

The Great Flood

Climate Change, Development Contributed to Impacts

David Fisher

Climatologists predict climate change will be marked not only by rising global temperatures, loss of polar ice and rising sea levels, but also more frequent and violent weather patterns. Sound familiar?

For Rhode Islanders, it should. Record rains in February and March caused flooding that destroyed homes, businesses and infrastructure. The impacts were most severe along the Pawtuxet, Wood and Pawcatuck rivers, and their tributaries, where bridges and dams washed out, including the Blue Pond, Geneva Pond and Usquepaugh dams.

Several factors contributed to these destructive floods. Heavy rain in a short period of time is the obvious culprit. Beginning with a Feb. 23-24 storm, the National Weather Service registered 4 inches of rainfall on its Warwick rain gauge. Another quarter of an inch fell between March 1-4 and from March 13-15 and March 22-23 the gauge logged another 3.7 and 3.4 inches, respectively. Add to that amount the 8.8 inches of rain that fell between March 29 and April 1, and Rhode Island was soaked by a total of 20.15 inches of rain in just 38 days.

Soil is like a paper towel, and depending on its quality, can only absorb so much water. When it reaches its saturation point, water begins to roll off. On March 29, the soil in Rhode Island's watersheds already was drenched, so, when heavy rains began the next day, that water rolled directly into already-engorged rivers, streams and reservoirs. The Pawtuxet River crested at nearly 21 feet, more than 11 feet above flood stage.

Concrete Jungle

Impervious surfaces, such as asphalt, concrete and roofing, also contributed to the severity of the recent flooding. These hard surfaces increase the speed with which stormwater runoff flows.

In Rhode Island, where development has long outpaced population growth, that carries added significance, since 75 percent of the population lives in a 40-mile-long urban/suburban corridor along the shores of Narragansett Bay and in the watersheds of the Blackstone, Woonasquatucket and Pawtuxet rivers.

In fact, 14 percent of the entire Narragansett Bay watershed is covered with impervious surfaces, according to the recent



Showcase Cinemas in Warwick, R.I., was built on a floodplain which was flooded in March. *Photo: R.I. Dept. of Environmental Management.*

Narragansett Bay Estuary Program environmental condition report, Currents of Change (www.nbep.org).

Besides creating plots of asphalt and acres of concrete, development also destroys natural buffers, such as wetlands, that help protect sensitive areas from flooding — or at least from disastrous flooding like the Ocean State recently experienced.

“We’ve developed land, and modified rivers, in ways which increase the height and speed of floods when they occur,” according to a recent op-ed written by Thomas Ardito, restoration

program manager for the Narragansett Bay Estuary Program, and Rachel Calabro, community organizer for Save The Bay. “Impervious surfaces such as roads, parking lots and buildings, combined with storm-drain systems, shunt rainfall directly into streams and rivers, rather than allowing it to seep into the groundwater, from which it would be slowly released to surface waters. As a result, our urban rivers rise more rapidly and flow more quickly than those in less developed areas.”

Wetlands and forests act as natural “sponges” to hold rainwater, releasing it slowly into the ground and surface waters such as rivers and lakes. Vegetation also increases the return of rainwater to the atmosphere through evaporation. According to an estimate by the U.S. Fish and Wildlife Service, Rhode Island has lost nearly 40 percent of its wetlands to development since the 18th century.

More Flooding Likely

According to the state emergency management agency, the recent floods were a 100-year to 500-year event — a 100-year flood, for example, has a one percent statistical probability of occurring in any given year. That doesn’t mean, however, that Rhode Island will have to wait another hundred years to witness something similar.

In fact, it is likely Rhode Island will experience severe flooding much more frequently in the future. Climatologists predict that the Northeast will witness increasing rainfall in the coming years, a result of climate change.

River floods are a natural occurrence, while flood damage is the result of development decisions, according to Ardito and Calabro. Both the Warwick and Rhode Island malls, they noted, were built on a floodplain — an area that, for thousands of years, has been

periodically inundated by the Pawtuxet River. Long before the malls were built, the land was forest, and later, until about the 1950's, it was used primarily for farming. The recent floods caused extensive damage because millions of dollars worth of buildings and inventory had been placed in an area susceptible to flooding.

As Rhode Island works to recover from last month's floods — with funding assistance from the federal government — “we must strive to reduce our vulnerability to future flood events, rather than simply rebuilding the problem,” wrote Ardito and Calabro. “Bridges and culverts should be redesigned to handle higher flows — so they don't act as dams during floods, as happened throughout the region during the March storm.”

Rhode Island's dams also are vulnerable to flooding events — as became clear when several failed during the March floods. Of the more than 600 dams in Rhode Island, some still serve useful purposes — water supply, recreation and hydropower — but most are obsolete. Most of these outdated dams provide no flood control benefits, because they have no additional capacity to store floodwaters.

Some obsolete dams — including three of the first five dams on the lower Woonasquatucket River, for example— have been removed in recent years, and more removals are planned. But much can be done to accelerate the pace of dam removal, according to Calabro and Ardito, by setting priorities for removal, streamlining regulatory requirements and providing more federal and state funding for the work, which can cost several hundred thousand dollars for a typical mill dam.

Rhode Island and Massachusetts “must find better ways of reconciling property issues related to dams, which are often privately owned structures, but can have a big impact on public resources and public safety,” Calabro and Ardito wrote in their April 7 op-ed. “In instances where private or public owners are unwilling or unable to manage dams in a manner sufficiently protective of the public interest, we believe states should be willing to use the power of condemnation to take ownership, and provide funding for removal or repair.”

There is precedent for “undeveloping” vulnerable areas, as was done in Warwick in the 1980's, when the U.S. Army Corps of Engineers bought and demolished more than 60 flood-prone houses in the area that is now Belmont Park. But even as the economic impacts of the recent flooding are being assessed, some developers



The Pawtuxet River flooded Interstate 95 on March 31. *Photo: R.I. Dept. of Environmental Management.*

still are trying to acquire permits and floodplain designation variances along the banks of the Pawtuxet River, some for plots as big as 10 acres.

One leading economic forecaster, in fact, recently told the Providence Business News that the state would be feeling the storm's impact for the rest of the year. Although it's too soon to estimate the size of the impact, the flooding will “definitely” result in slower economic growth and higher unemployment in the second and third quarters, according

to Andres Carbacho-Burgos. He told the newspaper he had no idea how many people will lose their jobs in retail locations, such as the Warwick Mall, that sustained heavy damage.

The short-term ecological effects of the floods are clear. Riverbanks have been eroded and some soil and standing water, post-flood, were, and may still be, contaminated.

The long-term environmental impacts are less known.

Uncounted tons of pollution were washed into Narragansett Bay: trash from roads and dumpsters; petroleum and other toxic chemicals from factories and garages; millions of gallons of raw sewage from inundated treatment plants.

In an aerial survey taken during the flood, plumes of what appeared to be industrial chemicals were observed in the water by Chris Fox, executive director of the Wood-Pawcatuck River Association, at the confluence of the Pawcatuck and Beaver rivers, adjacent to Kenyon Industries in Kenyon and at Horseshoe Falls in Shannock. As industrial lagoons were flooded out, heavy metals and chemical contaminants may have been washed downstream

by the rushing waters, and may have settled in new areas.

While the clean up of the damage caused by the March floods continues, it's unlikely that cash-strapped state and local governments will be able to make the big changes to infrastructure necessary to reduce Rhode Island's vulnerability to these kinds of events — although they may be more frequent in the future.

~David Fisher is a writer for EcoRI.

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