

BIGGER PIE FORUM

Why does the Mississippi River flood when levees don't break? And other questions.

By Kelley Williams — November 30, 2018

EDITOR'S NOTE: The Mississippi River affects numerous communities and thousands and thousands of residents and landowners situated up and down its 2,340 mile winding path. Wilkinson County is one of the areas which is hardest hit by floods which are ever-increasing in both frequency and severity. Kelley Williams, who owns Lake Mary Plantation in Adams County, has looked for the reasons that floods are coming more frequently and are more catastrophic.)

Q. What is a Mississippi River Flood?

A. An event that causes the river to cover land not normally under water. Levee breaks cause floods. There hasn't been a main line levee break since 1937. But it floods anyway — when the river gets higher than the land between its channel and the levees and hills that contain it (the batture). And when the river gets higher than the Yazoo and other tributaries that flow into it, this causes them to back up (backwater flood).

Q. How big are batture and backwater floods?

A. Two million acres in Mississippi and Louisiana flooded in 2011 and caused \$3 billion estimated damage. Thousands of acres in Mississippi flood every year. Its batture contains 600,000 acres. It is 400 miles long and up to seven miles wide between the river and the hills below Natchez. The Yazoo, Big Black, and Hohochitto Rivers have large drainage basins that have backwater floods.

Q. How are floods measured?

A. Flood metrics include height, flow, duration, frequency, timing (when they occur) and damage. Height, duration, frequency and timing are observed. Damage is estimated. Flow is calculated. Generally, the greater the flow, the higher the flood. The 1927 flood had the greatest flow, but wasn't the highest because levees broke and released it.

Q. Where are floods measured?

A. River height or stage is measured at river towns like Greenville, Vicksburg, Natchez and at other locations. Each location has its own gage and "flood stage" not correlated with elevation or other gages. For example, flood stage at Vicksburg is 43 feet, 48 feet at Natchez, and 35 feet at Baton Rouge. The highest stage ever measured at Natchez was 62 feet in 2011, and the lowest was minus 2 feet in 1940. (The river is not dry at zero on the gage.) Batture and backwater floods begin well below flood stage.

Q. What do the measurements show?

A. The river is getting higher, and floods are getting higher, longer, more frequent and more unpredictable. Trends are ominous. Historically, floods were moderate and often beneficial springtime events caused by winter rains and spring snow melt — with occasional outliers. That changed in the 1970's when the river began to rise.

Q. How much higher is the river? Why does it matter?

A. The average low stage at Natchez is 12 feet higher.

It increased from three feet in the 1950's to 15 feet in the decade ending 2017.

The average high stage increased 11 feet — from 43 feet to 54 feet. Not surprisingly, higher stages correlate with more frequent, longer and higher floods.

The river in the Natchez

reach exceeded flood stage once for 46 days in the 1950's.

It was above flood stage eight out of 10 years ending 2017 for a total of 389 days — eight times longer.

Four of the five highest floods ever measured have occurred since 2008.

The average high stage increased from five feet below flood stage to six feet above flood stage.

The batture floods completely around four feet below flood stage. Lower elevations naturally flood first. For example, rising water prevented harvesting low-lying crops in the Natchez batture this October although it didn't flood completely until November.

In the 1950's, it flooded four

years out of ten for 106 days total. It flooded every year in the decade ending 2017 for 788 days — over 7 times longer.

Q. Correlation is not causation. Could flooding be due to more rain?

A. More rain is a factor.

But the increase is slight and doesn't explain the higher river, record floods and ominous trends. Average annual rainfall of the last 10 years is 13% higher than the 1950's. But average flow down river is up 30% — over twice as much.

Moreover, wet years and dry years have been known since biblical times. Prudent engineers design for wet years. Four one-in-a-hundred-year floods since 2008 caused by normal rainfall suggests a lack of prudence. Odds are 325,000 to one against such a cluster of rare events.

Q. What do experts say? Why compare today's floods with the 1950's?

A. Increased flooding is 75% due to flood control and 25% to weather and is the worst in 500 years according to a study by scientists at the Woods Hole Oceanographic Institution published April 2018 in *Nature International Journal of Science*. Man-made changes to the river

that were intended to control floods have perversely caused more flooding. There were major changes in the 1940's, 50's and 60's. BPF thinks abnormal floods today are due to their cumulative effects. Hence, we examine them.

Q. Who is responsible for the changes?

A. Congress, the Mississippi River Commission (MRC) and the U.S. Army Corps of Engineers (Corps) are responsible for the changes. Congress created the MRC in 1879 and put it in charge of the river. It had a "levees only" policy until the great flood of 1927 showed that didn't work. So, Congress passed the 1928 Flood Control Act authorizing the Mississippi River & Tributaries Project (MR&TP), told the Corps to implement it and the MRC to supervise. The MR&TP added reservoirs, cutoffs, flood ways, training structures and more and higher levees. It focused on containing floods and preventing levee failures.

Q. What were the changes? Why were they made?

A. The changes were intended to make floods shorter and lower and to keep the Mississippi River from changing course. But they sent flow down river

faster than it discharged to the Gulf. This caused the river to rise and flood more. Bad engineering. Changes included: (1) Cutoffs that shortened and straightened the river and sped its flow; (2) A dam that blocked discharge of the faster flow down a natural channel and a replacement structure to control the flow; (3) A spillway that's supposed to discharge excess flow, but doesn't and flood ways that were planned, but not built.

Q. What went wrong with changes to the river intended to control flooding?

A. Wrong focus. Politics trumped engineering. Unintended consequences. The changes focused on containing floods and preventing levee failures instead of minimizing and discharging floods. Result: higher levees and higher floods. The Corps says \$14 billion spent on the MR&TP has saved a trillion dollars in flood damages from prevented levee failures and has a benefit to cost ratio of 70:1. It counts imaginary savings and ignores real damage from floods without levee failures. The Corps builds levees 3 feet higher than floods to provide a margin of safety. It keeps raising levees as the river keeps rising. Where does it end? Will

levees grow to the sky?

Q. What else went wrong?

A. Politics trumped engineering. Cutoffs were intended to minimize floods by speeding them to the sea. Faster floods are lower and shorter. Sixteen cutoffs completed in the mid 40's shortened the lower river 152 miles, and made it steeper. They worked as intended for a while. The river was so benign in the 1950's that Congress passed the 1954 Flood Control Act (FCA) to keep the river's flow to the Gulf like it was in 1950. Congress tried to lock the river in a time capsule.

But the river broke out. In 1950, 77% of its flow discharged to the Gulf at New Orleans via the main channel. The other 23% flowed down Old River (a natural channel north of Baton Rouge) to the Atchafalaya River and then to the Gulf at Morgan City, LA. This is a shorter steeper path to the Gulf than via New Orleans. As flow down river increased due to cutoffs and other changes, flow down Old River naturally increased. When it reached 40% of the total, experts feared the main channel would shift to Morgan City leaving New Orleans without a port (the largest for

U.S. agricultural exports) and Baton Rouge without a ship channel.

So, Congress ordered the Corps to dam up Old River and build the Old River Control Structure (ORCS) to limit the Mississippi's flow to the Atchafalaya. The ORCS began operating in the 60's and cut the flow back to 23%. Not surprisingly, the river began to rise in the 70's. The faster flow couldn't get out to the Gulf fast enough. It still can't. The 1954 FCA and its 23% bottleneck are still law.

Q. What else went wrong?

A. More politics. Planned flood ways to increase flow to the Gulf weren't built. A spillway (Morganza) to relieve floods doesn't work as planned. Not-in-my-backyard politics blocked construction of the Eudora and Boeuf flood ways to add flow capacity through Arkansas and Louisiana down the Red River basin to discharge at Morgan City. Local politics blocked a flood way in the Atchafalaya basin to discharge increased flow at Morgan City. The Morganza spillway that replaced it has been opened twice since built in 1954, but discharged less than one third its design flow. It's a key part of the MR&TP Project Flood plan that's supposed to discharge flow from rains like those that caused the 1927 flood. It provided little relief in the lesser 2011 flood. What's Plan B if it doesn't relieve the great flood either when it comes?

Q. What are the unintended consequences?

A. The river is a complex non-linear sometimes chaotic and constantly changing natural system. It reacts to man-made changes in unpredictable ways. Higher levees weren't intended to cause higher floods. But they do. Cutoffs weren't intended to cause bank erosion and channel damage. But they do. Training structures were intended to enhance navigation at low stages, not make floods longer and higher. But they do. The 1954 FCA that restricts discharge of faster flow to the Gulf wasn't intended to cause the river to rise and flood more. But it does. The Old River Control Complex (ORCC), which replaced the damaged Old River Control Structure after the 1973 flood, wasn't intended to cause a bottleneck downstream in the main channel (from silt deposits) that further restricts discharge to the Gulf. But it does. Project Flood designed to pass a 500 - 1000 year biblical flood wasn't intended to flood the batture every year. But it does. And so on.

Q. What can Congress and the Corps do now?

A. They can't unscramble an egg. But they can mitigate effects of some changes. The 1954 FCA can be amended to increase the flow at ORCC and the discharge to the Gulf at Morgan City and to vary the flow as the river's stages and flow change. The increased flow and dynamic operation of ORCC can mitigate flooding. The ORCC has unused capacity. But more flood ways may be needed. Building them won't be politically easier now than it was 75 years ago. But political fallout from levee failures and a course change could be much harder to deal with. The higher the flood, the greater the risk of levee failure. The higher the levees, the higher the floods.

Q. What can flood victims do?

A. Congress and the Corps have changed the river to benefit some and harm others. Changes cause batture and backwater floods that have damaged private property without permission from or compensation to owners. Public opinion is gradually changing as flood victims understand and complain. The Overton Window is moving. The perception is changing from "the Corps knows best" to "the Corps makes the same mistakes over and over." More flood victims can speak up. Louder!

Some property owners in Louisiana, Arkansas and Missouri have sued for damages under the "takings clause" of the Fifth Amendment of the Constitution. Litigation is pending. There may be more litigation from other property owners.



THE MISSISSIPPI RECORD FLOOD OF 2011 — The 2011 flood of the Mississippi River covered almost one-third of the land in Wilkinson County, and reached areas never before touched by river floodwaters. The top aerial photo shows the inundated community of Fort Adams, and the lower aerial photo show the Mississippi River at left, Artonish Lake in the foreground and Loch Leven Plantation in the upper right. All three water bodies are normally separated by dry ground, but not so much during the 2011 record flood. Mississippi River flooding is getting more frequent and more severe with each passing year. St. Patrick's Catholic Church in Ft. Adams has been boarded up and abandoned due to the frequency of Mississippi River flooding in the past 10 years. — Submitted Photos

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