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Chapter Forty-One

THE JOHNSTOWN FLOODS: CAUSES AND CONSEQUENCES

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INTRODUCTION

Johnstown, Pennsylvania has a long history of flooding. Nathan Shappee, in his seminal analysis of the Great Johnstown Flood,[1] identifies 16 occasions on which flooding occurred there during the 73 year interval between 1816 and 1888. In 1889, the worst flood Johnstown ever experienced caused the death of more than 2,200 people and the destruction of more than half the city's buildings. Because the 1889 flood was one of the major news stories of the second half of the nineteenth century, it is not surprising that media coverage of subsequent major floods in 1936 and 1977 was accompanied by comparisons with and retrospectives on the flood of 1889. All of this attention has contributed to Johnstown's lingering image as the "flood city."

THE "GREAT" JOHNSTOWN FLOOD OF 1889

In the annals of American disasters, "the tragedy of the Conemaugh" holds a position of prominence comparable to that of the Chicago Fire (1871) or the San Francisco Earthquake (1906). It earned this distinction as a result of the failure of the South Fork Dam, located about 14 miles upstream from Johnstown on the South

Fork of the Little Conemaugh River. In less than an hour after the dam was breached, the entire contents of the one mile by two mile lake moved down the narrow, winding riverbed into Johnstown itself, causing almost unimaginable destruction.

At the time of the 1889 flood, the South Fork Dam was nearly 50 years old. An earthen structure constructed between 1840 and 1852, it was built to insure a reliable source of water for the canal portion of the Pennsylvania statewide system of canals and railroads. Although the portage rail and canal system was abandoned after the Pennsylvania Railroad's Main Line was completed between Philadelphia and Pittsburgh, the Western Reservoir and dam were left in place. For years after, the dam suffered from poor maintenance, leaks and general neglect. In the 1870s, its discharge pipes were removed and sold as scrap metal.

In 1879, the dam and lake, now renamed Lake Conemaugh, became the property of the South Fork Fishing and Hunting Club of Pittsburgh. Prominent men such as Andrew Carnegie, Henry Phipps, Jr., Philander Chase Knox, Robert Pitcairn, Andrew Mellon and Henry Clay Frick built summer homes and a club house overlooking Lake Conemaugh. The dam underwent several changes intended to make it more useful to the vacationing Pittsburghers. It was lowered several feet at the breast so that a roadway could be constructed to carry carriages over the dam. Screens were placed across the spillway to prevent game fish from escaping. Repairs to and modifications of the dam made in the course of the Club's ownership were apparently undertaken without engineering supervision or consultation.[2,3]

On May 30 and 31, 1889, Johnstown experienced an unusually heavy rainfall. Although Johnstown's rain gauge was destroyed in the flood, rainfall has been estimated at 6.2 inches, based on precipitation reports from nearby locations.[4] In other sites nearby, even more precipitation fell. By midmorning on the 31st, the river had already risen 20 feet above low water level, and by noon it was higher than local residents ever remembered it being. The streets filled with water just as they had on many previous occasions, leaving much of Johnstown covered with three to six feet of water.

Flooding from the rainstorm was exacerbated by several factors. Decades of encroachment on the Little Conemaugh and Stonycreek Rivers upstream and at Johnstown had reduced the rivers' widths, causing water levels to rise. Runoff from surrounding hillsides was accelerated because of years of cutting timber for mine supports and charcoal to use in making iron.

The same rainstorm that caused the streets of Johnstown to fill with water also filled Lake Conemaugh, finally causing it to overflow the South Fork Dam. Water spilled over the breast of the dam, eroding away and cutting through its face until, despite efforts to save it, the dam was breached along its mid-section. An estimated 640 million cubic feet of water, or about 20 million tons of water roared downstream, reaching Johnstown in less than an hour after damaging or destroying a succession of settlements along the way (Figure 1). Johnstown experienced the highest mortality, with more than 1,000 deaths, followed by Cambria City with at least 360 and Woodvale with over 270.[5]

The extraordinary damage was due in large measure to the height and force of

the water as it moved downstream. The difference in elevation between the breast of the dam and the Stone Bridge across the Conemaugh River in Johnstown was about 450 feet. This dramatic drop in elevation over a relatively short distance caused flood waters to travel quite rapidly—22 feet per second down the channel to Johnstown.[3,4] The narrowness of the stream bed further raised the height of the water so that, by the time it reached Johnstown, it was a "wall" of water 30 feet high. Water from the dam then combined with the three to six feet of flood water already covering city streets.

Survivors compared the flood waters to a rolling "ball" of water in which the upper portion of the wave rolled over the slower moving underlayers of water, carrying along with it everything from locomotives, boxcars and trees to houses, livestock and bales of barbed wire.

One of the many vivid eyewitness accounts of the flood described it this way:

> It came like a thief, and was upon us before we were aware. Already when it reached us it had numbered its victims by the hundreds. Mineral Point and East Conemaugh Borough were gone, a passenger train was engulfed. Woodvale was swept away. Conemaugh Borough was shaved off as if by the sharp surface of an avalanche; in a moment Johnstown was tumbling all over itself; houses at one end nodded to houses at the other end and went like a swift, deceitful friend to meet, embrace, and crush them. Then on sped the wreck in a whirl, the angry water baffled for a moment, running up the hill with the town and the helpless multitude on its back, the flood shaking with rage, and dropping here and there a portion of its burden—crushing, grinding,

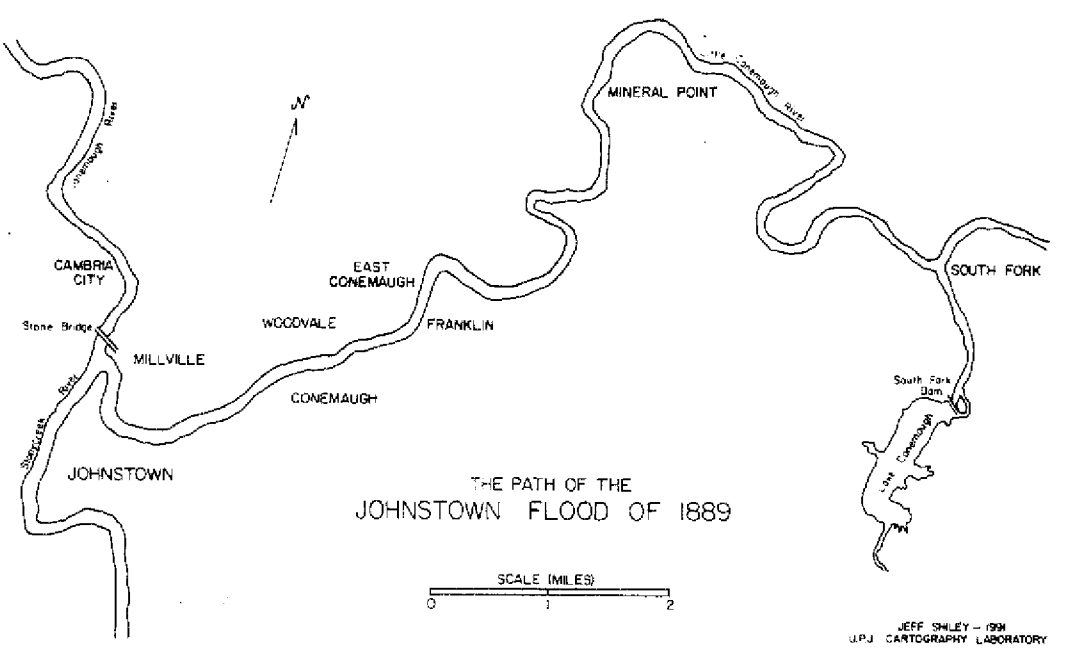

FIGURE 1. When the South Fork Dam was breached on the afternoon of May 31, 1889, it took less than an hour for the flood waters to move down the Little Conemaugh River to the city of Johnstown. A number of smaller settlements along the route were damaged or destroyed.

> pulverizing all. Then back with the great frame buildings, floating along like ocean steamers, upper decks crowded, hands clinging to every support that could be reached, and so on down to the great stone bridge, where the houses, piled mountain high, took fire, and burned with all the fury of hell you read about—cremation alive in your own home, perhaps a mile from its foundation; dear ones slowly consumed before your eyes, and the same fate your own a moment later.[6]

The fire referred to in the preceding quotation involved one of the most vivid images of the flood of 1889. The Pennsylvania Railroad's Stone Bridge over the Conemaugh River trapped flood refuse, forcing water to flow up the Stonycreek River and briefly retarding its removal from the city. As a result of this dam effect, flood waters rose higher and covered even more ground than otherwise would have been the case. Worse yet, the debris trapped by the Stone Bridge caught fire, burning several days before it could be extinguished (Figure 2). David McCullough,[7] author of the most well known account of the 1889 flood, estimates that between 500 and 600 people survived the flood itself only to become entangled in the rubble of the Stone Bridge, as many as 80 of them fatally.

The tragic 1889 flood produced some enduring consequences for Johnstown and surrounding communities. The flood provided the impetus for suburbanization

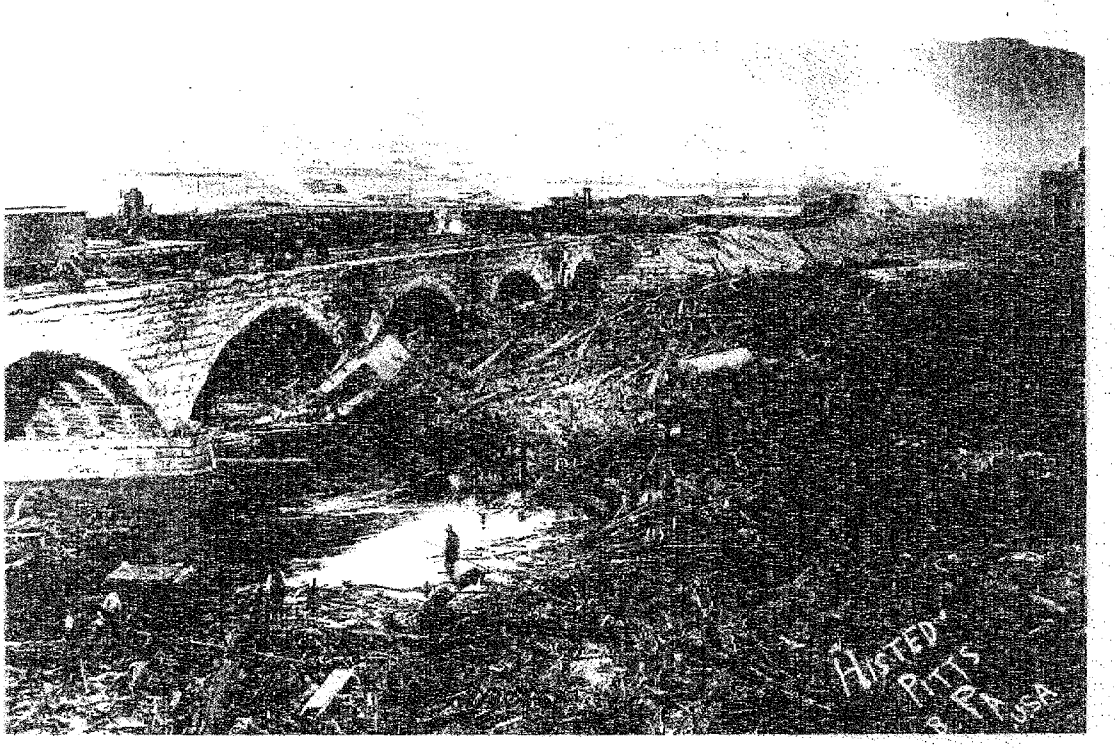

FIGURE 2. Refuse from the 1889 flood, at the site of the Pennsylvania Railroad's Stone Bridge on the Conemaugh River.

above the floodplain. It facilitated a rapid expansion of Johnstown's population and area by making consolidation with other boroughs and villages appear more attractive than before. No less important, it helped create the enduring perception of Johnstown as a flood-ravaged city, an image which subsequent floods have certainly reinforced.

THE SAINT PATRICK'S DAY FLOOD OF 1936

Johnstown's second major flood occurred at the end of winter in 1936. An especially thick snow mantle covered the Allegheny highlands, the result of a substantial accumulation of snow and a cold winter in which little melting occurred. Prior to March 17, up to 14 feet of packed snow was reported in upland areas. By late February city officials, already anticipating the consequences of a spring thaw, ordered the destruction of parts of the ice flow on the Stonycreek, fearing that the ice would jam up the bridges and cause flooding. Temperatures rose well above freezing on March 14, and were accompanied by several days of heavy rain, which subsequently caused flooding in locations throughout Pennsylvania and beyond.[8] In the Conemaugh drainage basin, warm rains caused the snow pack to melt quickly. By midafternoon on March 17, the Stonycreek and Little Conemaugh Rivers began to overflow their banks. Flood waters reached a height of 17 feet at City Hall in downtown Johnstown, flooding the entire downtown area plus adjacent wards (Figure 3). 77 buildings were destroyed and nearly 3,000 more were damaged. 25 deaths were attributed to the flood, although twelve of these were caused by heart attacks and shock rather than drowning. Damage in the city of Johnstown, excluding public works, was estimated at $40.8 million.[9]

President Franklin D. Roosevelt visited the city on August 14, 1936, promising residents that "the federal government is determined to keep you from facing these floods again." In keeping with that goal, the Corps of Engineers proposed constructing a series of flood control reservoirs in Western Pennsylvania to protect cities like Johnstown and Pittsburgh. The plan to build a reservoir on the Stonycreek was subsequently abandoned, and at Johnstown only a channelization program was implemented. The Corps spent more than $8 million deepening, widening and relining portions of the Stonycreek, Little Conemaugh and Conemaugh River channels, in an effort to speed flood waters through the city before they could overflow the river banks. For more than 35 years after the Corps of Engineers completed the channelization project, Johnstown had no severe floods. Even when Hurricane Agnes flooded Harrisburg and other cities along the Susquehanna River, Johnstown was untouched. This helped reinforce the locally popular but fatally flawed perception of Johnstown as "the flood free city."

THE 1977 FLOOD

The most recent severe flood in Johnstown occurred on July 19-20, 1977. Torrential downpours associated with a succession of thunderstorms resulted in heavy

rainfall in parts of Bedford, Cambria, Indiana, Somerset and Westmoreland counties. Parts of Cambria and Indiana counties received 8 to 12 inches of rainfall over an 8 to 9 hour period from early evening on July 19 to early morning on July 20.[10] The National Weather Service recorded 8.5 inches of rainfall for Johnstown beween 9 p.m. and 4 a.m.[11] One location in Johnstown recorded 2.2 inches of rainfall during a single 40-minute period between 2:50 a.m. and 3:30 a.m., but the storm was so localized that no precipitation was recorded as little as 20 miles away to the southwest of Johnstown.

A brief chronology of events for the 1977 flood[12] reveals how ineffective warning systems proved to be in this instance. During the afternoon of July 19, the Pittsburgh office of the National Weather Service (NWS) issued a series of statements about flash flood warnings for northern Crawford County and other areas in northwestern Pennsylvania, and noted that a thunderstorm had passed through southwestern Pennsylvania. At 7:30 p.m. the NWS issued its first weather statement for the Johnstown area. This statement, which was not a flash flood warning, was based on radar observations and some reports of brief but heavy rains and minor flooding in urban areas.

The severity of the thunderstorms caused electrical and telephone services to be distrupted over an increasingly wider area from mid-evening onward. At midnight,

FIGURE 3. Downtown Johnstown during the 1936 flood, as seen from the top of the Incline Plane.

streets in Johnstown were covered with water but still passable. By 12:45 a.m. Johnstown police were attempting to evacuate city residents. Communities in Cambria County were without phone service after 1 a.m. During the middle of the night, a succession of streams overflowed their banks and did substantial damage. The Solomon Run overflowed its banks and rushed through a public housing project in the Walnut Grove area of Johnstown and Dale Borough. Elsewhere, along the border of southern Cambria and northern Somerset counties, the Elton Run and Paint Creek overflowed their banks, completely overwhelming the flood-control project on the Paint Creek and causing water to rush through the boroughs of Scalp Level and Windber.

At 2:40 a.m. the National Weather Service, apparently unaware of the severity of local conditions, issued a flash flood warning for Indiana and Cambria Counties, noting that "heavy rain and some flooding has been reported in this area. Radar shows heavy rainfall continuing thru the area for the next hour or so. Person (sic) should move to higher ground immediately if near flooded streams."[12]

About 4 a.m. the Laurel Run Dam burst, sending 101 million gallons of water down the Laurel Run and killing 36 in the Middle Taylor Township settlement of Tanneryville.[13] Water from the Laurel Run Dam backed up the Conemaugh River and into Johnstown neighborhoods below the downtown area. Throughout the evening and early morning hours, flooding from overfilled streams occurred in such disparate places as Clymer, Homer City, Indiana and Cherry Tree (all in Indiana County), scattered sites in Bedford County, Seward and New Florence (Westmoreland County), and a variety of locations in Cambria and Somerset Counties.[14]

In an assessment of the flash flood warning system, a report to the Administrator of the National Oceanic and Atmospheric Administration notes that a timely announcement of flood watches and warnings for the affected area failed to occur in part because "our capability to predict heavy or extreme rainfall amounts over small areas is limited . . . ." The report found flaws in the interpretation of satellite and radar information and in the system of local reporting of weather information. It concludes that "on the disastrous night of July 19-20, 1977, neither the National Weather Service component of the Flash Food Warning System nor that part of it involving local communities and Civil Defense did much good for anyone in the Johnstown, Pennsylvania, area . . . ."[12]

A BRIEF COMPARISON OF THE THREE FLOODS

Tables 1 and 2 summarize some pertinent information about Johnstown's three most severe floods. The most common criteria for comparing the magnitude of hazard events are mortality and property damage. Additional dimensions examined here include causal factors, water height and areal extent of flooding. An examination of these attributes suggests that the three floods have little in common except for their association with Johnstown.