When the Fake Replaces the Real: How a Model Changed a River

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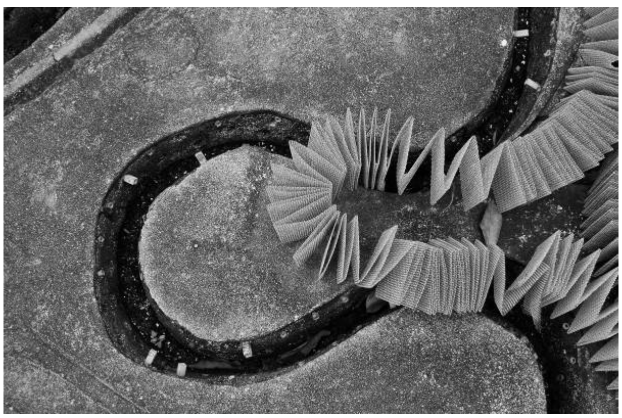

Figure 1: Mississippi River Basin Model, Clinton, MS, photo by author, 2010

> Society requires artifice to survive in a region where nature might reasonably have asked a few more eons to finish a work of creation that was incomplete.
> - John McPhee, in *Control of Nature*

For 27 out of 31 days in January 1937, rain poured into the Northeast. The ground, still frozen with snow and ice, mixed with unusually warm, wet weather and sent record amounts of water sheeting into the Ohio River. The effect was almost instantaneous; riverside towns immediately reported that water levels were quickly approaching, then quickly passing flood stage level. Among the many places affected, 70% of Louisville, Kentucky and 90% of Jeffersonville, Indiana were inundated as water crests reached as high as 20-28 feet above flood stage.[1] It was catastrophic.

And it confirmed peoples' fear that waters of the Mississippi River were, in fact, threatening the American way of life as much as lending to its success.

The nation had already seen what was widely assumed to be the last of the "Great Floods;" only ten years earlier in 1927, flooding throughout the lower Mississippi River Basin proved to be the most destructive and far-reaching inundation in the history of the United States. In the aftermath of what Secretary of Commerce Hebert Hoover called "the greatest peace-time calamity in the history of the country,"[2] Congress passed the Flood Control Act of 1928. This sweeping legislation called for the immediate implementation of a plan to unequivocally control floods on the Mighty Mississippi. The nation declared war against a single enemy: the Mississippi River. By 1936, the Army Corps of Engineers had built 29 dams and locks, hundreds of runoff channels, and over a thousand miles of new, higher levees.[3] On paper, it appeared that efforts to prevent the Great Flood of 1927 from ever happening again would be successful.

But the 1927 plan for flood control structures remained solely focused on single targets, not a system of interconnected, aggregating threats. The plan assumed that the "menace to national welfare"[4] was the Mississippi River exclusively, not its tributaries. When several rivers in the Northeast flooded in the winter of 1936 (in particular the Connecticut, Allegheny, and Monongahela Rivers), displacing hundreds of thousands of people in Massachusetts, Pennsylvania, New York, and even reaching far enough to evacuate the National Headquarters of the American Red Cross in Washington D.C.,[5] a double-crossed nation was now held in rapt attention. In the *New York Times* in March of the same year, the call for a more comprehensive approach rings from an anonymous editorial, "As of yet we have not envisaged the problem of curbing and utilizing our water resources as a whole from the Atlantic to the Pacific… If the floods have taught us anything, it is the need for something more than a dam here and a storage reservoir there… We need a kind of protection which considers something more than the exigencies of Johnstown, Pittsburgh, and Hartford – considers the social and economic future of a nation and a continent."[6]

Congress obliged this new national consciousness with the Flood Control Act of 1936. The act declared flood control a "legitimate federal responsibility"[7] and called for a substantial increase in federal funding for more comprehensive and wide-ranging construction of levees, dams, reservoirs, and dikes. It also passed jurisdiction of all flood-control programs to the War Department, more specifically to the Army Corps of Engineers. The primary determinant controlling the range of possible projects stated that the economic benefits of construction must outweigh the costs. The act was, in essence, driven by commerce but framed as a war.

As construction began on disparate control structures throughout the Mississippi River Basin and unexpected floodwaters tumbled into the Ohio River Valley in January of 1937, a District Engineer in Memphis, Tennessee began to question this approach to flood control. Major Eugene Reybold became concerned that, though the scope of construction had expanded to rivers beyond the Mississippi, the approach was still limited by the confines of current practical field research methods. It was difficult to keep track of what was being done at various points along the river, and there were few opportunities for discussion and collaboration, making it virtually impossible to predict how these isolated "solutions" might impact each other, either positively or negatively. To understand the Mississippi River Basin as a network of interconnected waterways, as a fluid and dynamic system with particular behaviors and patterns that more often than not exceeded the scale of a single site, methods of testing and experimenting similar to those used in scientific laboratories were needed. Reybold conceived of a "comprehensive model that could be used to develop plans for the coordination of flood-control problems throughout the Mississippi River Basin."[8] A scaled physical model of all lands affected by the Mississippi River and her tributaries could address the three major goals of the Army Corps:

> ...to determine methods of coordinating the operation of reservoirs to accomplish the maximum flood protection under various combination of flood flow; to determine undesirable conditions that might result from non-coordinated use of any part of the reservoir system, particularly the untimely release of impounded water; and to determine what general flood control works were necessary (levees, reservoirs, floodways) and what improvements might be desirable at existing flood control works.[9]

The concept of a testing ground where the various methods of flood control could be put into concert with each other, observed quickly and evaluated prior to the construction of full-size measures was revolutionary and Reybold understood that this would represent a major paradigm shift in the way the Army Corps operated, requiring time, space, a substantial reorganization of the administrative structure of the Corps and a sizeable increase in budget.

DESIGNING DEVICE-SPACE

The solutions to Reybold's desire for strategic renovations to the Corps' research methods arrived on the coattails of World War II. In 1943, the Army Corps of Engineers finally agreed to fund the construction of Reybold's model as a "waterways experiment station," drawing on both the suitable topography and considerable labor force available at Camp Clinton, a POW camp located about halfway between Natchez and Jackson, Mississippi. Under Reybold's direction, 3,000 German and Italian POW's (many of whom were engineers) began construction on a 20-acre working hydraulic model. The model would replicate the Mississippi River and its major tributaries (namely, the Tennessee, Arkansas, and Missouri rivers), amounting to approximately 41% of the United States and 15,000 miles of river.[10] Using the most current recording devices (hydrographic and topographic maps, aerial photographs, and valley cross-sections), the model would be constructed to reflect *existing* topography and river courses throughout the Mississippi Basin.

The site was cleared, excavated of 1 million cubic yards of dirt, and re-graded to a topography that roughly mimicked that of the Mississippi Basin. A thick underlayer of pipes and pumps was distributed throughout the site, larger inflow pipes positioned around the edges, outflow pipes snaking through the center and eventually connecting to the storm sewer. A water-collection basin was installed on the eastern edge; a 500,000-gallon water tower was built in the center. Large concrete panels, consistent and flat on the underside and uniquely molded on the top, were dropped over the pipes, held in place with a secondary structural system, sometimes wood, sometimes steel. Three wide, steel walkways were installed at equal intervals, each hovering about 4' above the concrete, connecting the north side to the south side. Next to the centermost walkway, a 50'-tall viewing deck was constructed, with open-air platforms at 20' and 35' above the model. Six small, shed-like buildings were constructed around the edges of the model, each installed about 30-50' from the model with very few windows but thick streams of data transmission lines running into the middle of the model; these were the control houses, one located near each major stream, each containing a single switch that could be used to activate that portion of the model.[11] The construction process was as complex as the resulting model, a labyrinthine interweaving of intricate systems designed to service the hydraulic functions of the model as well as a very specific array of full-scale work spaces and structures required to support Reybold's staff of 600.

Figure 2: Mississippi River Basin Model, Clinton, MS, photo by author, 2009

The model is classified as a "fixed-bed model" and was formed entirely from concrete at two scales: the horizontal scale is 1:2000 and the vertical scale is 1:100. The concrete was molded into riverbeds, sheer cliffs, flat plains, tributaries, oxbow lakes, as well as existing railroads, levees, and highways.[12] Because the concrete created an impermeable (fixed) ground, metal plugs, or inhibitors, were introduced to create drag in the water flow and simulate scouring. The concrete panels are not square but instead reflect the skewing that occurs when the longitude and latitude lines are projected onto a scaled, flat surface. Each panel is stamped with a marking system, apparently the place around some sort of opaque mutation of the Cartesian system not readable by the average layperson. To add further surface detail to the concrete ground on either side of the concrete-and-metal-plug rivers, accordion-folded metal screens fill most of the site, subbing as vegetation and sited using aerial photographs as a guide.

Hydraulic pumps, water-level gauges, and metal gates rise above the concrete at regular intervals, acting as the purveyors of weather and water. Because of the complex scale changes and material abstractions in the surface of the model, special testing equipment was developed specifically for the model. Some devices controlled water flow (in and out of the model); others converted model flow rates into minutes, hours, days, and seasons.[13] The amount of water released from each pump could be calculated and controlled, allowing the engineers the previously impossible ability to study endless of combinations of weather events. This river system could be operated in full or in parts. This river system could be turned on and, more importantly, this very particular river system could also be turned off.

Figure 3: Mississippi River Basin Model, Clinton, MS, photo by author, 2009

WHEN THE FAKE CLARIFIES THE REAL

The model allowed the Mississippi River Basin to become, for the purposes of study, an object, to become a manageable site. Here, engineers, community leaders and civilians could gather to discuss the potential ramifications of particular flood control measures and forecast likely scenarios given the selected prevention strategies. Each gallon of water passing through the model was the equivalent of 1.5 million gallons per minute in the real river, meaning one day could be simulated in about five minutes. This allowed for a tremendous capacity to collect data, to use the model as an active tool for communication, both internally and externally, and to distribute information about the river as a system. As mayors from major river cities gathered in the observation tower to watch the Mississippi River course through an entire flood season, it became possible to find edges, limits, and centers. However false or naïve these moves may have proven to be, they began as an honest inquiry into the depth and capacity of the basin as a system. The Basin Model had the effect of imbuing the river with "a reassuring degree of certainty," and policymakers began to adjust to a new scale of thinking.

At its core, the model acknowledges the river as the central defining characteristic of the landscape, not human occupation. Hierarchically, the model positions settlements, highways, railroads – all man-made constructions – at the behest of the river (or, to be more specific, moving water). Reybold built the model around the idea that the land we occupy was shaped first and foremost by the river system, a force that is continuously acting on many points in concert, a series of interconnected reactions tied to a central network more expansive and potent than perhaps previously realized. This ideological shift was a tremendous concession of power on the part of the Reybold and his fellow engineers who had previously felt quite strongly that the river could be pressed into complete submission in order to maximize the available occupiable land. It formalized the idea that not all sites could be transformed for development, one that had been lost during the frenzied period of levee building in the early 1900's and made exceptionally obvious in the wake of the floods of 1927 and 1936. By acknowledging the scale of the river (at least on its surface), the engineers could move beyond previous approaches that dealt only in localized solutions. By constructing the model at such a scale that one person could take in the entire length in one panoramic view, what emerged was the notion

Figure 4: Mississippi River Basin Model, Clinton, MS, photos by author, 2009-2010

that the river is a system, a network of continuous forces that creates unique but interconnected conditions. Each specific condition must be considered in the context of the whole.

It seems that Reybold understood this and, for 40 years, this was the tool used to extend that line of thinking throughout the Mississippi River Basin. This was the method for determining flood control strategies throughout the basin. And then, at some point in the early 1990's, the Army Corps walked away.

THE MODEL TODAY

The grounds (about 200 acres) have now become part of a larger public park in Clinton and the model lies quiet and nearly invisible somewhere within that. It has been completely abandoned, surrounded on all sides by thick vegatative overgrowth, left alone and easily ignored. Evidence of the labor camp or even Army Corps offices has long since been erased. The once-imposing guard gate, the barracks… all gone. What remains is the model. And it remains surprisingly intact, fairly evenly weathered by almost twenty years of abandonment, though consumed in some places by accumulated detritus from surrounding vegetation. But the same overgrowth that has currently rendered the Missouri River section of the model mostly unnavigable has also created a protective barrier of bramble and poison ivy, making it nearly impossible to see from the park and protected from the destructive force of misuse. It appears that very few park-goers have wandered into the model over the years, giving the whole site the strange sensation of warped time.

In fact, when preparing for my first expedition to the model, my search for an address or directions to the model turned up only vague descriptors: "near soccer fields and a remote-control airplane landing strip… in Clinton." Google searches failed to harvest what I truly expected would be a reliquary of anecdotal information from former basin model engineers, long lists of collected data from flood tests, Flickr photos of various model pieces displayed proudly on mantel pieces or wall-mounted shadow boxes from collection expeditions by amateur model enthusiasts (lines of metal plugs, rows of signs and water gauges, maybe even a piece of molded concrete turned abstract art installation)… In short, the model is difficult to locate both on site and online. Fortunately, Clinton doesn't have too many soccer fields and even fewer airstrips so I did, in fact, find the model.

Even in its abandoned state, I found it to be authoritative. It is an incredible demonstration of 20th century engineering, design and construction. Being careful to avoid the rampant poison ivy that now holds court over the surrounding landscape, I found that I could walk the north-to-south extents of the model, from Hannibal, Missouri to Baton

Figure 5: Mississippi River Basin Model, Clinton, MS, photo by author, 2010

Rouge, Louisiana, in only a few minutes. Labels for cities and towns have long since scattered, but using landforms as a guide, familiar places can be identified. Standing atop the river, with one foot on the plains of Vidalia, Louisiana and the other on the bluffs of Natchez, Mississippi, it's difficult to avoid feeling like the model is just a large playground, an operable toy replete with countless options to alter a small, contained (and fake) universe.

WHEN THE FAKE REPLACES THE REAL

> This is why a mapping is never neutral, passive, or without consequence; on the contrary, mapping is perhaps the most formative and creative act of any design process, first disclosing and then staging the conditions for the emergence of new realities.
> - James Corner, in "The Agency of Mapping"

Despite my most sincere academic objectives, 30 minutes into my first (and, frankly, second) visit to the model found me practically skipping across the abstract and beautiful contours, testing all remaining gates and chutes for potential operability, and even attempting to make a golf ball I found on my trek into the model wash down the river from Cairo, Illinois to Memphis, without getting it hung up in the tight meanders (I was thwarted by an unforgivably constricted bend at New Madrid). All this is to say that, in the short time I spent there, my perspective shifted. Despite knowing I was looking at, standing on, and manipulating an object that was no more or less than a point of reference, a miniaturization of the real thing, the size and scope of the model sucked me in. At some point relatively quickly after entering the model, it became a place in and of itself, a landscape with its own distinct behaviors (however bizarre). The model is an object but it isn't something I could hold in my hand or identify as being separate from the environment surrounding it; it is a place of its own. I became lost in its depths and found it very difficult to understand the model as merely a representation of a very real river system just 30 miles to the west.

I'm not suggesting that the Army Corps of Engineers lost their minds every time they conducted experiments at the Basin Model, recklessly abandoning their oath of service for unsupervised playtime, confusing their place of employment with some kind of adult Disneyworld. But I am interested in the disconnect that occurs when a model becomes the substitute for the "real thing," when the copy, which cannot hope to replicate the true complexity of its source, becomes the fulcrum around which decision are made. At an average total thickness of 6-8" (with only 3"-5" representing elevation above sea level), the constructed ground of the model hardly simulates the complexity and depth of the actual sedimentary profile. The perfectly folded metal screens distributed across the model in no way speak to the diverse array of ecosystems and habitats that weave into the river fabric. It endorses (which is to say that it cannot function without) a dangerous abstraction of real material (not the least of which includes human occupation), an omnipotent officiant of natural systems, and an unrealistic ability to isolate elements from the larger network of natural systems. So, despite the notable achievement of having accomplished the construction of such a model, what has this fake river done to our relationship with the very real one it seeks to mimic?

Certainly, there are certain necessary material sacrifices made during the process of construction – otherwise the real thing would suffice. Certainly, there are scale abstractions that must be accommodated – otherwise the real thing would suffice. But what are the implications of having reduced the complexity of an entire river system to an object that essentially amounts to surface, water, and an on/off switch?

In fact, what's at play here is more than just the reduction of material complexities. The initial design decision that (on paper) seems perhaps the easiest to justify, the extents of the model, proved the most elusive. In the original budget plan for the basin model, the decision was made at the outset to fund only the construction of a portion of the Mississippi River basin. A look at the 1942 "Definite Project Report" approved by the Army Corps shows the discrepancy:

> The proposed model would reproduce all streams in the Mississippi River watershed on which reservoirs for flood control are located or contemplated, together with all dams, levees, dikes, floodwalls, and other pertinent works… (and) only initially as far as the mouth of Old River (just north of Baton Rouge) for the reason that no inflow takes place below that point.[14]

This means that the supposedly comprehensive model of the Mississippi River Basin begins at Hannibal, Missouri (not Lake Itasca, Minnesota) and stops at Baton Rouge, Louisiana, excluding the mouth of the river and the entire Atchafalaya River Basin and floodway, a decision governed by the thinking that a separate model of the lower Mississippi (presumably with separate funding) could be used for those tests specific to that region.

Imagine my surprise when, on my first visit, I attempted to do what I believe we all do when faced with a map, a globe, or a 20-acre hydraulic model: I attempted to locate myself, my home, within the field of abstraction. After only minutes in the upriver sections of the model, I grew anxious to see how Reybold designed the transition into the fragile marsh and swamp ecologies of South Louisiana; how the hard lines of the concrete used in Missouri and Illinois potions of the model could be softened to accept this landscape of transparency. I wanted to see the Birdfoot, New Orleans (would the Lower Ninth Ward be modeled?), my family's home on Bayou Lafourche (once the east fork of the Mississippi River), and the Gulf of Mexico. Alas, standing ankle-deep in False River, an oxbow lake just north of Baton Rouge, I found that I had reached the end of the model and it took the rather unceremonious form of a leaf-and-twig-clogged drainage ditch.

While this decision was undoubtedly governed by the obvious difficulties tied to financing a project that not only stood counter to the standard research practices of the Corps but also would require a budget of over $17,000,000, the fact that all experiments conducted at the Mississippi River Basin Model produced data without the presence of the last 150 miles of the river, namely New Orleans and Gulf of Mexico seems to inevitably color the validity of the results and raises questions about how much the model is to blame for our rapidly disintegrating coastline and vulnerable edges. Despite best efforts to faithfully build a systems-based approach to flood-control, the system eventually constructed is fundamentally incomplete. Picking back up with the "Definite Project Report," which states that "provision would be made, however, for adding the remainder of the Mississippi River Basin at any time this might become desirable."[15] Fifty years of decisions about flood control were made at the Basin Model and modeling the outflow of the Mississippi River never "became desirable." In truth, I imagine the exclusion of the lowermost portions of the lower basin has less to do with open neglect and more to do with the politics that surface when intra-state policy-making tools like the Basin Model become deeply interwoven into the fabric of the public domain.

THE POWER OF SPACE IS GREAT

Ultimately, I do believe the model speaks to a promising moment in the paradigmatic relationship between us (as citizens – engaged or oblivious, as engineers and politicians, even as entire branches of the Army Corps of Engineers) and the river. It holds the ideals of balance in one hand and security in the other. It neither sacrifices the necessity of human inhabitation nor aims at the ruin of the river. Incomplete and unsuccessful though we have seen it to be, the Mississippi River Basin Model stands as an abandoned chapter in a much longer narrative about two fundamentally imbalanced forces of change colliding with each other: the growing American population with all the infrastructural trappings of support and certainty and the mighty Mississippi River, with all inherent geomorphologic shifts, alluvial depositions, and water level changes. The model broadened our perception of this relationship, both among the general public seeking to understand the scope of the system and also among those tied to the daily functioning of the river, namely the Army Corps of Engineers. Perhaps next versions (can the digital models being used today speak to the material complexities any better than the Basin Model?), with the introduction of material depth and soil composition, could extend this a bit further. Perhaps next generations will turn back to the river, ask new questions, unbury edges, and lift from the soft zones around the river the discordant pressure of economic viability. Or perhaps we, as residents of a river landscape, can simply look at the leftover model on our own, taking it in as a landscape in its own right, didactic and tangible, and gradually adjust our own perspective on time, change, growth, and decay.

Because, at some point, even the fake landscape will eventually develop its own "realness" – even authenticity – more so than as a replica of something else. Though the Basin Model no longer serves as a device, it remains as a relic space, subject to the same environmental behaviors as the river system it was designed to control. As I left the model at the end of a long and very hot day, it began to rain. In seconds, the river filled with water, small bits of leaves and dirt washing down towards Cape Girardeau, Missouri. The water pooled in some places, spinning into eddies when water flow from the tributaries reached the main channel. I lifted the gate at what I think might have been St. Louis, sending a wash of muddy water towards Memphis. I could see the water rising as it moved south, small sticks and gum wrappers kicked up over the edges as the river began its twisting stretch towards Louisiana. The straits of Baton Rouge sent the water rushing out with such force that it seemed to bound forward, almost leaping out of its container, off the concrete shelf, and into the poison ivy-filled wilderness.

Using the levees as a footpath, I walked upriver towards my car, which was parked near Hannibal, my thoughts pulling themselves out of the realm of the model. Taking stock of the sky and guessing about the time, I was pretty confident that the not-too-heavy rain couldn't have possibly overwhelmed the park… this was, after all, a site dedicated to water flow management. But, when I reached the parking lot, I found that the corner I had chosen as a prime spot was really a washout on the eastern edge of the model. It was full of water and I had to wade to my car.

> The power of space is great, and it is always active both for creation and destruction. It is the basis of the desire of any group of human beings to have a place of their own, a place which gives them reality, presence, power of living, which feeds them, body and soul. This is the reason for the adoration of earth and soil, not of the soil generally but of this special soil, and not of the earth generally but of the divine powers connected with this special section of the earth. But every space is limited, and so the conflict arises between the limited space of any human group, even of mankind itself, and the unlimited claim which follows from the deification of this space. The law of mutual destruction, therefore, is the unavoidable fate of the powers of space.
> - Paul Tillich, in *Theology of Culture*

ENDNOTES

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3 Ibid., 91.
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7 Barry Fowle, ed., *Builders and Fighters: U.S. Army Engineers in World War II,* (Fort Belvoir, Virginia: Office of History, 1992), 215.
8 J.E. Foster, "History and Description of the Mississippi Basin Model," *Mississippi Basin Model Report 1-6,* (Vicksburg, Mississippi: U.S. Army Engineer Waterways Experiment Station, 1971), 2.
9 Michael Robinson, "Rivers in Miniature: The Mississippi River Basin Model," in *Builders and Fighters: U.S. Army Engineers in World War II,* ed. Barry Fowle (Fort Belvoir, Virginia: Office of History, 1992), 281.
10 Robinson, 280.
11 Model construction specifications can be found in the Army Corps work logs, *Mississippi Basin Model Report 1-6.*
12 This system of projection is known as the Bonne Projection which combines polyconic and Lambert projections to "maintain close alignment along meridians and parallels."
13 Foster, 20.
14 Ibid., 6.
15 Ibid., 6.