

## Mitigation Matters: Policy Solutions to Reduce Local Flood Risk

This brief is one of 13 that examine state and local policies that have resulted in actions to mitigate flooding.



Harrison Shull/Getty Images

In 2004, the French Broad River, pictured here near Brevard, North Carolina, rose to near-record levels and caused extensive damage to the city.

# North Carolina City Adopts Stringent Standard for Building in a Flood Plain

Brevard's measure slows development in flood plains, reduces risk

## Overview

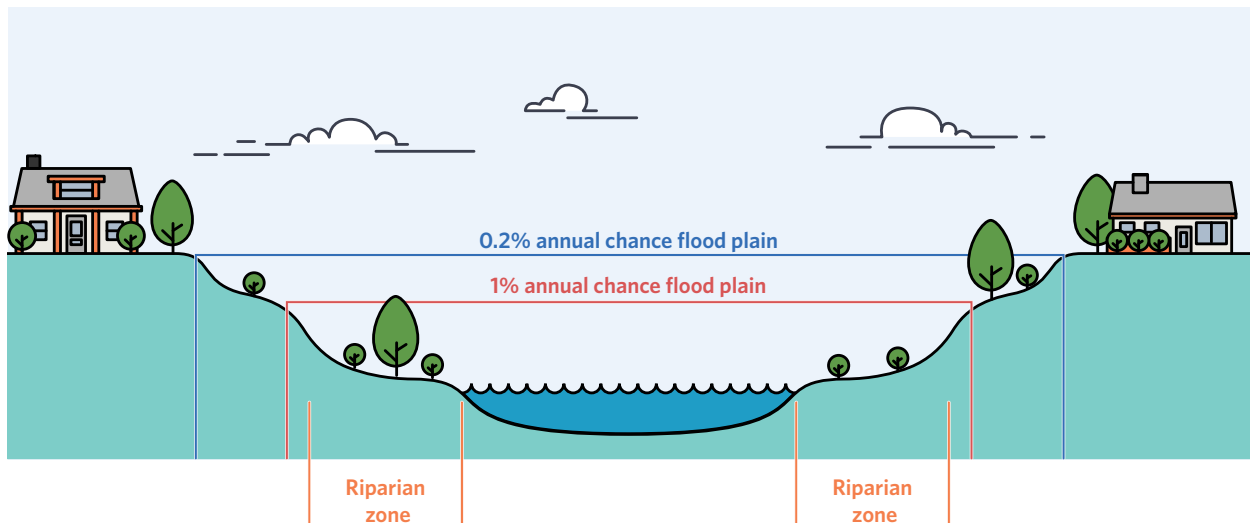
Lying in the foothills of the Appalachian Mountains in southwestern North Carolina, the small city of Brevard has long drawn visitors and retirees eager to hike or bike along ridgelines and trails that cut past dozens of waterfalls.

But the area's topography—combined with heavy rains and tropical storms—makes it one of the wettest in the United States, second only to the Pacific Northwest.<sup>1</sup> Recurrent flooding is a problem. In 2004, hurricanes Frances and Ivan inundated most of the region,<sup>2</sup> and the nearby French Broad River, just to the east of Brevard, rose to near-record levels and spilled onto flood plains, causing extensive damage.<sup>3</sup>

To reduce Brevard’s vulnerability to flooding, the city council adopted one of the nation’s strongest regulations on construction in a flood plain, with the aim of helping to ensure that projects don’t increase the risk of downstream flooding. The regulations have also lowered flood insurance premiums for many residents because of incentives in the federal flood insurance program.

## What is a flood plain?

Flood plains are areas near streams and rivers that experience repeated flooding. They reduce floodwaters’ energy and flow speed and provide storage for floodwater.



**Riparian zone:** The land along a river or stream where soils, vegetation, and habitat transition from aquatic to terrestrial. The extent of this zone will vary.

**1% annual chance (aka 100-year) flood plain:** The land area that is projected to be inundated by a flood with a statistically estimated 1 percent chance of being equaled or exceeded in any given year. Structures in this area have roughly a 1 in 4 chance of experiencing a flood of this scale over the lifetime of a standard 30-year mortgage.

**0.2% annual chance (aka 500-year) flood plain:** The land area that is projected to be inundated by a flood with a statistically estimated 0.2 percent chance of being equaled or exceeded in any given year.

Source: Federal Emergency Management Agency, NFIP Guidebook, [https://www.fema.gov/media-library-data/20130726-1647-20490-1041/nfipguidebook\\_5edition\\_web.pdf](https://www.fema.gov/media-library-data/20130726-1647-20490-1041/nfipguidebook_5edition_web.pdf).

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## Hurricanes show need for change

Over the years, storms have damaged homes near the French Broad River and along the many streams that originate in the mountains.<sup>4</sup> But the 2004 floods were unique, devastating Brevard and the surrounding region. The remnants of the two hurricanes brought torrential rains, washing out roadways and decimating crops.<sup>5</sup> Across western North Carolina, 11 people died, more than 16,000 homes were damaged, and 140 homes were destroyed.<sup>6</sup> Roughly \$75 million in crops and topsoil was lost.<sup>7</sup> As Brevard recovered, city officials began to search for an affordable way to mitigate future flooding.

## Revamping a decades-old policy

In 2009, the city council overhauled its Flood Damage Prevention ordinance, regulations dating from the early 1980s that governed Brevard's development. The updated ordinance includes a No Adverse Impact certification, designed to ensure that new construction or structural improvements in the flood plain will not exacerbate upstream or downstream flooding.<sup>8</sup>

### What is 'No Adverse Impact?'

No Adverse Impact certifications aim to ensure that the actions of a developer, landowner, or other community member do not negatively affect, such as through increased flood height or faster water velocity, the property rights of others within the flood plain. The standards for flood plain management that inform the certifications go beyond state and federal criteria.

Source: Association of State Floodplain Managers, "NAI - No Adverse Impact Floodplain Management" (2008), <https://www.floods.org/index.asp?menuID=349&firstlevelmenuID=187&siteID=1>.

Brevard's certification is required for any proposed development in flood plains. To get approval, builders must demonstrate that their projects will not increase the flood risk faced by other property owners or communities, measured by factors including the impact on flood levels and velocities, or potential bank erosion.<sup>9</sup> An engineer must analyze these variables using the most recent hydrologic and hydraulic models. The requirements are among the most protective in the nation; many other communities allow building in a flood plain without calling for such analyses.<sup>10</sup>

Brevard's updated ordinance made the city eligible for a voluntary rating under the Federal Emergency Management Agency's National Flood Insurance Program (NFIP), which insures property owners and renters at risk of flooding.<sup>11</sup> The Community Rating System (CRS) discounts insurance premiums for communities that take measures to reduce flooding. To participate, a community's flood prevention ordinance must meet certain standards for mitigation, flood plain management, and outreach activities, which Brevard's certification requirement exceeds.<sup>12</sup>

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## Why Does Development Cause Increased Flooding and Erosion?

When soil is removed and porous surfaces are paved over for development, rainfall can no longer drain directly through soil and other ground cover into the underlying groundwater system. Instead, water finds its way to ditches, streams, or stormwater systems, often combining with other runoff at accelerated rates as it enters sewers or natural water collection. Significant water increases can overwhelm man-made and natural systems, overtopping banks of streams or rivers, and flooding nearby spaces, especially in low-lying areas.

Source: C.P. Conrad, Effects of Urban Development on Floods, U.S. Geological Survey (2003) <https://pubs.usgs.gov/fs/fs07603/>.

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## Multiple benefits

The certification has reduced the risk that development otherwise creates by encouraging project locations away from vulnerable areas or at least ensuring that projects will not negatively affect neighboring communities.<sup>13</sup> What's more, Daniel Cobb, Brevard's planning director, said that so much expertise in flood plain management is needed to navigate the regulations that potential builders increasingly see flood plain development as cost-prohibitive.<sup>14</sup> As a result of the decrease in risky development, fewer people are at risk of flood damage.

In addition to reducing the risk of flooding, the policy change is helping to protect waterways, both in Brevard itself and the region, that are designated trout streams. Meanwhile, thanks to the CRS program, residents have seen their flood insurance premiums drop—a 10 percent discount for NFIP policyholders in especially high-risk zones called Special Flood Hazard Areas.<sup>15</sup>

## Conclusion

The stringent certification has worked for this small town, and Cobb believes it could be adopted by other towns threatened by flooding, as well as larger municipalities and states.<sup>16</sup> "Our higher standards ... are protecting the life and property of our residents and neighbors," Cobb said, "both upstream and down."

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*"Mitigation Matters: Policy Solutions to Reduce Local Flood Risk" examines policies in 13 locations: Arkansas; Brevard, North Carolina; Fort Collins, Colorado; Indiana; Iowa; Maryland; Milwaukee; Minnesota; Norfolk, Virginia; South Holland, Illinois; Vermont; Washington state; and Wisconsin.*

*To prepare the briefs, The Pew Charitable Trusts contracted with the consulting engineering firm Dewberry, which identified a range of state and local policies across the U.S. that are helping to reduce flood risk. Local officials and disaster resilience experts provided input during the research process. Two external reviewers—Nate Woiwode, project manager of The Nature Conservancy's North American Risk Reduction and Resilience team, and Elizabeth Albright, assistant professor of the practice of environmental science and policy methods at Duke University's Nicholas School of the Environment—provided expert insight. Neither they nor their organizations necessarily endorse the conclusions.*

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## Endnotes

- 1 "Flood Protection," City Connections, City of Brevard, <https://www.cityofbrevard.com/DocumentCenter/View/1558/2017-Understanding-Flood-Protection-PDF>.
- 2 "Western N.C. Braces for More Rain From Hurricane Ivan," WRAL.com, Sept. 15, 2004, <https://www.wral.com/news/local/story/1090666/>.
- 3 J. Boyle, "From the Archives: Impact of Frances, Ivan Lingers Years Later," Citizen Times, Sept. 6, 2017, <https://www.citizen-times.com/story/news/local/2014/09/06/hurricanes-frances-ivan-impact-lingers-years-later/15217637/>.
- 4 D. Cobb, planning director, city of Brevard, North Carolina, email to J. Fleck, Dewberry, Sept. 13, 2018.
- 5 P. Barker, "Florence's Potential Local Impact Unclear—Brevard, NC," The Transylvania Times, Sept. 13, 2018, <https://www.transylvaniatimes.com/story/2018/09/13/news/florences-potential-local-impact-unclear-brevard-nc/37903.html?m=false>.
- 6 Boyle, "From the Archives."
- 7 A. Latham, "Frances and Ivan: The Unwelcome Couple," Perspectives Online, North Carolina State University, Winter 2005, <https://projects.ncsu.edu/cals/agcomm/magazine/winter05/frances.htm>.
- 8 City of Brevard, North Carolina, An Ordinance Amending Brevard City Code Part II - Chapter 34 - Flood Damage Prevention, Ordinance No 2015-29 (2015).
- 9 Ibid.
- 10 Federal Emergency Management Agency, "National Flood Insurance Program Community Rating System Coordinator's Manual" (2017), [https://www.fema.gov/media-library-data/1493905477815-d794671adeed5beab6a6304d8ba0b207/633300\\_2017\\_CRS\\_Coordinators\\_Manual\\_508.pdf](https://www.fema.gov/media-library-data/1493905477815-d794671adeed5beab6a6304d8ba0b207/633300_2017_CRS_Coordinators_Manual_508.pdf); City of Brevard, An Ordinance Amending Brevard City Code Part II - Chapter 34 - Flood Damage Prevention.
- 11 Federal Emergency Management Agency, "National Flood Insurance Program Community Rating System Coordinator's Manual."
- 12 Cobb, email.
- 13 Federal Emergency Management Agency, "National Flood Insurance Program Community Rating System Coordinator's Manual"; Cobb, email.
- 14 Cobb, email.
- 15 Federal Emergency Management Agency, "April 2019 NFIP Flood Insurance Manual" (2019).
- 16 Cobb, email.

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**For further information, please visit:**  
[pewtrusts.org/mitigationmatters](https://pewtrusts.org/mitigationmatters)

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**Contact:** Matt Fuchs, officer

**Email:** [mfuchs@pewtrusts.org](mailto:mfuchs@pewtrusts.org)

**Project website:** [pewtrusts.org/flood-prepared-communities](https://pewtrusts.org/flood-prepared-communities)

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