 6 representative on the City of Newark Conservation Advisory Commission from 2002 to 2004 and was elected as the District 6 Council Member in 2004.

Smartyards and Social Attitudes
Moderator: Dr. J. Thomas Sims, Director, Delaware Water Resources Center, University of Delaware

Christina Basin Smartyards Program
John Harrod, Backyard Habitat Coordinator, Delaware Nature Society

Abstract:
"Smartyards,", a unique component of the Delaware Nature Society's (DNS) Backyard Habitat program, is an incentive-based effort to encourage homeowners to improve water quality by planting native, water-friendly plants and reducing or eliminating the need for chemical fertilizer and pesticide applications. While many efforts, such as the TMDL process, are underway at both federal and state levels, public understanding of nonpoint source pollution issues is necessary to cultivate awareness and create solutions. "Smartyards" helps individuals understand their own impact on the health of waterways by making the connection between land use practices and water quality. Participants certify their residences as official Backyard Habitat sites, while learning resource conservation practices and discovering how to provide habitat for a greater diversity of wildlife species thereby helping ensure the health of our streams and rivers by reducing the reliance on products that contribute to nonpoint source pollution.

John Harrod explains DNS's "Smartyards" program.

Through grant funding, "Smartyards" participants receive a landscaping package valued at approximately $500 and one-on-one technical assistance from DNS-trained Habitat Stewards that help them certify their property. Certification allows the National Wildlife Federation and state affiliates like DNS to map certified habitats, help determine where wildlife corridors have been created, and pinpoint specific watersheds that would benefit from the Backyard Wildlife Habitat program. Certification also provides an opportunity for property owners to educate and inspire others in their community.

"Smartyards" has produced an enthusiastic response from homeowners, regulatory agencies, and funders. While homeowners are eager to receive the landscaping packages and learn how to make a difference locally, regulatory and funding agencies are encouraged by "Smartyards" ability to address TMDLs, increase citizen education and action, and be easily duplicated in various watersheds.

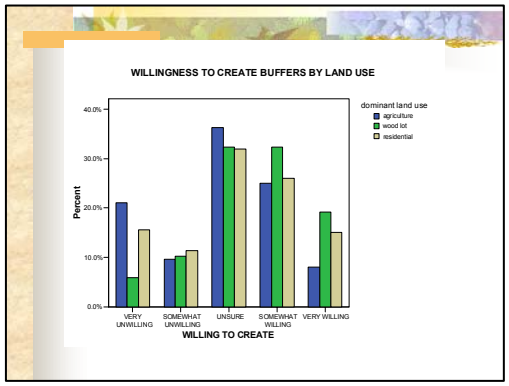
Biography:
In 2004 Mr. Harrod joined the Delaware Nature Society (DNS) as the Backyard Habitat Coordinator. He is responsible for administering the Backyard Habitat Program to reduce nonpoint source pollution and promote habitat enhancement and biodiversity conservation. He manages programs and volunteers to cultivate a stewardship ethic among the general population and those in the private sector. Prior to joining DNS, Mr. Harrod worked at J. Franklin Styer Nurseries for one year after receiving his M.S. in Public Horticulture from the University of Delaware. Mr. Harrod began work in the environmental education field at the Lady Bird Johnson Wildflower Center in Austin, Texas after earning a B.S. in Horticulture from Texas A&M.

Social Attitudes Toward Stream Buffers

Dr. Janet Johnson, Professor, Department of Political Science and International Relations, University of Delaware

Abstract:
A mailed questionnaire was administered to over 800 streamside landowners in Pennsylvania, Delaware, and Maryland, to determine current streamside land use, measure landowner willingness to create and maintain forested buffers, and gauge attitudes about alternative policies for encouraging streamside buffers. Thirty-three percent of landowners who reported that agriculture was the dominant land use indicated they were willing to create forested buffers, whereas 51 percent of owners of wood lots, and 41 percent of owners of residential properties indicated they were willing to create buffers. Large majorities of all types of property owners said that they were willing to maintain existing streamside forests. Half of all landowners said they would be more interested in creating or maintaining buffers if they contained plants other than trees in at least some areas. Willingness to create and willingness to maintain buffers were positively correlated with feelings of connection to nature, concern about the environment, and reported participation in pro-environmental behaviors. Landowners were asked about the importance of various possible impacts of streamside forests on their willingness to create or maintain streamside forests. Concern about maintenance costs and loss of income and appearance were negatively related to willingness to maintain. Belief in the importance of providing streamside forests for stream protection, providing wildlife and fishing habitat, improving downstream areas, and improving bank stability were positively associated with willingness to create and maintain streamside forests. Impacts such as too much shade, pests, encroachment of vegetation,

Dr. Janet Johnson discusses social attitudes toward stream buffers.



and views of the stream and meadow were not significantly related to willingness to create or maintain streamside forests. Respondents supported educational, voluntary, and financial assistance policies for the encouragement of streamside forests rather than regulatory approaches.

Biography:
Dr. Janet Johnson joined the University of Delaware in 1977. She received her Ph.D. in Government from Cornell University in 1979. She teaches in the areas of research methods, state and local government, and environmental policy. She is the coauthor of Political Science Research Methods now in its fifth edition. She is also the author of articles on environmental policy and state politics. Her current research addresses the relationship between environmental values and environmental behavior. She lives in Chester County along the Buck Run Creek.

The Role of Nonprofit Organizations in the Management of the Christina Basin

Martha B. Corrozi, Watershed Analyst, Water Resources Agency, Institute for Public Administration, University of Delaware

Abstract:
Nonprofit organizations have an important role in service provision and in a number of activities that govern the nation, including watershed management. As the nature and importance of watershed management continues to evolve, environmental nonprofit organizations will be expected to assist the government in managing watersheds throughout the nation. The Christina Basin applies a watershed management approach in which a variety of nonprofit organizations have an important role in the watershed management process.

Martha Corrozi presents the results of 25 nonprofit agencies, detailing the role of nonprofit organizations in the Christina Basin.

The watershed management approach is complex and the research, *The Role of Nonprofit Organizations in the Management of the Christina River Basin*, explores the complexity of involving nonprofit and government organizations in the management of the Christina Basin. The sources of information for this research were key informants in government and nonprofit organizations performing work in the Basin. The key informant identification was limited to persons with an established connection to the Christina Basin Water Quality Management Task Force and Committee or municipalities, counties, regional, state, and nonprofit organizations currently addressing issues in the Basin.

The key informants' responses confirm that a variety of views and academic disciplines are represented throughout the nonprofit organizations in the Basin, resulting in a variety of roles for the nonprofit organizations. Although the respondents conveyed that nonprofit organizations in the Basin play a variety of roles, most of the respondents, both government and nonprofit, expressed that the significant, if not primary, role of nonprofit organizations is conveying information and educating key players in the Basin. Even though the

respondents were overwhelmingly positive in discussing the relationship of nonprofit and government organizations and the role of nonprofit organizations in general, a variety of drawbacks were mentioned. This analysis describes the overall role of the nonprofits and the drawbacks and benefits associated with them as it relates to the management of the Christina Basin.

Biography:
Martha B. Corrozi is a Watershed Analyst at the Water Resources Agency (WRA) in the Institute for Public (IPA) Administration at the University of Delaware (UD). She joined the University professionally in June 2004. Prior to this position she worked at the United State Environmental Protection Agency's Chesapeake Bay Program in Annapolis, Maryland as an Environmental Management Fellow, the City of Wilmington's Public Works Department as an Environmental Programs Specialist, and IPA-WRA as a Graduate Research Assistant. Ms. Corrozi received her Bachelor of Science in Biology from Lehigh University and also holds a Masters of Public Administration, with a concentration in Water Resources, from the UD. She is a native Delawarean and lives in Wilmington in the Brandywine Creek Watershed.

Views from the Headwaters
Moderator: Martha B. Corrozi, Watershed Analyst, Water Resources Agency, Institute for Public Administration, University of Delaware

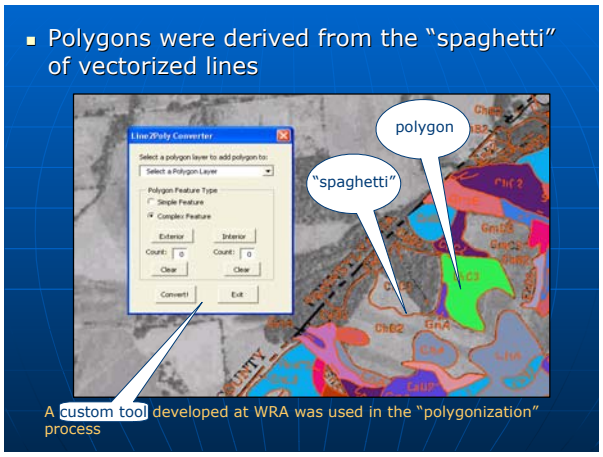
Playing the Hand You're Dealt: Optimizing the Utility of Analog Data – A Case Study
Andrew Homsey, GIS Services Manager, Institute for Public Administration, University of Delaware

Abstract:
This presentation began with an aerial tour of the Christina Basin. The 3D topographic/land use tour enabled the audience to "fly over" the Christina Basin beginning in the headwaters in Chester County, Pennsylvania, and into and through New Castle County, Delaware.

Andrew Homsey provides an aerial tour of the Christina Basin.

The aerial tour was followed by an overview of the rectification of soil maps. Mr. Homsey noted, in the course of using GIS to address water resources or other issues, existing data are often missing, inadequate, or in an inappropriate format for use. For instance, soils data from the Natural Resources Conservation Service (NRCS) for northern New Castle County exist only in traditional map-book format. New Soil Survey Geographic (SSURGO) data for the region are pending, but research tasks may require data immediately. For example, a 2004 study for the New Castle County Department of Landuse undertaken by the Institute for Public Administration's Water Resources Agency at the University of Delaware sought to develop a water budget for the Cockeysville formation at Hockessin, Delaware. Since no adequate digital soils data existed and accurate information on Hydrologic Soil Group was necessary to model infiltration for the water budget, it was critical to obtain the best available detailed soils data for the area. Procedures were developed to rapidly extract high-quality,

spatially accurate digital soils data from the 1970 Soil Conservation Service paper map series, which had been produced using hand-drawn lines atop aerial photographs. This exercise demonstrates that, given inadequate or not readily available data, adaptive reuse of non-digital sources can often provide viable, high-quality data layers to address a research question.



Biography:
Andrew Homsey is the manager of the GIS Services Group at the Water Resources Agency (WRA) in the Institute for Public Administration (IPA). Mr. Homsey has over 13 years experience in the field of GIS, much of it in the water resources or related fields.

Chester County Agriculture Conservation Projects
Dan Greig, District Manager, Chester County Conservation District, Chester County, Pennsylvania

Abstract:
This presentation showcases three farmers in Chester County, Pennsylvania, the upstream portion of the Basin, that have worked with the Conservation District to upgrade their farms. These farmers have been active in installing Best Management Practices (BMPs) and have contributed to improving water quality in the Christina Basin. The BMPs installed on these farms include: surface and roof runoff controls, fencing to keep cows out of the streams, manure collection tanks, water diversion systems, and many other BMPs. In addition to the contributions from the three farmers showcased, many of the dairy farms in Chester County have installed manure storage systems, barnyard runoff controls, nutrient management plans, and field conservation practices to minimize nutrient and sediment runoff into streams during storm events. Most of the mushroom fresh compost operations, and mushroom growing operations, which are concentrated in the Basin, have also developed Mushroom Farm Environmental Management Plans and are implementing BMPs to minimize impacts to the stream and basin. Unfortunately, it is also important to note that these BMPs are designed to function up to a specific storm event, if the storm event exceeds the design capacity, the BMPs are not effective nor are they expected to control pollution.

Work within the Basin is not completed, but there have been significant improvements within the last ten years. Most agricultural operators want to cooperate, although some farmers do not have the dollars that are necessary to upgrade their farms to implement the BMPs. Chester County Conservation District Staff and Natural Resources Conservation Service (NRCS) provide both free technical assistance to the landowners to install the practices and limited financial assistance. The Conservation District also participates in education, which is another key role in the process.

Biography:
Dan Greig is a lifelong resident of Chester County, Pennsylvania. Mr. Greig graduated from West Chester University with a degree in Geography and Urban Planning. Mr. Greig started working for the Chester County Conservation District in 1978 as a Resource Conservationist assisting in the implementation of BMPs on Agricultural Operations. In 1988, Mr. Greig became the District Manager. He has guided the conservation district in its growth from primarily providing agricultural services to a multiple program operation utilizing the technical abilities of 16 staff employees. Under Mr. Greig's management, the Chester County Conservation District has been recognized for its leadership in Erosion and Sediment Control, Stormwater Management, Watershed Planning, Mushroom Farm Water Quality Management, and many successful BMP implementation programs. Mr. Greig serves as the chairman of the Soils and Water Committee for the Pennsylvania Association of Conservation Districts. He is also the current chairman of the Southeast Pennsylvania Conservation Districts, an informal group made up of Chester, Bucks, Delaware, and Montgomery County Conservation Districts. Mr. Greig was the first Conservation District employee in Pennsylvania to have NRCS Engineering Job Approval. He also holds a NICET certification in Erosion and Sediment Control.

Hands Across the Watershed
Moderator: Gerald J. Kauffman, Director of Watershed Policy, Water Resources Agency, Institute for Public Administration, University of Delaware

Brandywine Valley Association
Bob Struble, Executive Director, Brandywine Valley Association

Abstract:
The Brandywine Watershed has a long history of pioneering efforts and accomplishments in watershed management. BVA was organized in 1945 and is the oldest small watershed association in America. It has been a model for many similar organizations throughout the United States and internationally. One of the earliest projects of BVA was the formation of the Chester County Conservation District in 1948. The Conservation District provides technical assistance for farmers interested in implementing conservation plans. Soil erosion was a serious problem in the 1940s and the Conservation District's assistance significantly reduced sediment loads in the creek. In 1948 the first limnological studies in the Brandywine began under Dr. Ruth Patrick from the Academy of Natural Sciences. These studies continued on a regular basis through the Academy of Natural Sciences until the Chester County Water Resources Authority and the U.S. Geological Survey began regular studies in 1969. Other major projects by the Association include the first landfill in Chester County in 1954 and the organization of the Chester County Water Resources Authority in 1961, still the only county water resources authority in Pennsylvania. The Authority was formed to implement the Brandywine Watershed Work Plan for flood control and water supply, which includes five dams to protect areas prone to flooding as well as provide flow augmentation in dry years. The BVA pioneered the concept of land application of treated wastewater effluent in 1972 and continues to promote this technology. The Association was also instrumental in the early recycling programs in the watershed, and in 1986 began education programs for local school districts. Currently the education programs make over 15,000 student contacts a year at the BVA's Myrick Conservation Center in Pocopson Township and at individual schools. The Watershed Learning Center program, Indoor Out School, and Watershed School are all ongoing education

programs focusing on the importance of water resources as part of an overall environmental education program. Working through friendly persuasion, the Association emphasizes the educational approach using sound technology and good science. The Association is supported by over 800 members, both individual and corporate, and is governed by a board of 30 volunteer directors and managed by a staff of five full-time and 25 part-time employees.

Biography:
Robert Struble is the Executive Director of BVA and the Red Clay Valley Association (RCVA). He was previously employed as a planner with the Chester County Planning Commission and served four years in the U.S. Navy as a Communications Technician with specialty in Chinese language. Mr. Struble attended Bowdoin College and Shimer College, Illinois, to earn a B.A. in Social Science. His graduate work was at the London School of Economics in Urban and Regional Planning and National Taiwan University, Taiwan, and Goethe Institute, Germany, for language study. Struble is a member of the Chester County Conservation District and serves as Secretary/Treasurer and on the Board of Directors. He serves as Treasurer and on the Board of Directors for the Chester County Water Resources Authority. He volunteered as Cubmaster with Cub Pack 110 from 2001 to 2004. He serves on the Environmental Advisory Committee in East Bradford Township and is the past president of the West Chester Rotary Club.

Red Clay Valley Association
Jim Jordan, Deputy Director, Red Clay Valley Association

Abstract:
The purpose of the Red Clay Valley Association (RCVA) is to promote, through education and scientific activities, the restoration and conservation of the natural resources of the Red Clay Watershed. The RCVA was founded in 1952 by a small group of Delaware and Pennsylvania residents that were concerned about the overall neglect of the watershed. Historically, RCVA has worked with municipal leaders, industry, and farmers to educate and promote the wise use of natural resources. In 1955 RCVA established the valley's first landfill to deal with municipal-type waste and in 1976 created the first drop-off recycling center in the region. The organization's efforts have led to the elimination of many municipal National Pollutant Discharge Elimination System (NPDES) discharges. As the demographics of the Red Clay watershed have changed from mostly farms and rural areas to subdivisions, RCVA has worked closely with homeowners associations and others to promote open space and riparian buffers along the Red Clay Creek and first order streams. RCVA has developed a computerized groundwater model that enables users to forecast the impacts of land use changes on the groundwater. RCVA is also one of the co-founders of the Red Clay Valley Clean-Up, which began 16 years ago, and continues to spearhead this event.

RCVA also supports education programs. In partnership with its sister organization, the Brandywine Valley Association (BVA), RCVA conducts education programs for area schools and operates a summer camp for local youngsters. An appreciation and understanding for the outdoors and natural resources is fostered through these natural resource education programs.

The organization has over 400 members and is governed by a volunteer board of directors. RCVA has a staff of five full-time and 25 part-time employees, which are shared with the BVA. RCVA staff continues to work quietly through education and partnerships to accomplish its mission.

Biography:
Jim Jordan is a graduate of the University of Delaware and Delaware Technical and Community College. He is the Deputy Director of RCVA. Mr. Jordan is a member of the Delaware Nature Society (DNS) and sits on the education, watershed, and land preservation committees. He is a member of the historic RCVA, and the Yorklyn Planning Group. Awards received include RCVA's Outstanding Conservationist – 1996, Hockessin/Pike Creek Rotary Club's Distinguished Citizen Award – 1997, and the DNS's Leadership Award – 1998.

White Clay Creek Wild and Scenic River Committee
Linda Stapleford, River Manager, White Clay Creek Watershed Management Committee

Abstract:
"…certain selected rivers of the Nation …shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations."
- National Wild and Scenic Rivers

Linda Stapleford discusses the White Clay Creek Watershed Management Committee.

The White Clay Creek watershed is renowned in the bi-state area for its scenery, recreational opportunities, historic features, and water supply resources. In 2000 the creek and its tributaries in Pennsylvania and Delaware were designated by federal legislation into the National Wild and Scenic Rivers System. This marked the first time an entire watershed, rather than just a section of river, was designated into the system. This "beyond-the-riverbank" approach takes into consideration the variety of influences outside the river corridor that affect river habitat and water quality.

Together with private organizations and citizens municipalities, counties, state and federal agencies, together with private organizations and citizens, sought the designation and developed the Management Plan to protect the White Clay Watershed and its special natural and cultural resources. These stakeholders continue to work in partnership through the White Clay Creek Watershed Management Committee. They have been engaged in the past few years in projects to improve and conserve water quality and water quantity; conserve open space, woodlands, wetlands and geologic features; protect native plant and animal species; preserve cultural, historical, and archaeological sites; enhance outdoor recreation opportunities; and encourage environmental education and outreach.

Biography:
Linda Stapleford's love for nature has led her to work in the environmental and education area for the past 20 years. Prior to her appointment as the White Clay Wild and Scenic program River Administrator, she performed public outreach and program administration for the Delaware Nature Society's (DNS) natural resources conservation department for 12 years. Her interest in environmental education was a primary focus for an earlier career teaching sciences at the secondary school level. She has a Bachelor of Arts in Biology and Education from Denison University and a Master of Applied Sciences in Environmental Engineering from the University of Delaware.

Christina Conservancy
Edward W. Cooch, Jr., President, Christina Conservancy

Abstract:
Formed in 1981, the 23-year old Christina Conservancy has contributed significantly throughout the Christina Watershed in various and numerous activities. The Christina Conservancy has been the principal sponsor of the Christina Clean-Up for 13 continuous years with participation ranging from 600-1,200 volunteers annually. These volunteers have collected more than 200 tons of trash and eliminated 10,000 tires from the watershed. The Conservancy has also provided a $25,000 challenge grant to the City of Wilmington to stimulate the removal of two sunken barges in the Brandywine/Christina Rivers. While the superstructure of the sunken vessel, the "State of Pennsylvania", has been removed, the remainder, submerged at high tide, is a serious navigational hazard. The Conservancy continues to work with the state's congressional delegation and presently about one-third of the necessary funds have been obtained to remove the remainder of the vessel. The Conservancy has also provided strong support and will continue to advocate for complete elimination of the City of Wilmington's combined sewer overflows. Currently three overflow sites have been corrected, but 36 sites remain. The Conservancy has also funded two interns to conduct a study to determine all of the point sources that are contributing pollution to the mainstem of the Christina. These studies have been very useful to the Delaware Department of Natural Resources and Environmental Control (DNREC), and most of the pollution causing discharges have been corrected. Finally, Mr. Cooch mentioned the Conservancy's recently formed partnership with Delaware Nature Society (DNS). The intent of this partnership is to obtain conservation easements in order to protect critical lands along the Christina. This partnership will enable landowners to maintain the control of their property while eliminating their responsibility to maintain the easement.

Edward (Ned) W. Cooch Jr. provides a historical account of the Battle of Cooch's bridge.

In addition to providing highlights of the Christina Conservancy's activities, Mr. Cooch provided a brief historical perspective of the Cooch's Bridge area and a historical account of the Battle of Cooch's Bridge, the only Revolutionary War battle fought on Delaware soil. Mr. Cooch described the history of the watershed at Iron Hill dating back to 1633. Iron Hill, midway along the Christina from the Elk River to the Delaware River, is currently a 300-acre park established in 1977.

Colonial governments mined the hill, and a forge is on the Cooch property. In 1777, 18,000 British troops in 265 ships sailed up the Chesapeake Bay and marched toward the area. General Washington, who had learned of the British plan to take Philadelphia from the west, went with Generals Greene and Lafayette to the top of Iron Hill which commands a view of the Delaware River, Elk River, and Chesapeake Bay. On September 3rd, the British approached the Cooch property on the Bridge Road, half a mile south of the bridge. The colonials opened fire, then fell back, outnumbered and out of ammunition – some fighting with swords. Then, retreated to Welsh Tract Church. Although some records claim the Stars and Stripes flag created by Betsy Ross was first flown at Fort Stanwich, New York, Mr. Cooch cites a 1926 letter that determines the flag flown in New York was not the Stars and Stripes. As the Congress had approved the Stars and Stripes before the Battle of Cooch's Bridge, it is possible that this was, in fact, the first occasion for the flying of that battle flag. Mr. Cooch claims that the British burned the family forge and, as a greater tragedy, drank all the liquor before departing on their trek toward the Battle of the Brandywine. Lord Cornwallis occupied the Cooch's house after the battle. In retribution, Mr. Cooch has hung a painting of the British surrender at Yorktown over his fireplace. The Cooch property is now protected in perpetuity, preserved as a state conservation easement along the Christina. Mr. Cooch noted that the over 190-acre Cooch's Bridge Farm, in his family for several generations, is now preserved through the state's purchase of the development rights. Should the property ever be sold, the state has the right of first refusal.

The historical account of the Battle of Cooch's Bridge was followed by the presentation of the "First Defender of the Christina River" award to Mr. Cooch. Mr. Cooch has been the biggest advocate for the protection and preservation of the Christina River. Mr. Cooch is a living example of environmental stewardship and is a model for those working to protect water resources in the Christina Basin.

Gerald Kauffman presents Edward (Ned) W. Cooch Jr., with the first "Defender of the Christina River" award.

Biography:

Edward (Ned) W. Cooch, Jr. is a native Delawarean born in Wilmington, Delaware, the son of former Lieutenant Governor and Mrs. Edward W. Cooch of Cooch's Bridge. He graduated in 1941 from the University of Delaware. Mr. Cooch served in the Submarine Mine Command during World War II and was promoted to Major. Upon his release from the service, he entered the University of Virginia Law School, graduating with a Bachelor of Laws degree in 1948. He then commenced the practice of law in Wilmington. He served as the President of the Delaware Wild Lands for six years and as the Director for 39 years. He presently serves as Director and President of the Christina Conservancy, was a member of the Executive Committee for the Christina and Brandywine Rivers Committee, and served for eleven years by the appointment of two governors on the Delaware Open Space Council which advises the state on land purchases. Mr. Cooch received the merit award from the University of Delaware in 1986, the 1992 Delaware State Bar Association's Community Service Award, the Delaware Audubon Society Conservation Achievement Award in 1999, and a gold medal from the National Society of Sons of the American

Revolution in 2003 for his efforts in preserving the Cooch family lands at Cooch's Bridge, the site of the only battle between the British and the American armies on Delaware soil during the American Revolution.

The History of the Christina Basin – George Washington Slept Here

Gerald Kauffman, Director of Watershed Policy, Water Resources Agency, Institute for Public Administration, University of Delaware

Abstract:

The waters of the Christina Basin are unique in Delaware for their water supply, ecological, economic, and historic values. The Brandywine, Red Clay, White Clay, and Christina watersheds provide over 60 percent of the drinking water for the First State. The basin is the habitat of the only six trout streams in Delaware. Bald eagles, a federally protected species, nest near Churchman's Marsh. Two hundred and twenty-seven years ago, the watershed was the site of two battles in the War for Independence – the Battle of Cooch's Bridge near Newark, Delaware, and the Battle of the Brandywine near Chadds Ford, Pennsylvania.

By historic accounts, the Christina Basin is Delaware's first watershed. The indigenous people of the watershed, the Minquas and the Lenape, knew a rocky landing at the mouth of the *Suppekongh* creek as *Hopkohacking* or "the place where we smoked the tobacco pipe." In 1638 the Swedes arrived aboard the *Kalmar Nyckel* and established Fort Christina at "The Rocks" on the Minquas Kill (the Swedes then renamed it Christina Kill) as the first permanent European settlement in Delaware. In 1765, Mason and Dixon finished the survey of their line that separated parts of the Christina Basin into three states. On September 3, 1777, the watershed was the site of Delaware's only Revolutionary War battle at Cooch's Bridge (debated to be the first time where the Stars and Stripes, the Betsy Ross flag, were unfurled in battle).


1802 – Du Pont Hagley Mill along the Brandywine

Just over 200 years ago, the du Pont's chose the falls of the Brandywine Creek north of Wilmington to power their gunpowder mills. In 1849, just before the Civil War, Harriet Tubman escaped slavery and traveled the Underground Railroad over the Christina and the Brandywine through Wilmington toward freedom in Canada. In 1886, the watershed was at the crossroads of the transportation web along the Atlantic seaboard as the B&O railroad built a second line parallel to the Pennsylvania Railroad through Newark and Wilmington. In 1931, the City of Wilmington built Hoopes Reservoir in the Red Clay Creek watershed, the first and largest reservoir in Delaware. During the Second World War, the Dravo shipyard was the largest industrial employer in Delaware, as it built 187 ships along the tidal Christina at Wilmington.

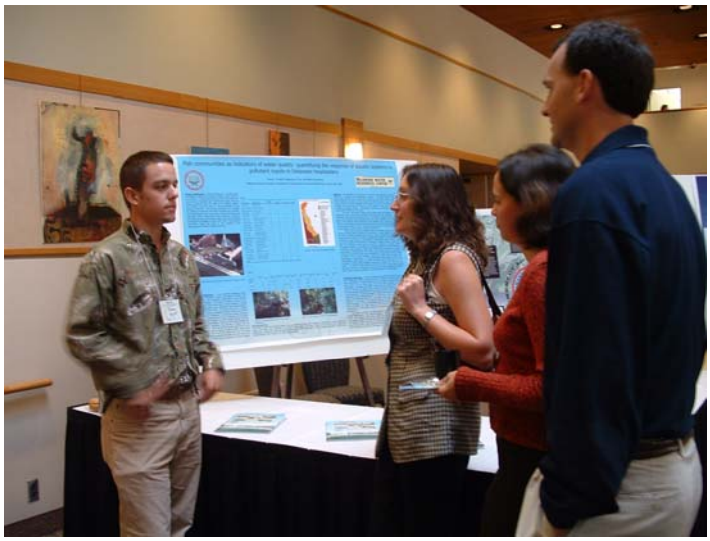
On October 24, 2000, President Clinton signed a law designating the White Clay Creek as a National Wild and Scenic Watershed, the first in Delaware and the first nationally to be designated on a watershed basis rather than a river corridor basis. Water supplies and water conservation plans in the basin helped sustain residents through the 100-year drought of 2002. Last year, the federal Environmental Protection Agency recognized the Christina Basin with a $1 million grant as the number one ranked watershed in the United States (out of over 170 watersheds) according to the targeted watershed grant initiative. Several months ago, the newspaper reported that the Port of Wilmington at the mouth of the Christina River imports some of the highest tonnage of fresh fruit in the United States. The Christina Basin is prominent in many ways, first in water supply and first in history.

The Christina Basin occupies an important place in Delaware and American history. Its streams and geology such as the Christina River, Purgatory Swamp, and Iron Hill are mentioned prominently by historians of the American Revolution. The watershed, with headwaters in Maryland and Pennsylvania, above the Mason and Dixon Line, is the only one in Delaware with waters that flow through three states. This historic watershed provides irreplaceable resources such as drinking water for 500,000 people in Delaware and Pennsylvania and nesting grounds for the bald eagle, our nation's symbol. The basin is a resource to be treasured for its natural and historic values. And yes, General George Washington did sleep here.

Biography:
Gerald Kauffman is Director of Watershed Policy at the Water Resources Agency in the Institute for Public Administration at the University of Delaware. Mr. Kauffman is responsible for providing watershed 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 appointments as the State Water Coordinator (by state law), the Delaware Co-coordinator for the Christina Basin Clean Water Partnership, and membership in the New Castle County Resource Protection Area Technical Advisory Committee. Mr. Kauffman teaches courses in Regional Watershed Management, Water Resources Engineering, and Watershed Engineering, Planning, and Design, and was co-founder of the University of Delaware's Experimental Watershed. Mr. Kauffman received a Master of Public Administration (MPA) degree with specialization in watershed policy from the University of Delaware, School of Urban Affairs and Public Policy. He earned a Bachelor of Science degree in Civil and Environmental Engineering, with a concentration in water resources, from Rutgers University and is a Certified Public Manager awarded by the Rutgers University Graduate Program in Public Administration. Mr. Kauffman is a registered Professional Engineer (PE) who has been licensed in four states (New Jersey-1988, Wisconsin and Illinois-1990, and Delaware-2000) and has over twenty years of experience in water resources management.

Following a luncheon, displays were exhibited in the lobby by the following organizations:

- Institute for Public Administration's Water Resources Agency at the University of Delaware
- Delaware Water Resources Center (DWRC) at the University of Delaware
- Delaware State University (DSU) Natural Resources Program (including two DSU DWRC undergraduate intern research poster displays)
- Tidewater Utilities
- United Water Delaware
- White Clay Creek Wild and Scenic Committee
- Delaware Envirothon
- New Castle County Conservation District



Delaware State University's DWRC Intern, Trevor Knight, discusses his research with Jennifer Jennings, Jennifer Campagnini, and Bob Ehemann.

Rick Mickowski of the New Castle County Conservation District displays information about the Delaware Envirothon.

2004 Water Policy Forum Participants

LAST	TITLE	FIRST	JOB TITLE	ORGANIZATION	ADDRESS	CITY	ST	ZIP	PHONE
Adkins, P.E.		Jared		Kent Conservation District	800 Bay Road Suite 2	Dover	DE		
Allison		Bruce	Professor	Wesley College	120 North State Street	Dover	DE	19901	(302) 736-2349
Ambrose		Robert	Public Utility Analyst	Public Service Commission	861 Silver Lake Blvd. Cannon Building	Dover	DE	19904	(302) 739-4247
Andres		Scott		Delaware Geological Survey	University of Delaware	Newark	DE	19716	(302) 831-0599
Arnold		Colleen	Water Quality Manager	City of Wilmington	103 E. 16th St.	Wilmington	DE	19801	(302)573-5527
Athey		David	Project Manager	URS Corporation	1200 Philadelphia Pike	Wilmington	DE	19809	(302) 791-0700
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Barscz, Jr.		Charles	Manager	National Rivers	200 Chestnut Street, 3FL	Philadelphia	PA	19106	(215) 597-6482
Baxter		Stefanie	Geologist	Delaware Geological Survey	U of D DGS Building	Newark	DE	19716	(302) 831-1576
Beauchamp		Lee		Beauchamp Custom Carpentry Corp.	4312 Elk Creek Drive	Salisbury	MD	21804	(443)880-2301
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Behrens		Bryan	Student	University of Delaware	658 Lehigh Road., Apt. 69	Newark	DE	19716	(302)245-2264
Bennett	Dr.	Robert	Christina Conservancy		117 Dallas Avenue	Newark	DE	19711	(302)731-4524
Berkheimer		Scott	Student	University of Delaware	5401 Scholar Drive	Newark	DE	19711	(302) 355-6406
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Braschoss		Eric C.	Student	University of Delaware	133 Haines Street	Newark	DE	19717	(267)303-5255
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Bundes		Joseph	Student	Wesley College	120 North State Street	Dover	DE	19901	
Bunting-Howarth		Katherine	Planner	State DNREC/DWR/Watershed Assess.	820 Silver Lake Blvd., Suite 220	Dover	DE	19904	(302)739-4590
Burcat		Bruce	Executive Director	Public Service Commission	861 Silver Lake Blvd. Cannon Building	Dover	DE	19904	(302) 739-4247
Butler		Eileen		Delaware Nature Society					(302)239-2334

Campagnini		Jen	Environmental Planner	Watershed Section State DNREC	820 Silver Lake Blvd. Silver Lake Plaza	Dover	DE	19904	(302) 739-4590
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Cole		Erin	Graduate Research Assistant	University of Delaware/IPA	DGS Annex	Newark	DE	19716	(302) 831-4933
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Conte		Holly J.		University of Delaware	1915 Sheldon Drive	Newark	DE	19711	(302) 369-3532
Cooch, Jr.		Edward W.	President	Christina Conservancy Inc.	P.O. Box 1680	Wilmington	DE	19899	
Corrozi		Martha B.	Watershed Analyst	University of Delaware/IPA/WRA	DGS Annex	Newark	DE	19716	(302) 831-4931
Cross		Kevin	Student	University of Delaware	276 South Chapel Street	Newark	DE	19711	(215)370-2449
Darby		Michael	Student	University of Delaware	28 Barnard Street	Newark	DE	19711	(302) 545-1917
Day		William H.	Board Member	Christina Conservancy	307 Arborn Drive	Newark	DE	19713	(302) 368-5792
Dayton		Jeff	District Director	Office of Congressman Michael Castle	201 N. Walnut St. Suite 107	Wilmington	DE	19801	(302) 428-1902
DeCoursey		William J.	Graduate Research Assistant	University of Delaware/IPA	260 East Main Street	Newark	DE	19702	(302) 831-4926
Dhanju		Amardeep	Student	University of Delaware	Alison Hall, Room 309	Newark	DE	19716	(302)831-1820
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Lussi		Jaime	Student	University of Delaware	30 Winterhaven Dr. Apt. 5	Newark	DE	19702	(302) 631-1754
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Maclver		Marlou	Coordinator of BEST	Rec. Parks & Open Spaces of Birm. Twp.	1140 Wylie Rd.	West Cheater	PA	19382	(610) 793-1595
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McCoy	Dr.	Eugene		Civic League for NCC					
McCoy		Gene	Civic League		2641 Majestic	Wilmington	DE	19810	(302)475-3398

			for NCC		Drive				
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