

HIGH WATER

ACE provides the first line of defense against dangerous flooding

By Terri Williams

When the levee breaks, as the old blues song says, mama, you got to go. The massive Mississippi River floods of 1927—which killed more than 240 people and inspired the song—triggered a large change in the way the U.S. Army

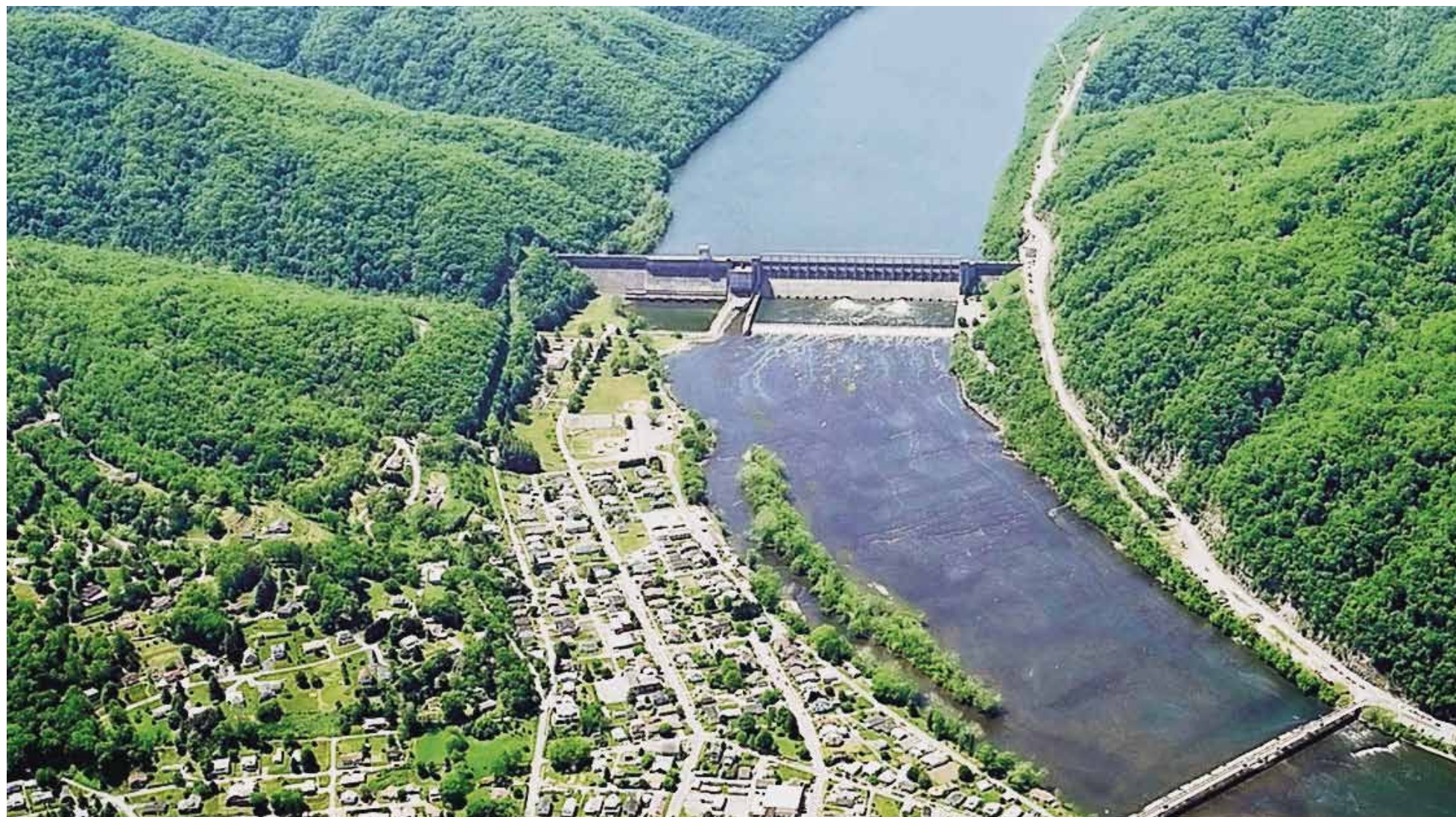
Corps of Engineers (ACE) handled floods and flood control. No more would the levees be a community's only protection against floods; the Corps now uses dams, spillways, reservoirs and more to keep water as close to a river's banks as possible to prevent damage to property and people.

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U.S. Army Corps of Engineers

Flood fight: Paul Machajewski, contractor for the Corps' St. Paul District, monitors a temporary levee in Fargo, N.D., during floods of April 2013.



U.S. Army Corps of Engineers

Bluestone Dam: The levee's primary purpose is to reduce major flooding along the New, Kanawha, Ohio and Mississippi rivers.

PREDICTING FLOODS

The Corps conducts routine inspections of its levees every year and periodic inspections every five years. The inspection checklist includes 125 items, ranging from operation and maintenance of levee embankments to floodwalls and interior drainage. The inspection ratings are cataloged in the National Levee Database (NLD), which allows the Corps and other emergency personnel to apply current storm information to particular levees and also project flooding probability based on past history.

The Corps approaches the job "from the perspective of people who depend upon the infrastructure for the benefits and flood risk reduction it provides," said Eric Halpin, special assistant for dam and levee safety. "Life safety is paramount."

With more than 670 flood damage reduction and navigation structures under its care, the Corps is also responsible for tens of thousands of acres of wetlands (which can help control flooding), 12,000 miles of commercial inland

navigation channels and 12 million acres of land and water in all.

The trick is to prevent the system from getting out of balance. It's not easy.

As recently as April, flooding caused the

Corps to halt barge shipping on parts of the Mississippi and Illinois rivers as barges broke free in the rapid current, some of them sinking. Ironically, this happened just a few months after barge shipping was almost stopped because the river was too low to navigate.

The effects were widespread. Almost 60 percent of U.S. grain export shipments are transported along this route to the Gulf of Mexico. When shipping was stopped, grain, corn and soybean prices spiked at the Gulf due to the shortage; they fell in the Midwest since the shipments could not be moved.

The economic impact was undesirable but unavoidable. "Public safety is our first priority. Rivers are unpredictable and dangerous in a flood," said Col. Christopher G. Hall, commander of the Corps' St. Louis District Office.

The levee system is complicated and far from infallible. A levee is a man-made structure—usually a concrete floodwall or earthen embankment—designed to contain, control or divert water from flooding a designated area. ACE does not control every levee in the country. It's in charge of 2,500

of the systems, about 10 percent or 14,500 miles of all U.S. levees. In addition, levees can deteriorate over time as a result of eroding banks, rusting closures, burrowing animals and worn-out pumps.

"People who use protected flood plains forget the risk they face," Louisiana State University geography and anthropology professor Craig Colten told National Public Radio in 2011. "They come to expect complete protection, and that was never offered" by the levee system.

According to Colten, the purpose of the levees is to protect the pipelines, major metropolitan areas and oil refineries along the Gulf Coast. He says that farmers and landowners are enticed by the rich soil and abundant crop yield provided by flood plains, but they should also weigh the hazards of living there.

Case in point: The collateral damage caused by some flood alleviation choices can include total property loss. In a 2011 effort to save Cairo, Ill., a small town of 2,800 at the junction of the Ohio and Mississippi rivers, the Corps blew a hole in a levee in

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New Orleans: A Lower Ninth Ward resident inspects a telephone pole that was toppled onto her home during Hurricane Isaac in August 2012.

Missouri. This action reduced pressure on other levees along the Mississippi River and lowered the water level by several feet. But the detonation also destroyed 100 homes and roughly 130,000 acres of fertile farmland in Missouri.

During the 2011 Missouri River flooding, melting snow and record runoff overwhelmed the Corps' ability to prevent flooding. The dams were unable to hold back the water—20 percent more than the dams were designed to hold—and the five months of flooding destroyed farms, businesses and highways in rural Montana and Missouri, causing billions in damage and a \$588 million levee repair bill.

Neil Grigg, a professor of civil and environmental engineering at Colorado State University, led an independent panel that examined the Corps' handling of the incident. The panel found no acts of negligence that precipitated or aggravated the flooding. However, Grigg echoed Colten's sentiments that residents in the flood plain underestimated the risk of living and working in a flood area. The residents erroneously assumed the levees would provide total protection.

Sometimes the Corps is found to be at fault when a levee fails to provide safety. A federal judge ruled in 2009 that the catastrophic flooding of New Orleans' Lower Ninth Ward and St. Bernard Parish during 2005's Hurricane Katrina was a result of the Corps' failure to maintain the city's levee system.

The Corps admitted that inadequate designs and data caused the levees to fail in New Orleans. As a result, it designed and constructed a \$14.5 billion system that included the \$1.3 billion Inner Harbor Navigation Canal Surge Barrier, the largest design-build civil works project in the Corps' history.

"The city had to have a unique system of

defense," said Bob Anderson, public affairs officer for the Corps' Mississippi River Valley District.

When a second hurricane drew a bead on New Orleans in 2012, ACE applied the lessons it learned from Katrina to implement successful flood control measures. As Hurricane Isaac approached, officials used the National Levee Database to project the storm's path and identify levees and other structures at risk. This allowed emergency personnel to focus on high-risk areas and provide timely warnings to communities in the storm's path. The measures paid off; Isaac resulted in far fewer deaths than those caused by the eerily similar Hurricane Katrina.

Levees are not the only area of concern; dams can also be problematic.

Two years ago, a group of emergency responders met to strategize and gauge the ability of personnel to respond in the unlikely event of a dam breaking. The dam was Bluestone Dam, located in the Corps' Huntington District, which encompasses 311 miles of the Ohio River and includes 45,000 square miles in parts of West Virginia, Virginia, Ohio, Kentucky, and North Carolina.

The meeting included search-and-rescue personnel from neighboring states as well as representatives from the U.S. Coast Guard, Navy, Air Force, Civil Air Patrol and Federal Emergency Management Administration.

The dam, which spans the New River and created Bluestone Lake, the third largest lake in West Virginia, was experiencing some deterioration in the bedrock and some undermining in front of the dam, said Bill Kershner, operations and planning officer for West Virginia's state Division of Homeland Security.

"Our main area of concern is what would happen if a very large storm system hits in the New River watershed and continues to



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Birds Point levee: ACE blew a hole in the levee to divert water from the town of Cairo, Ill., in May 2011.

dump water into the dam," he said. "One of two problems arises. If the dam overfills, then it could be overtopped and fail. This is an extreme concern and the probability is very low. The second problem would arise if the gates had to be opened to save the dam and the weather system already has the Gauley River and Greenbrier at flood stage. Then the water from the New River dumped into the mix would cause catastrophic damage to the Kanawha Valley."

Kershner said West Virginia's Division of Homeland Security tried to take an "all hazards" approach to this scenario and other potential problems that may arise. "A repair project (at the dam) has been in place for some time now and the main areas of concern have been repaired and stabilized," he said.

"The dam is much safer now, and the probability of failure is much lower now than it has ever been."



Associated Press

Alton, Ill.: A ConAgra Mill employee walks past wall recordings of previous floods after the city was under water again in April 2013.