50th Anniversary of the Delaware Water Resources Center

2015 Annual Meeting
Newark, Del.
April 17, 2015

Gerald J. Kauffman, Ph.D., Director
University of Delaware
Water Resources Center
Dr. J. Thomas Sims, Director
Delaware Water Resources Center
2000-2015
THE Water Resources Research Act of 1964, which I have approved today, fills a vital need.

Abundant, good water is essential to continued economic growth and progress. The Congress has found that we have entered a period in which acute water shortages are hampering our industries, our agriculture, our recreation, and our individual health and happiness.

Assuming a continuation of current practices, by the year 2000 there will not be enough usable water to meet the water requirements of parts of the States of Arizona, California, Colorado, Delaware, Idaho, Illinois, Indiana, Iowa, Kansas, Louisiana, Michigan, Minnesota, Montana, Nebraska, Nevada, New Jersey, New Mexico, New York, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, South Dakota, Texas, Utah, Wisconsin, and Wyoming.

This legislation will help us solve this problem. It will create local centers of water research. It will enlist the intellectual power of universities and research institutes in a nationwide effort to conserve and utilize our water resources for the common benefit. The new centers will be concerned with municipal and regional, as well as with national water problems. Their ready accessibility to State and local officials will permit each problem to be attacked on an individual basis, the only way in which the complex characteristics of each water deficiency can be resolved. The bill contemplates a high degree of interstate cooperation, and I urge that this be encouraged.

In large measure, this legislation is a tribute to the vision and wisdom of Senator Clinton P. Anderson of New Mexico. He has long recognized the problems. He developed the program. He guided it through Congress. He has been in the forefront of the effort to see that adequate supplies of water are available in all parts of the Nation.
A break from the|Presidents' portraits to|catch up with|leisure time.

*The Blue Hen.* Newark, Del.: University of Delaware, 1965.
The DWRC Internship Program

All DWRC Interns conduct a project consistent with the DWRC's research and educational interests listed below in the green box with the support of a faculty advisor from one of our co-sponsor organizations. Internships may be available in partnership with the following:

University of Delaware (UD) Water Resources Agency (www.udel.edu/dwrc) internships are supported which focus on water resource policy and management.

UD College of Agriculture and Natural Resources (http://canaudel.edu/ud) projects are supported with faculty in the departments of Animal and Food Sciences, Entomology and Wildlife Ecology, Applied Economics and Statistics, and Plant and Soil Sciences. For example, an internship in the Department of Plant and Soil Sciences could relate to soils, plants, and land management to water use and quality.

UD College of Arts and Sciences (http://www.cas.udel.edu/) Students can conduct internship projects in Biological Sciences, Chemistry, Political Science, Public Policy, or other subjects closely related to water resources.

UD College of Earth, Ocean, and Environment (http://www.coee.udel.edu/) Internships are supported in the areas of Geography, Oceanography, Marine Policy, and Physical Ocean Science and Engineering.

UD College of Engineering (http://www.engineering.udel.edu/) Projects can be developed in areas such as Chemical Engineering, Civil and Environmental Engineering, or Mechanical Engineering.

Delaware Geological Survey (http://www.dgs.udel.edu/) Researchers offer internships focusing on hydrogeology, ground water supply, and water quality.

Delaware State University (http://www.desu.edu/) Faculty support internships in the areas of Agriculture, Natural Resources, Aquaculture, and aquatic ecology.

Delaware Department of Natural Resources and Environmental Control (http://www.ddnrc.delaware.gov) Staff in DDNRC offices related to water resources occasionally offer internships on topics such as soil and water conservation, water quality, and climate change.

Topics in water resources research and education of interest to the DWRC:

- Water pollution - chemical, biological, physical, and transport
- Water supply, demand, and conservation
- Groundwater identification and protection
- Nutrient management and water quality
- Management and control of storm water runoff
- Treatment and use of wastewaters
- Protection and restoration of wetlands
- Pathogens, public health, and water quality
- Water resources topics in marine studies
- Water resource policy issues

How to Apply for a DWRC Internship

Select your topic. DWRC internships are for students from a wide variety of backgrounds and research interests. Titles of past projects can be found at http://www.udel.edu/dwrc/internships.html and include: Protective Dunes: Coastal Ecosystems, Wetland Studies, Water Quality, and Aquatic Ecosystems. Find your project and contact the appropriate faculty member to discuss your project topic and schedule an interview to follow up.

Program Details and Deadline

The DWRC provides $3000 in financial support for each undergraduate internship. Students typically work ten weeks full-time during the summer and additional hours during the fall and winter. Interns must submit a written report on their project and participate in a poster session at the UD summer undergraduate research conference. The application deadline for 2015’s DWRC interns is March 27, 2015. See second page for more information. For details on past projects, current faculty advisors, application materials to submit, and requirements for reports and posters, visit the DWRC website: http://ag.udel.edu/dwrc/
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**PARTNERSHIP WITH USGS**

- The National Institutes for Water Resources (NIWR) partners with the U.S. Geological Survey (USGS) through the provisions of the Water Resources Research Act (WRRA) to address water-related concerns by providing a national platform for research, training and collaboration.
- USGS provides each institute with a grant to target local priorities, recruit researchers and leverage federal funds with state money and private funding.
- 54 NIWR member institutes are housed in the country's land-grant universities in all 50 states, three U.S. territories and the District of Columbia.
- NIWR is the only federally mandated research program that focuses on applied water resource research, education, training and outreach.

**MAXIMIZING FEDERAL IMPACT**

NIWR's ability to attract and match non-federal funds to USGS grant-sponsored research multiplies the federal investment in local water projects. The NIWR-USGS partnership also strengthens USGS's own funding model, as NIWR institutes often allow funds to pass through the institutes to USGS State Water Science Centers. The NIWR institutes open doors for the USGS at the state-level to other funding sources that may require non-federal matching funds. In recent years, the USGS State Water Science Centers have benefitted from funds that have flowed through NIWR institutes from external sources for technical assistance and scientific expertise on large-scale, multi-partner projects that address emerging water research needs.

**IMPACT & COLLABORATION**

- NIWR member institutes assist public and private sector groups in their mission to protect human health, environmental resources and economic sustainability.
- Last year, NIWR member institutes sponsored more than 1,200 groundbreaking research projects.
- Grants from USGS and other sponsors are awarded through a competitive, peer-reviewed process.
- NIWR member institutes collaborated on projects with over 200 universities, 150 state agencies, 180 federal agencies, departments and divisions, and more than 185 local and municipal offices.

**WANTED: INTERNS**

The USGS is encouraging NIWR institutes to take advantage of its nationwide internship program, details of which follow:

- The interns are hired by the NIWR institute but work with USGS Water Science Center researchers.
- The USGS and NIWR have many available projects.
What is NIWR?

- Association of the Directors of the 54 Water Resources Research Institutes
- Dues from the institutes support it; volunteer led
- 50 states plus DC, Guam, Virgin Islands and Puerto Rico
- Representation in Washington, DC
- Van Scoyoc Associates – Jan Schoonmaker and Leslee Gilbert
- https://niwr.net
California
http://ciwr.ucanr.edu/
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http://www.pawatercenter.psu.edu/
Pennsylvania Water Resources Research Center
The Pennsylvania State University
304 Forest Resources Building
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http://www.weriguan.org/
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303 University Drive
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Vermont
http://www.uvm.edu/snr/vtwater/
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The University of Vermont
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Fax: (802) 666-8683

Virgin Islands
http://www.uvi.edu/sites/uvi/Pages/WRRI-Home.aspx
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Dr. Henry H. Smith, Director
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Fax: (340) 693-1205
Water Resources Research Act Program Administration

U.S. Geological Survey
Water Resources Discipline

Office of Chief of Research and Programs for Water

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Reauthorization of WRRA

- Last reauthorized 2007
  - The authorization for appropriations expired at the end of FY 2012, but we have appropriated the last few years.
  - Reauthorization relates to appropriations

- Have been working on reauthorization
  - Will have to work on legislation in this new Congress
Appropriations to support 104b and 104g programs

- FY15 -- $6.5 Million in President Obama’s Budget!
- FY14 – not in President’s budget; $6.5 million in Cromnibus Budget
- FY13: Not in President’s Budget Continuing Resolution & Sequestration USGS reduces programmatic funding
  - ($55K/Institute and eliminated 104G)
President submits the FY 2016 budget for Interior Department to the Congress for consideration

Measure is sent to House & Senate Appropriations Committees

House Appropriations Subcommittee on Interior & Environment holds hearings on FY 2016 bill

Subcommittee Marks up FY 2016 Interior & Environment Appropriations bill

Bill goes to the full Appropriations Committee for mark up

House of Representatives considers the FY 2016 Interior & Environment bill

Senate Appropriations Subcommittee on Interior & Environment holds hearings on FY 2016 bill

Subcommittee Marks up FY 2016 Interior & Environment Appropriations bill

Bill goes to the full Appropriations Committee for mark up

Senate considers the FY 2016 Interior & Environment bill

Conferees from both houses are appointed to the joint conference committee on FY 2016 Interior & Environment Appropriations bill

Conference committee meets to resolve differences and issues a conference report on the agreement

House votes on the conference report

Senate then votes on conference report

The bill is sent to the President for signature

The President may sign or veto the FY 2016 Interior & Environment Appropriations bill
Key Dates and Activities

- **NIWR 104B Applications**: due mid-January
- **NIWR Annual Meeting**: usually mid-Feb
- **NIWR 104G Applications**:
  - National Competitive Grants Program
  - Proposals due are February 19, 2015, 5:00 PM ET
  - Institute approval by March 12, 2015, 5:00 PM ET
- **3-yr Review of Institutes conducted for 2008-2010 in 2014**
- **Institute Annual Report**: due annually June
- Reporting through online system available at all times through IPRS system
Research Activities of the Delaware Water Resources Center
Water

- 97-3-1
- Essential for life
- Most precious chemical (H₂O)
- Universal solvent
- Exists in nature as all three states of matter
- No economic substitute

13.8 billion years ago

Sea Level Rise 10,000 years ago
The University of Delaware is fortuitously situated on campuses ideally suited by hydrology and geography to study water resources.
DRBC Compact
1961 AD
HOUSE APPROVES DELAWARE PACT

Federal-State Agreement on Basin Development Passes After Debate

POWER ISSUE IS RAISED

Action by Senate Is Only Remaining Obstacle to New Agency

Special to The New York Times.

WASHINGTON, June 29—

WASHINGTON, Sept. 15 (AP)—The Senate unanimously passed today a bill to create a four-state compact for the development of Delaware River Basin water resources. Differences with the House bill, passed on June 29, were expected to be ironed out promptly.

The only major change in the Senate version stipulates that any project undertaken by the interstate agency to be set up by the compact must have authorization of Congress if Federal funds are involved.

After House and Senate agreement the measure will go to President Kennedy for signing, ending a generation of study, negotiation and planning for the compact.

FOUR STATES SIGN DELAWARE PACT

President Joins in Approving Vast Program for Basin Backed by Governors

COMMISSION IS SET UP

Developing of River Valley Will Use, Conserve and Protect Vital Supply

By RUSSELL BAKER

Special to The New York Times.


Chesapeake, Delaware, and Hudson Basins
C-D-H Basin

- 2% of US land mass
- 10% of U.S. population,
- 1st and 6th largest cities in US, 6 state capitals, US Capitol
- 42nd, 55th, and 85th longest rivers in the US.
- Chesapeake longest navigable estuary in US (194 miles)
- Hudson (194 mi) and Delaware (96 mi), 3rd and 5th longest navigable tidal rivers.
- All 3 estuaries are drowned river systems
- Hudson is a fjord once carved by glaciers
Technical Summary
State of the Delaware River Basin Report

A Report on the Health of the 13,539-square-mile Delaware River Basin in Delaware, New Jersey, New York, and Pennsylvania

July 4, 2008
Now Entering the Christina River Watershed

Protect and Conserve
Figure 1-17  Load of soluble and insoluble phosphorus passing stations on the East Branch of the Brandywine Creek, August 13–14, 1973. Numbers are in kilograms of phosphorus per day. Hatched areas are towns and villages. (Modified after Cahill et al. 1975.)
<table>
<thead>
<tr>
<th>River Basin</th>
<th>Drainage Area (mi²)</th>
<th>Nitrogen Load (ton/yr)</th>
<th>Unit N Load (ton/mi²/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Susquehanna</td>
<td>27,490</td>
<td>73,040</td>
<td>2.7</td>
</tr>
<tr>
<td>Delaware</td>
<td>11,819</td>
<td>50,525</td>
<td>4.3</td>
</tr>
<tr>
<td>Potomac</td>
<td>14,658</td>
<td>44,707</td>
<td>3.0</td>
</tr>
<tr>
<td>Hudson</td>
<td>13,363</td>
<td>28,711</td>
<td>2.1</td>
</tr>
<tr>
<td>James</td>
<td>10,339</td>
<td>17,482</td>
<td>1.7</td>
</tr>
<tr>
<td>Connecticut</td>
<td>11,261</td>
<td>17,236</td>
<td>1.5</td>
</tr>
</tbody>
</table>
Figure 9. Map depicting the proposed Thompson Station Reservoir, Newark Reservoir, and Newark South Wellfield Iron Treatment Plant (source: WRA, 1999)
Newark Reservoir
2004
Sea Level Rise

Delaware
Mean elev. 60 ft msl

10,000 years ago

Figure 1. Sea level rise and coastal flooding impacts in Delaware (NOAA Coastal Services Center)
Drinking Water $2.8B

Shale Gas $400M

Forests $4.2B

Recreation $920M

Annual Economic Value
Delaware River Basin

- Marcellus Shale Gas
- Recreation/Water Quality
- Drinking Water Supply
- Forests

Annual Wellhead Value
Marcellus Shale Natural Gas
Delaware River Basin

- $ billion/year
- 2008-2012
- w/DRBC, NY, PA exclusions
- w/o exclusions
President-elect Martha B. Narvaez
American Water Resources Association
Governor Jack Markell
and
DNREC Secretary Collin O’Mara
Invite you to the event announcing:

**Clean Water for Delaware’s Future**

A plan for protecting public health and cleaning up our bays, rivers and streams while creating jobs and building a stronger economy

**Tuesday, March 4, 2014, 9 a.m.**
DuPont Environmental Education Center
Wilmington Riverfront
1400 Delmarva Lane
Wilmington, DE 19806
Fishery Restoration

America’s Founding Fish

American shad - *Alosa sapidissima*
Averages 14-29 inches

Hickory Shad - *Alosa mediocris*
Averages 12-15 inches
A CRIB DAM.
Deputy Dean
T. A. Baker Professor of Soil and Environmental Chemistry
College of Agriculture and Natural Resources
University of Delaware

Thank you Dr. J. Thomas Sims!
Second Director of the Delaware Water Resources Center (2000-2015)
UD Water Conservation Campaign

1980s AD