

## Recipe for Disaster: Ingredients of the Johnstown Flood of 1889

### To Teachers

To help you lead more fruitful discussion and to help students explore all the factors -- both obvious and subtle -- that contributed to the devastation of the Flood, we've provided the

following list of ingredients. It is by no means and "official" list, so if your class has a good argument for others, please share it with us! E-mail [education@jaha.org](mailto:education@jaha.org). (Column 3 has been

omitted from the key, since there is no "right" answer; it is included on student worksheets just to provoke thought.)

1 Flood Ingredient	2 How this ingredient made the disaster worse	4 How could it be changed (fixed, prevented, planned for, etc.)?	5 How different might damage have been if this ingredient had been changed before 1889?
<b>Stone Bridge</b>	Its thick arches didn't collapse in flood. Clogged with debris & acted as a dam, flooding more of Johnstown with backwash. Debris caught fire -- trapped people burned to death.	Build future bridges higher and with wider spans (more distance between piers). Keep spans free of debris.	If the bridge collapsed, Johnstown would have had less backwash, no fire. Less clean up without 30 acres of debris behind the bridge. Downstream towns may have been hit harder with more debris.
<b>Record rainfall</b>	Saturated the ground, created run-off streams couldn't handle. Flooded rivers overflowed their banks. Extra run-off ended up in the lake. The overflowing lake caused a sudden, massive failure of the dam, releasing much more water than the lake usually held into rivers that were already over their banks.	Can't change the rain, so other things have to change: Keep channels clear, inspect dams, have a warning system (and everything else on this list!)	Johnstown had minor flooding most springs, but the May 1889 rainfall was worse than anyone remembered. Flooding was already causing a lot of property damage before the dam broke. Without the extra rain, the dam may have held and failed more slowly later (like it did in 1862).
<b>Badly maintained dam</b>	People who were not engineers made changes to the dam that made it weaker, able to hold less water. They also removed the pipe (sluice or floodgate) that allowed the lake to be drained to make repairs. Even if they had figured out what was wrong and decided to make repairs, they couldn't! Without a sluice, there was no safe way to release excess water to keep the lake from overflowing (even well-maintained earth dams can't survive water going over the top).	Dams should all be inspected regularly. Government engineers should approve all dam designs. All dams should have sluiceways.	If the dam had been properly repaired and maintained (or if it had never been built at all), the floodgate could have been opened to drain off some of the water before it went over the top of the dam. There would have been flooding in Johnstown, as there already was before the dam broke, but not the devastation of the floodwave. It may have been more like the Flood of 1977 -- much less loss of life and property.
<b>Deforestation and waste water management</b>	Trees soak up a lot of rain and their roots help keep the soil from eroding. Without trees, rain erodes soil into gullies that collect water that quickly flows down the valley before it soaks in.	Clear-cutting forests should not be allowed. Today Pennsylvania has laws to limit lumbering so the forests always have enough trees to protect the land (and grow up to be lumber later).	Forests on the hills would have absorbed more run-off and slowed it down. Water may not have risen so quickly in the rivers and behind the dam. If it slowed down the run-off long enough, the rivers and lake may not have overflowed as soon.
<b>Terrain</b>	Rain runs off hills before it has a chance to soak into the soil. Deep narrow valleys don't allow floodwaters to spread out -- there is no place for the water to go.	Don't allow clear-cut lumbering so trees can absorb some of the run-off. Keep the river channels open; don't allow people to add to the riverbanks.	Forests on the hills would have absorbed more run-off and slowed it down. Water may not have risen so quickly in the rivers and behind the dam. If it slowed down the run off long enough, the rivers and lake may not have overflowed as soon.

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<b>River obstruction, banks built up, development too close to the rivers</b>	Narrower rivers hold less water, so extra water goes the only place it can: it floods over the banks.	Dredge the river channels, clear away debris, don't allow people to add to the riverbanks or build too close to the river.	It might not have made much difference in the terrible Flood of 1889, but it would save a lot of property damage during normal floods.
<b>Barbed wire</b>	Flood picked up huge spools of barbed wire from the Gautier factory. They unwound, so all the flood debris was tangled up in barbed wire. It made it very hard to rescue survivors and recover bodies.	Store products securely (wouldn't have helped in 1889 -- flood lifted and moved locomotives a mile!) Keep emergency rescue tools, (axes, crow-bars, bolt cutters) where floods can't reach.	If the debris wasn't held together by barbed wire, some people may have been able to be saved from the flood or the fire (no one had tools to cut through the wire -- all the tools were washed away in the flood)
<b>No good warning or evacuation system</b>	At about 11am the South Fork Hunting and Fishing Club sent a message about the dam's dangerous condition to be telegraphed down the Conemaugh valley. Where the telegraph lines were down, a runner was sent instead. The message reached Johnstown, but with the streets already flooded, there was no way to get the word out to everyone (it would be another 30 years before radio allowed instant broadcast warnings). After the dam broke the telegraph stations and lines were swept away before they could send out a warning.	Avoid putting telegraph and telephone poles in flood-prone or mud-slide-prone areas. Sounding factory and train whistles and church bells (make sure people know what the alarms mean). Encourage families and businesses to have "flood drills" to practice getting to high ground when the water reaches a certain level (rather than riding it out on second floors or attics)	Communication technologies available in 1889 would not have allowed instant broadcast warnings like we have today. The telegraph (or the brand-new telephone) could warn another telegraph office instantly. From there it would have been difficult to get the word out, especially after the streets were full of water. The Paul Revere-style warning that supposedly happened never would have gotten through the flooded streets. If a warning could have gotten out to the people, property loss may have been the same, but fewer people may have died.
<b>Politics</b>	<p>The South Fork Hunting and Fishing Club was secretive about their plans and not responsive to the questions about dam safety. Johnstownners apparently reluctant to press them. Mr. Morrell, president of Cambria Iron and Steel, joined the Club to keep an eye on them, but he died in 1884.</p> <p>The area that is the city of Johnstown was a collection of small boroughs in 1889. Lack of a central government made it hard to get things done that might have helped make the flood less damaging (like control riverbank additions, demand that the SFHFC repair their dam properly, create a warning system, etc.</p> <p>Afterwards, no one successfully sued the Club. The flood was considered an "act of God" (and it was true that there was severe flooding throughout Pennsylvania).</p>	<p>The Johnstown area boroughs could have taken their complaints about the dam to court to force the club to make the changes needed to make the dam safe.</p> <p>Maybe if the towns had worked together better before the flood, they would have had the "clout" needed to stand up to the "Boss's Club."</p>	<p>If the SFHFC had been more cooperative or, if not, the boroughs better able to work together, the dam might have been repaired properly. The flood of 1889 would still have happened, but the terrible devastation when the dam broke would have been avoided.</p>