Preparing for a Wetter Future in the Great Lakes Region

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Published online by the Milwaukee, Wisconsin, *Journal Sentinel*
1:00 p.m. CT July 24, 2016

On the evening of July 11, a violent and torrential storm swept through northwest Wisconsin, saturating communities, farms and forests from Lake Superior in Ashland County south approximately 75 miles to the Hayward Lakes area.

Twelve hours later, local residents woke to damage from rainfall totals ranging from five to 13 inches that washed out more than 100 road crossings â€" including two federal highways â€" stranding many in their homes and leaving three people dead. Current estimates put the damage at least at $30 million for repairs.

It will take years for us to fully recover from the devastating flooding â€" the sediment plume in Lake Superior was still visible from satellite images more than a week later. As we begin to debrief in the aftermath of the storm, it is important to understand what led to the widespread damage and what, if anything, northwest Wisconsin and other Great Lakes communities can learn from these recent events.

As is often the case, no single factor alone led to the flooding and damage that occurred. Rainfall from earlier in the day and week had saturated the soils and limited the ability of the land to absorb more rain. The amount and the intensity of the rainfall were unprecedented.

Although the sheer intensity of the storm was striking, it was not the only factor that contributed to the widespread damage. Like many communities throughout the Great Lakes region, many of the bridges and culverts in Ashland County are too small to handle the size of the new rainfall totals that the region routinely sees. This is a problem that is likely to get worse in the coming years.

Engineers often design bridges and culverts based on the largest estimated rainfall expected over a particular area for a so-called '100-year storm' or 100-year flood.

The rainfall estimates that have guided engineering and design throughout the Great Lakes region were originally developed in the 1960s and 1970s. Starting in the mid-1980s, different regions â€" such as northeastern Illinois â€" began updating rainfall estimates to better reflect current conditions. However, a substantial portion of the Great Lakes regional water infrastructure was developed based on outdated estimates and is now prone to washouts such as those seen in northern Wisconsin.

Starting in the early 2000s, the National Oceanic and Atmospheric Administration began a comprehensive process to update precipitation estimates around the country (New York

is the only Great Lakes state yet to be completed) and NOAA observed something interesting. Throughout most of the Great Lakes region, the more recent rain data showed that storms were more intense than previously estimated â€” in some cases, the rain was substantially more than the prior estimates that regional culverts and bridges had been sized for.

Of all of the regions around the Great Lakes where rainfall estimates have been updated, the area surrounding Ashland stands out as being a rainfall hotspot. The new analysis suggests that rainfall intensity in Ashland, and the surrounding area, is about 37% greater than previously thought â€” within the Great Lakes basin, this difference is second only to the areas outside Ludington, Mich.

Consequently, because most of the culverts and bridges throughout Ashland County and surrounding areas have been developed according to outdated rainfall data, they are likely much smaller than necessary, and more prone to washout.

As northern Wisconsin continues to rebuild roads, bridges and culverts following this storm, local, state, federal and tribal officials have to wrestle with one overriding question: How big of a storm should they build for? Wisconsin is in the process of integrating the updated NOAA rainfall estimates into its design standards statewide, so this likely will be the minimum standard to which the infrastructure will be rebuilt, but different states have adopted different standards.

Even when culverts and bridges are designed according to up-to-date rainfall estimates, they may still not be immune from washout in coming years. Climate change forecasts throughout the Great Lakes region suggest that future rainfall will be even more intense, and the size of the 100-year rainstorm is likely to increase. Bridge designs that work in this decade may not be sufficient in future decades.

A variety of options exist to adapt to these more intense climate conditions. Some have suggested 'overbuilding' culverts and bridges to accommodate likely future rainfall levels. Others have suggested modifying land use plans and development standards to minimize the runoff created by future, larger storms. These options all have merit, but their implementation is often challenged by financial limitations, particularly in rural areas.

Ashland County and the surrounding areas are now wrestling with these questions at a scale that most Great Lakes communities fortunately have not yet had to. However, as we look to a future with more intense rainstorms, road washouts and infrastructure damage in the Great Lakes basin are likely to become more common. Developing the political support and tools to finance, repair and proactively manage our water infrastructure is a critical need if we are to sustain Great Lakes communities and our environment into the future.

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