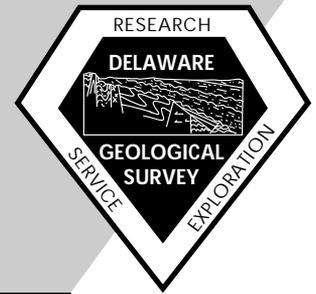


First State Geology

Current information about Delaware's geology, hydrology, and mineral resources

Published twice yearly by the Delaware Geological Survey
University of Delaware



Vol. 16, No. 2 • Summer 1998

The Northeasters of January and February 1998

By Kelvin W. Ramsey

The coasts of Delaware and Maryland experienced two severe northeasters between January 26 and February 6, 1998. A northeaster is a storm with gale-force winds from the northeast. Applied to the U.S. eastern seaboard, it is an offshore low-pressure system with a counter-clockwise atmospheric circulation that moves north along the Atlantic coast bringing winds from the northeast. As the system moves past the Delmarva Peninsula, the winds, which may reach hurricane force of 75 miles per hour, generate storm waves that impinge upon the beaches. The duration of the storm is a critical factor.

The two storms produced abnormally high tides over a long period of time (Fig. 1). The third and fourth highest tides of record were measured at Breakwater Harbor, Lewes, Delaware. High tides of record were also measured at the Coast Guard Station at Indian River Inlet and along Indian River at Rosedale Beach.

The storms were the most severe ones in recent years to batter the coast since the northeaster of December 1992. They were characterized by tropical-storm-force wind gusts, overflow of coastal dunes, and flooding of marshes and areas adjacent to the Inland Bays. Waves of over 20 feet were measured at a buoy offshore the Delaware-Maryland state line (Fig. 2). The storms also produced heavy rains and local stream

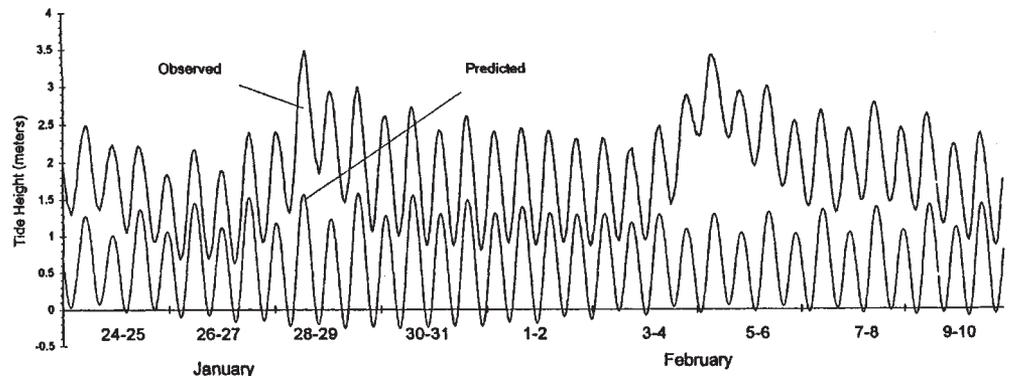


Figure 1. Observed and predicted tides for Breakwater Harbor, Lewes, Delaware, January 24–February 10, 1998.

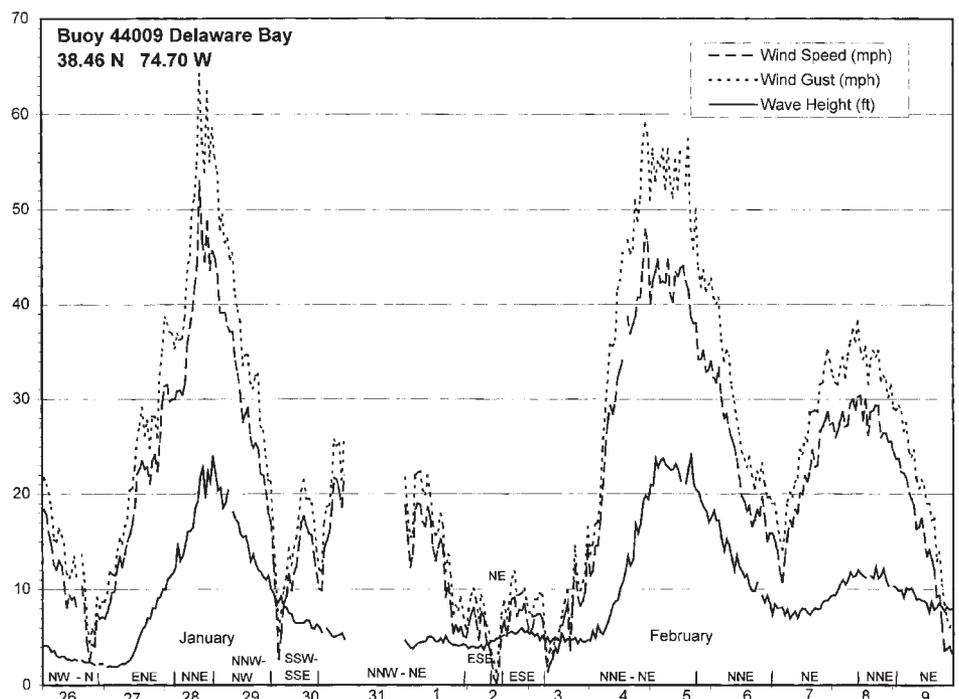
flooding in Sussex County, Delaware, and Wicomico and Worcester counties, Maryland. Over 9 inches of rain fell in western Sussex County.

In terms of severity and coastal change, the 1998 storms were at least an order of magnitude less than that of the March 1962 northeaster. In the 1962 storm, overwash was pervasive through-

out the length of the coast. Few sand dunes were left intact; the barrier islands were essentially flattened. Most structures adjacent to the beach were damaged or destroyed compared with the relatively few during the 1998 storms.

Why the 1962 storm was so severe remains a question. There were five successive high tides that were well above

Figure 2. Significant wave height, wind speed, and peak wind gust data from NOS Buoy 44009 located 30 miles offshore Fenwick Island.



normal, yet the February 1998 storm had several high tides that were comparable and low tides that were higher than those of the 1962 storm. Wave conditions may have been more severe for the 1962 storm as shown by the level of destruction along the coast.

The Delaware and Maryland coasts have not faced such a severe event since the development boom of the 1980s. If a storm similar to that of 1962 were to occur now, damage would be in the billions of dollars, and there might again be human casualties.

Tide, wave, wind, rainfall, and other data associated with the 1998 storms were collected by the Delaware and Maryland geological surveys and are published in Delaware Geological Survey Open File Report No. 40.

Authored by Kelvin W. Ramsey, Daniel J. Leathers, Darlene V. Wells, and John H. Talley, the publication represents a cooperative effort between private citizens, municipalities, and state and federal agencies to assess the storms. The report is available from the Delaware Geological Survey by calling (302) 831-2834 or ordering through our web site <http://www.udel.edu/dgs/dgs.html> and clicking on "Publications."

Photographs of March 1962 storm damage?

If you have any photographs showing damages resulting from the March 1962 storm and would be willing to loan them to the DGS for documenting the effects of that storm, please contact Kelvin W. Ramsey at (302) 831-3586 or by e-mail at kwramsey@udel.edu.

New Report on the Geology of the Milford Area

"Geology of the Milford and Mispillion River Quadrangles," Delaware Geological Survey Report of Investigations No. 55 by Kelvin W. Ramsey, accompanies DGS Geologic Map No. 8 of the same area also by Ramsey (see Summer 1994 issue of *First State Geology*). The report describes the Quaternary and Holocene surficial

deposits shown on the geologic map and the Miocene subsurface formations penetrated by boreholes in this area of Kent and Sussex counties between Houston and Delaware Bay. Knowledge of the distribution of sand, silt, and clay bodies within the stratigraphic units is important for understanding the distribution, transmission, and quality of ground water and the availability of mineral resources such as sand and gravel.

The report includes sections on the palynology of the stratigraphic units by Johan J. Groot, on clay mineralogy, and on the post-Oligocene geologic history including stream development. Appendices list data from boreholes and samples that document the results presented in the report as well as data used in compiling the geologic map.

The subsurface Miocene stratigraphic units comprise the Calvert, Choptank, and St. Marys formations of the Chesapeake Group that were deposited in marine inner shelf environments. Five confined aquifers are identified: Cheswold, Federalsburg, Frederica aquifers in the Calvert; the newly named Milford aquifer at the base of the Choptank; and an unnamed aquifer system consisting of scattered sand bodies in the upper Choptank and lower St. Marys.

The oldest surficial unit, the Columbia Formation, is of fluvial origin deposited during middle or perhaps early Pleistocene time. The next younger units are the Lynch Heights and Scotts Corners formations comprising the Delaware Bay Group, newly named in the report for the sand, silt, clay, and organic-rich deposits found adjacent to Delaware Bay. The stratigraphic position of the group is a cut-and-fill body inset into the Columbia Formation and older deposits. Each formation of the group represents one or more periods of erosion and deposition associated with lowered sea levels during glacial times and higher sea levels during interglacial times, respectively. The Lynch Heights Formation of middle Pleistocene age is of fluvial and estuarine origin. The Scotts Corners Formation was deposited in tidal, nearshore, and estuarine environments and is of late Pleistocene age.

The youngest surficial deposits comprise the modern stream, swamp, marsh, shoreline, and estuarine and bay deposits

plus the Carolina Bay deposits, the clayey silts and sands filling elliptical- to oval-shaped depressions scattered on the land surface of the Columbia, Lynch Heights, and Scotts Corners formations.

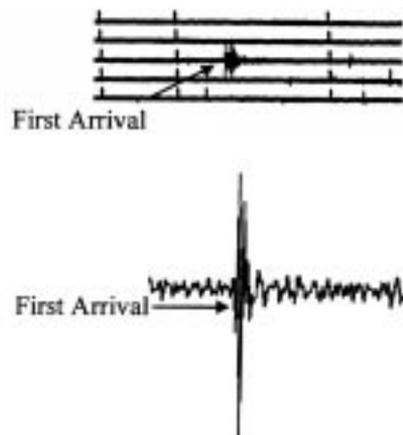
To obtain a copy of the report, call (302) 831-2834 or order through our web site <http://www.udel.edu/dgs/dgs.html> and click on "Publications."

Shaking Things Up in March

By Stefanie J. Baxter

Seismographs located at the DGS recorded three earthquakes in the Wilmington area during the month of March. The first event occurred on Sunday the 15th at 2:26 p.m. and had a magnitude of 1.8 on the Richter scale. The event occurred in the vicinity of 17th and West streets. It was recorded by all three seismometers operated by the DGS in northern Delaware and was heard and felt by several residents. For several days prior to this event residents called the DGS to report explosion-like sounds. This event, however, was the first to be verified as an earthquake and the first known earthquake in Delaware this year.

Two additional events were recorded on Thursday, March 19, at 12:37 a.m. and 1:28 a.m. and had Richter magnitudes of 1.7 and <1, respectively. These events were heard and felt by residents in the vicinity of 18th and Tatnall streets. Without calls from concerned residents, the very small event occurring at 1:28 a.m. might have gone undetected. Signals recorded on the paper seismographs were difficult to distinguish but were verified when the digitized signals were enhanced and fil-



tered. The figure compares the analog signal (top) with the digitally recorded and enhanced signal (bottom).

These are the first earthquakes to have occurred in Delaware since April 15, 1997. In addition to local earthquakes, regional events were recorded in New Jersey and Pennsylvania. On November 14, 1997, an earthquake with a magnitude of approximately 3.0 was recorded near Lititz, Pennsylvania, and a magnitude 2.5 quake was detected on March 25, 1998, in the Mad Horse Creek State Wildlife Management Area, New Jersey.

When an earthquake is suspected to have occurred, residents of Delaware and neighboring states are encouraged to call the DGS at 302-831-2834 or complete an earthquake questionnaire on the DGS web site at <http://www.udel.edu/dgs/qkform.html>.

OCS Policy Committee

State Geologist Robert R. Jordan continues to represent Delaware to the Outer Continental Shelf Policy Committee (OCSPC), an advisory body to the Secretary of the Interior. At a meeting in April, the committee again resolved to ask that Secretary Babbitt consider that the agencies within the Department of the Interior preserve geological and geophysical data utilizing the recording system of the American Geological Institute.

In an address to the committee, Senator Mary L. Landrieu of Louisiana vigorously supported the OCSPC's recommendation for return of a portion of OCS revenues to the coastal states.

Access to federal offshore sand and gravel resources, which are critical to Delaware for beach nourishment, has been made possible under Congress's changes in the OCS Lands Act according to recommendations of the OCSPC. Awaiting resolution is the controversy over royalty fees that may be charged by Interior.

Statemap Reception

Stefanie J. Baxter and Robert R. Jordan represented Delaware at the Statemap Reception held in the Rayburn Building, Washington, D.C., March 18. "Geology of the Seaford Area,

Bring Your Daughter to Work Day

Scott Andres brought his daughter Jen to the DGS on National Bring Your Daughter to Work Day, April 23. Jen, a fifth grade student at Bayard School, has strong interests in earth sciences and ecology and wanted to get first-hand experience seeing how professional scientists do their jobs. Jen participated in a number of activities during her visit. She learned how DGS keeps track of information about maps, wells, outcrops, water quality, and rock samples and got hands-on experience with assigning site identifiers, measuring latitude and longitude, entering data into the computer,



Jen Andres prepares a rock sample for x-ray diffraction analysis.

and cataloging and storing samples. She helped prepare and run a rock sample through x-ray diffraction analysis and also learned how to use a geographic information system to customize and print a map of Newark. Jen said the day was a huge success, "I never knew my dad did such cool stuff at work. I want to come back next year."

Delaware" (DGS Geologic Map No. 9) was displayed for members of Congress and their staffs as part of the states' exhibits to show products supported by Statemap, a component of the National Cooperative Geologic Mapping Program created by the National Geologic Mapping Act of 1992. Forty-seven states participated in the reception which was part of a 5-day liaison visit in Washington by the Association of American State Geologists (AASG).

The Delaware Geological Survey has supported the efforts of the AASG to improve geologic mapping throughout the United States. The mapping program has been reauthorized and we are hopeful that a supportive level of funding will be provided.

Recent Visitors

Among the recent distinguished visitors to the Delaware Geological Survey in the spring of 1998 have been William Condit, staff director of the U.S. House of Representatives Subcommittee on Energy and Mineral Resources, and Chief Geologist P. Patrick Leahy of the U.S. Geological Survey.

In Sympathy Boris J. Bilas, 1912-1998

We are saddened to report the death of Boris J. Bilas on April 30, 1998. He was the Delaware Geological Survey's laboratory and field technician from 1968 to 1973. He continued working as the technician for the University's geology department until his retirement in 1977.

Boris was highly versatile. At DGS he was not only our driller but also a topnotch laboratory technician. He was an excellent machinist and instrument technician and was willing and able to do most anything asked of him, from the highly technical to logging and curating geological samples. Those of us who worked with him remember him as a kind and honest man, greatly liked by everyone, with a wonderful sense of humor.

His death came as a surprise to all of us who were fortunate to have known him. We shall all miss him. Our condolences to his wife and family.

Publications

Recent DGS Publications

Reports of Investigations

- No. 55, Geology of the Milford and Mispillion River Quadrangles: Kelvin W. Ramsey, 1997, 40 p.

Open File Reports

- No. 40, Summary Report, the Coastal Storms of January 27–29 and February 4–6, 1998, Delaware and Maryland: Kelvin W. Ramsey, Daniel J. Leathers, Darlene V. Wells, and John H. Talley, 1998, 39 p. plus appendices.

Other Publications by DGS Staff

- **Thomas E. McKenna** and John M. Sharp, Jr., 1998, Radiogenic Heat Production in Sedimentary Rocks of the Gulf of Mexico Basin, South Texas: American Association of Petroleum Geologists Bulletin, v. 82, p. 484–496.

Staff Notes

Presentations

- **A. Scott Andres**, “Effects of Agricultural Drainage on Ground- and Surface-Water Quality in Delaware,” with **C. Scott Howard**, DGS, and Maria C. Pautler, University of Delaware College of

Agricultural Sciences, at Inland Bays Monitoring Subcommittee, University of Delaware College of Marine Studies, Lewes, January 16; “Possible Influence of Sampling Design on Monitoring of Phosphorus in the Water-Table Aquifer of the Middle Atlantic Coastal Plain,” at Agricultural Phosphorus in the Chesapeake Bay Watershed: Current Status and Future Trends, Penn State University, April 6–8.

- **Richard N. Benson**, as a participant in the Partners for Education Program of the Geological Society of America with second-grade teacher Mrs. Joan Boyce, talked about rocks and fossils to her enthusiastic students at the Carrie Downie School, New Castle, May 13.
- **Robert R. Jordan**, “The Delaware Estuary, Science Applied Eventually,” at Philadelphia Geological Society, Exton, Pennsylvania., January 22.
- **Kelvin W. Ramsey**, “Delaware During the Age of Dinosaurs,” at the Delaware Museum of Natural History, January 17.
- **William S. Schenck** and **Margaret O. Plank**, “Bedrock Geologic Map of the Delaware Piedmont” at the informal “Map Blast” session of the annual meeting of the Northeastern Section of the Geological Society of America, Portland, Maine, March 19.

Service and Awards

- Congratulations are in order for several staff members. **Mary F. Sullivan** has been promoted to Administrative Assistant and **Dorothy C. Windish** to Staff Assistant. Two persons from the DGS received 1998 University of Delaware Merit Awards: for professional staff to **Stefanie J. Baxter** and for salaried staff to **Roland E. Bounds**. The University of Delaware presented service awards for 40 years to **Robert R. Jordan**, for 25 years to **John H. Talley**, and for 10 years to **Kelvin W. Ramsey**.
- **Robert R. Jordan**, has been appointed to the Ad Hoc Committee on Climate Change of the American Association of Petroleum Geologists (AAPG) and also as a delegate to the Section on Minerals and Energy Resources of the National Association of State Universities and Land Grant Colleges (NASULGC); he has been selected to receive the John T. Galey Memorial Award of the Eastern Section of the AAPG; he was reappointed by Governor Carper to the Delaware State Board of Registration of Geologists for a term to extend until January 2000, and has been reelected as chairman of the Delaware State Boundary Commission..
- **John H. Talley** has been appointed to the Editorial Board of *Geotimes*.

First State Geology is published by the Delaware Geological Survey, a State agency established by an Act of the Delaware General Assembly in 1951 and organized as a unit of the University of Delaware.

Robert R. Jordan
State Geologist and Director
Richard N. Benson,
Editor, First State Geology

CHANGE OF ADDRESS?

Send mailing label and your new address, and/or

REQUESTS FOR PUBLICATIONS to:

Dorothy Windish
Delaware Geological Survey
University of Delaware
Newark, DE 19716-7501
302-831-2834

Delaware Geological Survey
University of Delaware
Newark, DE 19716-7501

First Class
Postage
PAID
Newark, DE 19716
Permit No. 26