Waters of Change: The Great Miami River Flood of 1913 and Its Policy Consequences

By Genevieve Angell Knight
WATERS OF CHANGE: THE GREAT MIAMI RIVER FLOOD OF 1913 AND ITS POLICY CONSEQUENCES

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by
Genevieve Angell Knight
Miami University
Oxford, Ohio
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APPROVED
Advisor: ________________________________
(William J. Green)
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Genevieve Angell Knight

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ABSTRACT

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The March 1913 flood of the Great Miami River in southwest Ohio was the largest weather disaster in the state’s history, and three times larger than any other flood on record for this river. This flood devastated the cities in the Great Miami Valley, most notably Dayton and Hamilton. The timeline of the flood and immediate recovery is given, and the psychological impact the flood had on survivors is examined through first-hand accounts. The timeline and impact of the flood form an important background for understanding why this flood produced the response it did.

The response to this flood was organized on a basin-wide scale, was locally financed, and planned for the long-term protection of the valley. All of these unique features are attributable at least in part to the influence and insight of John R. Patterson and Edward A. Deeds of Dayton’s National Cash Register Company, and Arthur Morgan, a nationally-recognized engineer and the chief engineer on this project. The response was institutionalized as the Miami Conservancy District, a new kind of governmental unit and a new approach to flood control. The Miami Conservancy District constructed a massive and highly-successful system of dry dams, levees and canalizations to manage future floods. Today the District has expanded its original mission to include management of all water resources in the Great Miami Valley.

The Miami Conservancy District emerged into a controversy over methods of flood control. The methods and approach used by the District are compared with the earlier “levees only” approach and with the recent Watershed Management approach. The District is found to be between these two approaches, and moving ever closer to the more inclusive Watershed Management approach.
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Introduction

The Great Miami flood of March 1913 was the greatest natural disaster in the recorded history of this valley. As much as three times larger than any other flood on record, it is first in a list of events that most influenced or changed the Hamilton area in the twentieth century (Blount 2000, p 5), and caused more death and destruction than any other weather event in Ohio’s history. Blount asserts, and the first-hand accounts and recorded memories of the flood support him, that the 1913 flood left strong emotional scars on its survivors (Blount 2002, p 5; Blount 2000, p 19; Puckett Ch. 1, Keller, Holbrock, Shellhouse, Esterquest, Ludwig in Hancock).

The 1913 flood changed the way people who lived through it conceptualized the river as well as their mindset toward it. “Terrifying flood memories caused people to turn their backs on the river. The Great Miami was feared – not seen as a useful resource – because of the tragic sequence that began Tuesday morning, March 25, 1913” (Blount 2002, p 5). The severity of this flood illustrated, in a way little else could have done, the deficiencies in the mindset the residents of the Great Miami Valley had previously held toward the river. In keeping with the dominant mindset of the early twentieth century, people in the Great Miami Valley probably looked on the river as a useful tool, an aid to industry and the economy, and, along with the Miami-Erie Canal, something that until recently had been an avenue of transportation of goods. The dominant paradigm at the time held that humans were separate from nature and had the ability and opportunity, perhaps even the duty, to control and improve upon elements of nature to make them more efficient and profitable from a human standpoint (Nash). After the flood, people
probably did not consciously realize that the river was part of a system that they did not fully understand; but they did realize that the river was something they could not control as easily as they had previously thought. They also realized that if interactions with this system are divided by political boundaries it would lead neither to better flood control nor a better overall understanding of the system.

The personal reactions people had to this flood are of central importance to the policy response. This response constituted a significant step in the history of flood control and river policy in this country. The organization formed in response to this flood, the Miami Conservancy District, took an approach to flood protection that differed from previously accepted approaches in important ways. Indeed, this approach showed similarities to current approaches to river management.

The first step in understanding how the 1913 flood generated such a response is to examine the circumstances in the valley at the time and the events of the flood itself, as well as the immediate relief and recovery efforts. The first-hand accounts of flood survivors are key to this examination.

Secondly, an examination of the steps in the formation of the Miami Conservancy District in the aftermath of this flood reveals the influence of a few important individuals. The changes in the policies, practices and programs of the Miami Conservancy District over the years brought its approach ever closer to current approaches.

Finally, I evaluate the significance of the Conservancy District’s approach by comparing it with other flood control and river management policies. The policy prior to the 1913 flood was commonly called “levees only,” and was based on the containment theory espoused by the U.S. Army Corps of Engineers. Elements of this old approach are
still evident in many places and policies today, notably along the main channel of the Mississippi River (Steinberg, Introduction). A much newer approach is the Watershed Management Approach, currently advocated by the U.S. Environmental Protection Agency, which is much broader, taking into account many more elements of the river system than “levees only” and attempting to address many more issues than flooding alone. Evaluating the approach taken by the Miami Conservancy District at the time of its formation in the context of these national policies reveals it as a step along the road from “levees only” toward Watershed Managements. While this approach took a broader view of flooding problems than containment theorists did, it retained many of their notions about the functioning of river systems and neglected to incorporate many issues that watershed managers now see as inherently intertwined with flood control.

Since the 1920s we have come to see that rivers are a much more complex and integrated system than we did at the beginning of the Miami Conservancy District. We have begun to question the dichotomy between humans and nature, and the environment has come to be seen as a much more important consideration and a valuable source of inspiration for management.
Part I: The Flood – Greatest Disaster in Regional History

History of the Flood – What Happened
Chapter 1  The Great Miami Valley in 1913: Description of Valley Conditions and the Storm

Geographic and Geologic Description of the Great Miami Valley

A series of glaciers carved out and formed the valley of the Great Miami River, the most recent of which was the Wisconsin glacier. Between twenty-four and fourteen thousand years ago this glacier advanced and retreated across southwestern Ohio, completely changing the topography. The Wisconsin glacier left behind deep valleys that it had carved and subsequently filled with its coarse deposits of gravel and sand. Today these deposits provide groundwater reservoirs the inhabitants of the Great Miami Valley use for drinking water. The drainage system of the streams and rivers in today’s much shallower valley developed in these deposits according to the topography the glacier created.

The Great Miami River watershed is 5,702 square miles, 4,277 of which are in Ohio (Miami Conservancy District [MCD] website), and the river itself is 170 miles long with an average slope of 3.9 feet per mile (Blount 2002 p 3, referencing the MCD). Ohio counties partially or completely encompassed by the Great Miami River watershed include Auglaize, Butler, Champaign, Clark, Darke, Green, Hamilton, Hardin, Logan, Mercer, Miami, Montgomery, Preble, Shelby and Warren counties. Ohio’s border with Indiana is determined by a line running north from the point where the Great Miami drains into the Ohio River. From its mouth the Great Miami watershed reaches north beyond Sidney and Bellefontaine to include Indian Lake. The watershed also reaches from near the

A watershed, also called a drainage basin, is the area of land from which all precipitation drains through a single point in a river; a simpler way to put it is: all the land around a river that drains into it. The boundaries of watersheds follow ridge tops and other topographic high points.
Indiana border east to beyond Springfield, although it narrows considerably near the river’s mouth and is entirely to the west of Cincinnati [See attached river basin map].

Wilfrid Gladstone Richards, a geographer who has studied the settlement of the Miami Valley, delineates the valley not by the boundaries of the drainage basin, but by the county boundaries. He describes the valley as “Reaching northward from the Ohio for 100 miles, and 70 miles in width” (p 1). Because he thinks of the Miami Valley as a geographic area defined by the history of European-American settlement, Richards includes the Little Miami watershed in his study. This led him to include four counties to the east of those listed above, and he did not include Auglaize, Hardin, or Mercer counties, because of the small percentage of these counties that falls within the Great Miami Valley. Thus, his definition of the valley, and therefore his measurement of its area, differs from that of my other sources, particularly the Miami Conservancy District website and publications, which define the Great Miami Valley by the topographic watershed boundaries. While it may be easier to describe the European settlement of the area by counties and municipalities, neither storms nor overflowing rivers pay any heed to political boundaries. So it was, of course, the land within the topographically-defined watershed that contributed to the Great Miami River Flood of March 1913.

Description of Settlements of the Miami Valley at the Time of the Flood

When European-Americans first settled the Great Miami Valley, settlement occurred preferentially along rivers, as it did throughout most of the Midwest (Richards p 24-29). The original settlers of Dayton in 1795 built on the river banks (Stevenson p 3), and Fort Hamilton was also built on the banks of the Great Miami in the 1790s (Blount
2002 p 3). Rivers provided faster transportation (at least for those going downstream) than any existing overland methods. Even though the Great Miami is not now commercially navigable, in the early nineteenth century flatboats were used to conduct trade along it (Richards p 33). Another reason settlement occurred first along the rivers is that the most fertile soils in the area are alluvial soils, making this an ideal location for farming. A local example of this settlement pattern is the oldest house in Oxford Township, the DeWitt homestead and former farm in the floodplain of Four Mile Creek. Richards states that these locations also made desirable farmland because a natural drainage system existed, lessening or eliminating the need for farmers to dig their own drainage ditches (p 63). Riversides also provide a desirable location for those seeking to establish industry, because rivers provide a ready source of power, coolant, and a waste depository. Thus, all the major cities and many of the more minor settlements in the Great Miami Valley are located on the river or its tributaries. [See attached river basin map] Riversides are also the location where canals are most easily constructed, and the Miami-Erie Canal traveled along the route of the Great Miami for much of the length of the river. Sections of this canal in Hamilton and Dayton played a role in the 1913 flood.

Both the geologic history, as it played out in the geography of the valley, and the settlement patterns in the valley helped to set up its towns and cities for the disastrous flood of March 1913. This combination of geology and settlement patterns not only helped establish the probability of flooding in the cities, it also played a role in
determining the disparities in the amount of death and damage each city experienced. Dayton was particularly poorly placed in terms of these losses. Four rivers, the Great Miami, the Mad and Stillwater Rivers, two of its major tributaries, and Wolf Creek, all converge in and just upstream of downtown Dayton (Eckert p 5). [See attached subwatershed map] Not only does all the water from the combined drainage areas of these streams flow through Dayton, but the channel of the Great Miami is wider at the point where it enters Dayton than it is at the point where it leaves Dayton. As it passes through the city, the river narrows from a channel of about 800 feet wide to one of about 500 feet wide (Eckert p 5). In addition, the river goes through a series of S curves within the city (“Keeping the Promise” video on MCD website). Hamilton, though not as precariously placed as Dayton, was built mostly in the floodplain and encroached on the normal river channel to a much greater degree than it does today.

By all accounts, the cities of the Great Miami Valley were flourishing at the time of the flood. In the 1910 census, Hamilton had over 35,000 inhabitants (Blount 2002 p 9), and Dayton’s population was about 130,000, making it one of Ohio’s largest cities (Eckert p 157-158). The bridge that connected Hamilton’s High and Main Streets before the flood was an iron truss bridge which, when it was completed in 1896, was “the longest single span bridge in the nation” (Blount 2002 p 6). Both cities were centers of manufacturing (Richards p 75), and their largest companies, the Champion Coated Paper
Company in Hamilton and the National Cash Register Company in Dayton, both played a significant role in the course of this flood and the recovery from it.

**Official flood stage** at Dayton was 18 feet, but because the levees in Dayton were constructed ones and over the years had been built significantly higher to prevent more minor flooding, the river would not overtop the levees until it reached 23 feet. The tops of the levees were generally 15 to 30 feet above the level of the streets immediately adjacent to them (Eckert p 11-12, 43, 58). In addition to its levees, Dayton had a dam at its northern end; Steele Dam was located just downstream of the confluence of the Stillwater and Great Miami Rivers, and was “a concrete roller dam rising eleven feet from the river bed.” The 1913 flood did not destroy this dam; it simply overtopped it and continued almost as though it were not there (Eckert p 71).

I have not been able to find a similarly detailed account of the levees in Hamilton as they existed in 1913, although from photographs they appear to have been smaller than those in Dayton. Perhaps this was due to Hamilton’s less precarious position in relation to the Great Miami River, and consequently the less frequent flooding in Hamilton’s history. According to Eckert (p 16), flooding in the low-lying areas of Dayton was frequent enough to perhaps have caused some complacency on the part of residents of slightly higher areas, leading them to not take action to protect themselves and their property until it was too late. Before this flood, Hamilton was built up much closer to the river channel than it is today. Currently the first street running parallel to the Great...
Miami River on its western bank is B Street. Why is the street nearest to the river not called A Street? It used to be. However, the Great Miami flood of March 1913 took with it the width of nearly an entire city block for most of the length of downtown Hamilton, effectively wiping this street off the map (Blount p 31), as Figure 1 below illustrates. The description of this photograph reads:

South A Street lost its identity when the flood of Tuesday, March 25, sent the waters of the Miami River all along this section. Many pretty homes were located along South A Street. The little park the city had built, went along with the rushing waters and the whole street appears to have been lost (The Flood Disaster).

This photograph was apparently taken looking south from approximately where Main Street intersects the river. So although Hamilton is no longer built immediately next to the river, it was at the beginning of 1913.

North-South streets in Hamilton (which run parallel to the river) on the east side of the river are numbered – First, Second, Third – with the exception of a few streets close to the river – Monument Avenue, and Front Street. North-South streets on the west side of the river are lettered – A, B, C.
Description of the Storm

The monumental storm system that produced so much precipitation over the Great Miami River watershed – between nine and eleven inches in three days (Blount 2002 p 3) – is described in the most detail by Eckert:

Three great air masses developed in mid-March of 1913: the first, an eddy spawned in tropical air over the Gulf of Mexico, headed northward bringing summerlike weather to Atlanta and unseasonably warm temperatures to central Kentucky as it sped toward Dayton. The second was an icy blast of frigid Canadian air that began as an eddy over the mouth of the St. Lawrence River, causing temperatures to plummet in Detroit and Toledo as it headed south toward Dayton. The third eddy was formed over the northern Great Plains and quickly turned into a wind of hurricane force, leaving thousands homeless, hundreds injured and a few dead in Omaha, after which it became merely a gusty weather-front as it passed through Iowa and Illinois, gathering strength again as it passed Indianapolis on its way eastward toward Dayton (paraphrasing p 3-4).

The map on the next page, Figure 2, shows the government record of rainfall from March 24 through March 28, 1913 (The Flood Disaster), and shows that over eight inches of rain fell over nearly all of the Great Miami Watershed in these five days. The average precipitation for this area in the entire month of March is about three and a half inches (http://www.cdc.noaa.gov). Even before this particular and impressive storm system unleashed its water on the valley, the ground was already saturated with moisture. This moisture consisted of water from the recent spring snowmelt as well as from other recent rainstorms. Due to continuing cold temperatures, the ground was still largely frozen. Saturated and frozen ground is a common occurrence in this area and climate toward the
end of March. Because the ground already had as much water as it could hold, coupled with the fact that it was frozen, it could not absorb any more water, and nearly all of the precipitation from this remarkably large storm system ran quickly over the land into the rivers and streams. “Engineers later explained that with the ground already saturated, 87 percent of the rain ran into the [Great Miami] river.” This rapid run-off led to a rise in river levels that was much more rapid than most people in the valley had seen before; “Within 48 hours, the Great Miami in Hamilton rose from 4.8 feet to an all-time high of 34.6 feet” (Blount 2002 pgs 3-4).

Although citizens of Dayton were rather accustomed to flooding, it became clear relatively quickly to those few paying close attention that this flood was different and was going to be larger than previous floods. The floods Dayton residents were used to had always been caused by one or two of the city’s four rivers flooding while the others remained only slightly above their normal levels. Once before, in 1866, there had been a
flood that was caused by three of the rivers at flood stage. But in March of 1913, “All four rivers were full to the point of overflowing as far as the eye could see upstream” (Eckert p 34-35).

**Cause of the Flood Disaster**

There is a consensus in the literature that the Great Miami flood of 1913 was caused by simply too much rainfall. This may seem like an elementary idea, but it is significant because it means not only that the major dams in the drainage basin held, but also that the levees that were breached during the flood were not faulty or poorly engineered, but rather that there was more water than they were designed to hold. This is not to say that the pre-1913 estimate of normal flood height, and therefore necessary levee height, was flawed. On the contrary, this particular flood was so far above the usual flood height as to be beyond any reasonable levee height.

The idea that the flood was caused by simply too much rainfall is also significant because it means that the flood was not caused by alterations humans had made to land in the watershed. Much of current research (Andoh and Declerck, Pijanowski et al., and Crooks and Davies) is demonstrating how alterations humans have made to the land in watersheds – deforesting, plowing, and urbanizing – increases the severity of floods. These activities do indeed cause precipitation to reach river channels much more quickly than it would in an undisturbed watershed, and the Great Miami River watershed had, by 1913, been largely deforested, much of it was being regularly plowed or grazed, and the process of urbanization had most definitely begun. While there are no exact numbers for land use in 1913, Richards reports that in 1850, 78% of the land in the valley was held in
farms (p 56), and that the total amount of farmland increased by almost 1,500,000 acres between 1850 and 1900 (p 68). He also reports that the urban population exceeded the rural and that “manufacturing and trade, rather than agriculture had become the dominant interest of the people” (p 88). So while the forces of deforestation and urbanization were at work, and in a few localized instances may have increased the severity of this particular flood (see end of “Timeline of Flood Events in Hamilton” in Chapter 2), human activities and constructions in the watershed did not have a significant impact on the flood of March 1913. It was simply too big to be affected by these things. Had the entire watershed been completely forested, it would not have noticeably lessened the height of this flood (Morgan).

But the cause of the flood is not the same thing as the cause of the disaster; if the watershed had been entirely forested, with no human settlements, this same flood would not have been a disaster. Had the watershed been uninhabited by humans and the same meteorological conditions combined to create the same storm, the subsequent flood would have been much the same, but would have had very different effects. The volume of runoff and river flow would have been very nearly the same and the floodwaters would have risen to approximately the same height overall. However, very little damage would have been done to the ecosystem. The Great Miami River and its tributaries would have risen rapidly, but slowly enough for most wildlife to get out of the way. While the water velocity would have been strong enough to topple trees and move a great deal of sediment, the system would have adjusted to incorporate these alterations and, aside from the individual organisms killed, the system would have largely returned to normal within a few weeks. Whereas most aspects of human-constructed systems – railroads, brick
houses, bridges – are not adapted to flooding, the rest of the ecosystem is (Martin). While there would have been damage, serious damage given the abnormally large size of this particular flood, it would not have been disastrous, and the ecosystem would not have been damaged, for floods are part of this ecosystem. The flood was caused by the shape of the watershed and the amount and intensity of rainfall, but the disaster lay in the destruction of human constructions and was therefore caused by building in the floodplain. The disaster would not have occurred if we had not built in the flood plain, but neither would it have occurred without the flood. However, the fact of flooding is entirely outside our control (Leopold and Maddock p ix) and if or how we choose to build in floodplains is entirely within our control (Steinberg p xix, p 98).
Chapter 2  More Water Than 30 Days at Niagara\textsuperscript{1}:  \textit{Flood and Damage}

The flood of March 1913 affected all the cities, villages, and settlements along the Great Miami River. Piqua, Troy, and Middletown are just three of the cities not discussed in detail here but that nonetheless suffered significant flood damage. While other cities suffered, Dayton and Hamilton were devastated. These two cities are the focus of the following description of the events of the flood and of the descriptions in Chapter 3 concerning relief and recovery efforts, and that chapter’s discussion of psychological effects of the flood is based on experiences of survivors from these cities. This focus derives from the fact that Dayton and Hamilton experienced more damage than other cities in the Great Miami Valley. The uneven damage was a result of placement within the watershed; Dayton and Hamilton are farther downstream than, for example, Piqua and Troy and thus had a greater volume of water flowing through them. Damage was also greater in these cities because of their particular physical relationships to the river as discussed in Chapter 1. This focus also derives from the fact that Dayton and Hamilton were the largest cities in the valley and thus there was more to be damaged than in smaller cities, and therefore more has been written about people’s experiences of the flood in these cities.

\textbf{Timeline of Flood Events in Dayton}

March 23, 1913, Easter Sunday, was stormy all day, but this rain was not part of the massive storm whose origins are described above (Eckert p 10). This rain was just part of the usual rains of late March and no one in the valley was concerned about

\footnote{\textsuperscript{1} Approximately four trillion gallons flowed through the Miami Valley in the course of the flood, which is about the same amount as discharges over Niagara Falls in 30 days (Becker and Nolan p 23).}
flooding. The day before, in fact, was a beautifully sunny day and the river level at the bridge at Main Street in Dayton had stood at two feet (Eckert p 9).

But on Monday the massive storm hit in earnest and the rain increased in intensity and it continued to downpour all day (Eckert p 14). Probably the first person to become concerned about a possible flood was Harry Alps, who worked at the United States Weather Bureau office in Dayton. At 11:30 Monday morning, when the river had risen steadily to a gauge height of 11.6 feet and was not yet showing any early signs of cresting, he determined that the possibility of flooding in the city’s low-lying residential areas had become likely (Eckert p 9, 10-11). At this point in time, Alps was forecasting that the river level would crest at least at fourteen feet if the rain were to stop, and possibly more than sixteen if the rain did not stop. He doubted that the flooding would get serious enough to necessitate calling in the National Guard (Eckert p 11-12). By five that evening, however, Alps had revised his forecast to predict that if the rain were to stop soon, which did not look likely, the river would crest right around eighteen feet, official flood stage. Also at this time, he recommended that the National Guard be alerted to stand by. Despite the heavy rains and the rapid rise in the river levels, most people in Dayton remained unaware of the threat of flood swiftly bearing down upon them.

In the early hours of Tuesday, March 25, 1913, the Great Miami River at Dayton surpassed its flood stage. At 2:20 AM it was recorded at eighteen feet, eight inches “with no cresting of the river in prospect.” The prediction at this point

‘In prospect’ here refers to methods hydrologists and Weather Bureau scientists have to look at the stage and movement of a river at one point and its stage and movement at points upstream and predict its behavior at the point in question (Barry). This phrase means that at this time there were no observable indications that the Great Miami River at Dayton was going to stop rising.
was for the downtown business district to receive a foot or two of flood water, while surrounding residential areas might get as much as five or six feet (Eckert p 19). By four in the morning water was beginning to fill the streets in the low-lying residential areas, backing up from the river through the sewers, some of which had not been closed off in time, and gushing into the roads (Eckert p 21-22).

At seven o’clock the river gauge reached twenty-four feet and water began flowing over the levee just east of the Main Street bridge onto Monument Avenue. The overflowing water quickly eroded the top of the levee, enlarging the gap, enabling more water to flow through and erode more of the levee, speeding the flood of downtown Dayton. The water reached three feet deep in the business area within forty-five minutes (Eckert p 68-69). At just about the same time as this levee break, water overtopped the levee at Steele Dam and poured down Great Miami Boulevard through a residential area north of downtown and on the opposite side of the river. In this area, the water reached five feet deep within an hour (Eckert p 71-72). But these were not the only levee failures of the day, nor were they even the most significant. An hour and a half after the first levee break, just as the current in the streets downtown had slowed and it was beginning to look as if the flood in that area had reached its peak, “A great section of levee 350 feet long and 26 feet deep at the head of Taylor Street east of the downtown district suddenly gave way and a fantastic volume of water thundered into the streets.” The current in this five-to-eight-feet deep rush of water was phenomenal, breaking nearly all first-floor windows it encountered, tossing streetcars like toys, tearing the asphalt pavements up from the streets, and knocking buildings off their foundations (Eckert p 95-96).
Dayton was thus nearly completely cut off from communication with the rest of the world by the flood and many hundreds, if not thousands, of its citizens were trapped in upper stories before most realized that this flood might in fact be life-endangering, and that they would need major and immediate help from outside sources.

Dayton’s great tragedy within the larger tragedy of the flood began at two in the afternoon this fateful Tuesday when the Burkhardt and Rotterdam Drug Store, at the corner of Third and St. Claire Streets exploded and collapsed. This gas main rupture did not look at first as though it was going to cause additional destruction, but the people trapped by the flood in neighboring buildings began to move away over the rooftops, moving to slightly more distant buildings on the block (Eckert p 142-144). Later in the afternoon, at about fifteen minutes before four, Saettle’s Café at the corner of Vine and Main exploded, also likely due to a break in the gas main (Eckert p 154). This explosion was to the south of the central business district in a more residential area than the first one, but they both led to fairly devastating fires.

The second explosion led to a much smaller fire, but one that acted much sooner; it was spread across Main Street by some burning debris that had fallen off the café and been taken by the current to lodge against the end of a row of houses which caught on fire one by one (Eckert p 198-200).

The Burkhardt and Rotterdam Drug Store simply smoldered throughout the day Tuesday, but posed no real threat to those near it. However, a little after one Wednesday afternoon, nearly twenty-four hours after the first explosion, there was another one inside the drug store. This explosion ignited a barrel of alcohol, which kept the fire burning long enough to spread to adjacent buildings and grow rapidly. As the many people
trapped on that block by the flood fled farther away across rooftops, the fire grew hot enough and large enough to spread from building to building by going around the firewalls (Eckert p 228-240). Like the earlier, smaller fire to the south, this one also perpetuated itself and expanded when burning debris falling from one building drifted south across the street and ignited another block (Eckert p 262-265).

The picture above, Figure 3 (Middendorf), shows what was left of the block where the fire originated after the floodwaters receded. Wednesday night the remaining portions of the fire were extinguished by rain mixed with snowfall that also provided drinking water to many flood refugees throughout Dayton.
As the fires raged, the end of the city’s destruction by water came into sight early Wednesday morning as the water finally crested at 29.0 feet. The map of Dayton below, Figure 4, shows the extent of the flooded area, and was taken from the “Official Plan for the Protection of the District from Flood Damage,” which was adopted by the board of directors of the Miami Conservancy District three years after the flood. This plan and its adoption will be discussed in Chapter 4.

Figure 4 Map of Dayton in 1913. The Shaded Area Shows Portion Flooded. From “Official Plan for the Protection of the District from Flood Damage” Miami Conservancy District
Timeline of Flood Events in Hamilton

Perhaps because it is a smaller city than Dayton, the surviving record of river stages and levee breaks is not as complete at Hamilton. The timeline of events in Hamilton, particularly the events that took place early on, before most people were aware of the risk of flooding, must be reconstructed primarily from first-hand recollections of the flood.

The first major recorded flooding event was the flooding of the Champion Coated Paper Company’s mill on the west side of the Great Miami River, between A and B Streets. The mill’s boiler room was quickly submerged, and many employees stayed in the building, placing machinery belts, samples and other valuable equipment on high shelves and above the water’s probable path. Some stayed as late as two o’clock in the afternoon, by which time the water had reached shoulder height. Many of these dedicated employees had to escape their building by crossing electric wires, which by that point of the day no longer had any current in them, to buildings and higher ground to the west (Blount 2002 p 34).

A second important early event in Hamilton was the dismissal of the city’s schools. Apparently, about an hour after classes started, Hamilton school leaders somehow received a warning from a source in Dayton that a dam had broken in Dayton and there was a surge of water rushing down the river. Although this report was not strictly true, when combined with the heavy rains, the rapidly rising river, and the fact that they could no longer communicate with Dayton to confirm or deny this report, it was enough to cause Hamilton educators to close their schools and instruct their students to return home. (Blount 2002 p 8).
A rumor similar to the one that caused the closing of Hamilton schools circulated widely in both Dayton and Hamilton as Tuesday went on, and over Wednesday as well, that the Lewiston Reservoir had broken and released a ‘wall of water’ that was rushing down the Great Miami River and would greatly increase the amount of flooding already going on. Like the earlier rumor spread in Hamilton, this one was not true, although there was some real fear of this dam breaking, and at 4:30 Tuesday afternoon Governor Cox of Ohio ordered a crew be dispatched to the reservoir to shore up the dam and prevent a collapse (Eckert p 160).

By eleven Tuesday morning the Great Miami River at Hamilton had reached a gauge height of 24.3 feet, thereby exceeding the record previously set during a flood in March 1898 (Blount 2002 p 6, p 9). Shortly after noon, a series of destructions began that was possibly the most serious and significant, at least in the short term, for many Hamilton residents. The Black Street Bridge, the northernmost of Hamilton’s four bridges across the Great Miami that connected the two halves of the city, was destroyed at 12:12 pm. The High-Main Bridge, the longest single-span bridge in the nation at the time of its construction and the bridge that connected the city’s two main thoroughfares, fell at 12:28pm. In the following series of four photographs, we can see the bridge’s final few minutes as recorded by C. S. Jacobi, a Hamilton photographer. In the first picture, Figure 5 (Hamilton’s Disastrous Flood) on the next page, we can see across the bridge, which was closed to all traffic at eleven, and down Main Street on the west side of Hamilton. The water in the foreground looks smoother than it actually was due to the length of the exposure for this photograph.
Figure 5  High-Main Bridge. Caption reads “Taken 10 minutes before this structure was swept away by the flood. The railings are going in this photo, if you note carefully.” From “Hamilton’s Disastrous Flood: 100 Photographic Views, March 1913” Smith Library of Regional History

Figure 6  Debris Against High-Main Bridge From “The Flood Disaster (Illustrated) 1913” Smith Library of Regional History
Figure 7 Three Feet of Water Flowing Above High-Main Bridge Six Minutes Before Collapse. From “Hamilton’s Disastrous Flood: 100 Photographic Views, March 1913” Smith Library of Regional History

Figure 8 High Street After the Flood. From “Hamilton’s Disastrous Flood: 100 Photographic Views, March 1913” Smith Library of Regional History
In Figure 6 (two pages previously), the second photograph in this series, which was actually taken a few minutes before Figure 5, we can get some idea of the force that was battering this bridge. Note the angle to which the current and turbulence have raised the poles that are stuck against the side of the bridge. The description of this photograph tells that the log building on the right in the foreground is the “historic powder magazine used in old Fort Hamilton over a century [before the flood]. It has completely disappeared and not a timber of it has been seen since the flood” (The Flood Disaster). Figure 7 (top of previous page – Hamilton’s Disastrous Flood), the third photograph in this series, is probably the last picture taken of this bridge before it started to fall. It is a great view of the water flowing completely over the road surface of the bridge. The structure marked “S.S. Monument” on the picture is a part of the Soldiers, Sailors and Pioneers Monument, which was one of the only buildings on the riverbank to survive the flood intact. Figure 8, the fourth and final picture in the series (bottom of previous page – Hamilton’s Disastrous Flood), was taken after the water had receded. In it we can see not only that the High-Main bridge is gone, but also that the Monument survived the flood well, and that the asphalt of the street was torn up and badly damaged by the floodwaters.
Despite attempts to anchor it by parking several full coal cars on it, Hamilton’s railroad bridge followed the High-Main Bridge into the raging river at 2:12 PM. Interestingly, no one at the time seemed to consider this attempt to save the bridge remarkable enough to warrant comment, and none of the first-hand accounts I was able to find mentioned it at all. The coal cars and final collapse of this bridge are pictured in Figure 9 above (Flood at Hamilton, Ohio). Also note the spectators on the bank in the foreground. The southernmost of Hamilton’s bridges, the Columbia Bridge, held out longer than the others, but it too tumbled into the river at two o’clock AM Wednesday, completing the severance of the two halves of Hamilton (Blount 2002 p 6-7).

Shortly before one o’clock in the morning on Wednesday, March 26, a fire broke out in the flooded Champion Coated Paper mill that eventually destroyed everything above the water line, as the photograph on the next page, Figure 10, shows (The Flood Disaster). This was Hamilton’s costliest fire at the time, with damage totaling $1.7 million (Blount 2002 p 34).
Not long thereafter, the Great Miami River reached its crest at Hamilton too, at 32.6’ at about three in the morning (A.H. Horton and H.J. Jackson in The Ohio Valley Flood of March-April 1913, quoted in Blount p 19).

Blount describes the swollen Great Miami River as three miles wide in Hamilton on Wednesday, when it stretched from between C and D streets on the west to the present Erie Highway, Ohio Route 4, which at the time was a part of the Miami-Erie canal (p 8-9). This extent of water can be seen in the map on the next page, Figure 11, which, like the map of Dayton, was taken from the “Official Plan for the Protection of the District from Flood Damage.”

Hamilton’s section of the Miami-Erie canal had been built in 1827, but “By 1913 the canal was seldom used, and considered a health and safety hazard. But in March 1913, it saved dollars and possibly lives by restricting the flood.” The canal’s embankment was higher than the land around it, and formed a levee stopping the eastward expansion of the floodwaters. In the late 1920s building highways over old canals was promoted by the Miami Valley Super Highway Association, and Hamilton’s 2.2 mile-long section of highway opened in 1936 (Blount 2002 p 24). Engineers would
Figure 11. Map of Hamilton in 1913. The Shaded Area Shows Portion Flooded. From “Official Plan for the Protection of the District from Flood Damage” Miami Conservancy District
later measure that on Wednesday the floodwaters had reached depths of more than 43 feet in several locations in Hamilton (Blount 2002 p 8-9).

Some of the most severe flood damage in Hamilton occurred at a considerable distance from the usual river channel. A few blocks west of the Miami-Erie canal there was another strong current, leading Blount to describe the situation during the flood as, “‘Two raging rivers’ [that] cut separate paths through Hamilton. . . . one following the usual course of the Great Miami, the other in a new channel centered along North Ninth Street.” Blount recounts that a reporter looking for the explanation of this second current determined that the river was divided upstream by the Cincinnati, Hamilton and Dayton Railroad Bridge at New River, between Hamilton and New Miami. This bridge had been washed away many times and had most recently been rebuilt with massive, well grounded concrete abutments which not only withstood the force of the flood but with debris piled against it “formed a dam that diverted the current ‘through a high bank and then down into the east part of Hamilton,’ the reporter said.” If this bridge had not divided the current and the water in this section of the city had ‘Only been back water, without current,’ [the reporter] concluded, ‘houses would not have been swept away and the destruction would have been comparatively small’” (Blount 2002 p 40).

Death and Damage Estimates

The flood of the week of March 23, 1913 is ranked as ‘Ohio’s Greatest Weather Disaster,’ with Ohio weather historians rating it higher than more recent tragedies, “Because the extent of death and destruction exceeds all other weather events in the state’s history” (quoted in Blount 2002 p 5). Blount tells that Hamilton’s death toll
“Exceeded 200 within two days” and that “Complications added 85 to 100 names to the sad list in following months” (2002 p 3). Other sources give exact numbers of flood-related deaths for the state or an area within the valley (e.g. Becker and Nolan p 43). However, there is no way to know exactly how many people died in Great Miami flood of 1913. Blount describes the difficulty associated with an exact count:

Some bodies couldn’t be identified; other victims were never recovered. . . Unidentified bodies found here may have been carried from counties to the north. Many people disappeared. Some survivors said their neighbors – especially those in smashed rental property – were never seen again. In many cases, it was never determined if they had died or relocated” (Blount 2002 page 3-4).

This confusion was likely aggravated by the fact that communication was slow and difficult during this time. In terms of physical damage to the city, in Hamilton there were “300 buildings destroyed; another 2000 damaged houses and structures had to be razed; and property damage topped $10 million in 1913 values – or about $167 million in recent dollars (Blount 2002 page 3).

Perhaps one aspect of flood damage that would not occur to many people who have not been through a significant flood is the accumulation of sediment dropped in its floodplain by the river. As mentioned before, this natural process is often considered a beneficial one when it brings good agricultural soils to valleys. However, the 1913 flood seems to have deposited most of its sediment in the cities, “Hamilton streets had to be cleared of about 200,000 tons of mud” (Blount 2002 p 4). Several letters written by Hamilton residents to family members in other cities concentrate on the quantity and pervasiveness of this smelly river mud in the city. A detailed discussion of the possible psychological impact of this flood mud is in Chapter 3. Although I have concentrated my discussion on the Great Miami Valley’s two main cities, the tragedy of the flood was also
felt in the surrounding countryside where many fertile farm fields, nearly ready for the spring planting, either had their topsoil washed away, or layers of sand and gravel deposited on top of them, rendering them useless as farmland.
Chapter 3  Food, Money, and Mud: *Immediate Relief, Recovery, and Psychological Impact*

Relief During the Flood: Dayton

Half an hour before noon on Monday, March 24, when the river reached 11.6 feet and Harry Alps of the Weather Bureau determined that the city’s low-lying residential areas would likely flood, Alps notified Mays Dodds, Dayton’s safety director, and Dodds and his assistants began telephoning residents of those areas to warn them that they would soon be getting water in their area (Eckert p 9, 10-11). Despite the heavy rains and the rapid rise in the river levels, most people in Dayton, unless they lived in a low-lying area and had either already seen some flooding or had received warning from the Weather Bureau or the local police, remained unaware of the threat of flood swiftly bearing down upon them. A notable exception was John H. Patterson, President of the National Cash Register Company. According to Eckert, Mr. Patterson was one of the few who had taken detailed notice of the particular vulnerabilities of Dayton’s geographic situation, and recognized this as the beginning of the major flood the valley was geologically disposed to deliver (p 13-14, p 57-58).

Slightly before the usual start of the working day, at six, John Patterson gave orders for the whistle of the National Cash Register Company to be blown “at one-minute intervals for thirty seconds” until he canceled it, as a way of warning people about the oncoming flood (Eckert p 35). This alarm was the first warning many people had that Dayton was really in danger. However, many who did not live near the river either did not know what the whistles were or mistook them for fire whistles and still did not consider themselves to be in any danger (Eckert p 29-30, 41). At an emergency full-scale executive meeting held at 6:45, Mr. Patterson declared that the NCR Company was
temporarily converted into the Dayton Citizens’ Relief Association for the duration of the flood, and set into motion the preparations and organization necessary to procure and provide necessities such as bread, soup, drinking water, blankets, clothes, hospital and sleeping facilities, and boats for what were soon to be the victims of the greatest flood in the recorded history of the Great Miami Valley (Eckert p 56-62). After the flood, this effort and amazing organization and execution on the part of NCR would be highly praised. The foresight and quick, effective action on the part of John Patterson and his employees saved many lives. Their response was far more organized than that of the local government, which was taken off guard and was itself hard-hit by the flood. The response of NCR was also far swifter than any response that could come from organizations, either governmental or aid-based like the Red Cross, outside of the city, as nearly all lines of communication and nearly all transportation routes were completely taken out or severely damaged by the swiftly rising waters before it was generally recognized that a serious flood was going to occur. The location of NCR’s headquarters outside of the main business district, pictured in Figure 12 on the next page (Middendorf), at the top of Fairgrounds Hill on the southern outskirts of the city, greatly aided the company’s ability to help flood suffers, as it was above, although not by much, the high water mark. In the photograph, note that while water is visible quite close to the building, it remains dry. The sources for Eckert’s highly detailed accounts are often unclear in the extreme, making it difficult to put full faith in his facts. The executive meeting, however, would have been recorded in detail, and if Eckert is accurately portraying the discussion that took place at this meeting, it would seem that the swift and decisive action taken by NCR is attributable to no more or less than John Patterson’s
accurate prediction of how bad the flood was going to be and his determination to act on his knowledge. How Patterson arrived at this prediction remains unclear.

Just as this executive meeting was drawing to a close at seven o’clock, and each department head began re-organizing and mobilizing his department for the relief effort, the river gauge reached twenty-four feet and water began flowing over the levee just east of the Main Street bridge onto Monument Avenue.

Dayton had been nearly completely cut off from communication with the rest of the world by the flood and many hundreds, if not thousands, of its citizens had been trapped in upper stories before most realized that this flood might in fact be life-endangering, and that they would need major and immediate help from outside sources. Because of the isolated situation of Dayton, one of the earliest of many stories of heroism that would arise out of the flood may have been the most significant because it brought aid to the greatest number of people. Edgar Newell, a 74-year-old veteran of the Army Signal Corps and former reporter for the Associated Press, having gone to the high water mark earlier that morning and seen for himself the developing disaster, climbed a
telegraph pole at about ten in the morning. Using his penknife, he sent a Morse code message to the Associated Press office in New York, and another to the U. S. Commissioner in Washington D. C., the only federal official he knew. These messages told that all of Dayton was going under floodwaters, which was not much of an exaggeration. The messages requested that the Associated Press send reporters to cover the flood, requested that the commissioner send supplies and relief to Dayton and notify the Red Cross (Eckert p 113-114). As nearly all telephone, telegraph and railroad lines had already gone down, or were to go down shortly after this time, this heroic act was instrumental in alerting the outside world to the events in Dayton and getting the people in the flooded city the help they needed. Governor James M. Cox of Ohio, himself a Butler County native (Blount 2002 p 56), was first alerted to the situation in Dayton at about 11:30 Tuesday morning by a call from the Ohio Red Cross Society. The Red Cross had received a call from the Associated Press asking what kind of relief the governor was authorizing be sent to Dayton, and was calling the governor’s office for instructions (Eckert p 121-123). About an hour later the governor received direct confirmation of the flood via a telephone operator calling him from the flood district on the only operating line out of Dayton (Eckert p 126-127).

The evacuation Tuesday afternoon of the little residential block that had been ignited by drift from the explosion of Saettle’s Café was accomplished the way many other evacuations were that day; the escapees used a ladder to walk or crawl from one porch roof to the next. Once the inhabitants of this block reached the end of the row of houses, they seemed trapped but were rescued by Fred Scott, an employee of the National Cash Register Company. He walked across a telephone wire, using electric wires as
handrails (the power having long since gone out) and climbed down the telephone pole nearest the group of nearly twenty people, now marooned on a garage roof. Using a rope he swung them over to the pole from where they all walked across the wires to safety on Fairgrounds Hill late Tuesday evening (Eckert p 198-200).

Nearly 300 people who were trapped on the block that had contained the Burkhardt and Rotterdam Drug Store escaped across rooftops to buildings farther away from the fire, and eventually across streets with rope slings (Eckert p 228-240). The more than 300 people trapped on the second block ignited by this fire also escaped over rooftops to the far side of the block (Eckert p 262-265). Under the direction of John “Moose” Mollahan, this group took refuge in the Beaver Power Building. They protected themselves from further spreading of the fire by blocking all the windows facing the fire with heavy metal machinery, and stacking all the remaining smaller machinery and furniture against the north wall. They then formed a bucket brigade, dumping water on the roof and all the north-facing walls until everything was far too wet to allow the fire to take hold.

Relief During the Flood: Hamilton

Even before serious and widespread flooding began in Hamilton, a few events occurred that possibly saved many lives by convincing many residents that the threat of flood was real and immediate. The first of these was the flooding of the Champion Coated Paper Company’s mill. Although this flooding occurred in a relatively small area of the city, Champion was Hamilton’s largest industry and as such, employed a significant number of the city’s inhabitants (Blount 2002 p 34). Another early event that
alerted many people in Hamilton to the danger the river posed, and alerted many more people than the flooding of Champion’s mill, was the dismissal of Hamilton schools. As the students walked home through the city, they repeated the rumor of a dam break in Dayton to adults they met in the streets, and it spread quickly. Many who believed the rumor, or thought it plausible enough to take some precautions, returned home to either try to secure their house and belongings, or to take what they could and “Run for the hills!” In this way the rumor and the closing of Hamilton schools may have saved thousands of lives in Hamilton (Blount 2002 p 8).

The fire at the Champion mill was quite difficult to combat because Hamilton’s fire department had been very disrupted by the flood, with most of the units stranded away from their flooded firehouses. The fire could have been even worse, though, had it not been for Charlie Soule, one of Champion’s original ten employees. In another of the stories of heroism in this flood, Mr. Soule dove about twelve feet under flood waters to fix a broken fire hose connection, which he accomplished on his third dive (Blount 2002 p 34).

Throughout both cities, wherever the current would allow it, very nearly everyone who had access to a boat was ferrying uncounted stranded flood victims from upper stories to higher ground or to upper stories of more stable buildings. Many rescuers worked non-stop to the point of collapse, and many thousands of people were saved in this way in each city (Morgan p 29-31).
Recovery and Reconnection Begin

The western half of Hamilton was the smaller section of the city and all municipal services were located on the eastern side of the Great Miami River. Because of the severing of the city when all its bridges collapsed, once flood waters began to slowly recede, the western half of Hamilton had to rely on aid from surrounding areas on its own side of the river. “The assistance came from Oxford, College Corner and Liberty, Ind., and points between. ‘All along the line, at McGonigle, Woods, Cottage Grove and Lotus, the farmers piled up food and sent it to Hamilton’” (Republican-News quoted in Blount 2002 p 31).

Volunteers did not just bake bread and give up clothes, blankets and money to be sent to Hamilton, although these things were given in abundance, but some also volunteered their time and labor and traveled to Hamilton to lend a hand. “One of the most visible groups was a contingent of more than 40 Miami University students. . . . The students were deputized and assigned police duties west of the river. Their task was to discourage looting and enforce marital law” (Blount 2002 p 37).

The Champion Coated Paper Company distributed (from their less-damaged buildings) water and electricity to the isolated west section of the city for five weeks after the disaster. The company did not charge the city for providing this service, and asked only that “If it is possible, the water rent of the citizens of West Hamilton be remitted during the period in which we furnished same” (Blount 2002 p 38).
Within about a week after the floodwaters receded, “The separated city was linked again by a narrow pontoon bridge” three feet wide, pictured in Figure 13 on the right (Flood at Hamilton). This temporary bridge allowed separated families to re-unite and people from one side of Hamilton to see the extent of the destruction on the other side of the river. The bridge was not the most reliable of structures, as “More rain and a rushing river caused its periodic closing. Finally, part of the pontoon bridge was swept away when it was hit by driftwood” (Blount 2002 pg 32).

Several weeks after this second separation of the city, on Thursday, April 24, “The J. K. Cullen, a ferry, was launched on the river” (Blount 2002 p 32).
Hamilton Citizens’ Relief Committee, this barge, shown in the photograph on the previous page (Flood at Hamilton), Figure 14, was guided across the river by a cable and relied on the power of the current to propel it from one bank to the other. In contrast to the raging current that had so devastated the city, by this time, “the current was often too weak to propel the ferry and a motor was added.” This ferry served as the main east-west link in the city for about four months. It was then used by crews at the direction of the president of the Baltimore & Ohio Railroad, Daniel Willard, to construct a “temporary High-Main Street Bridge in Hamilton, in less than two weeks, reconnecting the split city” (Blount 2002 p 43). The ferry remained in use until “June 21, 1914 – because of ‘a leak, neglected plumbing and overweight’ – the ferry sank in 10 feet of water near the Soldiers, Sailors and Pioneers Monument” (Blount 2002 p 32).

The Hamilton Courthouse served as a temporary morgue for ten days after the flood. Most of the work was done in the courthouse assembly room, and caskets were piled on the courthouse lawn. A public funeral was held on March 30 for 49 victims who had been identified by that date. It was the earliest bodies could be buried, because Greenwood Cemetery was under water until then (Blount 2002 p 25).

Hamilton was placed under martial law, effective Saturday morning, March 29, and was governed by the Ohio militia. Some effects of this included: a city-wide curfew (7pm-6am), the closing of all Hamilton saloons, urging that candles be abandoned in an effort to prevent fires, all water was requested to be boiled before being used, men who were not helping with the clean-up and recovery were targeted by the military, and volunteer police had orders to shoot anyone caught looting (Blount 2002 pgs 28-29). Dayton was also placed under martial law, and had similar restrictions put in place until
recovery and reconstruction efforts could restore the city to a point where the civil government could re-assume daily governance.

**Psychological Impact of the Flood**

The effects of the flood disaster were not only physical and economic, but psychological, as is shown by the available first-hand accounts. This event affected the lives of people in this region as no other event in this time period did. Although it is evident that “For many survivors of the 1913 flood . . . the emotional scars remained for a lifetime” (Blount 2002, p 5), first-hand accounts vary greatly in terms of the author’s assessment of how his or her life was changed. A great wealth of accounts, mostly letters written at the time to family members in other cities or remembrances written later for a collection concerning the flood, has been compiled in the Smith Library of Regional History, located in the Oxford branch of Hamilton’s Lane Public Library and in the Butler County Regional Historical Museum and Archives, near downtown Hamilton. Some of the first-hand accounts are signed with both first and last names; these are often the accounts that were written at a latter date for the purpose of being collected. Other accounts are only signed with first names, which is generally the case for letters sent to family members at the time of the flood. A few sources have no name connected to them. Where I know the last name of the flood survivor, I cite their letters or other accounts with their last name, and where I only have the first name, I note it in the citation.

First-hand accounts concentrate largely on the anxiety people experienced during the flood. This anxiety was primarily due to the multiple unknowns in their situation,
such as how high the river would get, when and if they would be able to start cleaning up, and what they would be able to salvage. But the greatest anxiety arose from not knowing where loved ones were or if they were alive and safe. Particularly in Hamilton, with all of the bridges out and the current remaining far too strong to attempt crossing in a boat, there was little to no communication across the Great Miami during the first several days following the flood. Many men who worked on one side of the river and lived on the other were separated from their families for many days. Blount recounts one of these stories (p 19), and mentions uncertainty and anxiety aspects of the flood (2002 p 31).

Many of the flood remembrances, at least those written by people who were adults at the time of the flood, concentrate on the authors’ actions during the flood in terms of saving their possessions, helping rescue others, what they were able to eat during the flood, and what they found when they could return to their downstairs. Accounts from people who were children at the time of the flood are fewer and concentrate on how aware they were of the situation, their parents’ reactions, and the stories they were told about it afterward.

One of the most pertinent things the first-hand accounts can tell us is the degree to which inhabitants of Dayton and Hamilton expected a flood. As discussed above, there were minor floods, at least in Dayton, that were frequent enough for residents to be unsurprised at the prospect of a rising river, and adopt the attitude, “Lowlands’ll be flooded sure, this keeps up” (Eckert p 36). By the first-hand accounts we have, it seems that many people did not realize that the flood was really a severe one until the water was in their front lawns, sometimes knee-deep (Unsigned account, Puckett, Charles [first name], Keller, Holbrock, Shelhouse). This attitude tells us that minor floods were
commonplace but that truly dangerous ones were few and far between. A flood on the level of the one that took place in March of 1913 was outside of their concept of the river and what it could do.

Another important insight obtained from first-hand accounts is the pervasive nature of mud. Nearly every first-hand account I have read mentioned mud. The flooded cities were literally coated with it when the water receded. Moving water carries sediment – pebbles, sand, and particles of soil – and the faster the water is moving and the more water there is the more sediment it can carry. The massive volume of floodwater and the speed with which it swept over the Great Miami watershed meant that the flood carried an immense volume of sediment with it. As the water slowed down, it could no longer carry as much sediment, and the heavier bits dropped out of the flow and settled on the ground. Gravel and sand were mostly left in the normal stream channels and on farm fields, while heavy clay particles settled in sheltered parts of the valley, where the current was slower. The finest particles did not drop out of the water until it came to a near standstill, in a living room for example, where they would coat everything below the water line (Morgan p 59). Arthur Rahl, not a resident of the Great Miami Valley, but a special correspondent for The Outlook, who traveled to Dayton in order to report on the flood, gave the following description of the mud:

You must see and smell and slip in and become smeared with the universal mud.

This mud—fine black, slimy river silt—was in and over everything. It was as if the first story of all the houses and shops and office buildings...were a mold into which had been poured so much of this infinitely penetrating thin plaster. When the water left, everything that it had touched—walls, furniture, pictures, books, carpets, the goods on merchants’ shelves—was coated with this uniform filth. It lay three or four inches deep on all floors—black, sloppy, evil-smelling. . .
The sight of this unexpected, reptilian substance, burying soft carpets, and the usually inviolate household goods, brought home to the outsider the inhuman ruthlessness of such a flood even more, perhaps, than crushed houses or the poor, still figures in the morgue. One is prepared for smashed and overturned houses, for the sight of death. But about this black and glistening slime, mordant as dye, unescapable as a volatile gas, soaked into the fiber of cloth, worked into the pages of books, there was something malignant and strange. It struck one like a personal indignity, as if smeared on one’s own flesh (quoted in Morgan p 59, 61).

Another description of the flood provided by Morgan is that written by Miss Marot, of the Marot School, at the time of the flood:

At present the city’s problem is mud. We are buried in tons of sticky mud. I have calculated that in our house alone we have one hundred tons. In this, as in most houses, are plastered and buried dishes, silver, books, chairs, furniture. Every drawer is glued with mud, within and without. People put the hose through their pianos, onto their upholstered furniture. We ooze at every pore. The back yards are full of mud—the front yards, steps, sidewalks, streets, basements. Men wade above their knees in mud (p 61).

Mud is briefly mentioned in accounts by Charles [f. n.], Arthur [f. n.], Henry Kessling, Helen Kessling, Shelhouse and an unsigned account as being deep in the authors’ houses. Keller not only mentions it in his house, but also how much one could be paid for cleaning mud out of houses in the uptown district. The mud clearly affected everyone in the flooded district by adding immensely to the clean up work and ruining more of their possessions than would have been ruined by water alone. In addition to the inconvenience of the mud, its ubiquitous nature is also quite significant. Many people in Hamilton and Dayton avoided the loss of a loved one, many avoided the loss of their most prized possessions, many mostly avoided going hungry, cold or thirsty during the flood, and some even avoided the water. But no one who went into the center of one of the cities within at least three weeks after the flood could have avoided the mud. The
mud served as a continuous reminder of the devastation of the flood and an illustration of what the river could do. This strong sensory reminder made sure that everyone in the area knew how inadequate their previous conception of the river had been, and through its persistence perhaps led people to begin developing a new mindset toward the river and its capabilities.

Three of my examples of remembrances were written by survivors who were children at the time of the flood: Bonnie Bookwalter Esterquest, Eloise Ludwig, and Marvin H. Puckett. Esterquest, who was four at the time of the flood, recalls being terrified. Later she realized how much the event had changed her family’s dynamics and joyful approach to life. Ludwig, who was six, recalls regarding the flood as a bit of a lark at the time, but later realizing it affected her family as nothing else did. Puckett, who was three, has no memories before the flood, but the joyfulness apparent in the rest of his memoirs indicates that his family was perhaps not as affected as Esterquest’s. Of the first-hand accounts available, those most likely to be accurate are the letters written at the time of the flood by adults, as these accounts were not distorted by any mis-remembering. Accounts written by those who survived the flood when they were children were written long afterward, and are most likely to have been influenced and distorted by what others told them (Puckett) or by what they have read about it (Esterquest). Most of the major differences among these experiences correlate with the location of the individuals. The worst memories, those with the most trauma and worst after-effects, were Esterquest’s and coincide with where the flood was the most sudden and most severe – in downtown Dayton; her family had to flee on foot when the levee broke, and escape the fire by crossing to different building on the rooftops. Ludwig also lived in Dayton, but evidently
farther from the downtown section and where the levees broke, because her family was able to be rescued from their home by boat. Puckett, on the other hand, lived in Hamilton and his family did not have to leave their house at all. While his memories seem to be the least traumatic, with only the temporary uncertainty about where his father was, the fact that he can remember it specifically and that these are his earliest memories may indicate the importance of these events as much as the memories themselves do. Much of the rest of the difference among these remembrances can likely be attributed to the age of the narrator at the time of the flood, to the unreliability of memories in general and particularly memories of events from so long ago.

Blount recounts a fairly typical survivor’s account of the flood from a letter a Hamilton man wrote to a relative a few days after the flood:

Houses, horses and drift [debris] of all kinds struck us and passed on. . . . Hauling it away now in great loads. The loss of life is fearful, finding bodies all the time. Just think of it, 10 feet of water in our house. A raging torrent. . . . Our porch gone, every window downstairs broken, floors warping, piano, bookcase, books, pictures on the wall gone, china closet fell to pieces, mud a foot deep on floors. I can not describe. . . . We have floor cleaned off now, but the harder we work, the more there seems to do (Blount 2002 p 42).

In the face of such hardships, residents of Hamilton, Dayton, and all the surrounding areas recovered from the flood remarkably quickly. Frank P. Richter, a Hamilton lawyer said of the reaction of Hamilton residents that, “the people discovered in themselves latent energy and recuperative powers, and a faculty for material helpfulness and co-operation which they did not previously dream they possessed” (quoted in Blount 2002 p 58). It was on this base of energy, recuperative powers, and material helpfulness that the Miami Conservancy District was subsequently built.
Part II: The Response – A New Approach

The Miami Conservancy District – What was Done
Chapter 4: Planning, Opposition and Legislation

Planning

Having examined the events that motivated residents of the valley to take action on flood control, I now look at the action they took – what, with the experience of this flood as well as all previous experiences of the river, did they deem to be important?

The traditional, standard view of floods is a short-term one. We do not tend to worry about floods until the water starts to rise or, as in the first-hand accounts mentioned in the previous section, until the water enters our yard, and we tend to forget about floods not long after the water returns to its normal channel (Steinberg p 99-100). The usual response to floods is to re-build any protective structures that failed, perhaps building them a little stronger; the goal is best expressed as “Keep us safe from the next big one.” The goal that was adopted by the residents of the Great Miami Valley was, in contrast, to “Keep the valley [read: cities] safe from all future big ones” (Becker and Nolan p 107). Why they adopted a goal that was fundamentally different in this way is an important question and one we will likely never be able to answer fully. There was a personal level to this decision – a resolution that a flood like this must never occur here again, that going through it once was more than enough for anyone. It is likely that there was also a strong economic factor in this decision. Hamilton and Dayton were large manufacturing centers, not just in this region, but of some national significance. Dayton was home of the National Cash Register Company, the premier producer of cash registers in the nation. Hamilton’s Champion Coated Paper Company was an innovator in the production of colored paper. Middletown’s American Rolling Mill Company, later ARMCO and AK Steel, a producer of steel, was also of great importance. (Blount 2002
It was of economic importance to entrepreneurs in this area that their businesses be, and seem to investors to be, secure. Business interests in New Orleans recognized much the same fact during the monumental flood of 1927 on the lower Mississippi River. When out-of-state investors and potential investors saw in the newspapers that these cities were in danger from flooding, their willingness to invest in businesses and manufacturing in these locations would decrease. In New Orleans, near the very base of the Mississippi River watershed, the business interests had time to do damage control before and during the 1927 flood. Because of its location in the basin, New Orleans had plenty of warning that a flood was coming and because big floods were relatively common on the Lower Mississippi, people believed the flood had a potential to be dangerous. Thus, business interests in New Orleans attempted to do a great deal of damage control before the flood ever reached the city, perhaps with the goal of making it clear to investors that the city was in control of the situation and flooding was not seriously a concern (Barry p 231). In Hamilton and Dayton, on the other hand, no one had any time to react, let alone begin a damage-control public relations campaign before the flood. As has been said, the flood had effectively shut down the city before most residents realized there was danger of a serious flood. Therefore it was not possible for business interests in the Great Miami Valley to attempt to convince investors that flooding had never been a problem. By the time people realized the magnitude of the flood, the best image businessmen could project for their investors was one of a valley able to cope quickly, effectively, and dependably with hardships. The attempt to project just this image may have been an important force pushing for the effective and conspicuous flood protection system.
The first official steps taken after the flood with regard to future flood control occurred on April 18, 1913 when an emergency act was passed by the Ohio Legislature “authorizing the mayor of any city to appoint an emergency commission of not more than four members for expediting repair and reconstruction work made necessary by the flood” (Morgan p 133). At this point, an approach to flood control was being taken that was evidently still a short-term one, which was the most common approach to flooding and flood control. The short-term nature of this approach is evident in the “emergency” nature of the appointed commissions. It is also apparent that the approach was still a local one, one based on municipalities. The first indication of recognition that flood control may be better affected on a larger and longer scale comes in the form of a letter to John Patterson of the National Cash Register Company in Dayton dated April 22, from the flood control committee of Troy (Becker and Nolan p 105):

Our citizens are very much worked up over the flood conditions and the liability for further serious trouble and at a meeting last night, in which steps were taken to immediately overcome the local difficulties so far as possible, it was decided to appoint a committee to meet with the citizens or committee of Dayton and other towns in the Miami Valley, looking to more permanent relief (quoted in Morgan p 133).

At the first meeting of Dayton’s Flood Prevention Committee, which was a sub-committee of the Dayton Citizens’ Relief Committee, held on May 2, 1913, two important decisions were reached (Stevenson p 33): “there was small possibility of quick Federal assistance in flood control, and second, that action would be hastened and public confidence increased if the citizens should raise the fund to begin flood-prevention work” (Morgan p 135). The first decision was likely very accurate as there was at that time considerable debate about what kind of projects the Federal government had the authority
to undertake as well as a power struggle among agencies for who would determine which specific projects should be funded and executed (Ferrell p 163).

The idea evident in the second decision, that public confidence is heightened by public participation, is an idea that is promoted by and incorporated into the current Watershed Management Approach to flood control and river policy (Brady p 19). This idea, briefly, is that people care more about things in which they feel they have been included. Thus when, for example, public meetings are held about a proposed plan, there will generally be less opposition and more co-operation.

The day after the above decisions were reached, the committee met again and passed a resolution calling for a Flood Prevention Fund of $2,000,000 that would “constitute a voluntary gift from the people of Dayton” (Morgan p 136). In this resolution it was stated:

That it is the sense and best judgment of this committee that there be prompt and definite action to determine the cause of the inundation of the city of Dayton on March 25, 1913, and to apply the maximum of human knowledge and scientific skill with the necessary measure of financial resources to prevent the recurrence of a similar calamity.

That to enable this committee to take up the vast program of surveys, plans, specifications, condemnation, contracts, and construction incident to and connected with the work of protection of life and property, to allay the fears and misgivings of the people, and to reinstate the beautiful city of Dayton as an attractive location for home life, happiness and commercial prestige and success, there shall be provided a Flood Protection Fund of $2,000,000 (quoted in Morgan p 135-136).

This declaration, coming so quickly after the flood, of the committee’s intent to “determine the cause of the inundation” through the use of a “vast program of surveys, plans” etc., seems peculiar given that the Army Corps of Engineers, who were and are largely in charge of engineering navigation and flood control works in this country, had an established response to flooding, known as containment theory. It consisted mainly of
building larger and stronger levees (Barry p 157). What prompted the Flood Prevention Committee to place such an emphasis on a thorough survey of the Valley? In fact, at this time there was considerable debate within the Army Corps of Engineers about whether or not they should expand their concentration from “levees only” and begin building multiple-use projects such as reservoirs (Ferrell Chapters 3 and 4). Several other organizations in other parts of the country were also beginning to broaden their concept of water as a resource (Ferrell p 96). While these facts likely influenced the mindset of the Flood Prevention Committee, Arthur Morgan, in his book on the Miami Conservancy District, specifically credits Edward A. Deeds, vice president of the National Cash Register Company (Stevenson p 39), with appreciating the “need for thoroughgoing study as the basis for adequate planning” as well as promoting the idea to the public (Morgan p 141-142); Deeds is widely recognized for this key role (Frost and Nichols p 46). Attending the first meetings of the Flood Prevention Committee in Mr. Patterson’s absence, Deeds was soon recognized as leader of the committee (Morgan p 141), and Morgan is firmly of the opinion that without his understanding and persistence, “the Miami Conservancy project probably would not have been realized with a full and adequate treatment of the problem” (p 147). Much of the momentum behind this project can, it seems, be traced back to a few determined individuals like Patterson, Deeds and Morgan, who saw to it that their vision of complete protection for the Valley would be realized. Arthur Morgan was an engineer who had won national repute for his flood control and drainage projects on the lower Mississippi. Morgan’s company was engaged by the Flood Prevention Committee to engineer and plan a system of flood control. Morgan subsequently became chief engineer for the MCD flood control project (Becker
and Nolan p 105). He would later go on to act as chief engineer of the Tennessee Valley Authority (Stevenson p 38).

Arthur Morgan arrived in Dayton on May 5, 1913 and met with members of the Flood Prevention Committee to outline a program for preparing plans for the possible protection schemes. Later that day the Morgan Engineering Company was “engaged to make surveys and to prepare plans for flood control” (Morgan p 152). Morgan’s early recognition that “here was a problem such as seldom if ever had been handled successfully in America,” and insistence that “thoroughgoing studies and plans would be essential, and that those in authority would need to resist popular demand to ‘make the dirt fly’ in construction before dependable plans could be matured” (Morgan p 152), were key to the formation of the Miami Conservancy District (Becker and Nolan p 105, Stevenson p 41). This recognition, along with the ability of Deeds and others in authority to convey the importance of this point to the public, enabled the District to take an effective long-term and basin-wide perspective in this flood control program, one that otherwise might not have been possible.

Today, there are detailed maps that have been made by the U.S. Geological Survey that cover the entire country. With these or similar maps, it would have been possible to draw up a plan of possible protection schemes within a few weeks (Becker and Nolan p 105). But there were no such maps in 1913, and so little of the Miami Valley had been reliably mapped that the engineers attempting to plan this flood control project had to first conduct a complete topographic survey of the Valley (Morgan p 153). Within a few days of Morgan’s arrival, small teams of surveyors were in the field, mostly collecting first-hand flood evidence. Within two weeks “about fifty men in several
surveying parties were at work on a topographic survey of the flood plain of the Miami River,” and before the end of May the first meeting of a consulting board of hydraulic engineers was held in Dayton (Morgan p 152-153). While surveying work was underway, several “emergency engineering steps” were taken, such as removing debris from the channel, setting up a flood-warning system via a set of new river-gauging stations, rebuilding levees that had failed, and reaching agreements with railroads, cities, and counties that no permanent bridges would be built until the plans for the necessary width and depth could be agreed upon. These immediate actions, although they did not “make the dirt fly,” likely helped fulfill the popular demand for immediate action to some degree. Nonetheless, these things were not readily evident to residents of the Miami Valley as dirt-flying undertakings, and thus there were still “rumblings of discontent” by the end of summer 1913 (Morgan p 154-155).

On October 3, 1913, the Morgan Engineering Company submitted a preliminary report outlining possible plans for protection, which is reproduced in full in Morgan’s *The Miami Conservancy District* (p 155-160). The company had set out to investigate “every possible method of flood protection in order to be assured that no possibilities were overlooked” (p 156). Thus the report includes assessments of the feasibility of different plans involving diversion channels; improving the existing channel via raising levees, straightening the channel and improving the construction of bridges; and storage reservoirs (Morgan p 156, Stevenson p 42). Major diversions of the rivers flowing into Dayton were among the earliest plans found to be impracticable (Morgan p 156, Stevenson p 43). The preliminary conclusions about storage reservoirs were perhaps the most surprising aspect of this report, and it is here that we see the first indication of why
the Miami Conservancy District would eventually take this course of protection. While the construction of reservoirs for flood control was being debated at the time, it was still quite an uncommon course to actually take:

At the time we began our investigations, we did not believe that complete flood protection could be secured by storage reservoirs, and our investigation of this means of river control was carried out chiefly because it has been our policy to examine carefully every possible method of improvement.

We find upon examination that due to the alternate widening and narrowing of the valleys of the Miami, Mad, and Stillwater Rivers, they are peculiarly adapted to the construction of reservoirs. Many of these reservoir sites are made impossible by the locations of towns or railroads. We have investigated all of the more practicable sites over the watershed, and have determined upon six which fully meet the requirements.

We have not completed estimates for any other methods of improvements, but have progressed far enough to make reasonably certain that if all the interests which are affected bear their fair proportions of the costs, flood protection for the Miami Valley can be secured by a system of storage reservoirs more cheaply and more quickly than by any other method. We have outlined a system which will give complete relief from floods to the entire Miami Valley (Morgan p 158).

It was to be expected that the engineers would consider storage reservoirs to be the least likely form of flood protection before the survey work began, as this was still a largely untested approach on this scale; indeed, many respected engineers in the country at the time discredited reservoir systems (Ferrell Chapter 4). This is not to say that reservoirs were a new idea, but rather that they had not yet been used to great extent in the United States (Morgan, quoting the report of the larger consulting board, p 169). This system of protection had been overlooked in part because most of the large flood control works done up to that point were along the lower Mississippi River and in its Delta region. This region does not lend itself well to protection by reservoirs; in order for reservoirs to have enough volume without taking up in impractical amount of land, there must be a fair amount of change in elevation that simply is not found in the lower reaches
of the Mississippi River. “It is only where basins can be filled to a considerable depth that this method is economical” (Miami Conservancy District Official Plan p 84). For this and various other reasons, mostly due to institutional inertia, the U. S. Army Corps of Engineers resisted most forms of flood control apart from the building of levees, in accordance with “containment theory” (Ferrell Chapter 3), a theory that will be discussed in Chapter 7. The system of retention basins also required the co-operation of many counties, cities and towns in the watershed, making it more complex to instigate and effectively implement (Stevenson p 43). In fact, retention basins are most suitable for controlling short, fast-moving floods such as those produced by the size and topography of the Miami River and its watershed, as opposed to that of the Mississippi (Morgan p 164).

It is thanks largely to the exhaustive nature of the investigations conducted by these engineers that they stumbled upon today’s highly successful form of flood protection, and did so rather quickly. One of two important and innovative policies that guided Morgan and all the engineers who worked for him on this project was that of ‘conclusive engineering analysis.’ This policy calls for exploration of every possible solution whether or not it seems promising at the outset. This approach ensures that a better solution will not be overlooked simply because an adequate one was researched first (Becker and Nolan p 130-131). The second of these innovative policies was ‘dynamic design,’ which means that the engineer always considers the design of the work to be in progress and fluid, allowing for changes necessitated by circumstances (Becker and Nolan p 130). Both of these approaches became common practice later but were new in the 1910s.
Once the Morgan Engineering Company had discovered that retention basins would work well and, in comparison with other possible methods, could be quickly and inexpensively constructed, investigations began to center on this system, dropping consideration of channel diversions, and using channel improvements only as supplementary works (Stevenson p 44-45). This turn of the investigation is discussed in the progress report made by the consulting board of hydraulic engineers in January of 1914 (Morgan p 162), in which the members of the board also repeatedly urge care, caution and patience in the completion of the detailed plans for the protective dams (Morgan p 162, 164).

The word ‘dam’ brings to mind images of large hydro-electric dams such as the Hoover, Aswan or Grand Coolie Dams and the gigantic lakes they create, as well as, perhaps, images of farm ponds and small recreational lakes created by more modest damming projects and small ponds and wetlands created by beaver dams. When we think of dams, we tend to think primarily of the water behind them. The dams planned and built by the Miami Conservancy District are not these kinds of dams. They are dry dams, meaning that most of the time they do not actually retain water in their retention basins. After much searching, the engineers found a precedent for dry dams this large in the form of two dams on the Loire River in France that were more than two hundred years old (Morgan p 165). The unusual nature of these dams provided an opportunity for those opposed to their construction to critique them and predict their failure. A basin-wide system based on dry dams on this enormous scale was without precedent. The fact that residents of the valley were unfamiliar with both flood control systems on this large of a scale and this kind of dam gave rise to increased opposition to this plan. Dry dams have
an outlet large enough to permit the average flow of their river to pass through unimpeded (Morgan p 171). Only when the river is in flood do they begin to retard some of the flow, holding it back to keep the river at a level the downstream channel can contain and letting it out gradually. These openings, at least in the Miami Conservancy District dams, are completely open without any kind of gate, as can be seen in Figure 15 above, and operate completely automatically (Morgan p 169-170, 171). Because the retention basins are usually empty of water and because they are most likely to hold water during the wettest part of the year (late winter and early spring), the retention basins present a minimal threat to crops grown within them. In fact, farmlands within the retention basins, as shown by the precedents in France, tend to grow better crops than surrounding farmlands, because when the basins do hold water they are fertilized by the silt that settles out and is left behind when the water recedes (Morgan p 166, Stevenson p 46). This silt is put to use as good agricultural soil, and thus siltation behind the dams and filling-in of the retention basins is prevented. These dams were never meant to be
used for power generation, navigation, or to supply water for homes or irrigation. They created retention basins (also called detention basins) as opposed to storage reservoirs, which permanently store water (Morgan p 171); in fact, these uses would not be supported by retention basins and their infrequent water storage. Storage reservoirs, the lakes behind large hydro-electric dams, are not generally beneficial in terms of flood protection because using them for this purpose requires them to be as empty as possible in order to contain a large volume of flood waters, while all their other multiple uses require them to be as full as possible in order to generate the most power or provide the most irrigation water or the best recreational conditions (Miami Conservancy District Official Plan p 84).

**Opposition**

Opposition to the developing flood protection plan – consisting of a system of retention basins supplemented by channel improvements – came largely from the northern, upland part of the Great Miami watershed (Morgan p 174, Becker and Nolan p 108, Stevenson p 46-47). These areas had seen the least amount of flooding and, under this plan, would be paying the most for flood protection in terms of land. This opposition arose in part from ignorance of the plans and uncertainty concerning how they would work (Stevenson p 47-48) as well as a campaign on the part of local attorneys to discredit the flood control plan and prevent the passage of the law necessary to form a conservancy district within which such a plan could be implemented (Morgan p 193-194). Much of the opposition was based on the misunderstanding that the dams being planned would be used for power generation and profit by Dayton companies at the expense of farmers
(Morgan p 194), and was perpetuated by denouncing the consulting engineers as having been selected to agree with the business interests of Dayton. These accusations included the contention that the flood was caused either in large part or entirely by the “confining of the natural course of the Miami through business greed” within Dayton (Troy, Ohio News of January 22, 1914, quoted in Morgan p 195-196). It is true that large amounts of damage resulted directly from building too close to the river and that this is ultimately the source of most flood damage. However, this particular flood was so much larger than any in recorded history, indeed one of the largest capable of being produced in this basin, that no such flood was foreseen, much less planned for. There was very little Dayton and other cities in the lower valley could have done with the technology and resources available at the time to predict a flood on the level of that of March 1913. Also, a flood this large occurs so rarely that it was entirely outside the residents’ conception of the river, so it was very unlikely that the cities would have been prepared and given the river enough room to contain this volume of water. Opposition also resulted from the fact that the proposed district that would organize and enact whatever flood control plan was ultimately decided upon would form a new political sub-district. The creation of a new administrative district that crossed and disregarded previously existing political boundaries required a significant adjustment in the mindsets of valley inhabitants (Stevenson p 47). Apparently, once the facts were made clear to the farmers, the opposition faded, but this took more than a year (Morgan p 203). One of the main points that changed people’s opinions was likely a clear understanding of how the project would be financed. The fact that those whose lands were not touched by the flood would not be
required to pay for any flood control measures probably helped to change many minds (Morgan p 203).

**Legislation**

The Flood Prevention Committee, informed by the assessments of the Morgan Engineering Company, wanted to establish a large-scale water-control project that was unprecedented, not only in Ohio, but in the United States (the reasons behind the desire for a large-scale project are discussed in more depth in Part III). Thus there was no law on the books that would support such an organization, so one had to be written and enacted before the Miami Conservancy District could be formed (Morgan p 176, 181). The drafting of this legislation was carefully informed by the engineering work done in the Miami Valley in 1913, as well as a thorough review of existing flood-control code in many states (Morgan p 176-177). Arthur Morgan’s first draft was submitted to Judge O. B. Brown, attorney for the Flood Prevention Committee on October 4, 1913, one day after the preliminary engineering report was submitted to the consulting board. In a later letter to Brown, Morgan “noted the proposed districts as ‘conservation districts’ because the constitution [of Ohio] specifically authorizes the organization of such districts” (quoted in Morgan p 178). The final draft of the bill was drawn up with zest and meticulous care by John A. McMahon, with the financial sections written by Horace S. Oakely of Chicago (Morgan p 183, 185-186). The “proper name” to distinguish this act and the bonds that would pay for its enactment from other flood control acts and other bonds was drawn from the Conservancy of the Thames, an organization in charge of the details of “controlling the waters and traffic on the Thames.” Thus the act was named
“The Conservancy Act of Ohio,” and the bonds, “Conservancy Bonds.” The name that has now come into common use in Ohio and several other states was first used in the United States for this law (Morgan p 188-189). The Conservancy bill was signed into law by Governor James Cox, a native of the Great Miami Valley, on February 7, 1914. Since that time the meticulous writing of the law and careful consideration of engineering details have proven most beneficial:

In the organization and execution of the project the Ohio Conservancy Act proved to have legal soundness, practical adequacy, and convenience of administration. Its soundness was attested by the fact that it withstood prolonged and vigorous attack in the state and Federal courts. Its adequacy was described by Mr. McMahon when he remarked that whatever unusual circumstance arose, it seemed that the act had been written to provide for that particular situation. Its convenience of administration is attested by the fact that no other flood-control project of even a quarter of its size had moved to completion so quickly after the law had been sustained by the courts (Morgan p 185).
Chapter 5:  *Construction*

The efforts of many skilled and determined individuals working for the benefit of the Great Miami Valley resulted in the complete construction, within a decade of the great flood, of the first comprehensive flood prevention system in the country. Moreover, it was built and has ever since been maintained entirely by locally-raised funds.

Usually, when a public entity, such as a division of the government, takes on a construction or other capital project, traditionally it hires private contractors to carry out the construction. This was not the course of action taken by the Miami Conservancy District. Rather, the District itself directly took on all the construction and necessary support activities (Becker and Nolan p 115). The construction proposed in the Official Plan was “the largest construction project in the nation up to that time” (Becker and Nolan p 115). Arthur Morgan, Chief Engineer, believed the most practical and efficient way to undertake and achieve such a project was for the District to have direct control. This approach meant that the District had to purchase building equipment, recruit a workforce, build houses and towns for them at the dam sites, lay railroad track, build barges and acquire a fleet of vehicles, among other things (Becker and Nolan p 115).

The construction period lasted from 1918 through 1922 (MCD website). The ‘features,’ the District’s name for the separate elements of the protection, are all designed to withstand up to a certain level of flooding, called the Official Plan Flood (OPF). The 1913 flood is the flood of record in the Great Miami Valley, meaning it is the highest water ever observed here. Arthur Morgan determined, from the survey of the Great Miami Valley, that the largest flood that can occur in this valley would be the size of
1913 plus 20% more runoff. The OPF is a flood the size of the 1913 one plus 40% more runoff, thus giving the District’s system a significant margin of error.

Five dam sites were determined based on such considerations as width and height of the valley, bedrock on which to site the concrete outlets, distance downstream from towns, and location relative to existing highways and railways (Becker and Nolan p 110, Republican-News Supplement). The final locations of the dams are shown on the map on the next page, Figure 16. This map was taken from Becker and Nolan, page 112. The following series of figures are aerial pictures of each of the District’s five dams.
Figure 5: The Five Dams of the Miami Conservancy District.
Figure 18  Huffman Dam on Mad River not far above Dayton  From Becker and Nolan p 184
Figure 19 Englewood Dam on Stillwater River, also not far above Dayton. The Largest of the Dams From Becker and Nolan p 193
Figure 60  Taylorsville Dam on the Great Miami River between Tipp City and Dayton.  Caption Reads “The still-to-be-finished Taylorsville Dam at work during high water in the spring of 1922”  From Becker and Nolan p 187

The still-to-be-finished Taylorsville Dam at work during high water in the spring of 1922. This aerial photograph, from McCook Field’s Technical Data Section, provides an extraordinary view of the hydraulic jump.
In keeping with the District’s goal of being fiscally fair, one which was likely necessary for its political survival, they were very careful to completely reimburse anyone who suffered a loss due to construction of the flood protection features. Thus some land was purchased and flood easements were purchased for other areas:

Such lands as were actually to be occupied by the dams or used for borrow pits or otherwise necessary construction purposes naturally were bought outright and remain in the possession of the conservancy district. Outside of this range, however, the basin lands are not permanently withdrawn from the agricultural service of the community, since only those in the very bottom of the valley will be frequently flooded, and those
near the spillway level will be wetted only in the conjectural, improbable rainfall-and-flood contingencies on which the whole project is based as an ultimate possibility (p 834 of reprint in Becker and Nolan Appendix A).

By the time the Conservancy Law was passed, survey work done, the Official Plan finalized and approved, and construction ready to begin, the United States had joined World War I, and the Miami Conservancy District had to carry out its plans in a war-time economy. One of the consequences of this economy was increased difficulty in finding and acquiring the heavy machinery needed for such a large project (Becker and Nolan p 119-120).

Perhaps the most significant of the many innovations that came about as a result of the construction of these dams and associated flood control structures, certainly the innovation about which the most is written, is the “hydraulic jump.” This innovation was necessitated by the design of the dry dams. The dams are designed, as has been described, to be able to retain large amounts of water, only allowing what the downstream channel can contain to pass through the discharge conduits at the base of the dam. The more water retained in time of flood, the more pressure would be put upon the water flowing through the conduits and the more energy it would have and the faster it would flow. With this much energy, the water would have been able to erode the river channels below the dams, and eventually this erosion would have eaten its way back upstream and possibly undermined the dams themselves. A way had to be found to dissipate the energy of the pent-up water without eroding the stream channels. This way was the hydraulic jump. The theory behind hydraulic jumps was poorly understood at this point in time, and the Miami Conservancy District’s jumps were the first of their kind ever built (Becker and Nolan p 124). Models were developed by some of Arthur
Morgan’s engineers and tested in Edward Deed’s swimming pool before developing the design to be incorporated into the District’s dams. The conduits fed water down a series of concrete steps, over a low wall and into a “stilling pool.” These steps are best seen in Figure 22 above, where water is first beginning to flow into the jump. The low retaining wall and stilling pool are best seen in Figure 23 on the next page. In this photograph, our viewpoint is from the top of the dam down into the empty jump. This design caused the water to pile on top of itself, creating a standing wave that safely dissipated the energy by internal friction, eliminating the risk of erosion (Becker and Nolan p 123). This standing wave is shown in Figure 24, also on the next page. This image also imparts an understanding of how much energy can be dissipated in this way.
Figure 27  Lockington Hydraulic Jump. Caption Reads “View of hydraulic jump pool from top of the wall at Lockington just before water was allowed in through entrance channel June 11, 1919” From Becker and Nolan p 123

Figure 24  The Hydraulic Jump in Action at Germantown During Flood of April 15, 1922 From Becker and Nolan p 125
Another much-touted aspect of the construction orchestrated by the Miami Conservancy District is the organization of the workforce. Becker and Nolan credit Arthur Morgan with being not only a masterful engineer, but also a “social visionary concerned about the improvement of individuals and the community” (p 131). Each dam and other major worksites had associated with it a ‘model village’ for the construction workers and their families, complete with sanitary sewers, water lines, electrical services, a mess hall, schools, and ‘Community Associations’ (Becker and Nolan p 132). Whether or not these efforts were really reflections of a great social vision of Morgan’s or if they were built merely for convenience or to avoid labor problems, they added to the complexity and scale of the District’s achievement.

The dams themselves are earthen mounds constructed mainly of gravel and sand with an impervious clay core, formed with hydraulic fill. Hydraulic fill means that the materials making up the dam were deposited by a flowing stream of water. When this method is used to construct a dam, low embankments are built to define the edges of the dam. Sluices discharge sediment-laden water just inside these embankments and the water flows toward the core pool, depositing sediment preferentially along the way. That is to say that the courser material drops out sooner, leaving the very finest sediment to

![Figure 25 Diagram of how Hydraulic Fill Works](From Becker and Nolan p 127)
settle in the core pool. This fine sediment forms an impervious core. A diagram of this method is provided on the previous page as Figure 25, and a photograph of this method in action during the construction of the Germantown dam is provided below as Figure 26.

The hydraulic fill method requires the flow to be well under control to work properly. The levees along the lower Mississippi are constructed using this same method (Barry). The concrete elements of the dams, the only parts that are not earthworks, consist of the
discharge conduits, the spillway, and the retaining walls, as can be seen in Figure 27 below.

The spillways function as safety valves for the dams. Because these dams are narrower near the top than at the base, they are weaker there. This weakness does not present a significant problem because the upper sections of the dam have to retain water on a far fewer occasions than the lower sections do, and even when they do retain water, they must resist far less weight than the lower sections. Even so, a spillway was constructed in each of the District’s five dams. A section of each dam is left about fifteen feet lower than the height of the remainder of the dam so that, in the unlikely event enough water is ever retained in the basin behind the dam to reach that height, the discharge from the basin will be increased to protect the dam from damage and possible failure. These spillways prevent the water level from ever reaching the top of the dam and flowing over. If water were to overtop a dam, it could erode it fairly rapidly.
Chapter 6: Maintenance, Success, and the District Today

Maintenance and Finance

One of the many unique things about the Miami Conservancy District is the fact that it is and has always been funded entirely by local finances. Nearly every source that discusses the District emphasizes this fact. One of the most hotly-contested issues in the flood controversy described by Leopold and Maddock was who pays for flood control. Since the Federal government made flooding one of its concerns in the Flood Control Act of 1936, all taxpayers have been paying for flood protection works that only protect a small portion of the population. In 1913 the question of who should pay for protective engineering works was, of course, a relevant one, but the practice of everyone paying had not yet been established. Thus, the District came up with a way to finance its undertakings by which the amount an individual paid was proportionate to the degree of protection received. If a property was underwater during the 1913 flood, the owner would have to pay a flood assessment. The amount of this assessment is based on the depth of water on that property in 1913 and the current market value of the property. From these two pieces of information, the benefit the owner of that property gets from the existence of the protective works is calculated monetarily, and the owner must then pay that amount to the District yearly. In this way, the dams, levees and channel improvements of the District’s Official Plan are maintained in proper working order.

Start-up capital for the Miami Conservancy District was provided by Conservancy Bonds purchased primarily, but not exclusively, by residents of the Great Miami Valley. These bonds totaled $34,000,000 (1918 dollars) and at the time it was the “largest special-assessment bond issue for flood control in the nation’s history” (Becker and
Nolan p 116). These bonds were paid off at the end of their 30-year term, at which point the assessments were lowered to cover only maintenance costs.

The conservancy law lays out two basic requirements relative to benefits and costs of the flood-protection project:

1. The total of benefits must warrant the expenditure, and
2. Equitable distribution must be accomplished. Unless the flood-protection project should benefit the property owners within the district in real, demonstrable manner by an amount exceeding the cost of the project, it should not be carried out (Becker and Nolan Appendix A).

In order to demonstrate its economic viability beyond any doubt, the Miami Conservancy District uses a 2:1 cost-benefit ratio. For this system of flood damage reduction to be accepted, it was necessary that the cost of the system be substantially less than the cost of damage it was designed to prevent. With this ratio, land owners do not pay more than half the value of the damage that their property, at its current market value, would sustain under the unprotected conditions of the 1913 flood (Becker and Nolan Appendix A). Thus the ‘equitable distribution’ requirement is met using the flooding factor to ensure “uniform determination of benefits” (Becker and Nolan Appendix A). This calculation applies only to bonds issued by the District for specific construction projects such as the original construction of the dams. The flood assessment is calculated using the same principles, but maintenance rates “cannot exceed one percent of benefits for a property without approval of the Conservancy Court” (Becker and Nolan Appendix A). The Conservancy Court is the governing body of the Miami Conservancy District and consists of one common pleas court judge from each of the counties within the District’s official boundaries (MCD website). The cost of original construction of the flood protection features was $33,000,000, while the benefits they provided were $78,000,000. This ratio
has been maintained over the history of the district; “As of 1983, the District had collected $93,000,000 in assessment for flood control and had prevented flood damages estimated at $235,000,000. Interestingly, 1913 flood damages were $129,000,000; in today’s [1988] dollars, those damages would amount to $1,032,958,636” (Becker and Nolan Appendix A).

Success

The Miami Conservancy District’s system of flood prevention has been and continues to be amazingly successful, with no flood in the last eighty years having caused damage in the protected areas (Bernard). Flooding is still seen in areas along the Great Miami River, and is even seen in some urban areas, as happened in early January of this year [2004]. This fact does not indicate that the flood prevention system has failed, because it was not, in fact, designed to protect the areas that have seen flooding. The system of retention basins and the supplemental levees and channel straightening were only designed to protect the areas that were established cities when the system was planned and put into place. According to Kurt Rinehart, the current manager of rivers and streams for the Miami Conservancy District, “Areas along the river that were later developed ... do not have the same flood protection” (quoted in Bernard).

The flood prevention system has never yet been tested to its capacity, or indeed anywhere near its capacity. The largest flood in the Great Miami River Valley since 1913 occurred in January of 1959, at which point the records were set for three of the five retarding basins for percentage of their storage space in use. The other two retention basins saw their maximum storage during the previous June. The greatest percentage of
storage space that has been used in a Miami Conservancy District basin in the 82 years since construction was completed has been 31.8 percent at the Germantown Dam on Twin Creek during the flood of January 1959. This same flood set the records at Taylorsville Dam on the main stem of the Great Miami River between Tipp City and Dayton at 11.6 percent, and at Huffman Dam on the Mad River at 15 percent. Englewood Dam, on the Stillwater River, and Lockington Dam, on Loramie Creek just above its confluence with the Great Miami, both had their maximum storage records set during June of 1958 at 21.1 percent and 17.1 percent, respectively (MCD website).

Records of stream flow in this country are kept by the United States Geological Survey, and one of the many records kept is annual maximum peak, which measures the highest a stream gets each year.

![USGS Graph](http://waterdata.usgs.gov/nwis/sw)

**Figure 28** Yearly Maximum Flows of the Great Miami River at Dayton From [http://waterdata.usgs.gov/nwis/sw](http://waterdata.usgs.gov/nwis/sw)
In the graph on the previous page, each point represents the highest discharge of water in the Great Miami River to go past the monitoring point in Dayton in its corresponding year. This particular site has records for every year from 1893 to 2001. The graph shows that the Miami Conservancy District’s flood prevention system is not very likely to be tested to its capacity. The 1913 flood is very nearly three times larger than any other flood recorded in Dayton in over a century.

The same observation can be made from the above graph of data from Hamilton, Figure 29, where the 1913 flood was more than three times larger than any other recorded flood event. It is useful to compare these two graphs to one of data from Sidney, a city that is much higher in the watershed than Hamilton and Dayton, and is not protected by
any of the District’s dams. The flood record for Sidney begins with the flood of 1913, so this datum is a little hard to see on the far left of the above graph, Figure 30. At the measurement site for this graph, the flood of 1913 was only slightly more than twice as large as the next largest flood. Also, because this site is upstream of the others and because the river level at Sidney is not regulated by any dams upstream of it, the annual peaks vary more than they do in Hamilton and Dayton. The first two graphs may suggest that no flood since 1913 would have come close to causing a comparable amount of damage and destruction even without the Conservancy District’s flood protection system. However, the Sidney site, where the water levels are not regulated by the dams, serves to show that the peaks at the downriver sites have indeed been visibly altered as a result of
the construction of the Miami Conservancy District dams. If we were to extend the fluctuations seen in this last graph downriver to Dayton and Hamilton, we can see that the protective works have likely prevented a great deal of damage. Because the District’s flood control works were planned with such an abnormally large flood in mind, it is highly probable that these works will continue, provided they are properly maintained, to be as successful as they have been.

The most recent occasion on which all five of the Conservancy dams were retaining water was in the first week of January of 2004 when between two and five inches of rain fell across the valley in a span of three days. Twin Creek was at 48.6 feet at the Germantown dam at the end of this three day period. The conduits through the dam are twelve feet high, meaning that twelve feet of water was flowing through them and the dam was storing 36 feet of water. This depth represented a volume of less than fifteen percent of the dam’s capacity (MCD website).

The Miami Conservancy District’s flood-control structures, so meticulously planned, fought for, constructed, monitored, and maintained have worked very well for the last eighty years, and are very likely to continue doing so. This statistic is remarkable because most conventional dams have an operating life of between fifty and one hundred years before their reservoirs are filled with sediment, rendering them useless (Fradkin). Because these are dry dams, not conventional ones, the reservoirs are in use for most of the year. Rather than merely providing a place for sediment to accumulate, this dam design allows the sediment to be put to agricultural uses and thus there is very little or no net accumulation of sediments.
The District Today

While the basics of what is necessary to provide protection from floods have not changed since the Miami Conservancy District was formed in 1915, nearly everything else has changed – especially how we conceptualize not just floods, but rivers. At the time of the formation of the District the only concern, and a very powerful concern so soon after the devastating flood of 1913, was to control and manage flood waters. Since then the concentration of the District has expanded and grown to include many other aspects of water management.

The Miami Conservancy District’s website characterizes the current challenge as being “to protect and preserve the Great Miami River watershed and our region’s valuable water resources,” which gives an indication of how the District’s emphasis has changed over its nearly 90 years of existence. A clearer picture is gained from the District’s mission and vision statements, also found on their website. “Our Vision... Healthy watersheds that support sustainable communities and a higher quality of life for our generation and those to come.” “Our Mission... Protecting lives, property and economic vitality by providing unfailing flood protection, preserving water resources, enhancing river corridors and conserving valuable land within the Great Miami River Watershed.” The District also characterizes its current programs as “well-integrated, tying flood protection, water resource monitoring, recreation and conservation together in an effort to improve the management and quality of our region’s water resources.”

In this exploration of today’s MCD, the important part is not so much in how well they are doing what they claim to be, but rather in comparing these claims and their goals to their past goals as well as to other approaches to managing floods, rivers, and
watersheds, as well as being interested in what mindset and viewpoint is reflected in the choices of these goals and claims.

The District’s four listed goals are as follows:
1. Mitigate flood damage to properties within the watershed.
2. Collect and analyze water resource data that supports sound management of the watershed.
3. Develop a system of greenways along the stream corridors that provides recreation, wildlife habitat, and water supply protection.
4. Improve the quality of water resources in the Great Miami Basin.
(MCD website)

These goals reveal the expansion of the MCD’s mission since it was established, following a tendency of agencies and bureaucrats that is well-documented in political science literature. At the beginning of its existence, the Miami Conservancy District’s only goal was to construct and maintain flood protection structures in the valley such that severe flood damage would be eliminated from protected areas. This goal has been successfully met, as discussed in the previous section, and more goals have subsequently been added. This statement is not to imply that these new goals came about merely in order to give District employees something new toward which to work. For one thing, the maintenance and monitoring of the flood protection works is neither a small nor an unimportant task. Goal #2 above can be conceived of as an elaboration of this original goal, and not necessarily an expansion. Also, these new goals reflect important aspects of the evolving conceptualization of rivers. I believe these expanded goals show that the structure of the Miami Conservancy District lends itself quite well to addressing problems in addition to flood control.

Many specific programs have been and are being organized and/or funded through the Miami Conservancy District, most having to do with establishing and
maintaining greenways along river corridors or other means of promoting ecosystem health.
Part III: The Difference – The Miami Conservancy
Policies and National Policies
Critique of the Response – What it Means

The flood control controversy into which the Miami Conservancy District emerged was, and is still today, basically twofold. The first point of contention is over who is responsible for providing flood control; the second is over what is the best method of flood control.

People who live in areas where it floods frequently tend to advocate federal responsibility and financing of flood control projects, whereas those who live where flooding is less frequent tend to believe that the responsibility and financing of such projects should come from a more local level. The Miami Conservancy District addressed this half of the controversy very efficiently, due at least in part to the magnitude of the 1913 flood. Because this flood was so abnormally high, the damages it caused were abnormally high. Those who benefit directly from the MCD works – as measured by the level of the 1913 flood – are the only ones who pay for them. It was an approach no one could argue with at a time, when the federal government’s role in financing projects was much smaller than it is today, and when there was no precedent for federal financing of any similar projects. This solution seems as though the MCD simply took one side of the issue. While this perception is correct, the District also had good reasons to respond to those who would argue for the financial burden to be spread over a wider area, the most important of which was the likelihood that the project would then never be carried out. Advocates for spreading the cost could argue, legitimately, that the benefits of flood control structures extend beyond the area that would be flooded.
without them. However, at that time there was a debate raging within and between the different federal agencies that had some jurisdiction over flood control projects. This debate concerned the possibility of multiple-use projects and which agencies would be responsible for deciding which projects would be financed and carried out. Because the development of federal power in the area of flood control was haphazard, there was no clear solution to this debate. With this heated controversy taking place, the protection of the Great Miami Valley from floods may have never been realized had it been turned over to the federal government. Spreading the financial burden equally throughout the valley was also not a viable option, as the majority of opposition to the District was coming from people whose houses had not been flooded in March of 1913, and it made formation, successful legislation, and co-operation much more likely if these people could be re-assured that the District did not constitute an exploitation of the rural uplands by the floodplain cities, but could instead demonstrate the fairness of their financial arrangement. Flood control, as it was experienced along the Mississippi Embayment in the nineteenth century, only gradually came to be accepted as an issue of such a large scale that it could only be adequately addressed by the federal government. By 1913 this gradual acceptance had not reached the point where the federal government would have been likely to address the Miami Valley flooding, even without a heated debate at the federal level.

The second part of the controversy is how to actually go about controlling floods. This part usually comes into play, in practice, after it has been determined who will finance and otherwise be responsible for a particular project. Theories regarding flood control vary widely and have often been contradictory. The next section examines two
very different approaches to flood control, “levees only” and Watershed Management. I will and then compare each of these approaches to that taken by the Miami Conservancy District.
Chapter 7: Old and New – Downstream and Upstream

Approaches to controlling floods can be separated into upstream and downstream approaches. Downstream approaches are those that attempt to separate the storm waters from valuable property once the water is in the main channels of the river system. Upstream approaches are those that attempt to retain storm waters on the land or in the upper reaches of the watershed, delaying them and thus preventing a rapid rise of water downstream and therefore a flood. Generally speaking, the history of flood control in this country has moved from downstream approaches to upstream approaches, mirroring the history of environmental protection moving from basic, human-centered concerns and approaches to larger, system-centered ones.

Levees Only

The oldest approach to flood control in the present-day United States is the building of levees, first documented in New Orleans in 1726 (Barry p 40). Levees are earthen hills or walls that raise the level of stream banks so that it takes a higher water level to overtop the banks and cause a flood. The construction of levees has been the preferred approach of the U. S. Army Corps of Engineers since flood control became part of its authority in the second half of the nineteenth century. Levees were likely built before that time by individual land owners, usually to protect their farms, as well as by municipalities, chiefly to protect their business interests. Levee construction has been most intense along the lower Mississippi River (below the confluence with the Ohio River), where the land is very valuable as farmland and also very low-lying. The levees
in this region resemble large natural hills and are the highest landforms in sight (Barry p 190).

Levees were not merely the preferred flood control approach of the U. S. Army Corps of Engineers, for over half a century, they were the only approved approach. For many years the Corps’ approach to flood control has been accurately nicknamed “levees only.” This approach grew out of a complex set of circumstances involving scientific studies, personal rivalry, and confusion of conclusions. The best way to understand this approach, and to examine some aspects of the flood-control controversy, is by looking at how it came to be the federal flood policy.

The argument originally used to justify the “levees only” policy was called “containment theory” and was developed based on observations made on the Po River, an alluvial river, in Rome during the seventeenth century by Giovanni Guglielmini. Alluvial rivers are those which flow through channels and valleys filled with sediment that they deposited; the Mississippi below Cape Girardeau, Missouri, 30 miles north of Cairo, Illinois, where the Ohio River joins it, is such a river (Barry p 39). Guglielmini argues that alluvial rivers such as this one always carry the maximum possible amount of sediment, thus the faster the river is moving, the more sediment it has to carry.

The main source for this sediment had to be the riverbed, so confining the river and increasing the current forced a scouring and deepening of the bottom. In effect, the adherents of this theory argued, levees would transform the river into a machine that dredges its own bottom, thus allowing it to carry more water without overflowing (Barry p 41).

Theories that were developed on and worked for other rivers, however, did not seem to apply to the lower Mississippi, which served as this country’s early testing ground for approaches to flood control.
The history of “levees only” in this country has been fraught with conflicts and controversy. The first definite involvement of the federal government in flood control was to commission a study of the lower Mississippi with the intention to investigate not only how the river worked, but how it could best be controlled and tamed (Barry p 21, p 37). Right from the beginning, a conflict between civil and army engineers that had existed since the formation of the Army Corps of Engineers (Shallat p 2) interjected itself into this issue. After the commission had been given to Captain Andrew Atkinson Humphreys, an army engineer, the country’s civil engineers demanded that the commission be given to a civil engineer as well (Barry p 37). The commission money was eventually split between Humphreys and Charles Ellet Jr., who was one of the most highly-regarded civil engineers in the country and the only one with a European education, having attended the best engineering school in the world, L’Ecole des Ponts et Chaussées in France (Barry p 36). Each of these men had a unique and interesting life story, very different from the other’s, which is likely what led them to take very different approaches to their commission. Humphreys saw this assignment as his opportunity to make a name for himself, and became rather obsessed with his report. Ellet on the other hand had already been making a name for himself by building the first and longest suspension bridges in the United States and innovating in that area of engineering, and took a much more relaxed approach to his report. Whereas Ellet reasoned and drew his conclusions from rather scant hydrologic data, Humphreys and his assistant, Lieutenant Henry Larcom Abbot, collected masses of detailed hydrologic data on all imaginable aspects of river flow and flooding. Humphreys worked intensively, talked to reporters so much that his superiors deemed it excessive, and became rather erratic. Rumors were
heard that Ellet had nearly finished his report, and shortly afterward Humphreys seems to have had a nervous breakdown (Barry p 44), leaving him unable to work on his report and it was eventually delayed by about a decade.

Ellet, in his report, took the position that the channel had already been too constricted to enable adequate protection from flood damage (Barry p 45, Ferrell p 14). He proposed that the best way to rectify the situation was to allow and aid the restoration of the natural processes that retain water on the land and store storm waters (Ferrell p 14). He was one of the earliest to recognize that floods were increasing because of the actions and constructions of humans in the watershed. Ellet contended that there were actions that could be taken and engineering works that could be constructed that could counteract the previous, damaging actions (Ferrell p 15). His main recommendation was for a “comprehensive approach to control of floods, including improving levees, enlarging natural outlets, and adding artificial outlets and reservoirs” (Barry p 45). He had reasoned that it would be best to attempt to restore the natural regime of slowing down storm water to avoid a rise in the main channel of the river (Ferrell p 21-22). Thus, his conclusions were completely contrary to the advocates of “levees only.” That was largely because he had observed that the theories on which this position was based simply did not apply to the Mississippi.

When it was finally completed in 1861, Humphreys and Abbot’s report examined and evaluated many different possible approaches to flood control (Ferrell p 26) and was thoroughly supported by good quality data. It received very little attention until the end of the Civil War, at which point it was widely praised and quickly recognized as one of the most influential engineering reports ever written (Barry p 50-51). The data in the
report are still considered reliable and instructive (Barry p 53), but the conclusions drawn from this collection of data have since been seriously questioned. Many times throughout his report, Humphreys dismissed the “levees only” approach, seeming to favor using outlets (Barry p 52). This dismissal seemed to be supported by his data, but he eventually concluded that levees were the only method by which flood damage was assured of being lessened or eliminated, and that there was no evidence that any other system would work (Ferrell p 26, Barry p 53-54). This seeming contradiction was a result of Humphreys’ need to make a name for himself and for his report to be the most important and most influential. Since Ellet’s report had already debunked famous European theorists ten years earlier, Humphreys would not achieve great recognition by merely confirming Ellet’s findings (Barry p 53). So he attempted to demolish Ellet’s methods and findings, apparently inventing arguments to justify his rejection of outlets (Barry p 53). But even though, as part of his effort to distance himself from Ellet and the outlets and comprehensive planning Ellet advocated, Humphreys was recommending levees and only levees, he continued to reject the hypothesis that supported containment theory and the “levees only” approach to flood control. Even though Ellet’s study has since come to be recognized as drawing many valid conclusions, it was Humphreys’ study that determined early federal policy toward flood control. This choice was likely made because of the greater thoroughness of Humphreys’ report, the fact that he was advocating a familiar and proven method of flood control, and, simply and rather crudely, Humphreys survived the Civil War and Ellet did not.

Levees can be classified as a downstream approach to flood control, probably the farthest downstream of approaches. Jetties, a variant of levees, extend out into the Gulf
of Mexico (Barry p 89). Levees are built where the flooding occurs and are only effective at that particular location. Levees are usually found along main channels of rivers where valuable property of one kind or another is located close to the river. A system of levees takes into account nothing except how high and powerful the water gets at that spot. This limited view, not so much its location, is what makes the approach a downstream one. When planning and constructing levees, the issues at hand are purely engineering ones, and are further limited by space. Some things not considered and not included in a “levees-only” system are: where the high water is coming from, what factors have contributed to making the water high, and the ecosystem where the levee is planned to be built, much less the ecosystem upstream. This approach to controlling floods only considers the simple, straightforward aspects of a flood, and ignores the larger systems within which floods occur and can be understood. The view of flood control inherent in the “levees only” approach reflects a similar view of the river and of the environment as a whole. That is to say, along with the “levees only” approach comes an attitude of detachment and exploitation toward the river behind the levees. As Barry describes it for the Mississippi, to strive to completely control a river requires hubris (p 21). This agenda comes from a worldview that does not include the complexities of ecosystems, but rather the belief in defined, soon-to-be known and understood laws that will facilitate engineering projects through which human societies can dictate answers to such natural problems as flooding.

“Levees only” fixes a problem by addressing the symptoms without attempting to understand the causes of the problem. It worked well when large portions of watersheds remained largely unaffected by human activities, and the only areas we had any reason to
be concerned about were those where we lived and kept our damageable property. There are now very few watersheds on Earth which can be said to be largely unaffected by human activities, and the “levees only” approach is no longer a responsible one to take in, for example, the Mississippi River Basin.

**Watershed Management**

Watershed Management is not only a system of flood control; it is an approach to managing the complete river system and therefore takes much more into account than traditional approaches to flood control do. Watershed Management addresses not only issues concerning excess water quantity, but also shortages of water and issues concerning water quality, as well as ecosystem health and sustainability. This approach conceptualizes rivers and their watersheds as parts of complex, integrated systems. While this approach acknowledges that we do not yet completely understand these systems, it holds that managers of rivers and watersheds should make use of the parts we do understand to assist in meeting their goals.

Watershed Management is neither a discipline nor an engineering practice, nor does it tend to produce one-time solutions such as constructing a levee or a dry dam. In this case the structure is built and completed and then only needs to be maintained as it was built to serve its function fully. Watershed Management is an on-going process in which the evaluation of current methods and policies and subsequent adaptation of them as needed is integral.

One of the chief drawbacks of Watershed Management is that the federal government has no real authority to institute, enforce, or finance such projects. Much as
flood control was seen in the first half of the nineteenth century as outside of the powers of the federal government as established by the *Constitution*. The issues dealt with by Watershed Management are not seen as issues suitable to be addressed by the federal government. One of the things that makes it difficult for Watershed Management to be administered on the federal level, even if legal justification for it existed, is the heterogeneity of watersheds. A levee, while it may need to be adapted and modified slightly to function optimally at its particular location, is basically the same structure meant to address the same issues. These issues include: highest likely flood, speed and power of water, condition of bedrock beneath the levee, etc. In contrast, the issues that need to be addressed under a Watershed Management approach vary greatly from watershed to watershed. For example, an urban watershed with lots of pavement, roofs, and other impermeable surfaces will have a very different flooding regime than a similar-sized rural watershed; whether it is an agricultural or a forested watershed will also make a difference. Watershed Management is designed to be adapted to the conditions, needs, and problems of every individual watershed on which it is applied.

Watersheds with different areas have to be dealt with in completely different ways as well. Watershed Management will simply not work on the scale of the Mississippi, nor even on the scale of the Ohio River. At the other end of the scale, it would be pointless to come up with a Watershed Management plan for a stream the size of the one that feeds the Duck Pond on Western Campus, or even one the size of Collins Run, in Oxford, Ohio. Collins Run is not likely to have any problems that cannot be addressed in other ways, or that are worth the time and money to develop complex plans to mitigate them, while large watersheds such as the Ohio’s are so diverse that it would be
impossible to enact a comprehensive Watershed Management plan that involved so many people and so many different concerns.

Because there is no real, established, governmental authority for the creation and enactment of the Watershed Management programs, such programs are voluntary. Rather than being a ‘command and control’ approach as was common for environmental laws in the 1970s, a ‘consensus and co-operation’ approach must be taken to Watershed Management in order for it to have any potential viability. This factor is another of the main reasons specific regulations regarding Watershed Management cannot be dictated at a high level of government. Consideration of local issues is essential, and compromise and adaptation to fit the specific and unique circumstances of each watershed are necessary. These characteristics make the practice of Watershed Management very different indeed from the prevalent practices of other, more traditional, approaches to flood control.

Watershed Management is at the opposite end of the spectrum from “levees only.” Watershed Management, as the name says, takes the entire watershed into account, not merely where the symptoms of the flooding problem occur. Watershed Management is thus an upstream approach to controlling floods. Some of the more common aspects of Watershed Management programs include no-till agriculture, retention of water on upland sites prior to reaching a channel of any size, and minimizing impervious surfaces such as parking lots (Andoh and Declerck). These aspects all focus on slowing down precipitation on its way to stream channels, the best way to minimize storm surges in rivers, the most common form of river floods. Watershed Management is difficult to discuss in terms as narrow as those used for “levees only” because of its
complex nature. The most important thing all Watershed Management programs have in common is a conceptualization of the entire river system, integrating human and natural aspects and striving toward the enactment of a co-ordinated, concerted plan focused on the health of the entire system. Now that nearly all areas of most watersheds, from the mouths to the headwaters, in this country, certainly in the Midwest, have been strongly affected by the actions and industry of humans, it has become necessary to take all the areas of and all the issues in a watershed into account when enacting policy or taking some action that will impact a part of the many interlocking systems present in a watershed. It is no longer responsible to simply build a levee or other flood-modifying structure and not take into account the upstream and downstream consequences it could have or the consequences for water and habitat quality, among many other issues.
Chapter 8  Newer than Old:  *Comparison of Miami Conservancy Approach and Downstream Flood Policy – How the MCD Moved Toward Watershed Management*

The largest flood in recent memory in the United States occurred in 1993 on the upper Mississippi River, inundating large areas of land in Iowa and Missouri. Concerning the effects of this flood at Hannibal, Missouri, Ted Steinberg commented:

But in this instance, at least, the [Army Corps of Engineers] stood vindicated, and the agency pointed to its success as evidence of the effectiveness of the structural response to floods. Build a wall high and wide enough and it may well succeed in engineering a city out of harm’s way (p xvi).

Just prior to the great flood of 1993, the Corps had completed a floodwall that protected Hannibal’s historic downtown and Mark Twain’s boyhood home, which is now a museum. This floodwall did not and was not designed to protect the areas of the city where the poorest residents lived (Steinberg p xvi, xvii). While the downtown area did remain free of floodwater, the poorer sections of town saw almost eight feet of it (Steinberg p xvii). The approach to flood control chosen by the town of Hannibal, approximately seventy years after the completion of the Miami Conservancy District projects, was an example of the older “levees only” approach. With this approach, the planners did not consider the effects of or effects on any parts of the system other than the small, specific areas designed to be protected. The experience of the 1993 flood reveals one of the weaknesses of that approach, even when it is working as planned.

This approach and theory were questioned before the 1913 flood of the Great Miami River, but the plan drawn up and executed by the Miami Conservancy District was the first one of significance that was in direct opposition to the stated policies of the Army Corps of Engineers. Within the context of the national-level controversy over
flood control at the time, the Corps tried to block the Conservancy District from carrying out its plan, but as there was no federal money financing it, they could not do so (Barry p 159).

Steinberg’s statement “build a wall high and wide enough and it may well succeed in engineering a city out of harm’s way” seems as though it could be applied to the instance of the Miami Conservancy District as well. The walls, in the form of dams and some supplemental levees, are big and high enough that they seem to have engineered the urban areas of the Great Miami Valley out of harm’s way for at least the foreseeable future. But this comment does not, in fact, directly apply to the system in place in the Great Miami Valley, because Steinberg is describing the mindset behind the practice of building levees nearly exclusively, and an entirely different approach to flood control was taken by the Miami Conservancy District.

The “levees-only” approach was based on theory developed on a river system very different from those on which the United States government was trying to apply it; “levees-only” was a blanket approach, often used without detailed consideration of the system in which the levees were to be constructed. It is in this area that the approach taken by the Miami Conservancy District differs most significantly from that advocated by the Army Corps of Engineers. Both approaches depend upon engineering solutions to the ‘flood control problem’ and both of these solutions center on the use of massive earthworks to retain high water. Indeed, levees themselves are an integral part of the flood control system in the Great Miami Valley, and the current degree of flood damage mitigation could not have been achieved for the urban areas without them. Before 1913,
levees built under the “levees-only” approach were also funded (nearly) exclusively by locally-raised funds and administered by local ‘levee boards’ (Barry p 125).

What made the Miami Conservancy District unique were the time and resources devoted to tailoring a flood protection system to the particular geologic and geographic settings of this valley and its cities. With this effort to tailor-make a protection system came a need to thoroughly examine the entire valley. It was this concern (held chiefly by Patterson, Deeds, and Morgan) with finding the best engineering solution specifically for the Great Miami Valley that led to the design of its new, unusual, and monumental system. The other factor that contributed significantly to differentiating the MCD approach from “levees-only” was its long-term perspective. Both the large-scale and long-term aspects of the perspective taken by the Miami Conservancy District’s founders may have arisen partially out of a desire to maintain the economic viability of the area.

Even land that had not been flooded was taken into consideration and included in the design of the flood protection system. The planners considered how this land contributed to flooding, how it could be used in a system, and how it would be affected by the system as a whole. The fact that these things were considered makes the MCD approach more of an ‘upstream’ one than “levees-only,” and is the major way in which it moved toward a Watershed Management Approach.
Chapter 9  Older than New: *Comparison of Miami Conservancy Approach and Upstream Flood Policy – How the MCD is Not There Yet.*

At the time of its formation, the Miami Conservancy District had the goal of controlling and managing flood waters to protect and preserve the watershed and the region’s valuable water resources (MCD website). This single-goal approach to dealing with a river is quite contrary to the Watershed Management approach, in which, as has been discussed previously, many different concerns of all the stakeholders within a watershed must be taken into account. But so soon after the devastating flood of 1913, flood control was more than likely the chief concern of most people in the Great Miami Valley, at least those in the low-lying areas. Since its foundation, as the residents of the valley have become less concerned with flooding (Blount 2002, p 5), the mission of the MCD has gradually expanded to encompass many more aspects of its role as a public trust in charge of water resources. These aspects include programs in groundwater preservation, river corridor improvement, land conservation and storm water quality management (MCD website).

The main points in which the Miami Conservancy District still falls short of the Watershed Management approach today are that its stated goals are not a cohesive whole and do not represent an over-arching plan for the continued health of the watershed, and that ecological concerns are not as important in the MCD policy as they are in many Watershed Management plans. The major reason for this piecemeal development is that all programs undertaken by the District or with funding from the District need to be justified in terms of protecting the resources of the watershed. Whatever projects the MCD undertakes must not reach beyond what is allowed within the Conservancy law of
1914. This requirement places some limitations on the ability of the District to formulate and implement plans that are centered on ecosystem health.

Although the Miami Conservancy District has been unable to implement a usual form of Watershed Management, it has provided a way for aspects of such a program to be introduced into the valley in a familiar context. Because the District is a division of the Ohio state government, enforcement of a comprehensive and cohesive Watershed Management plan is outside its power, as it is for the federal government (see Chapter 7). However, the MCD was founded with a definite and sound base on a specific law, which had been written while carefully taking into consideration the diverse interests in the watershed. Thus the district was able to be organized in such a way that it allowed for the inclusion of aspects of a Watershed Management approach, without being hampered by the requirements of consensus and voluntary co-operation, as such programs often are (see Chapter 7).

As discussed in Chapter 7, the goals of the Miami Conservancy District have expanded considerably in its nearly 90 years of existence to include several programs that resemble measures often included in a Watershed Management program. However, these programs are being administrated by a governmental organization with a greater ability to enforce its programs than most Watershed Management projects have, as they are often designed and administered by local universities. Although the District is only able to implement such programs in a piecemeal way, dependent upon each program’s benefits to the valley’s water resources, it is able to implement them and is gradually expanding its mission and goals. In watersheds without a Conservancy District or similar regional governmental organization to address these issues, they have to be addressed using a
Watershed Management approach. These approaches are rather undependable, because they are usually organized by universities and therefore are contingent upon funding from grants and upon a local university having a faculty member interested in conducting research in this area. The administrative framework of the MCD is much more thorough and supports such projects better than university-based Watershed Management frameworks are able to do. Significantly, the Conservancy District system is inherently a longer-term and larger-scale way to approach Watershed Management.

Throughout its history, as can be seen on its website, the Miami Conservancy District has been taking on more and more aspects of a Watershed Management approach to river management, broadening its area of responsibility from only flooding and the relatively simple, unchanging concerns for that endeavor, to include several more environmentally-centered goals and the more complex and changing concerns that go along with these endeavors. While there are significant legal limitations to integrating a Watershed Management approach with the existing structure of Conservation Districts, there are also several potential advantages.
Conclusion

The 1913 flood of the Great Miami River was not only the largest flood on record in this valley in terms of water discharged, but also in terms of lives lost, damage done, and people affected. The lives of the survivors were profoundly impacted as well as the way they viewed the Great Miami River, and, to an extent, nature in general. The response to the damage this flood caused was unique; it was remarkable for its thoroughness, meticulous planning and local financing. Much of what made this response unique is attributable to a few individuals. John Patterson and Edward Deeds seem to have understood the necessity of taking a long-term, basin-wide perspective when addressing the Miami Valley’s flooding problem. They secured the help of Arthur Morgan who took such a perspective and is responsible for the design of the watershed-sized system of flood protection works. For the Miami Conservancy District to form and carry out its mission of protecting the Miami Valley from flooding, several things had to happen: a new kind of legislation had to be passed and subsequently proven in the courts; a kind of flood control that had never been used in the United States had to be adapted to this valley; hydrologic principles that had previously been only poorly understood had to be explored and become the basis for inventions used; and all of these new ideas had to succeed against the forces of precedent and established policy. While these new and unique aspects of the Miami Conservancy District represented a significant change in mindset from that represented by the “levees only” federal approach to flood control at the time, mindsets have since developed that go beyond those evident in the MCD approach. Since the environmental revolution in the second half of the twentieth
century, opinions have turned against structural, engineered solutions to river management, largely because they have traditionally been short-sighted, as the Hannibal, Missouri, example illustrates.

Not only have the flood control structures built by the MCD been successful, but the administrative structures the organization has built have also been successful in terms of adapting to and incorporating the mindsets and ways of thinking about the environment and its relationship to human societies that have emerged since the MCD began. The administration of the MCD was methodically organized in such a way as to deflect all the challenges of unconstitutionality that it had to face; this organization also, although probably not intentionally, left room for the expansion of the District’s goals to include environmental and ecosystem health and viability. Thus the example of the Miami Conservancy District serves to show that engineering solutions to flood control problems can be successful in the long term if they have been specifically designed with a long-term and large-scale perspective.

The Miami Conservancy District continues to incorporate new ideas of river management and more aspects of the Watershed Management Approach. Because it is a division of the state government of Ohio, it is not likely that the MCD will expand so far in this direction as to have a full-fledged Watershed Management plan. The constitutionality of conservancy districts has been upheld in Ohio’s Supreme Court, but the problems of cooperation and consensus remain, and even in the context of conservancy districts, the government does not have the authority to carry out Watershed Management programs. Thus, the most the District is able to do is provide a structure to facilitate the component parts of a Watershed Approach. As time goes on, the District
will likely continue to expand its goals and mission to include more environment-centered programs. Thus, this unique response to an abnormal flood 90 years ago will continue to stay on at the forefront of flood control and river management.
BIBLIOGRAPHY


Climate Diagnostics Center website: [http://www.cdc.noaa.gov](http://www.cdc.noaa.gov)


“Flood at Hamilton, Ohio Historic Disaster Illustrated” Located in the Smith Library of Regional History, Lane Public Library, Oxford, Ohio.


Keller, Jacob J. “FLOOD LETTERS – 1913.” Butler County Regional Historical Museum and Archives, Hamilton, Ohio. Folder: Flood/1913 Remembered, April 1913 (?).


Shelhouse, Daisy Hancock. “1913 Flood.” Butler County Regional Historical Museum and Archives, Hamilton, Ohio. Folder: Flood/1913 Remembered, undated [later than 1913].


