A Very Long History of the Lower Mississippi Valley

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Imagine citizens so ignorant of geography that few know of the existence of their nation's fifth largest river by discharge into the sea, much less its name. Imagine a media standing mute when that river lengthens by a factor of nine. Imagine bureaucrats who credit but then disregard warnings of impending disaster along the river's floodplain. Imagine that for political gain legislators invest massive sums of taxpayer's money in projects that actually increase the peril. Imagine the United States.

One is likely to hear of the Atchafalaya River only along the mid-Gulf Coast.[1] Of U.S. rivers only the Mississippi, Saint Lawrence, and Columbia discharge more water into the sea. Rivers draining the populous east coast are small fry by comparison, as illustrated by Figure 1. The largest of those, the Susquehanna, discharges barely a sixth as much water as the Atchafalaya, and New York's Hudson but one part in fifteen.

The Atchafalaya is obscure because it is a distributary of the Mississippi. Tributaries bring water to a river; distributaries carry some away. Nearly everyone in the

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[1] A·tchaf·a·lay·a [ə-chăf'ə-lī'ə] is French colonial spelling of Hacha Falaia, Long River (actually River Long) in the Choctaw language. In Cajun country the river is called Tchaf·a·lay·a. See http://www.yourdictionary.com/ahd/a/a0493200.html for an audio pronunciation.

U.S. has heard of the Ohio River, the Mississippi's largest tributary, but the Atchafalaya carries almost as much water away from the main stem as the Ohio brings to it.

I. The Atchafalaya Versus the Mississippi – Who You Callin' Punk, Fool?

Rivers customarily donate a substantial share of water to a distributary only for brief periods, if ever – for a half century a third of the Mississippi's water has flowed into the Atchafalaya. Most distributary mouths lie closer to the main outlet – the Atchafalaya empties south of Morgan City, about 130 linear miles west of Birdsfoot, the Mississippi's set of short terminal distributaries. Properly considered, the Atchafalaya increased in length from 150 miles to 1,420 in 1945 when it pirated the Mississippi's tributary Red River after a century-long struggle. Such features might seem mere curiosities were it not for the underlying process – the Atchafalaya has not merely captured a lot of the Mississippi's water that it then diverts to a remote outlet, the Atchafalaya is capturing the Mississippi itself.

From the juncture of the two rivers water remaining in the Mississippi travels over twice as far to reach the Gulf of Mexico because it must cross a delta that has been accumulating over the past millennium. Thus the Atchafalaya's mean gradient is more than twice the Mississippi's, increasing the water velocity and its capacity to move sediment. Hence the Atchafalaya erodes its bed more rapidly than the Mississippi. In the normal course, the Atchafalaya would have captured the Mississippi by 1975 but for artificial impediments (Johnson 2006), but for half a century Congress has ordered the the Army Corps of Engineers to freeze the Atchafalaya's share of water at the third it had in the 1950s. Dam construction across Old River began early in that decade. Old River was the south branch of a former Mississippi meander, the branch having become merely a

connector between the rivers following the Atchafalaya's capture of the Red.[2] One is amazed that such a momentous matter has been so poorly noticed by U.S. taxpayers, who continue to finance those massive and increasingly costly impediments.

Over the ensuing decades the erosional difference has left the Mississippi's surface higher than the Atchafalaya's. The Mississippi's surface is now roughly a two to three story building higher than the Atchafalaya's at Old River, but at times that difference has approached the height of a four-story building. Imagine the potential energy of the nation's largest river with its surface poised so high in the air.

Bedrock is more than a mile beneath Old River sediments (Cox and VanArsdale 1997; 2002; VanArsdale and Cox 2007). Though some sort of anchor into the deep rock might be technically feasible, such a contrivance would be immensely expensive and none has been attempted. Consequently as the Atchafalaya deepens it threatens to undermine both the barrier and the locks. A sudden substantial failure of either would drop a deluge into the Atchafalaya. A wall of water racing along the Atchafalaya from the Old River complex to the Gulf would scour farmlands and crush habitations. The eight Louisiana parishes that touch the Atchafalaya house nearly half a million residents (2000 census). Though many of them live miles from the river 22,000 live in municipalities right against the river bank.

Perhaps the event will prove less catastrophic. For a span of well over two hundred miles the Mississippi lies no further than ten miles from the Atchafalaya or one of its tributaries. The land gradient is trivial and thus the floodplain is much broader,

[2] Hence the name *Old River* is simply an abbreviated form of *Old Channel of the Mississippi River*. The Old River complex surrounds the coordinates 31°02'N, 91°39'W on Google Earth.

assuring that every few decades floods merge the two rivers temporarily. When some future inundation recedes, water from the upper Mississippi may be following some flood-eroded crossing channel into the Atchafalaya, leaving no way for the Corps to get the genie back in the lantern.

The correlation is weak among prolonged rains in the Midwest draining into the Illinois and Wabash, heavy rains in the Appalachians draining into the Ohio and Tennessee, sudden snow-melting warm spells in the mountains draining into the Missouri, and thunderstorms across the Great Plains draining into the Arkansas. LSU hydrological engineering professor Raphael Kazmann

> says that the Tennessee River and the Missouri River were "the two main culprits" in the 1973 flood. In one high water and another, the big contributors vary around the watershed. An ultimate deluge might possibly involve them all. … "I watched the Ohio like a hawk, because if that had come up, I thought, Katie bar the door!"
>
> McPhee (1989, 28)

Someday the culprits will include three or four or five major tributaries. Then the facilities at Old River will be undermined or bypassed. People will die.

With careful contemplation the Corps might mitigate the dire consequences that face people along the Mississippi from the juncture all the way to Birdsfoot, including the large metropolitan areas around New Orleans and Baton Rouge, and the mortal threats against those living near the Atchafalaya. Both the Corp's completed projects and its plans for the future, however, encourage people elsewhere to bring themselves and their resources into the lower Mississippi Valley rather than encouraging people who are there to get out.

II. A Little Plate Tectonics

Continental landmasses consist of relatively light surface material atop heavier subsurface platforms – tectonic plates – that in turn are driven slowly around the globe by convection currents in a still heavier molten core. As they float about, the landmasses sometimes agglomerate into a supercontinent that eons later is rifted to pieces by convection in the core.

Pangaea, which formed about 300 million years ago, was the most recent supercontinent. About 70 million years later Pangaea began to rift apart, leaving still observable mirror image coastlines along continental margins. Tectologists call one part Laurentia, the primordial North America. Laurentia was not merely separating from Pangaea's other parts, it very nearly sundered into pieces. The latter rifts proved unsuccessful, but left a dramatic feature that is now called the Mississippi Embayment. River sediment has built a sequence of deltas, later ones overlaying the earlier, which have gradually buried the Embayment, today all the way to the Louisiana coast and onto the Continental Shelf.

A great river, its distributaries, and its tributaries have worked unceasingly for some 80 million years to bury close to 600 miles of the failed rift's downfaulted block with a shingled sequence of overlapping deltas.[3] A lot of old deltas lay hidden beneath the surface. Though most of the Embayment's archaic deltas are hidden under subsequent deposition, the seven most recent ones are discernable on nearly any map of the Gulf Coast. On Figure 5 they are shown by chronologically arranged numbers off the coast of Louisiana.[4] The midpoint of the reign of the oldest mouth shown was roughly

[3] By comparison, dinosaurs disappeared about 66 million years ago.

[4] The condensed draft discusses only figures 1 and 5, with others in the full draft available from the author.

5,000 years ago. Notice that the Embayment's river mouth has swept back and forth over time, resembling an untethered garden hose as it flails about when the water is turned up. That happens because the river builds a sediment mound around its mouth, and that mound – the delta – gradually lengthens. Eventually the river moves into a shorter and thus steeper route to the Gulf, more or less by running down one edge of the delta it has just built.

Today's mouth seems further east than any predecessor. That impression is misleading, but just – a delta's outer margin slowly subsides beneath the sea after the river moves. Lobe 4 once emptied about 8 miles further east than Birdsfoot, as evidenced by the arc of barrier islands. Birdsfoot extends 73 miles further south, however, so number 4 did not reach nearly as far into the Gulf. Moreover, lobe 4's furthest extension came at the very end of its reign. No other outlets have reached either as far east or as far south as Birdsfoot. It is also striking that all even numbered deltas are toward the east while all odd numbered deltas are in the west. The outlet does not creep gradually along the coast; when it has moved it has relocated by at least 70 miles and by as much as 170.

Throughout the United States people tell you that the Mississippi flows from north to south, but those who live around New Orleans think of the flow as being from west to east. Figure 5 shows the source of that discrepancy. For the final 200 miles – almost ten percent of the river's entire length – the flow really is more west to east than north to south. Suppose that a person who is totally uninformed about U.S. geography was shown Figure 5 with the rivers erased and asked to guess which number represented the outlet of a major river that courses through the white colored terrain. Any odd number would seem a more likely reply than Birdsfoot, number 6. If then shown the two

rivers, that person almost certainly would select outlet 7 – the Atchafalaya's – which does by far the better job of complementing the public's intuition that the Embayment's great river is orientated north to south.

III. Public Goods Gone Bad

> The military engineers of the Commission have taken upon their shoulders the job of making the Mississippi over again – a job transcended in size by only the original job of creating it. … One who knows the Mississippi will promptly aver – not aloud, but to himself – that ten thousand River Commissions, with the mines of the world at their back, cannot tame that lawless stream, cannot curb it or confine it, cannot say to it, Go here, or Go there, and make it obey; cannot save a shore which it has sentenced; cannot bar its path with an obstruction which it will not tear down, dance over, and laugh at. But a discreet man will not put these things into spoken words; for the West Point engineers have not their superiors anywhere; they know all that can be known of their abstruse science; and so, since they conceive that they can fetter and handcuff that river and boss him, it is but wisdom for the unscientific man to keep still, lie low, and wait till they do it. … Otherwise one would pipe out and say the Commission might as well bully the comets in their courses and undertake to make them behave, as try to bully the Mississippi into right and reasonable conduct.
>
> Mark Twain (1883, ch 28)

A. To Bully the Mississippi into Right and Reasonable Conduct

Efforts to control the Mississippi began at what now seems a ridiculously small scale. When the French Mississippi Company established a trading post in 1718 adjacent to a short indigenous portage between the river and Lake Pontchartrain the colonists sited their settlement on the highest land between river and lake, the north bank's natural levee. Within months the French colonials were struggling with flood waters. Something would have to be done if the post was to remain near the portage. Had the cost exceeded the expected benefit, La Nouvelle Orléans would have been abandoned. But a barrier against the river was expected to be a public good in both the economist's and the prosaic sense – nonrivalrous and nonexcludable as well as beneficial for nearly all the residents – so the

colony's governor mustered everyone to build an artificial levee atop the natural one.[5] That three foot levee owed what effectiveness it had to the absence of similar ones elsewhere.

With settlement gradually moving up and down and across the river, levees began appearing elsewhere. A three foot levee may deflect a small flood when other banks have none, but if a four foot barrier is constructed across the river, water spills across the shorter one instead. Of course water would spill onto the floodplain upriver and downriver, reducing pressure along the stretch where competing levees were going up, but by 1828 both river banks had continuous levees throughout southern Louisiana.

Confining within the river's normal mile-wide channel a far from unprecedented sixty feet deep and fifty mile wide flood would require a continuous levee along each bank roughly 1,500 feet high, about the height of the world's tallest skyscrapers. To be strong enough to prevent the water's weight from toppling them, those levees would have to be commensurably thick at the base. Those are patently unworkable dimensions. Further, the majority of the territory that drains into the Mississippi lies less than 1,500 feet above sea level.[6] Such enormous levees would not confine a flood to the river channel but assure that the riverbed remained the only dry refuge in the valley.

Thus occasional very serious flooding along the Mississippi is inevitable. If levees reduce the impact in one place, a perfectly foreseeable impact will be to magnify the impact elsewhere. The most that can be done is to choose a few spots to protect and

[5] It is interesting that the French did not emulate the indigenous people in the area, who did not attempt to confine the river but built mounds where their villages could be placed above the flood.

[6] Pittsburgh's elevation above sea level is 770 feet, Minneapolis's 850 feet, and Omaha's 1,060 feet.

temporarily abandon the rest to floodwater. One can reasonably ponder which of the alternative spots to protect, but trying to protect them all is a fool's errand.

Levee building comprises what game theorists call a prisoner's dilemma. Whatever those on the river's right bank do, those on the left bank are personally advantaged if they build higher levees, while whatever those on the river's left bank do, those on the right bank are personally advantaged by building higher levees along their side. Reminiscent of the barber chair scene in Charlie Chaplin's *The Great Dictator*, levees ratcheted upward along both banks though in the main each increment did little more than return the threat to the opposite side. Those who constructed or elevated any given levee neglected their effort's impact on those living elsewhere along the river.

The levees seemed to be public goods. Doubtless they were just that until the settlers began to multiply and disperse. At that point the levees were unmasked as public goods (in the economist's nonrivalrous and nonexcludable sense) gone bad (in the prosaic sense). The burden was borne by the locals, however, so the bad public goods were self-limiting if not self-correcting. Maybe competing levees could be coordinated in a mutually acceptable way, the less important ones being torn down. If not, when incremental construction cost began to exceed the benefit of being flood free, people would halt further investment and take their capital someplace that was less threatened.

With the Swamp Land Act of 1849 Louisiana's levee race began to tax pockets across the nation. From the perspective of those in the lower valley, the long-run benefit no longer needed to exceed the long-run cost to be worthwhile, the short-run benefit merely had to be positive, cost be damned. If national taxpayers foot the bill, the net benefit can be both negative and large without inducing valley residents to relocate.

B. Being Bullied by the Atchafalaya

The Atchafalaya and Mississippi are inseparable, so it is no surprise that their histories have been similar. A public good in the economic sense that was anticipated to be a public good in the prosaic sense was soon discovered to have unforeseen flaws. Corrective projects were in turn found to have unanticipated faults, and so on.

In 1826 the Secretary of War selected Henry Shreve as Superintendent of Western River Improvements (Dorsey 1941; McCall 1984). Shreve decided to dredge through the narrow neck of a counterclockwise-flowing meander in the Mississippi River to shorten the route that boats had to travel. In contrast to Shreve's mile long cut, the meander had added about thirty miles for steamboats to travel along the Mississippi (McCall 1984, ch. 12). As important, water rushing into the Mississippi from the Red followed a few miles further along by water rushing out into the Atchafalaya had created hazardous eddies. The cut was expected to eliminate that problem too. Totally unexpected, however, was that much of the Red River water began traveling down the Atchafalaya instead of remaining in the Mississippi. That increased the erosion rate along the Atchafalaya.

Though accompanied by unintended consequences, it is plausible that a century's navigation along the Red and a shortened and less hazardous route along the Mississippi represented public goods for the U.S. in both the economic and the prosaic senses. Nonetheless, the improvement, if such it was, inadvertently altered forever the Mississippi's relationship with the Atchafalaya.

Many people along the Mississippi's lower reaches benefited from having quite a lot of water flowing down that channel, but none benefited individually by enough to pay the enormous sums required to keep the water there. If anyone undertook the burden,

other beneficiaries could not be excluded from the impact, and thus would be disinclined to share the cost. Congress decided that the nation's taxpayers should finance the project, though it would benefit southeastern Louisiana almost exclusively.

Maintaining the Mississippi's flow became impossible without retaining the share that was on the verge of being drawn into the Atchafalaya. Other people, however, would benefit if the water running down the Atchafalaya continued to increase, and they were now to be taxed to share the expense of projects that would injure them. A more subtle and important problem is that Corps efforts are utterly hopeless in the long-run, while they create a major hazard for many of those same people.

In brief, Corps governance of water distribution between the rivers is indeed a public good in the economic sense of being nonrivalrous and nonexcludable and beneficial to someone, but it is not a public good in the prosaic sense. On balance a lot more people have and will be injured than benefited. It is a bad public good.

IV. Interest Groups

That Congress will fail in the endeavor to ration the Atchafalaya is certain, though the timing is not. Without a very substantial policy change in Washington, an entirely predictable and largely preventable disaster will inevitably follow in the Atchafalaya basin. This section asks why, at such enormous expense, Congress has tried to halt the age-old cycle through which the Mississippi sweeps its lower channel.

According to standard theory, successful interest groups in contested situations are compact and have individually substantial stakes in the outcome, while their opponents are dispersed and, though numerous, typically have individually small stakes.

The anomaly is that, were they fully informed the dispersed group would win a vote or would buy off the concentrated group if matters were settled in a market. Becoming informed takes time and money however, so members of dispersed groups cannot justify the effort and are rationally ignorant and rationally apathetic. Due to substantial individual stakes in the outcome, concentrated interest group members are more likely to understand policy implications, and to become active in supporting an outcome they favor. That presents an opportunity for politicians to improve their short-run prospects at their constituents' long-run aggregate expense.

> Insofar as they are motivated primarily by the goals of reelection or reappointment to office, agents in the public sector assign less weight to the future benefits and costs of any action than they do to those which will be realized in the nearer term. Most public decisions are influenced by results that are highly visible and for which credit can be taken before the next election or the next opportunity for promotion to higher office. As such, politicians and bureaucrats tend … to postpone developing plans for coping with dire events that in all likelihood will occur on someone else's watch.
>
> Shughart (2006, 34)

McPhee (1989, 6-7) suspected the petroleum refining and petrochemical complex was the compact interest group that regularly wins the contest on Capital Hill. Clearly petrochemical facilities along the lower Mississippi will become less valuable if the water moves into the Atchafalaya, but that interest is both short-run and conditional on modifications at Old River having been made in the first place. In 1950, when the attempt to control the Atchafalaya began in earnest, refinery capacity in the entire state was less than 200 million barrels per year (Cusimano and French 2003a, 8; 2003b, 18). In 1963 when the dam across Old River was completed, Louisiana's capacity was still less than 400 million barrels per year. By 2005, the capacity of the Baton Rouge to New Orleans sector alone was 746 million barrels per year (U.S. Department of Energy 2006). The vast bulk of threatened capacity, in other words, has come on line since the effort to

control the Atchafalaya accelerated. Were it not expected that the Corps would keep Mississippi water confined to its existing channel new capacity would simply have been constructed elsewhere.

Moreover the economic life of petroleum refining and chemical plant averages less than eighteen years (Baldwin 2005). Even the plant along the river in 1950 would by now have been depreciated and rebuilt an average of three times. With a reasonable expectation that the Atchafalaya would capture the Mississippi, that reinvestment would not have occurred where it did.

The Army Corps of Engineers is in many ways a misnomer; virtually all actual construction, maintenance, and operation is performed by civilians obtaining work (or not) on a project-by-project basis under contracts let by the Corps. Construction, maintenance, and operation of Corps projects require enormous workforces, typically receiving wages above local alternatives. Incumbent politicians easily elicit voter support by bringing new jobs into the district, and the Corps has always been one of their most accommodating tools.

Will voters react negatively to projects that prove not merely of low value but counterproductive? There little reason to anticipate much political fallout. Contracts are let by the Corps, for which voters do not vote. Politicians eagerly claim credit while Corps jobs roll in, then noisily blame faceless and nameless Corps employees – or even Mother Nature – if and when the projects go awry. Notice the blame Katrina is bearing for the damage to New Orleans, though Katrina was in no sense an unprecedented Louisiana hurricane.

Who at the moment of a project's failure could know which politicians' vote-trading with otherwise disinterested colleagues bears blame for decisions made long ago? Who will trouble to discover the votes, many cast by now-retired and thus invulnerable officials, that were crucial for authorizing misbegotten projects? A resultant disaster that lies even a decade hence will occur after many who voted for the funding have left office.

Conclusion

The flesh of salmon plucked from a stream is rivalrous and excludable. Removing a dam that interferes with upstream salmon migration to spawning grounds would help maintain the gene pool, providing nonrivalrous and nonexcludable benefits. Almost all the dams that environmental groups now urge the government to remove in order to provide that public good were initially constructed by the government, arguably to provide other public goods such as flood relief. As we were once told that the government must undertake dam construction because public goods are undersupplied by the private sphere, we are told now that the government must pull them down because public goods are undersupplied by the private sphere. Once the Corps has dammed all the promising sites, they will be able to get busy ripping the dams out.[7]

At present, however, the Corps is more anxious to construct than to deconstruct.

> [T]he Army Corps of Engineers held a meeting … [regarding] locks and dams it has constructed on the Mississippi River over the years. There was a PowerPoint presentation on various options. One – clearly not the Corps's favorite – was to eliminate a dam in East Alton. To illustrate that idea, the presentation included a picture of a dam being dynamited.
>
> Mr. Bensman rose later to support removing the dam. Big mistake. … A Corps security officer … decided that Mr. Bensman was threatening a public facility. … An F.B.I. agent then contacted Mr. Bensman, who was surprised to learn that federal investigators believed a terrorist might announce his plans at a public hearing … .

[7] That a policy reversal may extend a bureaucracy's lifespan was first noted by McChesney (1990).

> When the agent said he wanted to visit his home, it occurred to Mr. Bensman that he needed a lawyer. … [T]he agent threatened to "put you down as not cooperating."
>
> All this started because Mr. Bensman believes the Army Corps builds way too many locks and dams on the Mississippi … .
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> *New York Times* (2006)

What has been argued above might be analogized roughly to a mathematician's proof-by-disproof, where certain things are initially assumed to be true as a prelude to demonstrating some logical contradiction or other impossibility, driving one inexorably to the conclusion that the assumptions must, therefore, be false. The government-provision rationale that has become embedded in the theory of public goods was assumed to be true as regards Corps projects in the lower Mississippi Valley as a prelude to demonstrating gross empirical inconsistencies that flow from that assumption.

But at the end of the day will the demonstration save lives, not to mention the massive capital that is at risk? The disdainful indifference of those who authorize such badly misdirected projects – Congress – and the cynical fecklessness of those who execute it – the Corps – is startling, to say the least. The dangers facing southern Louisiana, notably in the Atchafalaya Basin and along the Mississippi from New Orleans to Birdsfoot, are neither new nor unrecognized by at least a few scientists and journalists. Those in mortal risk must also begin to understand their peril, as people in, say, North Dakota must understand the financial peril that they face as taxpayers who fund massive, dangerously counterproductive Corps projects.

An awful lot of public goods in southern Louisiana have gone bad. They have proven to be very bad public goods indeed.

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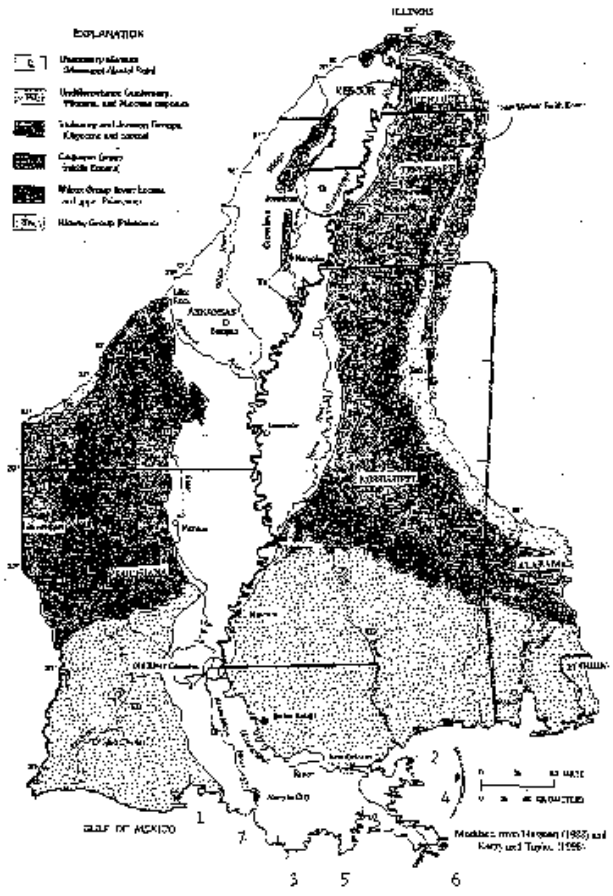
LOWER MISSISSIPPI VALLEY FROM OHIO RIVER TO GULF OF MEXICO



ARCHAIC AND ACTIVE MISSISSIPPI RIVER OUTLETS

Figure 5