Design Against Nature:
Flooding, Water Supply, and Public Space in Los Angeles

by

Max William Thelander

B.A. American Studies
Kenyon College, 2008

Submitted to the Department of Urban Studies and Planning
in partial fulfillment of the requirements for the degree of

Master in City Planning
at the
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

June 2012

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ABSTRACT

Starting in the late 19th century, Southern California saw the first of several waves of explosive population growth that have resulted in today's mega-region. While many early settlers were attracted by the city's famous sunshine, the surging population exceeded locally-available water supplies early on. Los Angeles responded by building a vast system of aqueducts to appropriate waters from across the West.

At the same time, Los Angeles faces the most severe flooding hazard of any major American city, due to the rare but extreme rainfalls that are intrinsic to its Mediterranean climate. Historically, the Los Angeles River had flowed freely across the basin, but soaring demand for land set the stage for battle between an unpredictable natural system and modernist engineering methods. The river was converted into infrastructure, a concrete channel designed to chute stormwater out to sea as quickly as possible.

Since the mid-1980s, a movement to 'revitalize' the river has gained increasing momentum. The river is one of the few remaining open spaces in many parts of central LA, and could form the backbone of a regional trail network to rival the freeways, as well as making ecologically valuable habitat connections. However, much of this vision depends on reducing the need for river to convey the entire watershed's runoff.

The 21st century will present California with greater water supply challenges, as well as the potential for more severe urban flooding. It is clear that the last century's approach of building mega-scale, single-purpose infrastructure cannot sufficiently meet future needs. What is needed now is a decentralized approach to stormwater, in which rain is captured where it falls. This approach holds the potential to reduce flooding (enabling revitalization of the main river channel), reduce dependence on imported water by recharging local aquifers, and reduce downstream water pollution, among other benefits. However, the widespread implementation of this concept will depend on the public taking a much more active role in managing their watershed.

Thesis Supervisor: Anne Whiston Spirn
Title: Professor of Landscape Architecture and Planning

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Natural Context & First Contact (prehistory – 1900s)

Non-linear climate and ordinary extremes

For as long as it has been around, Los Angeles has had a relationship with water best described as "dramatic", a love-hate affair marked in equal measure by dependence and fear. The image of perpetual sunshine was what spurred the city's early years of explosive growth, attracting hordes of Easterners who sought out the mild air and fair skies, a climate that reputedly had the power to cure a wide variety of ailments.[1] Here at the far end of the continent was a miraculous place where it was never either too cold nor too hot, where the air was softened by the ocean's moisture but it hardly ever rained. And yet, although sunshine has driven waves of urban expansion, the absence of water has also historically been the most significant factor limiting the city's otherwise unconstrained development. However, the story of Los Angeles is not only about sunshine and water scarcity, for Southern California epitomizes the old adage that when it rains, it pours. Or rather, "it neither rains nor pours; the skies simply open up and dump oceans of water on the land."[2]

This is the nature of LA's Mediterranean climate: long periods of drought punctuated by extreme precipitation events. 92% of the annual precipitation in Los Angeles falls within six months of the year, between November and May. Not only is rainfall unevenly balanced within each year; from year to year, there are much greater fluctuations than is typical for cities in temperate climates. To a meteorologist, "when viewed serially, historic seasonal rainfall totals in the Los Angeles area display an

1 Carey McWilliams, *Southern California Country: An Island on the Land* (New York: Duell, Sloan & Pearce, 1946), 96–103.

2 Ibid., 184.

almost aggravating randomness."[3] Given these conditions, meteorological averages lose their traditional value as predictors of typical conditions: "if achieved, 'average' is only a transitional state between extremes of wet and dry, flood and drought." [4] In this climate, extremes are the ordinary scenario.

Mike Davis draws an interesting comparison in how different groups of settlers arriving in Southern California responded to this climate. The first wave of non-native arrivals, "the Franciscans and their Spanish military escorts…were intimately familiar with the dramatic landscape metabolism of the Mediterranean region." In contrast, the large number of Easterners and Midwesterners who began flocking to LA roughly a century after the Spaniards' arrival literally lacked the words to describe this kind of environment. "English terminology, specific to a humid climate, proved incapable of accurately capturing the dialectic of water and drought," Davis claims.[5] To offer one illustrative example, "chaparral", the word for the thick, tangled, and highly combustible shrubs that cover the hillsides of coastal Southern California, is believed to have originally come from the Basque language.[6]

Mediterranean environments differ from the temperate environments of the Eastern U.S. and northern Europe in several important ways, not all of which are immediately obvious. In temperate climes, low-intensity, high-frequency events are the principal force that shapes the physical environment. In California's Mediterranean climate, the opposite is true. Rather than happening gradually but consistently, change in the physical environment comes in sudden bursts, the result of high-intensity, low-frequency events.[7] Furthermore, Mediterranean environments are characterized by a much greater degree of complexity than is typical of temperate environments. Part of this has to do with topography; the mountains ranges surrounding Los Angeles create numerous microclimates within a small area. Each microclimate constitutes a unique ecological niche, resulting in greater biodiversity; more com-

3 "The Climate of Los Angeles, California," National Weather Service – Los Angeles/Oxnard Weather Forecast Office, accessed February 3, 2012, http://www.wrh.noaa.gov/lox/archive/LAClimate_text.pdf, 26.

4 Ibid., 26–27.

5 Mike Davis, *Ecology of Fear: Los Angeles and the Imagination of Disaster* (New York: Metropolitan Books, 1998), 11–13.

6 Merriam-Webster Online, s.v. "chaparral," accessed April 30, 2012, http://www.merriam-webster.com/dictionary/chaparral.

7 Davis, *Ecology of Fear*, 17–18.

plexity per square mile. This may be a boon to nature lovers, and underlies the claim that in Southern California, one can go skiing and surfing in the same day. The greater complexity also introduces a significant degree of uncertainty, however. Thus, the Southern California environment displays characteristics of a chaotic system, in which "small changes in driving variables or inputs – magnified by feedback – can produce disproportionate, even discontinuous, outcomes."[8] An example of such a feedback loop, one which has caused major destruction in greater Los Angeles over the years, is the cycle of fire- flooding-erosion. Multiple-year droughts create ideal conditions for wildfire; these fires sweep rapidly through the hills, leaving their slopes barren. When the drought is broken by a heavy rain event, there is nothing to hold the hillsides in place, and massive flows of mud and boulders surge down into the valleys. In such situations, fire and flooding amplify each other's effects.

The chaos and complexity which define the climate and landscape of Southern California in particular are also aspects of river systems in general. The geologist Jeffrey F. Mount compares the life of a river to the life of a soldier, stating that both consist of "98 percent boredom and 2 percent terror, with most of the significant work being accomplished during moments of terror."[9] In the case of rivers, this cycle is known as "dynamic metastable equilibrium." The "moments of terror," during which dramatic shifts in a river's morphology take place, can be related to long-term changes in climate, tectonics/geology, and "the cumulative impacts of certain land use practices."[10] While the existence of some kind of relationship is fairly well established, what is less well understood is the way that incremental changes in these external variables eventually precipitate short-lived bursts of change in rivers. In search of a scientific explanation for such cataclysmic episodes, geologists have proposed theories about thresholds that, once crossed, trigger massive change.[11] But if our knowledge of these forces is incomplete, prediction is nearly impossible. According to Mount, a complete model of all the variables

8 Ibid., 19.

9 Jeffrey F. Mount, *California Rivers and Streams: The Conflict Between Fluvial Process and Land Use* (Berkeley: University of California Press, 1995), 12.

10 Ibid., 11.

11 Ibid., 12.

and their interconnected influences would resemble "a Rube Goldberg contraption with innumerable arrows, boxes, and strings."[12] These systems are not random in the literal sense, but the logic of their operation is so complex that they usually defy human attempts to forecast their outcomes.

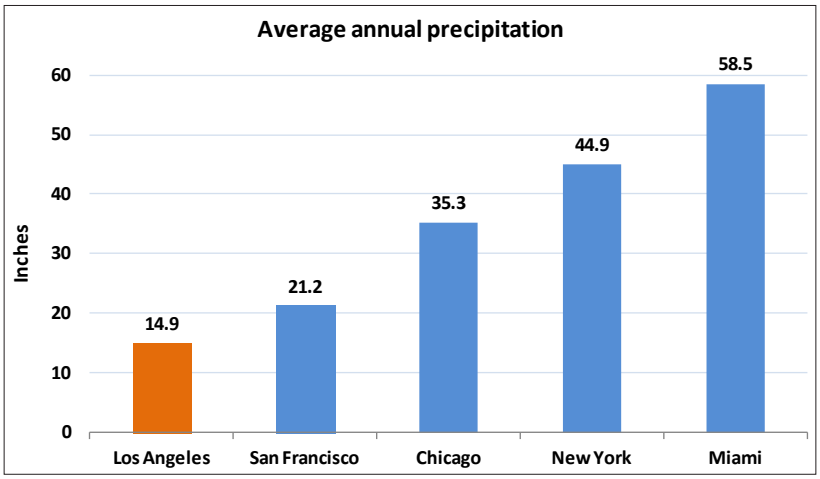
For these reasons, tinkering with such complex systems is, from Mount's perspective, risky business. This point of view, he believes, is "significantly different from that held by most hydrologists and engineers, who see a river as a…hazard whose seemingly capricious behavior needs to be controlled by bigger and better engineering solutions. Problems created by altering the variables will be corrected by yet more engineering solutions. The geologist sees these solutions as ultimately 'temporary' and doomed to eventual failure."[13]

12 Ibid., 13.

13 Ibid., xiii.

Land of little rain: Los Angeles's semi-arid climate has been both the driver of and biggest impediment to its growth.

SOURCE A



The amount of variation between average and peak flows is exponentially greater on the Los Angeles River than on rivers in the East and Midwest.

SOURCE B

river / site	drainage area (sq mi)	year-round average (CFS)	all-time peak streamflow (CFS)		peak-average ratio
USGS 11103000 **LOS ANGELES RIVER @ LONG BEACH CA**	827	**223**	**129,000**	2/16/1980	**578**
USGS 11097500 **LOS ANGELES RIVER @ LOS ANGELES CA**	514	**85**	**67,000**	3/2/1938	**788**
USGS 01104500 **CHARLES RIVER @ WALTHAM, MA**	251	**318**	**4,150**	2/3/1976	**13**
USGS 07010000 **MISSISSIPPI RIVER @ ST. LOUIS, MO**	697,000	**194,400**	**1,070,000**	8/1/1993	**6**

DATA SOURCES

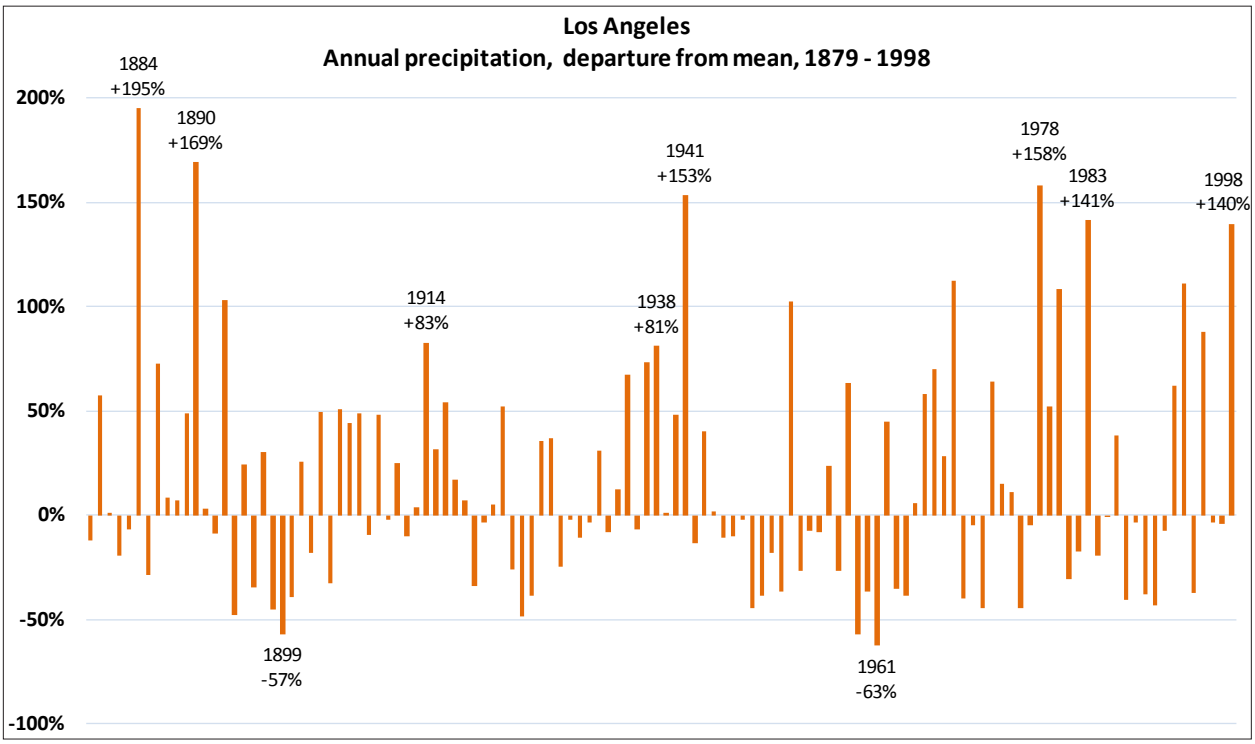
A Weatherbase, accessed August 28, 2011. http://www.weatherbase.com/

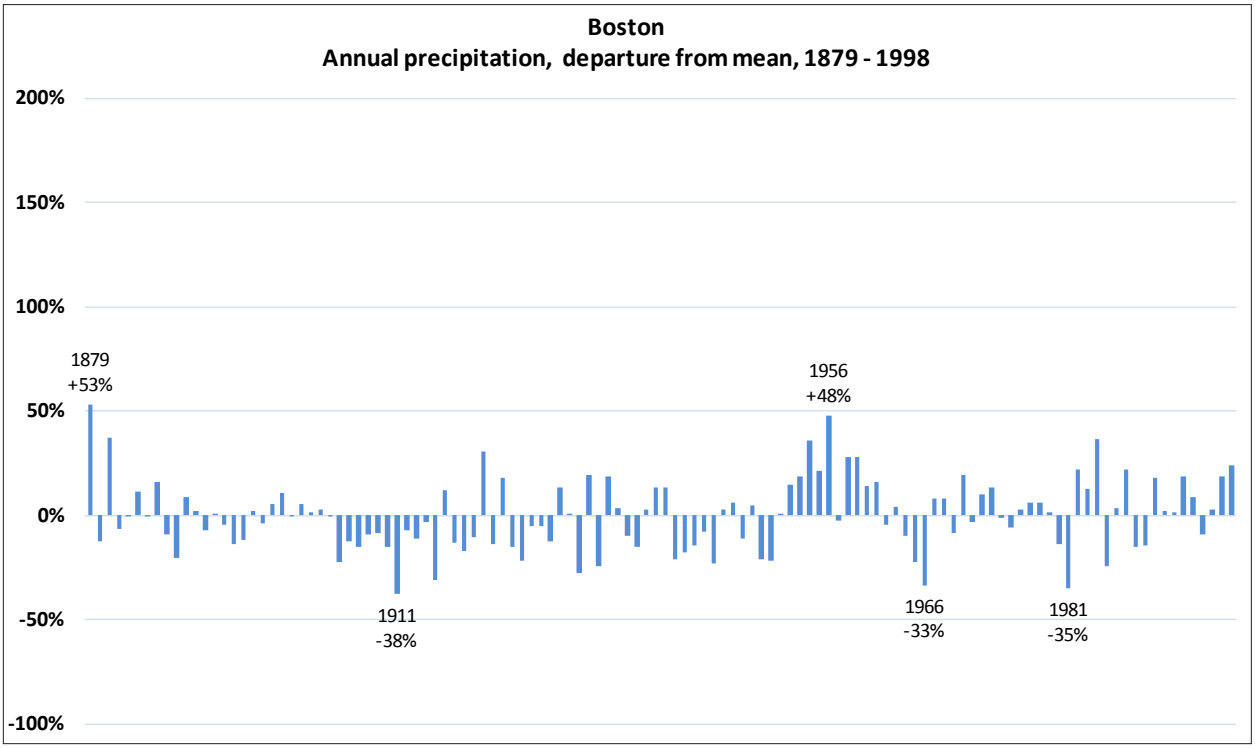
B "Peak Streamflow" and "Annual Statistics," USGS National Water Information System, accessed January 27, 2012,
http://nwis.waterdata.usgs.gov/nwis/nwisman/?site_no=07010000&agency_cd=USGS
http://nwis.waterdata.usgs.gov/nwis/nwisman/?site_no=01104500&agency_cd=USGS
http://nwis.waterdata.usgs.gov/nwis/nwisman/?site_no=11097500&agency_cd=USGS
http://nwis.waterdata.usgs.gov/nwis/nwisman/?site_no=11103000&agency_cd=USGS

C "Monthly Rainfall Data for Downtown Los Angeles," National Weather Service, accessed January 29, 2012, http://www.wrh.noaa.gov/lox/climate/data/cvc_rainfall.html.

"Monthly precipitaton totals for Boston, MA," National Weather Service, accessed January 29, 2012, http://www.erh.noaa.gov/box/climate/bospcp.shtml.

Year-to-year variations in rainfall are likewise much greater in Los Angeles than in the temperate climates of East Coast cities.





SOURCE C

Farmland and the Los Angeles River looking north from Elysian Park, ca. 1895.
USC Digital Library, http://digitallibrary.usc.edu/search/controller/view/chs-m3602.html

Water supply:
The river and the birth of Eden

The paradoxical nature of LA's climate is neatly exemplified in what was once its signature natural feature: the Los Angeles River. Many a visitor to Los Angeles has wondered why its downtown is located where it is, fifteen miles inland from the Pacific Ocean, a site seemingly devoid of any remarkable features. The answer to this geographic mystery lies in the river – though a modern visitor could be forgiven for failing to perceive the river's significance, or even its existence. The part of the river known as the Glendale Narrows, just north of downtown LA, was the only reliable, year-round

source of fresh water in the entire LA Basin.[14] For the Native Americans who had established their villages along in its banks for thousands of years, for the Spanish missionaries who encountered them in the late 18th century, and for the residents of the young city that grew up around the *pueblo*, the LA River was a source of life.

The riparian landscape before urbanization. Los Angeles River in Griffith Park, ca. 1920.

USC Digital Libary, http://digitallibrary.usc.edu/search/controller/view/chs-m2364.html

Early accounts from explorers and settlers, describing a lush riparian landscape teeming with wildlife, strain the imagination of any reader familiar with the contemporary LA River. Once upon a time, there were oaks and walnuts, willows and cottonwoods, cattails and bulrushes. Deer and packs of antelope, coyotes, gray foxes, mountain lions, and the occasional grizzly bear (icon of the Golden State) wandered near the river banks. In the waters of the river and its tributaries lived at least seven species of fish. And in the air, more than 100 bird species co-existed: nighthawks, cactus wren, and roadrunners; yellow-billed cuckoos, Bell's vireo, and long-eared owls; California quail, green-backed herons, and Savannah sparrows, to name only a few.[15] Prior to the arrival of Europeans, the Tongva (Gabrielino) Indians native to the Los Angeles region lived a hunter-gatherer lifestyle supported in all respects by the river. The Tongva derived the raw materials for all of their food, clothing, and shelter from the

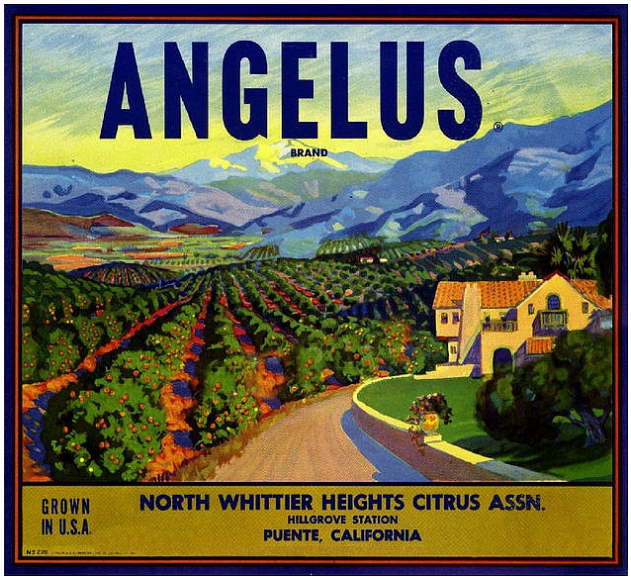
14 Blake Gumprecht, *The Los Angeles River: Its Life, Death, and Possible Rebirth* (Baltimore: Johns Hopkins University Press, 1999), 4, 26–30.

15 Ibid., 22–26.

plant and animal life that was in turn sustained by the river's water.[16] When the Spanish arrived in the region, there were some twenty-six villages within one mile of the river.[17] One of the largest of these villages, called Yangna, is believed to have been located near the present-day location of Union Station in downtown Los Angeles.[18]

In July 1769, an expedition led by Captain Gaspar de Portolà set out from San Diego, heading north over land towards Monterey, with the mission of establishing a *presidio* (military fort) there. On the first of August, the party was taking a day of rest in honor of the Roman Catholic feast of *Nuestra Señora la Reina de los Ángeles de Porciúncula* (Our Lady the Queen of the Angels of Porciúncula). On that day, several men in the party went out exploring, and upon returning to camp they reported to the others their discovery of a large river. They decided to name the river, and the entire valley surrounding it, for the feast; in time, the name (in shortened form) would be inherited by the *pueblo*, and eventually the modern metropolis. Father Juan Crespí, a priest accompanying the expedition, made a long entry in his journal that day describing the river. He wrote of a "pleasing spot among the trees on this pleasant river," and went on to prophesize the future: "To my mind, this spot can be given the preference in everything, in soil, water, and trees, for the purpose of becoming in time a very large plenteous mission."[19]

On September 4, 1781, on a site not far from where Portolà's party had 'discovered' the river, a group of eleven families recruited by Spanish authorities formally established *El*



Southern California as Garden of Eden.

A Box of Pictures, "Vintage Citrus Crate Label - La Puente, California," http://www.flickr.com/photos/g_cliser/3971117662/

16 Ibid., 31–32.

17 Ibid., 29.

18 Ibid., 29.

19 Ibid., 38.

Pueblo de Nuestra Señora la Reina de los Ángeles de Porciúncula.[20] They immediately set to work tapping the river's flow to suit their needs, and within one month they had completed the *Zanja Madre* ("mother ditch"), which ran south from the river to the plaza at the center of the new settlement. Throughout the 19th century, the *zanja* system was expanded to connect to the outlying lands beyond the *pueblo*. By the 1880s, the system had expanded enough in scale and complexity that it was overseen by a *zanjero* with several assistants.[21] Water from the river, distributed through the *zanja* network,

Los Angeles County citrus exhibit, 1894 California Midwinter International Exposition.

Calisphere, "Interior of Southern Cal. Building, C.M.I.E., San Francisco -- 802," http://oac.cdlib.org/ark:/13030/tf8870130t/

20 Ibid., 43.

21 Ibid., 77.

enabled the transformation of the semi-arid LA Basin into a cultivated country of vineyards and orchards. The landscape described in earlier accounts was gradually replaced by a profusion of oranges and lemons, olives and grapes.[22] The output from these fields (with abundant embellishment from city boosters) contributed to the city's turn-of-the-century image as a garden paradise. This image, promulgated and reproduced through a variety of media, from fruit crate labels to World's Fair exhibits, played a significant role in attracting new settlers to Southern California, propelling the region's first major population boom.

22 Ibid., 55.

Flooding:
The origins of a problem

Los Angeles is not unique among major cities in being subject to occasional bouts of heavy rain. However, in the case of LA, climate has a powerful co-conspirator: topography. Not more than fifteen miles from downtown, the broad, flat expanse of the basin abruptly terminates and the San Gabriel Mountains begin their steep ascent, gaining elevation at the rate of 2,000 feet per horizontal mile until they top out at over 10,000 feet. In the winter, storm systems that have carried moisture thousands of miles across the Pacific slam into these mountains and, unable to travel any further, unload their contents onto the slopes below. Among these peaks, some of the most intense rainfall anywhere in the United States has been recorded, such as on the single day in January 1943 when over 26 inches of rain fell near the Mount Wilson observatory.[23] Although the geologically young San Gabriels are among the fastest rising mountains in the world, they are being eroded almost as quickly by the torrential rains.[24] It is these waters, powered by the force of gravity, that give the local hydrology its high energy kick. As the waters work their way inexorably down to the valleys below, they sweep up everything that lies in their path, effectively flushing out canyons of anything that is not firmly anchored to the earth.[25] The urbanized region of greater Los Angeles is in fact built on top of material carried down from the mountains in this way: debris cones (at the base of the foothills) and an alluvial plain (further down, in the basin). The very foundations of the modern metropolis constitute the accumulated evidence of past storms.

While the Cadillac-sized boulders are carried a mile or two at the most, the water keeps on going, across the basin, all the way to the sea. Herein lie the origins of the modern day story of the Los Angeles River. As is typical for rivers in semi-arid Mediterranean climates, the LA River only flowed intermittently along most of its length. Because its flows during most of the year were too meager to

23 "The Climate of Los Angeles, California," National Weather Service, 36.

24 Gumprecht, *Los Angeles River*, 132–34.

25 John McPhee, "Los Angeles Against the Mountains," in *The Control of Nature* (New York: Farrar, Straus, Giroux, 1989), 181–272.

carve out banks, the river in its natural state lacked a clearly defined channel. Consequently, when the torrents of water did come, there was little to hold them in place, and they flowed freely across the basin, seeking out the path of least resistance. This meant that the river was notoriously unpredictable; one might go searching for it after a major storm and find that it had moved twenty miles across town. This is precisely what happened on several occasions in the 19th century, when its mouth moved from Long Beach to Santa Monica and back again.

It is due to this confluence of climate and topography that Los Angeles is said to face a greater threat from flooding than any other major American city.[26] "The impetus and fierceness of these floods can be likened to that of the discharge of a bursting dam," noted one of the first reports the Army Corps of Engineers produced when they began studying the local flooding problem.[27] These floods have, over the years, killed more people in Los Angeles County than earthquakes. In the 19th century, before humans began undertaking large-scale efforts to control the local rivers, major storms would leave literally hundreds of square miles of the LA Basin underwater. As indicated by evidence from the paleoclimatological record and historical accounts, rare but epic floods have been occurring for quite some time in Los Angeles.[28]

26 Gumprecht, *Los Angeles River*, 131.

27 U.S. Engineer Office, *Flood Control in the Los Angeles County Drainage Area* (Los Angeles: U.S. Engineer Office, 1938), 2.

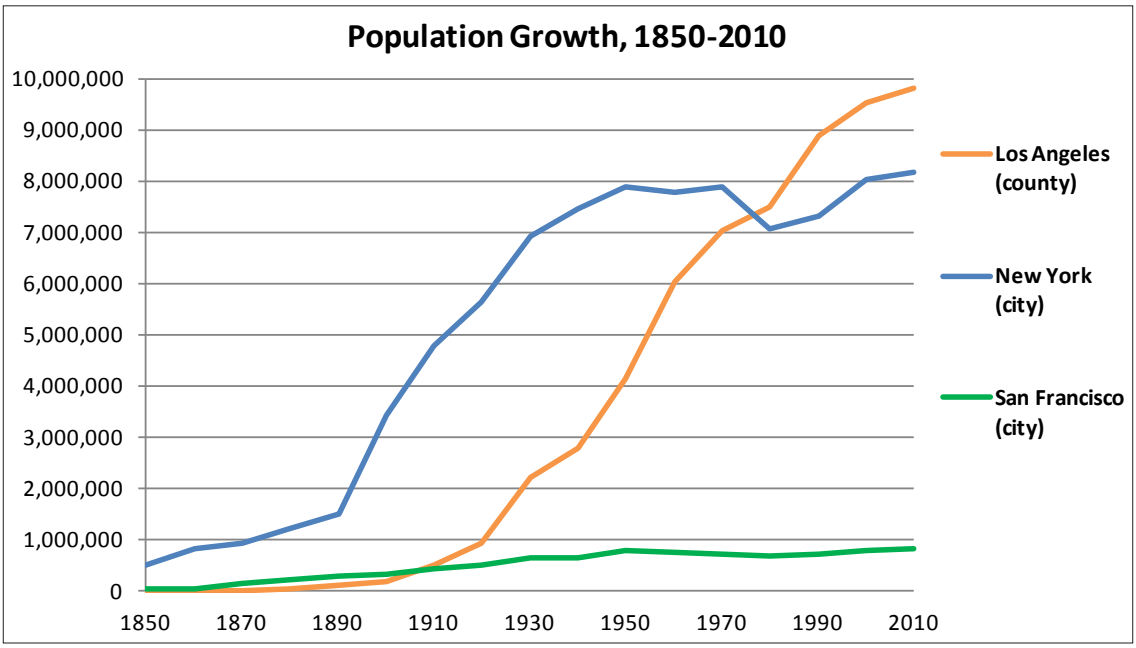
28 "The Climate of Los Angeles, California," National Weather Service, 59.

2
The Infrastructural Era (1910s – 1970s)

Water supply:
The beginnings of imported water

For its first century, Los Angeles was a sleepy agricultural settlement, even as San Francisco's population exploded during the Gold Rush years. In those days, LA must have felt like the ends of the earth, isolated by mountains on three sides and by an ocean on the fourth (the port at San Pedro Bay, now the nation's busiest, was then in its infancy). In 1876, however, the longtime dream of the city's boosters was realized, with the arrival of the first transcontinental railroad. From this point on, Los Angeles's future would be urban.

By the beginning of the 20th century, the region's population had grown substantially. This wave of growth was rather unique in that most of people who came to LA during these years were



By the early 20th century, numerous diversions left the river entirely dry downstream of downtown Los Angeles, while railroads and industry developed in the adjacent floodplain. Los Angeles River near Seventh Street.

USC Digital Library, http://digitallibrary.usc.edu/search/controller/view/chs-m24188.html

searching not for a living, but for the good life. This contrasts with the motivations of the immigrants then pouring into Eastern cities, as well as those who would come to LA in subsequent migrations (Dust Bowl refugees during the Depression, African Americans during World War II, and an array of Latino and Asian groups more recently). Those arriving in Los Angeles at the turn of the century were, in Mike Davis's words, "the restless but affluent babbitry of the Middle West…retired farmers, small-town dentists, wealthy spinsters, tubercular schoolteachers, petty stock speculators, Iowa lawyers, and devotees of the Chautauqua circuit."[29] To them, it mattered little that Los Angeles had no real economic base. The Southern California landscape appealed to their desire for greater contact with

29 Mike Davis, *City of Quartz: Excavating the Future in Los Angeles* (London: Verso, 1990), 25.

the "exotic." In Los Angeles, Reyner Banham enthused, "the southern palm will literally grow next to northern conifers," arguing that "it was this promise of an ecological miracle that was the area's first really saleable product – the 'land of perpetual spring'."[30] At the same time that Los Angeles offered an exotic physical environment, it also promised refuge to a mostly Anglo, upper-middle class, from a different kind of exotic: the distressingly foreign immigrant cultures that were transforming cities like New York and Chicago.

With Los Angeles's population doubling or tripling every ten years and no end in sight, it soon became clear that the river on its own would not be able to supply all the city's water needs indefinitely. It was estimated that the river could dependably supply 45 to 50 million gallons per day (MGD). With per capita water use then slightly over 300 gallons per day (far higher than in most cities), the river could only sustain a population of about 150,000.[31] At first, the discovery of artesian waters beneath the LA Basin seemed to offer a solution to the problem. These waters, like the debris cones and alluvial plain underlying the city, had accumulated over millions of years. When the first wells were drilled in the 1870s, the subterranean water would sometimes shoot up dozens of feet in the air. But despite the widespread belief that the supply of these waters was limitless, by the turn of the century the water table had already declined substantially in many places. Water that had gushed forth extravagantly in 1875 could scarcely be made to appear even with concerted pumping in 1900. As Carey McWilliams sardonically observed, "the artesian water supply was wasted, as a young spendthrift might dissipate a legacy, in a single generation."[32]

From 1893 to 1904, a drought loomed over the region. William Mulholland, then the city's chief *zanjero*, became increasingly alarmed about the city's dwindling water supplies, and took the step of installing water meters for the first time. In 1903 he actually went so far as to propose that the city's

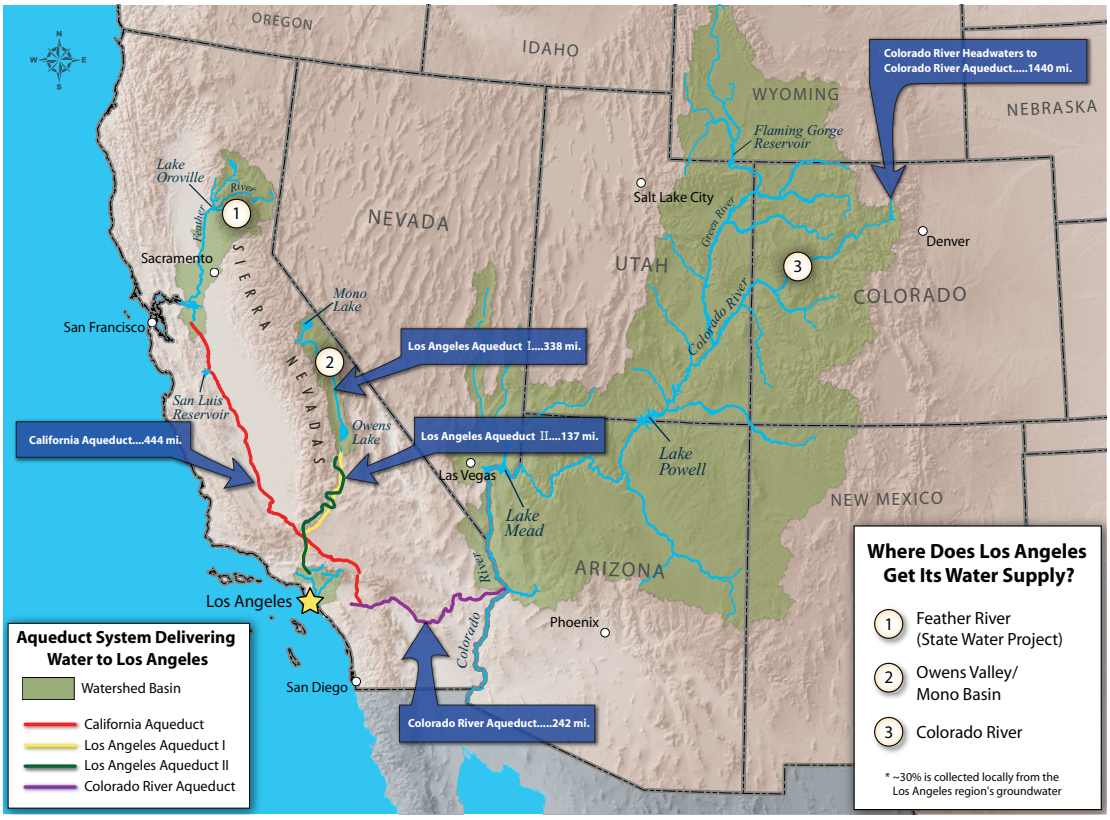
30 Reyner Banham, *Los Angeles: The Architecture of Four Ecologies* (Berkeley: University of California Press, 2009), 13.

31 Gumprecht, *Los Angeles River*, 96.

32 McWilliams, *Island on the Land*, 185.

further growth be capped.[33] What happened instead set the tone for years to come.

In November 1913, the Los Angeles Aqueduct was completed, carrying water 233 miles from the Owens Valley in the eastern Sierra, across the Mojave Desert and into the ever multiplying faucets of the thirsty city. At the aqueduct's opening ceremony, as water coursed down the cascades for the first time, Mulholland made his famous proclamation to Angelenos: "There it is. Take it." And take it they did. In so doing, however, the aqueduct's builders and the people of Los Angeles effectively wiped out what had been a thriving agricultural valley. But the people of the Owens Valley were not going to give up their water without a fight. From the beginning, the aqueduct was wrapped up in scandal (as dramatized in the film *Chinatown*).[34] The ensuing political and legal battles over water rights would



Rain falling across vast areas of the West is delivered to Los Angeles through its three aqueducts.

Council for Watershed Health, "Where Does Los Angeles Get Its Water Supply?" http://watershedhealth.org/Files/map/85_LA-water_supply.pdf

33 Gumprecht, *Los Angeles River*, 99.

34 For a more detailed nonfictional account, see Marc Reisner, *Cadillac Desert: the American West and Its Disappearing Water* (New York: Penguin, 1993), 52–103.

Jet Lowe, "SECOND AQUEDUCT JUST EAST OF JAWBONE HAER CA-298-X-1,"
Historic American Engineering Record, http://www.loc.gov/pictures/item/ca3170/

continue to play out in courts for the rest of the 20th century, and would ultimately come back to haunt Los Angeles. But for the crowd that had gathered that day at the cascades, there was only celebrating. An editorial in the *Los Angeles Times* the following day glorified the occasion:

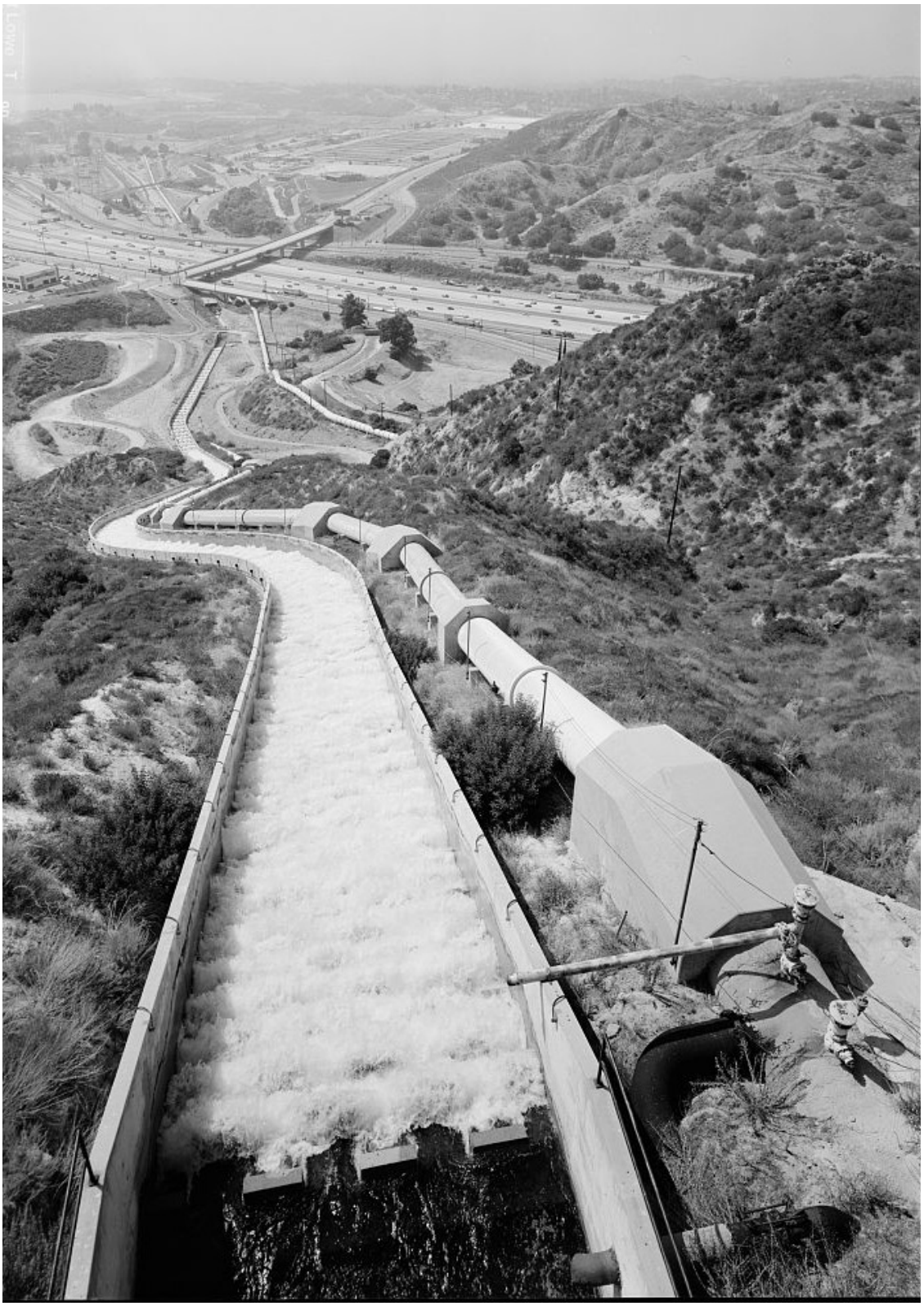
> …And a great river has been turned from its course – a course that it followed since the hand of God raised the mountains and laid the oceans in their places on the morn of creation – and brought down to serve the people of Los Angeles who are here today, and the millions more who are to come tomorrow, and tomorrow, and tomorrow.[35]

What happened in the following years typifies a pattern that has recurred with several variations in the history of Los Angeles, in which a perception of unlimited, eternal abundance gives way all too quickly to the reality of inadequacy. And so it was that only ten years later, in 1923, Mulholland

35 Quoted in Richard Gordon Lillard, *Eden in Jeopardy; Man's Prodigal Meddling with His Environment: the Southern California Experience* (New York: Knopf, 1966), 142.

Aqueduct	*Operator*	*Years Built*	*Length*	*Capacity*	*Source*	*Threats to long-term reliability*	*Notes*
Los Angeles Aqueduct	LADWP (Los Angeles Department of Water and Power)	1908 - 1913	233 mi	485 cfs	Owens River (@ Independence, CA)	LA's allocation reduced by court decisions requiring shallow flooding of the Owens Lake bed to mitigate toxic dust storms.	The story of its building is dramatized in the film *Chinatown* .
Colorado River Aqueduct	MWD (Metropolitan Water District of Southern California)	1933 - 1941	242 mi	1,600 cfs	Colorado River (@ Lake Havasu)	Climate change may lead to longer, more severe droughts in the Southwest, reducing flow in the Colorado. Water has historically been over-allocated (i.e. water rights exceed available supply).	The aqueduct consists of 2 reservoirs, 5 pumping plants, 63 miles of canals, 92 miles of tunnels, and 84 miles of buried conduit and siphons.
California Aqueduct (aka State Water Project)	DWR (California Department of Water Resources)	1962 - 1972	444 mi	13,100 cfs	Feather River (via Sacramento Delta)	Vulnerable to earthquake-triggered levee failures and to saltwater contamination from sea level rise. LA's allocation reduced by court decisions requiring increased "environmental water" to protect endangered species habitat in the Delta.	At the Edmonston Pumping Plant, water is pumped 1,926 feet over the Tehachapi Mountains.

DATA SOURCE
California Department of Water Resources, California Water Plan, 2009 Update, http://www.waterplan.water.ca.gov/cwpu2009/index.cfm, SC-31--33.



Jet Lowe, "VIEW SOUTH/SOUTHEAST LOOKING DOWN ON 2ND AQUEDUCT AND 1ST AQUEDUCT CASCADES TOWARDS FILTRATION PLANT AND LOS ANGELES RESEVOIR, HAER CA-298-AH-3,"
Historic American Engineering Record, http://www.loc.gov/pictures/item/ca3180/

had cast his eye to a watershed yet more distant than the Owens Valley, and recommended that the city begin assessing the feasibility of importing water from the Colorado River.[36] That vision became a reality in 1941, when the 242-mile-long Colorado River Aqueduct came online. With the addition of this second aqueduct, rain falling across a region spanning from Wyoming to New Mexico would now water the lawns of Los Angeles. Unlike the Los Angeles Aqueduct, which the city's Department of Water and Power (LADWP) had built on its own, the Colorado River Aqueduct was constructed in cooperation with the federal government (the Hoover Dam, integrated with this project, remains one of the greatest monuments ever to federally-sponsored public works). What the two aqueducts did have in common was the prolonged legal wrangling that accompanied and outlasted the massive physical construction. Whereas before the city had battled the Owens Valley over water rights, the new enemy was the state of Arizona. The arguments reached a peak when a case brought by Arizona reached the Supreme Court in 1956, resulting in "one of history's most complicated water cases," a trial that produced more than 22,000 pages of testimony and 4,000 exhibits, and was ultimately decided in Arizona's favor.[37] As with the first aqueduct, these legal battles have continued to this day, with ongoing repercussions for Los Angeles.

By the early 1960s, the region's population had multiplied yet again, and the cycle of searching for another water source began again. The California Aqueduct, completed in phases over the next ten years, would be the largest and longest yet, spanning 444 miles from the Feather River in northern California to the metropolises of the south. California's governor at the time, Pat Brown, promised that the project would "correct an accident of people and geography" by connecting the water-rich north with the water-hungry south.[38] Before this water could reach Los Angeles, however, it had to surmount the Tehachapi Mountains. This herculean feat is accomplished by the Edmonston pumping plant, "the highest lift per volume in the world." Every minute, the pumps at the Edmonston plant can

36 Ibid., 143.

37 Ibid., 145.

38 Joel Bourne, "California's Pipe Dream," *National Geographic*, April 2010, http://ngm.nationalgeographic.com/print/2010/04/plumbing-california/bourne-text.

lift 2 million gallons of water 1,926 feet over the mountains, after which it flows downhill to the cities below.[39] To do so, this single pumping plant uses, on average, 3,280 GWh (gigawatt hours) of electric power per year, enough to supply a city of 1.4 million people.[40]

Flooding:
The beginning of institutional flood control (1915-1935)

Reporting on the plans to build the Aqueduct, the Los Angeles Times published the headline: "Titanic Project to Give City a River."[41] It seemed that the city had forgotten about its original river, which by then had gone completely dry even in the areas where it had once flowed year-round, thanks to diversions and pumping to supply the growing city. But the river would not disappear entirely. In February 1914, just a few months after William Mulholland presided over the debut of the city's "new river," the old river reasserted its presence in a major way.

The 1914 flood was merely one more in a long succession of floods that had washed over the LA Basin. In fact, this flood was not even particularly severe by historical standards. It was estimated that during the previous major flood, in 1889, the LA River's peak discharge had been 65% greater than in 1914.[42] Before the basin urbanized, there were floods, but not a flooding problem; the latter came only with the introduction of large numbers of humans into the local ecosystem. Before During major storms, the river had roamed across the basin wherever it pleased. Floodwaters would

39 "California State Water Project At A Glance," California Department of Water Resources, accessed March 9, 2012, http://www.water.ca.gov/recreation/brochures/pdf/swp_glance.pdf.
(capacity = 4,480 cubic feet per second ~ 2,010,764 gallons per minute)

40 "7.16 Energy," California Department of Water Resources, accessed March 9, 2012, http://www.water.ca.gov/environmentalservices/docs /mntry_plus/DEIR%20–%20Volume%201/07.16%20Energy.pdf;
"Table 5A. Residential Average Monthly Bill by Census Division, and State 2010," U.S. Energy Information Administration, accessed March 9, 2012, http://www.eia.gov/electricity/sales_revenue_price/xls/table5_a.xls.

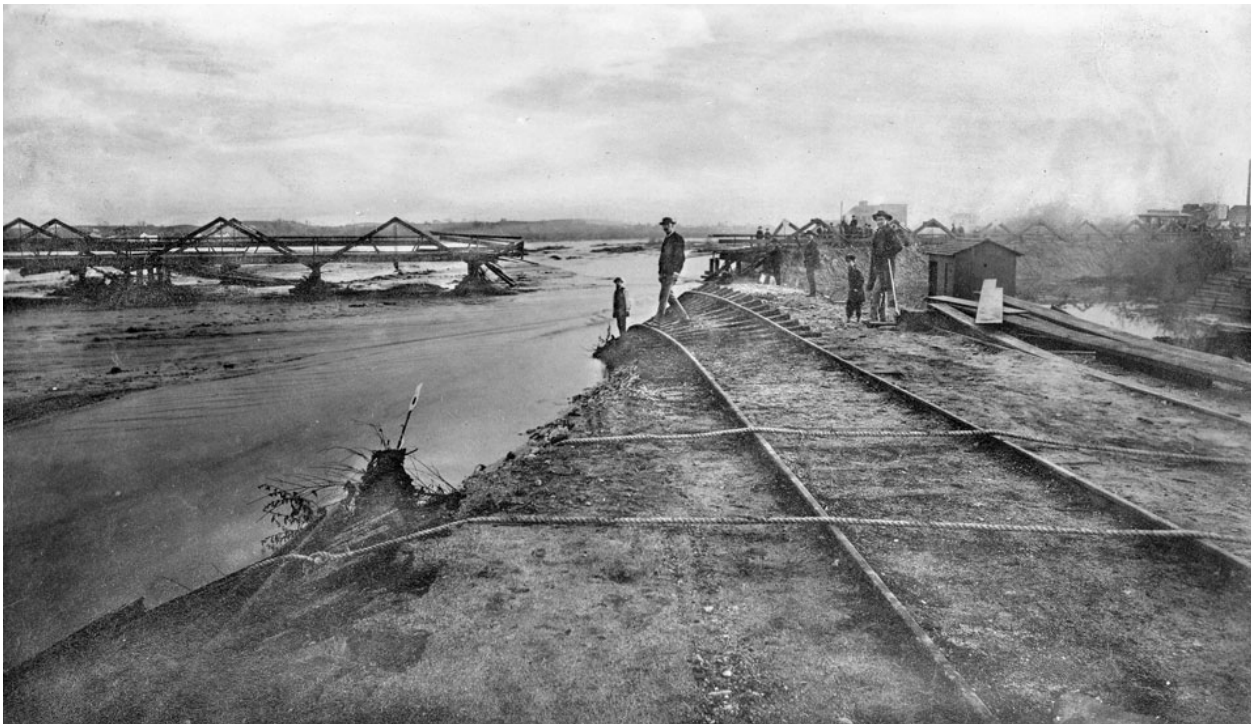
Average monthly electricity use of a California household, 2010: 562 KWh. Average household size = 2.88.
(1 GWh = 1,000,000 KWh) (3,280 x 1,000,000) / (562 x 12 / 2.88) = 1,399,358 people

41 Gumprecht, *Los Angeles River*, 105.

42 Ibid., 177.

inundate large tracts of land, but within a few days they would flow out to sea or seep into the ground, with minimal human impacts. "The Indians had merely walked uphill in flood time and downhill in drought time," Richard Gordon Lillard points out.[43]

What changed between 1884 and 1914 was, of course, the human factor. In 1880, there were just over 33,000 people residing in all of Los Angeles County. By 1910, thirty years later, the population had increased fifteen-fold, to just over half a million. The assessed value of property had also increased fifteen-fold between 1890 and 1914.[44] With such rapid urbanization underway, an epic battle was shaping up: between the forces of nature, and the forces of capitalism (in the form of real estate development). The capricious whims of a dynamic natural system were quickly proving to be



Encroaching urbanization was proving to be incompatible with the river's unpredictable behavior. Damage during the Los Angeles flood of 1885-1886.

USC Digital Library, http://digitallibrary.usc.edu/search/controller/view/chs-m28.html

43 Lillard, *Eden in Jeopardy*, 101.

44 Richard Bigger, *Flood Control in Metropolitan Los Angeles* (Berkeley: University of California Press, 1959), 2.

fundamentally incompatible with the static boundaries of private property. With surging demand for real estate, the city's official cartographers now committed the river to a narrow, strictly defined corridor, and proceeded to divide all the surrounding land into saleable parcels.[45] Mapping the river in this way was the first step towards making the static river channel a physical reality.

Jared Orsi, in his history of flooding in Los Angeles, points out a peculiar coincidence: many of the years in which the city experienced its fastest growth were also years in which floods were conspicuously absent. Of course, to newcomers, this absence was hardly conspicuous; for the most part, it went entirely unperceived, as they simply assumed that the mythology of a benevolent climate was true. Those who had inhabited the region for a longer time knew better; the Mexican community, for example, was aware of the great floods of the 19th century from stories told by their elders. But most newcomers dismissed these stories as exaggerated bits of folklore. Thus, the people who were most actively involved in shaping the city during this era were the people who had the least understanding of the dynamic local climate.[46] Speculators and developers, who were subdividing new tracts on a daily basis, gladly seized upon the ignorance of the newcomers, selling off lots at the mouths of canyons, in floodplains, and sometimes even in dry stream beds.[47]

The 1914 flood, then, came as a surprise to many of the city's residents. When all was said and done, the damage totaled more than $10 million (2012: $230 mil.).[48] For the first time, there seemed to be a broad consensus that the situation constituted a crisis: that the river could no longer be permitted to inflict such damage on the city, that something had to be done at once. Facing public outcry from all quarters, politicians vowed that the city would never again be caught unprepared.

Prior to 1914, the only efforts at flood control were undertaken by individual property owners,

45 Jared Orsi, *Hazardous Metropolis: Flooding and Urban Ecology in Los Angeles* (Berkeley: University of California Press, 2004), 13.

46 Ibid., 13–17.

47 Bigger, *Flood Control in Metropolitan Los Angeles*, 3.

48 Ibid., 1. (All 2012 amounts calculated using the U.S. Bureau of Labor Statistics Inflation Calculator: http://www.bls.gov/data/inflation_calculator.htm)

or at best groups of neighbors. The approach was uncoordinated and unscientific. Often, one person's levees would simply redirect floodwaters onto a neighbor's lot. There were stories of people sabotaging levees that threatened to inundate their own land, and of levee builders guarding their work at gunpoint from such attacks.[49] The failure of these piecemeal efforts to prevent widespread flooding in 1914 highlighted the need for a new approach. First, there would be a need for technical expertise to guide flood control efforts in the most rational and efficient manner. Second, there would need to be a new management structure: a centralized authority charged with coordinating efforts into a comprehensive, unified system for the benefit of the region as a whole. Third, there would need to be a way to finance all of the flood control works. In all three respects, the events that followed the flood of 1914 serve as an interesting study of the struggle to maintain the unity that arose from a crisis situation, amidst forces tending to promote fragmentation. In the immediate aftermath of the disaster, there was unanimous agreement that "something had to be done." In the following years, however, there would be widespread disagreement over just *what* should be done (engineering and design), and *how* it should done (implementation and financing).

Within one month of the flood, a group of five engineers appointed by the county Board of Supervisors had set to work studying the flood problem. Four of the five engineers divvied up the watershed into sub-areas, with each of them taking responsibility for studying and proposing flood control solutions in one of the areas. Their respective recommendations were then to be synthesized into a single plan. The fifth engineer, James W. Reagan, took on the assignment of determining, for the entire county, the extent of areas inundated in historical deluges. Given this unique task, Reagan set about his work in a very different way than his colleagues. While the others pored over hydrological and geological data, Reagan hit the road. Over the course of several months, he logged some 25,000 miles on sojourns that took him throughout the county. Everywhere he went, he interviewed ordinary people about their perspectives on the flooding problem, their memories of past floods, and what

49 Orsi, *Hazardous Metropolis*, 19–20; Gumprecht, *Los Angeles River*, 174–76.

measures they thought should be taken to prevent future flooding. Though Reagan lacked traditional credentials, having dropped out of the American Society of Civil Engineers under mysterious circumstances, he developed a reputation among the public for political savvy and charisma.[50] Reagan ultimately amassed some 600 pages of interview notes, and what he heard from the people led him to a radically different conclusion than the other four engineers, whose meetings he had stopped attending. A key point of contention between Reagan and the others was whether to focus on measures to reduce upstream causes of flooding (such as soil conservation and small check dams in the mountains), or on downstream measures to contain flooding's effects (levees and channel fortifications).

Consonant with the prevailing ideals of the Progressive era, civic leaders had asked these engineers to propose the "best" flood control solution, based on a rational analysis of the problem. However, unable to come to any agreement with the others, Reagan finally submitted his own minority report to the Board of Supervisors (and refused to show it to his colleagues beforehand).[51] The fact that the appointed engineers had reached divergent conclusions, that there were multiple possible solutions and no objective way of assessing which was the "best," flew in the face of the era's faith in rationalized decision-making.

Apart from such questions pertaining to engineering and design, there was also the question of implementation. From early on, it was evident that the flood control measures being contemplated did not (and could not) fall within the purview of any existing government agency; an entirely new one would need to be created expressly for this purpose. At the state level, however, past disputes between regions (typically north versus south) had led to a strong tradition of home rule, and the absence of any statewide coordinating body. At the federal level, it would be another twenty years before the Army Corps' mission was extended beyond strictly maintaining navigability. Given the acknowledged need for a unified, region-wide approach, the only remaining space for such an authority to exist was at the

50 Evidently, there has been more than one charismatic Reagan in Southern California history.

51 Orsi, *Hazardous Metropolis*, 40–42.

county level.[52]

Finally, there was the question of who should pay for all the new flood control infrastructure that the engineers would recommend. Two possibilities were considered: either a general tax on all property within the county, or the creation of a special-assessment district, which would target the costs much more directly on the owners of property that had suffered the worst flooding, who stood to benefit the most from the new infrastructure. Predictably, opinions on this issue split along city/county lines, as most of the population lived within the city, but the largest flood control benefits would accrue to large landowners downstream from the city. The city ultimately submitted to the county on the issue for the sake of expediency and maintaining an appearance of unity in front of the state legislature, which had to approve the new authority. With the matter put aside, the Los Angeles County Flood Control District (LACFCD) was formally created in June 1915. Surprisingly enough, the Board of Supervisors selected the maverick Reagan to lead the new authority.[53]

Despite the initial hiccups, Orsi cites the establishment of the Flood Control District as marking the beginning of technocratic, "assembly-line style" flood control.[54] He argues that this approach has three distinguishing characteristics. First, it "vested much power in unelected experts," a faith rooted in the desire to exclude "special interests" from policymaking. Second, it was built upon "an alliance between governmental bodies and private economic interests." This accords with a pattern described by Robert Fogelson in *The Fragmented Metropolis*, in which public authority was used "in the pursuit of an urban environment that maximized growth and private profit" through infrastructural expansion.[55] Third, "although the public was not literally shut out of the decision-making process, policy debates, which so frequently revolved around technical issues and excluded political or moral

52 Ibid., 42–46.

53 Ibid., 48.

54 Ibid., 52.

55 Robert Fishman, introduction to *The Fragmented Metropolis: Los Angeles, 1850-1930*, by Robert M. Fogelson (Berkeley: University of California Press, 1993), xvii.

ones, inhibited participation by nonexpert citizens."[56]

In January 1917, Reagan submitted a package of flood control improvements to the Board of Supervisors, and the following month it was placed on the ballot for voter approval. The package was a fairly balanced mix of upstream and downstream measures, a balance necessitated by the need to appeal to voters throughout the district. Several large dams and numerous smaller check dams would be built in the mountains, while the river channel between downtown Los Angeles and the ocean would be straightened and lined with "pile-and-wire fence" (two parallel rows of wooden piles spaced a couple feet apart, lined on both sides with hog wire and filled in the center with brush).[57] Part of the plan also included diverting the river's mouth one mile to the east to prevent it from depositing sediment in the harbor, which was becoming increasingly vital to the region's economy. Despite growing public impatience with the lack of visible progress since the 1914 flood, the bond passed by only a narrow margin, mostly due to the fact that the dispute over who should pay for the work had never really been satisfactorily resolved.[58]

One of the most ambitious projects ever attempted by the Flood Control District began in the 1920s, and is interesting as an early example of efforts to integrate water supply and flood control. Unfortunately, despite the idea's promise, the project ended in dramatic failure and was never built, leaving instead a legacy of mistrust. In May 1924, the District submitted a bond to Los Angeles County voters for their approval. The centerpiece of the bond package was a proposal to build the tallest dam in the world. The cost, $25 million (2012: $336 mil.), was 50% more than the entire flood control plan the engineers had proposed in 1915.[59] For this large cost, however, the proposed dam would offer two great benefits. By holding back water rushing down from the mountains and releasing it at a controlled rate, the dam would not only reduce flooding, but would also enable more of this water to

56 Orsi, *Hazardous Metropolis*, 53.

57 Gumprecht, *Los Angeles River*, 187.

58 Ibid., 191.

59 Orsi, *Hazardous Metropolis*, 58.

be returned to the ground, rather than the sea.

Several factors had combined to bring this grand vision closer to the realm of reality. In 1915, much of Reagan's dissent from his colleagues had centered on his belief that the upstream projects they proposed were not worth their cost. Sometime in the intervening years, however, Reagan apparently experienced an epiphany of sorts on the importance of water conservation as part of a flood control strategy. Thus in the lead-up to the 1924 bond vote, he proclaimed that:

> The depletion of the underground water supply in Los Angeles is alarming. The present plan of running this very much needed floodwater away to the sea as quickly as possible, in order that the rancher in the lower thirty-five miles of the district may be protected, should be discontinued as quickly as possible.[60]

The precise reasons for Reagan's dramatic change of heart are unclear. He may have been persuaded in part by a prolonged drought during those years; in any event, the drought had raised the perceived importance of water conservation among the public, providing the necessary base of political support to pass a bond measure. Unusually rapid population growth in the early 1920s, fueled by the local discovery of oil and the booming motion-picture industry, further emphasized the urgency of the water supply issue, while the larger tax base enabled the city to contemplate projects of a scale previously not feasible. The 1924 bond measure passed in a landslide. Shortly thereafter, however, the San Gabriel Dam project began to unravel.

First, controversy emerged over where the dam should be located and how high it should be built. There were concerns over its cost and the impacts it would have on other projects being planned nearby. Lawsuits and hearings prevented the start of any construction, and various panels of experts were unable to conclusively agree on the relative costs and benefits of the proposed dam, in a situation reminiscent of the deadlock in 1915. Personal politics may also have been at play, as Reagan's take-no-prisoners style had earned him enemies in various corners of the local political arena. Then, a twist

60 Quoted in Gumprecht, *Los Angeles River*, 194.

of circumstance killed off the project entirely. Just after midnight on March 13, 1928, the St. Francis Dam (completed two years prior under the supervision of Mulholland to store water from the Los Angeles Aqueduct) collapsed, sending a 200-foot-high wall of water and "concrete chunks weighing several thousand tons each" surging down the Santa Clara River valley below. The wave of destruction (like a tsunami in reverse) killed more than four hundred people before it reached the ocean, 50 miles from where the dam had been.[61] In the aftermath of this tragedy, which remains one of the worst peacetime disasters in American history, public faith in engineering was badly shaken, if only temporarily. An investigation attributed the dam's catastrophic failure was attributed to the weakness of the underlying rock. This prompted, for the first time, an examination of the geology at the site of the proposed San Gabriel dam, which revealed a similarly hazardous level of instability. A contractor on the project, apparently already aware that the dam was unbuildable, was at the time being paid exorbitant rates to excavate material from the site on the condition that they would later build the dam at cost. A juicy scandal proceeded to unfold in full view of the public, featuring the mysterious disappearance and reappearance of key sections of certain engineering documents, and a county supervisor who was eventually sent away to the San Quentin state penitentiary.[62]

The failure of the San Gabriel dam project wrought irreparable damage on the Flood Control District's credibility, seriously impairing its ability to sell the public on future projects, and setting off a downward spiral that culminated in the end of locally-led flood control. Reagan resigned in 1927 and his position was taken over by one E. C. Eaton, who brought with him a management style that sharply contrasted with that of his predecessor. Eaton made it his mission to bring order to a program that, under Reagan, appeared to many to have been guided more by short-term political imperatives than by methodical, long-term planning rooted in sound engineering principles. Progress on installing protective measures since 1914 had been incomplete at best; less than half of the LA River had been lined with permanent levees, while the rest of its length was held in place only by the insubstantial

61 Orsi, *Hazardous Metropolis*, 68; Reisner, *Cadillac Desert*, 97–100.

62 Orsi, *Hazardous Metropolis*, 61–72.

pile-and-wire fences, or by nothing at all.[63] Meanwhile, the assessed value of property in the county had increased twenty-six-fold during this period. To carry out his new agenda, Eaton published a plan in 1931 that, at least in theory, served as the foundation for flood control in Los Angeles for the remainder of the century, including after the Army Corps became involved.

Unfortunately, the Flood Control District was still suffering from the negative image it incurred after the San Gabriel Dam fiasco, and had trouble securing the funds it needed to implement this plan. Meanwhile, new subdivisions continued to appear like mushrooms along the city's constantly moving periphery. Not only did these areas now demand flood protection, they contributed to the overall flooding problem by drastically increasing the amount of impervious surface in the watershed. Thus when a storm hit on New Year's Eve 1933, large areas of the county experienced flood damages. The hardest hit were a string of foothill communities, where 600,000 cubic yards of muddy debris poured down from the mountains and killed at least 49 people.[64] When Eaton (who obviously lacked Reagan's political savvy) pointed out that the county's citizens had themselves to blame for failing to pass needed bond measures, he only fanned the flames of public outrage. Even after the disaster, voters refused a Fall 1934 bond proposal to finance the most urgently needed protection.[65] The Flood Control District, then, found itself in the impossible situation of being unable to slow down or regulate new development that exacerbated the flooding problem with each passing day, and unable to secure the funding necessary to build adequate flood protection. The end was drawing near.

One significant and recurring theme during this era of local flood control was that problems in the legal and administrative structure, specifically with overly rigid restrictions on the way that bonds could be used, served as impediments to effective action. Because bond measures were placed on the ballot for specific amounts of money to finance specific projects, the major design elements had to

63 Gumprecht, *Los Angeles River*, 199.

64 Ibid., 203.

65 Ibid., 205.

be determined in advance. Consequently, public input was essentially limited to a "yea" or "nay" to preconceived designs (and not even to individual projects, but rather to bundles of projects).[66] Once funds had been allotted in this way, the law required that they be spent on the specific designs that the voters had ostensibly approved. This limited the Flood Control District's ability to explore alternative designs in response to considerations that arose later in the process; funds could not even be legally used to study alternatives.[67] The District was also prohibited from using funds for what might be called preventative, or non-structural measures, such as disseminating information to the public on which areas faced the greatest flood hazards.[68] Though these restrictions were born out of good intentions, namely to prevent graft and promote the efficient use of funds, they ended up having a crippling effect, continually impeding the very goal of efficiency which they sought to uphold.

The Olmsted plan and the Army Corps (1930s)

By the 1930s, a "perfect storm" was brewing that would soon herald the next major phase in the river's evolution. In 1935, the Flood Control District had grown desperate and beseeched the federal government for assistance, filing a request for WPA funds to implement its 1931 plan. President Roosevelt approved the application, assigning the Army Corps of Engineers to supervise the work, and by the end of that year the Corps had arrived in Los Angeles.[69]

A number of historical circumstances gave additional momentum to the Army Corps' engagement with the LA River. The Flood Control Act passed by Congress in 1936 gave the Army Corps greater prominence nationwide, as they began taking on "improvement" projects on a number of America's major waterways. (Robert Mount, the geologist, wryly observes that in engineering circles,

66 Orsi, *Hazardous Metropolis*, 48–49, 53.

67 Ibid., 64.

68 Ibid., 89.

69 Gumprecht, *Los Angeles River*, 206.

"major surgery on the fluvial system" is "routinely referred to as 'river improvement,' as if nature just didn't quite get it right the first time.")[70] With the nation still in the depths of the Great Depression, there was a desire for projects that would generate employment in large numbers, and what Los Angeles had in mind fit this bill. Within months after the Army Corps' work began, some 17,000 men had been hired from local relief rolls to work on the project.[71] More generally, this era was marked by a widespread faith in technology and engineering as solutions to the social and environmental problems afflicting humanity, characteristic of early modernism. The Corps' work likely would have proceeded without any further affirmation, but affirmation came nonetheless in the form of another flood in March 1938. This flood, the worst in the city's history before or since, with 87 deaths and $78 million (2012: $1.27 bil.) in damages, silenced most lingering doubts about sealing the river's fate in concrete.[72] And nothing less than concrete would do. Originally, plans had called for unlined channels in the river's lower reaches. But during the 1938 flood, numerous levee failures convinced the Corps' engineers to reevaluate their design. Given the nature of the work that the river would be required to perform, conveying enormous volumes of water at high speeds, the Corps' engineers concluded that it would be necessary to cover both the sides and bottom of the channel in reinforced concrete along virtually the entire length of the river.[73]

Local reaction to the arrival of the Army Corps on the scene was, by and large, quite positive. For most, there was a feeling of relief. After years of bungled work under local leadership, the belief went, the Army Corps' expertise in efficient project management would be the city's salvation. Better still, from now on the money to pay for flood control would be coming from the federal government, rather than local taxpayers; it appeared to be an all-around windfall.[74]

Still, the sentiment was not entirely unanimous. The Municipal League of Los Angeles argued

70 Mount, *California Rivers and Streams*, 292–94.

71 Gumprecht, *Los Angeles River*, 207.

72 Ibid., 216.

73 Ibid., 220–21.

74 Ibid., 208.

that "Engineers think of flood control problems only in terms of mechanics and hydraulics. The biologic factors and the economic and social aspects are every bit as important."[75] They therefore advocated an approach that situated flood control within an integrated regional planning program that included forest and soil conservation, fire prevention, and zoning. Carey McWilliams, writing in 1946 (less than a decade after the Corps' arrival), likewise critiqued the city's heavy reliance on structural methods of flood control and argued instead for hazard zoning:

> Flood control has, in fact, become a major political setup in Los Angeles, the basis of which is to build more cement causeways so that surface waters may be carried to the ocean as swiftly as possible and with the minimum damage to extensive property holdings which have been built in areas that should have been zoned against occupancy.[76]

Mike Davis made the same point half a century later, in his essay "How Eden Lost Its Garden," tracing the idea back to a plan prepared in 1930 by the firm of Olmsted & Bartholomew.[77] That plan, entitled "Parks, Playgrounds, and Beaches for the Los Angeles Region," (referred to hereafter as the 'Olmsted plan') proposed setting aside wide buffers along many of the region's rivers and streams. These interconnected corridors (which the planners gave the somewhat whimsical title of "pleasureway parks") would collectively form a 440-mile-long network of open space extending through greater Los Angeles, connecting the mountains to the sea. Significantly, these parklands would serve the additional purpose of hazard mitigation, allowing the rivers room to expand during high flow conditions without any harm to life or property. Ancillary benefits would include the contribution of these open spaces to groundwater recharge as sites for percolation, and their ability to improve what Kevin Lynch would call the "imageability" of the LA Basin's vast, repetitive grid, by breaking it up into smaller units. Several allusions are made to Olmsted Sr.'s design for the Boston fens, but the scale of the system pro-

75 Quoted in Orsi, *Hazardous Metropolis*, 109.

76 McWilliams, *Island on the Land*, 195.

77 Mike Davis, "How Eden Lost Its Garden: A Political History of the Los Angeles Landscape," in *The City: Los Angeles and Urban Theory at the End of the Twentieth Century*, ed. Allen John Scott and Edward W. Soja (Berkeley: University of California Press, 1996), 160–85;

Olmsted Brothers and Bartholomew and Associates, *Parks, Playgrounds and Beaches for the Los Angeles Region: A Report Submitted to the Citizens' Committee on Parks, Playgrounds, and Beaches* (Los Angeles: Citizens' Committee, 1930).

posed in Los Angeles is radically enlarged. This is demonstrated by a color map contained in the plan, showing the Boston park system superimposed over Los Angeles, the Boston Common centered over downtown LA, the Charles River trailing off towards Santa Monica – a Lilliputian Emerald Necklace surrounded by a giant metropolis.

The network of "pleasureway parks" envisioned in the plan would include three east-west corridors: one running along the Pacific coast, another running along the base of the San Gabriel mountains, and a third in the middle connecting several smaller hill ranges. Six north-south corridors would run from mountains to sea, paralleling several of the region's rivers and streams, including three separate segments of the Los Angeles River totaling 17.6 miles. These corridors would range in width from a minimum of 300 feet to a maximum of 1000 feet or more, enough to allow floodwaters to spread beyond the confines of an engineered channel. River banks would be landscaped with native trees, such as cottonwoods, sycamores, willows, and poplars. All told, these linear parks would encompass an area of about 70,000 acres, including 16,000 acres of land then already in public ownership (for comparison, Griffith Park, the largest in Los Angeles, is 4,310 acres). The plan estimated the total cost for this system at $143.9 million (2012: $1.98 billion), of which about two thirds was for acquisition and one third was for improvements.[78]

The Olmsted plan offers a remarkable alternative perspective on the flooding problem in Los Angeles. All previous efforts had focused on treating the problem's *symptoms*, searching for the most effective way of containing the waters to minimize damage to property, and had addressed this problem in isolation (with the notable exception of efforts to integrate water conservation in the 1920s). The Olmsted plan took a completely different approach, stepping back to consider the underlying *causes* of the problem, namely the indiscriminate spread of urbanization with no regard for the region's natural systems. With prescient insight, the plan points out how any approach that merely treats the symptoms is self-defeating and bound to eventually fail.

78 Olmsted and Bartholomew, *Parks, Playgrounds and Beaches*, 95–138.

The Olmsted firm had raised the issue of zoning to prevent development in flood-prone areas as early as 1926, in a letter to the county Board of Supervisors:

> In the absence of proper legal control of building operations on such lands, it is as certain as anything can be that, partly through ignorance and partly through unscrupulousness, these areas will be largely developed in such a manner that in every period of heavy rainfall not only will streets be submerged but the waters will rise over the floors of houses and other buildings, causing enormous inconvenience and economic loss, creating seriously unsanitary conditions, and tending to produce the most objectionable of slums.[79]

The letter urges that these areas be acquired for recreational purposes, but notes "this can be done at the price of agricultural land if, and only if, speculators are restrained from developing and marketing building lots on low lands." Noting that similarly low-lying areas in Boston had been subject to such regulations for the past 70 years (i.e. since the 1850s), the letters points out "the dangers of uncontrolled private development" on low-lying lands "are much more insidious in the Los Angeles

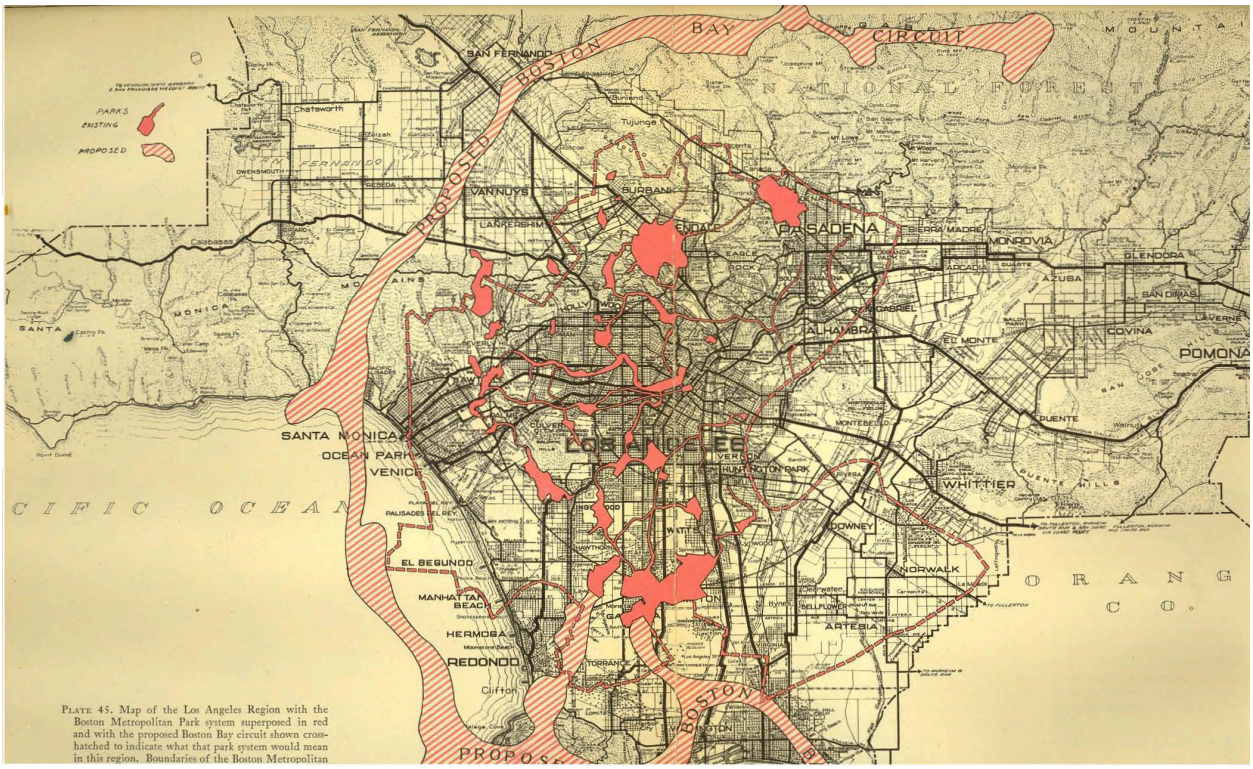
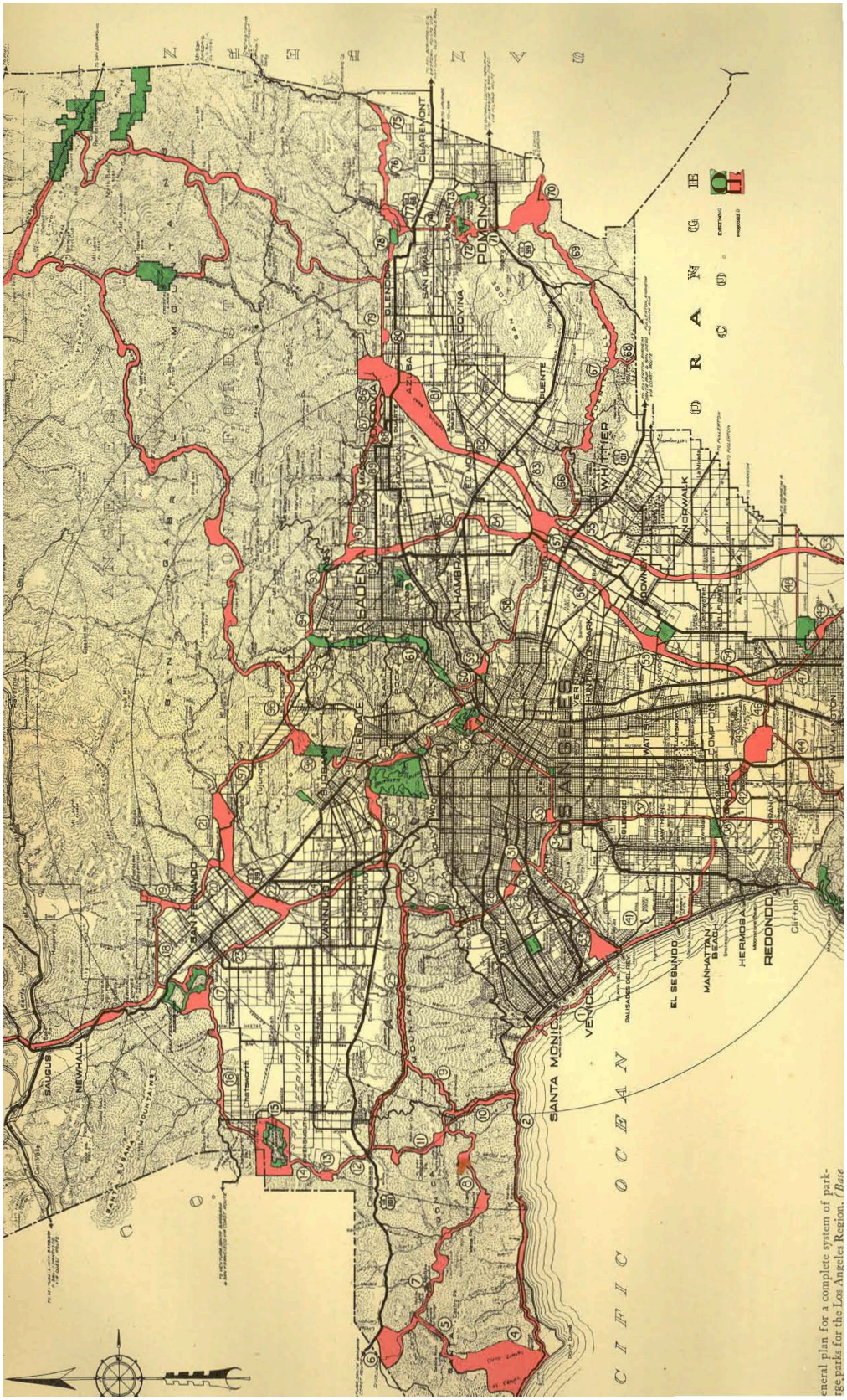


PLATE 45. Map of the Los Angeles Region with the Boston Metropolitan Park system superposed in red and with the proposed Boston Bay circuit shown cross-hatched to indicate what that park system would mean in this region. Boundaries of the Boston Metropolitan

Boston's Emerald Necklace superimposed over Los Angeles.

Olmsted and Bartholomew, *Parks, Playgrounds and Beaches*, Plate 45.

79 Ibid., 149.

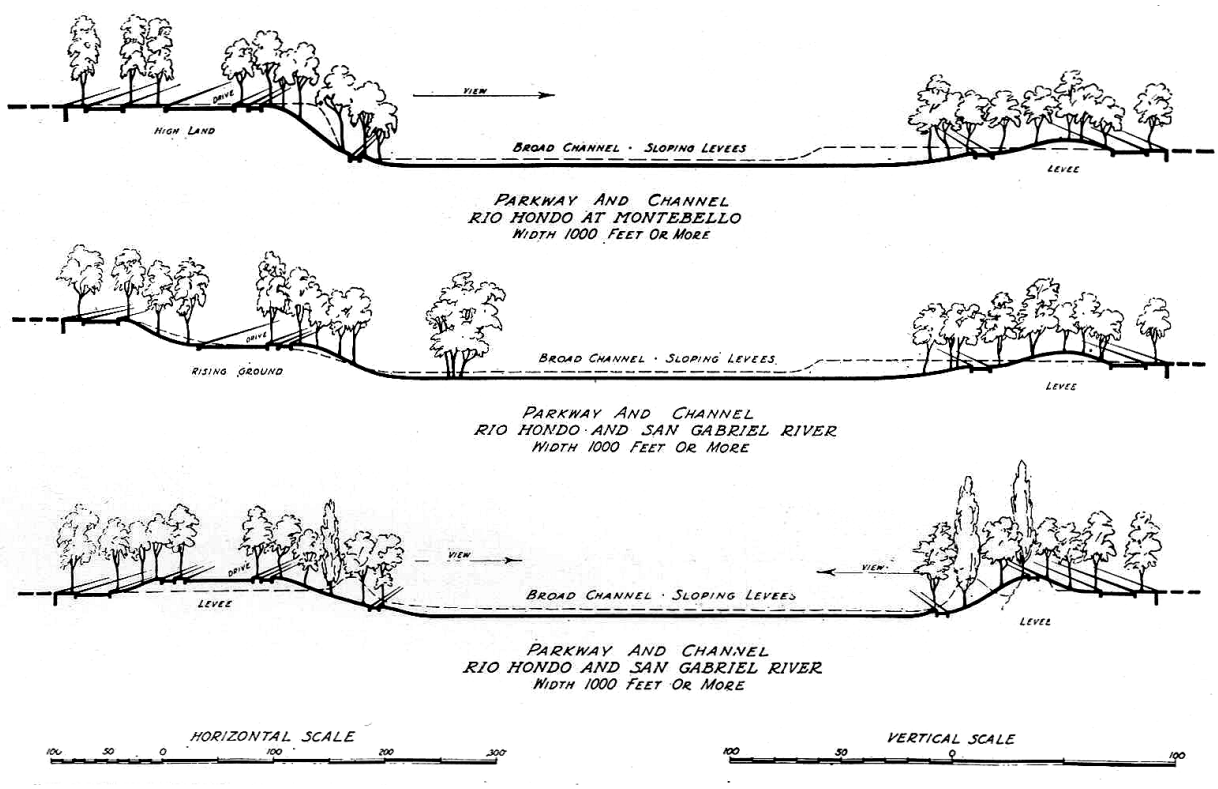


Map showing existing parks (green) and the plan's proposed network of parks and corridors (red).

Olmsted and Bartholomew, *Parks, Playgrounds and Beaches*, Plate 46.

Sections for 'pleasureway parks' proposed in the Olmsted plan.

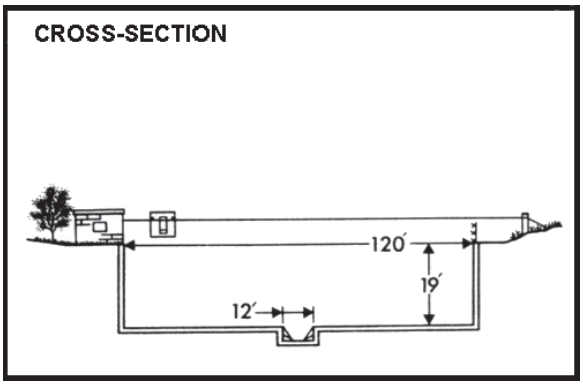
Olmsted and Bartholomew, *Parks, Playgrounds and Beaches*, Plate 48.



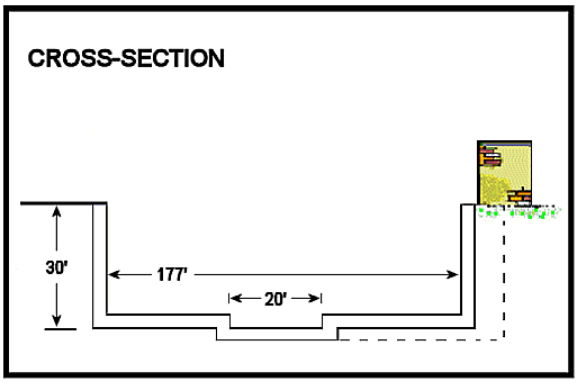
Sections as built by the Army Corps of Engineers.

Los Angeles County Department of Public Works, Water Resources Division, http://dpw.lacounty.gov/wrd/runoff/

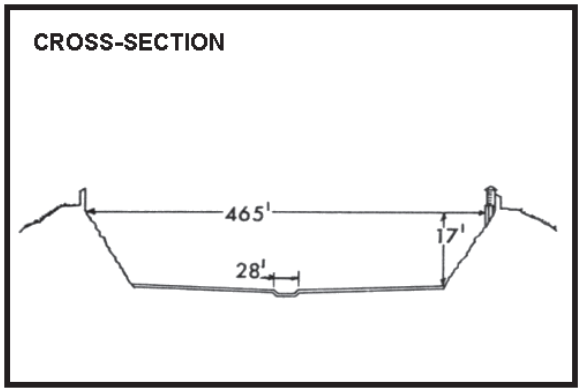
at Tujunga Avenue
DRAINAGE AREA: 401.0 square miles



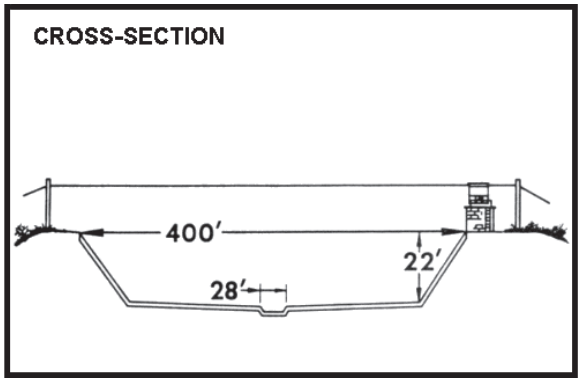
above Arroyo Seco
DRAINAGE AREA: 511.0 square miles



below Firestone Blvd.
DRAINAGE AREA: 596.0 square miles



below Wardlow River Road
DRAINAGE AREA: 815.0 square miles



district than in eastern seaboard cities because extreme fluctuations in rainfall here make most of these low lands during dry seasons much less unattractive for building operations than in the East."[80]

A thoughtful analysis of real estate economics was central to the Olmsted plan. The plan explained how the region's critical shortage of open space was the result of unrestrained speculation that had artificially inflated land values. In such a situation, the profits to be made by developing every square foot of land were an irresistible temptation. Faced with such a stacked deck, public parkland didn't stand a chance. The fundamental reason that development had spread even to risky areas, the plan argued, was a misallocation of costs and benefits. Because the cost of protecting these areas from natural hazards "does not fall on the purchaser alone, and scarcely ever on the vendor, but most heavily on the community at large," the most elemental incentive for not building in these areas was removed.[81] The plan goes on to describe how instituting total or partial restrictions on development in hazardous areas such as floodplains would not only lessen the amount of public money spent on building costly protective infrastructure, it would also drive down the market value of these lands, making it far more feasible to acquire them for public use.

The plan was also astute in its political posturing, making the case that a continuation of the status quo posed a grave threat to the region's scenic beauty, widely acknowledged as the very engine driving the whole growth machine. This argument simultaneously appealed to the idealistic sensibilities of civic reformers, and the pragmatic self-interest of developers and other boosters.

Unfortunately, once the firm of Olmsted & Bartholomew handed over "Parks, Playgrounds, and Beaches" to the Chamber of Commerce, the plan was quietly shelved.[82] Though some of its recommendations were later realized by virtue of coincidence, the plan as a whole was never implemented. The precise reasons for this can only be guessed at, but Mike Davis blames the plan's silent

80 Ibid., 151.

81 Ibid., 14.

82 Greg Hise and William Francis Deverell, *Eden by Design: The 1930 Olmsted-Bartholomew Plan for the Los Angeles Region* (Berkeley: University of California Press, 2000), 1-63.

death on the "selfish, profit-driven presentism [that] ruled Southern California."[83] The plan's vision of "a dramatically enlarged Commons…alarmed guardians of Los Angeles's reputation as the capital of antiradicalism and the open shop," Davis claims.[84] Moreover, he argues, the number of jobs that the Army Corps project would generate had the effect of aligning local labor unions with the conservative "guardians" of big business, forming an indomitable alliance. Davis also describes how, as far back as 1917 (when the Flood Control District's first bond measure was being debated), large floodplain landholders such as the Southern Pacific Railroad staged a campaign of fearmongering propaganda targeting the working-class homeowners who also lived in flood-prone areas (and still do, particularly south of downtown). The river, claimed this campaign, had the potential to cause "a calamity equal to that of Johnstown or Galveston," unless it were brought under the control of man.[85] Indeed, preying on the public's fears has always been an effective way of building support for the most expedient solution and squelching discussion of any alternatives.

More generally, we might trace the failure of Olmsted's vision to take root back to Los Angeles's infamous dearth of civic spirit.[86] This is especially true when it comes to landscape. Most movements to create and/or restore urban parks, at least in America in the 19th and 20th centuries, have been started by members of a wealthy cadre of civic elites. However, in Los Angeles, unlike in denser cities such as New York, most of the wealthy and even many of the middle-class have open space of their own, in the form of their own (often lushly landscaped) private backyards. Those of means also have relatively easy access to mountains and beaches whose grandeur outstrips anything at the immediate peripheries of an East Coast metropolis. It is, therefore, conceivable that these outlets satisfied the desire for contact with nature among the class of people who were in a position to influence the shaping of the city, taking the steam out of a would-be urban parks movement.

There is an amazing, sad irony in that the plan's authors actually predicted its fate. In the plan's

83 Davis, "How Eden Lost Its Garden," 162.

84 Ibid., 164.

85 Quoted in Davis, "How Eden Lost Its Garden," 165.

86 This tendency has been observed by many, and was notably articulated by Fogelson in *The Fragmented Metropolis*.

introductory chapter, they observe that "the rapid growth of population, which makes the rapid expansion of park-system facilities so urgent, also makes its financing particularly difficult," because the capital investment required for "the first requirements of a new population, such as buildings, streets, sewers, and water supply," is exceptionally high in proportion to the present population. They even paraphrase the local mindset: "The benefit of parks bought now will accrue largely in future years… We can get along without them a while longer, anyhow…we would rather use our money to get lots on speculation for personal profit than give it up in taxes for our share of a park system." Recognizing that "it is perhaps harder, financially and politically, for Los Angeles to get [parks] than for any other such community," they conclude: "The real question is, how far will the people…be able to meet the test?"

Laurie Olin speculates that the plan was hidden away because it threatened the to upset the established power structure, to take away influence from the very group that had commissioned it (the Chamber of Commerce). He says:

> It is rather like a proposal we made recently to the University of California in Berkeley, where we said, "Yes, we can do a plan for Berkeley, but only if the University allows us to have direct access to the President and some of the Regents. We have to reorganize how you manage capital projects; otherwise there's no point in it…We made the presentation to middle management, to whom we were essentially saying we're going to go over you, around you, reorganize you. Needless to say, we didn't get the job.[87]

Likewise, it seems as if the clients for the Olmsted plan had expected the landscape architects to produce a simple beautification plan, but ended up getting way more than they had bargained for. Sensing the threat to their own power, their self-preservation instinct kicked in, and they stifled the whole thing, lest the provocative idea leak out and expand beyond their control. The only way around this kind of response, Olin believes, is to take the vision to the public, as they (and not out-of-town landscape architects) are the ones who are in a position to agitate for change. "Only local residents can harangue their government and force them to do these things," says Olin.[88] It is interesting to consider

87 Laurie Olin, "The Power of Diction," interview by Greg Hise and William Francis Deverell, in *Eden by Design: The 1930 Olmsted-Bartholomew Plan for the Los Angeles Region* (Berkeley: University of California Press, 2000), 288–89.

88 Olin, "The Power of Diction," 305.

how things might have turned out differently if the Olmsted vision had been widely publicized – if this vision of a potential future would have been adopted and advocated for by local citizens.

Blake Gumprecht, author of the most comprehensive history of the LA River, seems to rationalize the city's failure to implement the plan, offering a variety of reasons for deeming it unfeasible. He notes that "the huge $230.1 million price tag was seven times the entire budget of the city of Los Angeles in 1930," and that declining property values with the onset of the Great Depression could have made local officials "understandably reluctant to pursue a program that would take perhaps another 100,000 acres off property tax rolls." He contends that the plan "would have increased the cost of flood control because of the high price of real estate in Southern California."[89] However, justifications such as these overlook the plan's central premise, that limiting development in hazardous areas through zoning would have the dual effects of reducing expenditures for structural flood control and making the land more affordable for public acquisition. The issue of financing does raise another interesting prospect, however. It is true that in 1930, the city's finances were largely tapped out, due to the very causes described in the plan, namely the disproportionately high expenditures on streets, aqueducts, and other infrastructure needed to support low-density living in a semi-arid environment. Imagine, though, what if the infusion of federal money that came with the Army Corps had been used to implement the Olmsted plan, instead of building conventional flood control?

Gumprecht also argues that the plan's recommendations "were not true flood control proposals" because they did not include technical specifications, and faults "designers like Olmsted, who too seldom realized that, to reach the engineers, they had to speak their language."[90] In a general respect, there is some validity to this point. However, it is unreasonable to expect a plan for parks and open space, particularly one operating at the scale of a vast region, and one that was commissioned by a decidedly non-technical audience (the Chamber of Commerce), to provide this level of technical detail. This expectation misunderstands the purpose and function of such a planning document, which is

89 Gumprecht, *Los Angeles River*, 268–70.

90 Ibid., 270, 349.

more about offering a vision of what could be, an idea compelling enough to foment broad political support. If a plan is effective in instigating the public's desire to realize its vision, then engineers (ideally, working in close collaboration with the landscape architects) are quite capable of translating that vision into technical specifics.

The Olmsted plan is noteworthy for both the boldness of its vision and its careful attention to detail. Still, it is not entirely clear that the wide river corridors it proposed would have been feasible even at that relatively early stage in the city's development. Zoning ordinances prohibiting development in the floodplain had in fact been proposed at least once even before the Olmsted plan. These were never adopted, however, because of concerns that they would not withstand legal challenges, and (more importantly) because they contradicted the strongly pro-growth ethos of city leaders.[91] As a result, much of the land along the river had already been developed into a mix of industrial, commercial, and residential districts by the 1930s. Just to acquire a corridor of the minimum possible width, the Flood Control District had to spend large amounts of money buying back land. This included the actual channel of the river, much of which had fallen into private ownership because the river was not considered navigable and only intermittently contained water. Even in places that appeared undeveloped, land had already been subdivided and sold, and plans and permits were already in place. Whether or not it was too late to stop such development from actually being built may be a matter of opinion, but in Gumprecht's view, by the 1930s "the time had long since passed in which the river may have been allowed to flow relatively unhindered through a wider, more natural floodplain."[92]

From this perspective, Olmsted's plan appears less than realistic in its treatment of the rivers, having come just a few years too late. On the other hand, there were instances where constraints less flexible than a desire for open space forced engineers to consider alternatives. For example, parts of the river channel were so hemmed in by topography (through the Glendale Narrows) or existing development (through downtown) that engineers deemed the cheapest option to be construction of a

91 Ibid., 209.

92 Ibid., 215

large flood control reservoir (the Sepulveda Basin) to hold the water upstream, even though this would require acquiring thousands of prime, buildable acres in the San Fernando valley. This proved that almost anything was possible given enough money, and that economic calculations (always based on an invisible set of assumptions and values) ultimately dictated what could or could not be built.

In the section that details recommendations for the individual parkway sections, the Olmsted plan makes occasional reference to designs for flood control channels then under consideration. Referring to one at Ballona Creek, it notes with uncanny prescience that "such a channel if merely walled in is likely to become a very ugly feature in the district, standing empty and dry most of the year, a receptacle for papers and rubbish."[93] Unfortunately, this is precisely what happened. After a brief hiatus during World War II, the Army Corps' work on the river proceeded day and night throughout the 1950s. By the time the project was completed in the late 1960s, more than 90% of the river bed had been lined in concrete, at a cost of more than $3 billion (in 2012 dollars).[94] The river had also undergone a semantic transformation: from hence forth, it would be officially referred to as the "Los Angeles County Drainage Area" (LACDA).

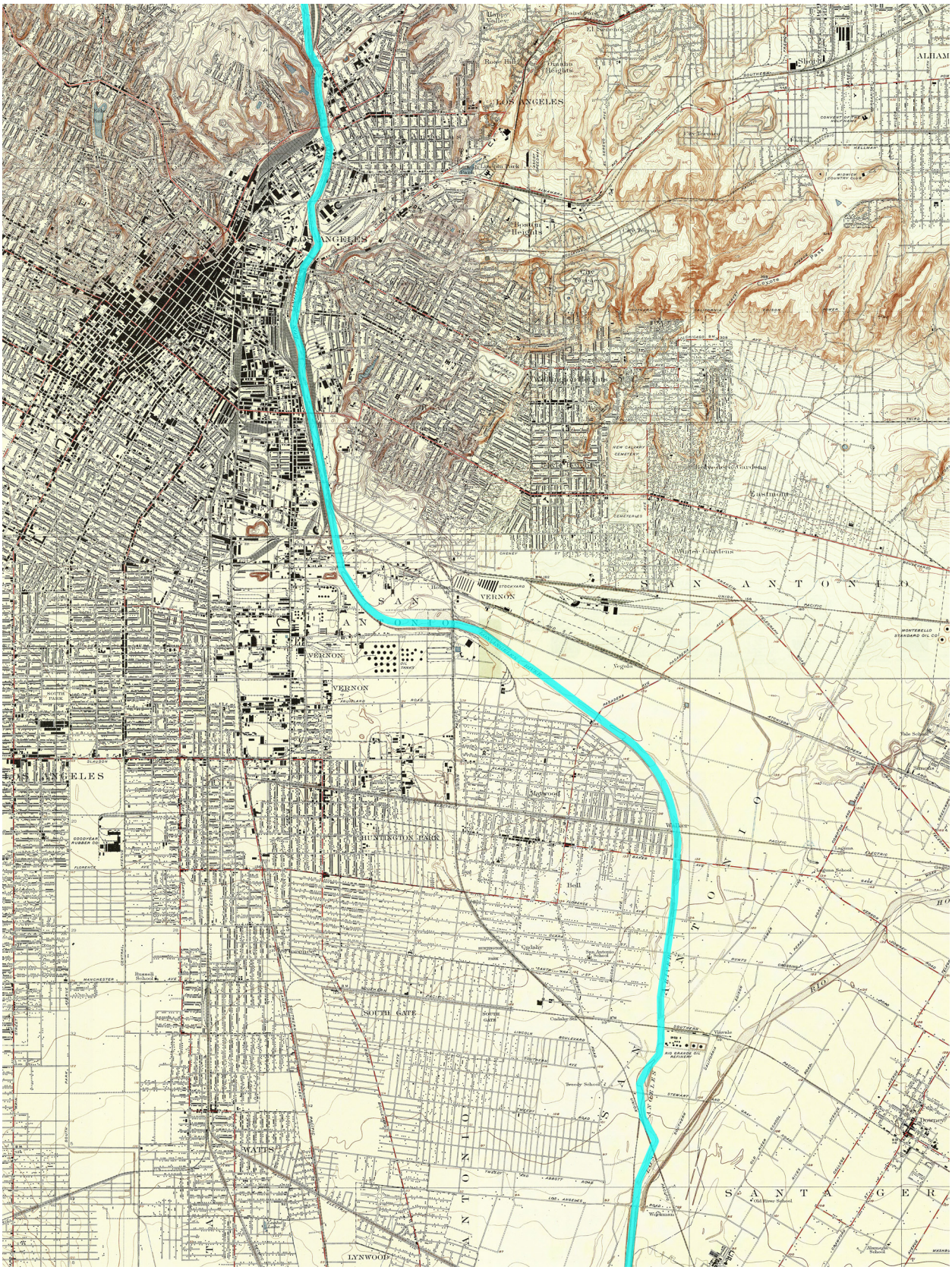
Looking back at the Army Corps' "improvements" to the river, there are several points that deserve mentioning. Most significant among these is the Corps' neglect to incorporate water conservation in their flood control program. A report published by the Army Corps in 1938, as it was preparing to begin its 30-year-long project in Los Angeles, does make reference to "the necessity of conserving as much as is possible of the discharging flood waters to replenish the ground water storage, heavily

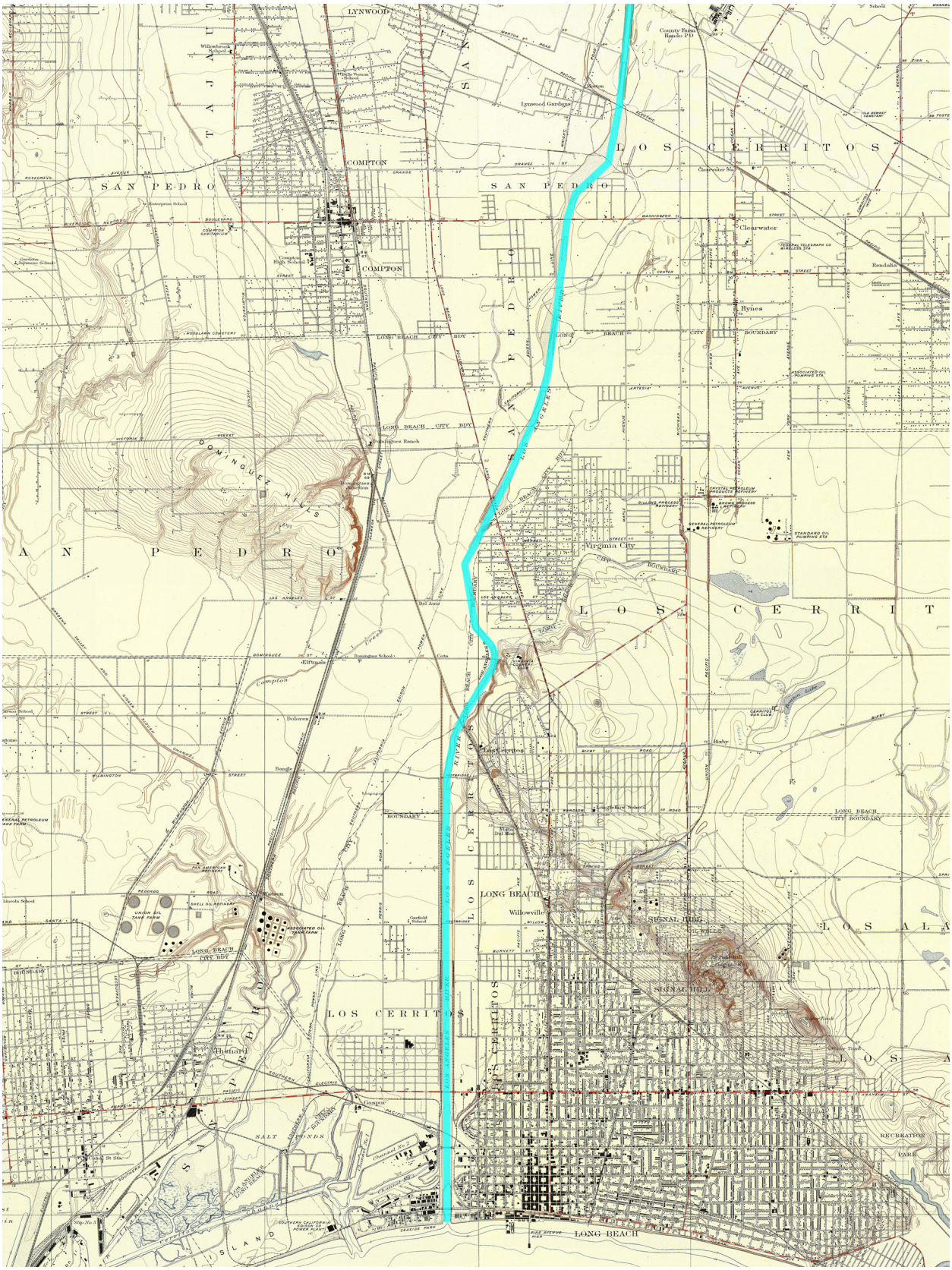
Following pages: Maps from the mid-1920s show various states of development along the Los Angeles River. Near downtown, development had already constrained the river to a narrow corridor. Areas further downstream were not yet heavily built out, although the extension of street grids shows that these areas will not remain undeveloped for much longer.

Historical USGS topographic quads, assembled and modified by author. http://www.alexandria.ucsb.edu/6min_los_angeles_county/

93 Olmsted and Bartholomew, *Parks, Playgrounds and Beaches*, 115.

94 Gumprecht, *Los Angeles River*, 206–07, 222–24. Total is my estimate, based on sum of inflation-adjusted expenditures.


LOS ANGELES
VERNON
SAN ANTONIO
HUNTINGTON PARK
Maywood
Bell
SOUTH GATE
MATTES
LYNWOOD
SANTA GER


LYNWOOD
COMPTON
SAN PEDRO
LOS CERRITOS
Clearwater
Hynes
Virgina City
LONG BEACH
Willowville
SEASIDE PARK
SALT PONDS
ISLAND

depleted in recent years, and on which the life of much of the region depends."[95] The report claims that the flood control basins the Corps proposed to build would address the conservation issue by "holding the water so that it can be released at a rate which will permit increased percolation into the streambed, thereby conserving much of the run-off which would otherwise waste into the ocean."[96] However, the report does not explain how such percolation could possibly occur when more than 90% of that streambed was lined in concrete. Moreover, operational policy dictated that water be released from these flood control basins as quickly as it was possible to do without causing flooding downstream, rather than at the much slower rate necessary for optimal percolation, so that the basins would be empty and ready to accommodate the next storm whenever it hit. It seems clear that conservation was an afterthought, to the extent that it received any consideration at all.

Designs constraints alone cannot account for this neglect, as demonstrated by the emphasis given to conservation in the Flood Control District's 1931 plan, which claimed that its proposed measures could conserve enough water to meet the needs of nearly half a million people.[97] The Flood Control District has, in fact, carried out a conservation program concurrently with the flood control program it manages jointly with the Army Corps. This is ac-

Flood Control Infrastructure
in the Los Angeles County Flood Control District

Construction Materials	
cement	3.5 mil. barrels
reinforced steel	147 mil. lbs.
stone	460,000 tons
earth excavated	20 mil. cubic yards (~ 800,000 dump trucks)
The System Today	
open channels, total length	500 mi
range of depths	2 to 40 ft
range of widths	2 to 600 ft
underground storm drains	2,800 mi
catch basins	120,000
flood control basins	5
flood control reservoirs	15
stormwater pumping plants	33
debris control basins	143
stabilization dams	225

SOURCES:

Gumprecht, *Los Angeles River*, 226-27.

"No Way Out: The Dangers of Flood Control Channels," Los Angeles County Department of Public Works.

95 U.S. Engineer Office, *Flood Control in the Los Angeles County Drainage Area*, 3.

96 Ibid., 4.

97 Gumprecht, *Los Angeles River*, 202.

complished through what are called "spreading grounds", large, shallow basins with highly permeable soils, located adjacent to rivers. During storms, water is diverted into the spreading grounds, where it can percolate into the ground and recharge aquifers. During dry periods, the spreading grounds are filled with treated wastewater and (rather counterintuitively) with water imported from afar via the system of aqueducts.[98] In this way, the District has managed to conserve an average of 274,982 acre-feet (89.6 bil. gallons) per year.[99] However, this system has been operated solely at the initiative of the county. "Because conservation could not be justified on navigational or national defense grounds, it did not fall within the jurisdiction of the Army Corps," explains Orsi.[100] Gumprecht also points out that while the Flood Control Act of 1936 allocated many millions of dollars for the Army Corps' work, upstream conservation measures proposed by the Forest Service and the Soil Conservation Service were given short shrift.[101] Part of the explanation for the declining political will to implement water conservation measures doubtlessly relates to the completion of the Colorado River Aqueduct in 1941. To short-sighted politicians and the public, this signaled (once again) the arrival of unlimited water abundance.

Another trend associated with the Army Corps' takeover of local flood control was the continuation, and indeed the strengthening, of the technocratic regime. No longer reliant on voter-approved bonds, flood control became even more removed from public involvement. One rare exception to this rule occurred in a case where one of the Corps' proposals adversely impacted a well-heeled, well-organized, and well-connected constituency, as was the case in a controversy over the Whittier Narrows

98 The rationale behind the use of imported water relates to the fact that this water is less expensive during the winter and, once stored in local aquifers, can be pumped out in the summer when demand peaks.

99 "Imported and Recycled Water Delivered in Acre-Feet, Water Year: 2011-2012," Los Angeles County Department of Public Works, http://dpw.lacounty.gov/wrd/spreadingground/watercon/file/Imported%20&%20Reclaimed%20Data%202011–2012.pdf.

1 acre foot ~ 325,851 gallons. Though 89.6 billion gallons may seem like a very large amount, it is only a small fraction of all the precipitation that falls in the watershed, and a small fraction of the region's total water usage.

See also Los Angeles & San Gabriel Rivers Watershed Council, *Water Augmentation Study*, http://www.usbr.gov/lc/socal/reports/LASGwtraugmentation/report.pdf, ES-2; and Los Angeles & San Gabriel Rivers Watershed Council, *Ground Water Augmentation Model*, http://www.usbr.gov/lc/socal/reports/LASGwtraugmentation/AppC.pdf, 14.

100 Orsi, *Hazardous Metropolis*, 117.

101 Gumprecht, *Los Angeles River*, 207–8.

Dam in the 1940s. The dam, which formed part of one of the flood control basins proposed by the Corps, threatened to occasionally inundate the town of El Monte. Residents of the town formed a committee to oppose the plan and, using their own funds, hired a team of engineers to design a counter-proposal. Doggedly working their political connections, the citizens of El Monte eventually forced the Corps to accept a compromise design that spared their town.[102] Such cases of active public involvement in shaping flood control policy were exceedingly rare, however.

Despite the prevalence of the technocratic approach, the design of flood control works was less scientific than it appeared, and relied to a considerable extent on leaps of faith and trial-and-error. For example, debris basins, which eventually formed an integral part of the overall flood control battalion, were discovered by accident, as related by John McPhee in his essay "Los Angeles Against the Mountains":

> Strung out along the San Gabriel front are at least a hundred and twenty bowl-shaped excavations that resemble football stadiums and often as large. Years ago, when a big storm left back yards and boulevards five feet deep in scree, one neighborhood came through amazingly unscathed, because it happened to surround a gravel pit that had filled up instead. A tungsten filament went on somewhere above Los Angeles.[103]

In designing the components of their flood control program, the Corps faced a double challenge: a lack of historical data on climate and streamflow, and the difficulty of predicting the rate and locations of future urbanization in the region. In 1938, the oldest weather records in all of Los Angeles County only went back 65 years. Streamflow records went back only half as far, at best, and generally had only been collected for the mountainous upper reaches of streams. In the basin, where most of the population lived, data was virtually nonexistent.[104] "In Los Angeles county," stated the Corps' report, "the stream records are so short, the improvement works so recent, the flood peaks so flashy, and the population increasing so rapidly, that 'height' or 'flood stage' has not come to be the criterion that it is

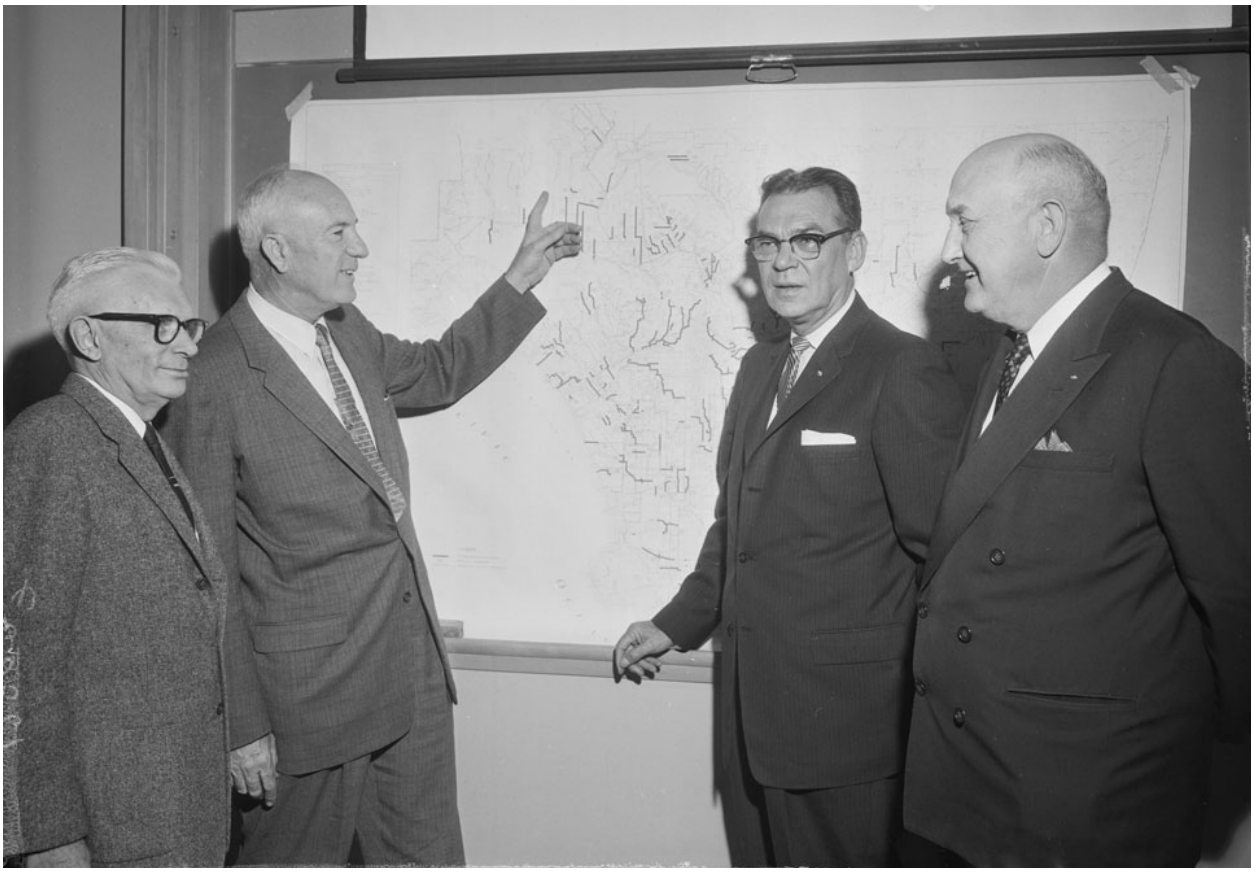
102 Orsi, *Hazardous Metropolis*, 120–28.

103 McPhee, *Control of Nature*, 192.

104 U.S. Engineer Office, *Flood Control in the Los Angeles County Drainage Area*, 21–22.

in the East or Middle West."[105] Given such a severe paucity of the data normally used as the basis for design, the Corps' engineers resorted to such unconventional sources as the diaries of Mission fathers; ultimately they were forced to make a best guess. Unfortunately, several decades later it would become clear that the assumptions upon which the whole system was founded deviated substantially from the present-day reality.

Though the Army Corps has borne a great deal of the blame for ruining the Los Angeles River, this history shows that by the time they arrived in Los Angeles, the situation had reached a point where they often had few options other than to pave the river. The real culprit here is the local political leadership, which failed to prevent widespread development in the floodplain during the city's



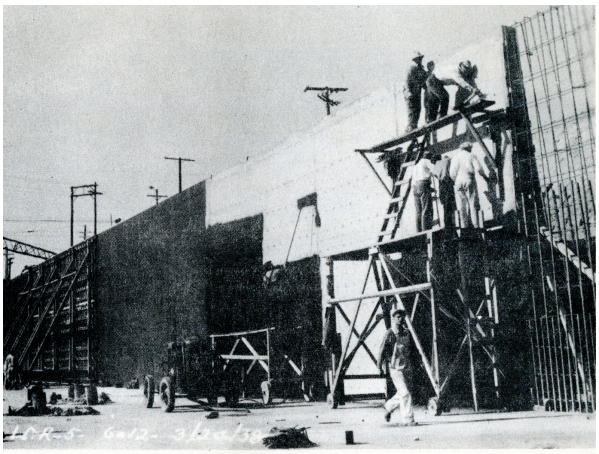
Flood control handled by the experts. Meeting of the Flood Control District, 1958.

USC Digital Library, http://digitallibrary.usc.edu/search/controller/view/examiner-m14463.html

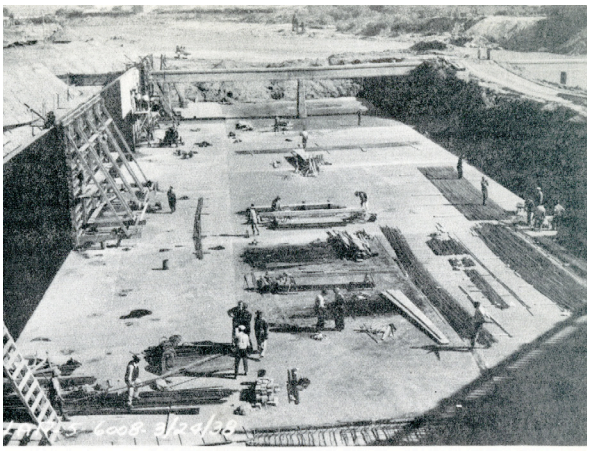
105 Ibid., 29.

Photographs from a 1938 report by the Army Corps of Engineers show the scope of work then already underway.

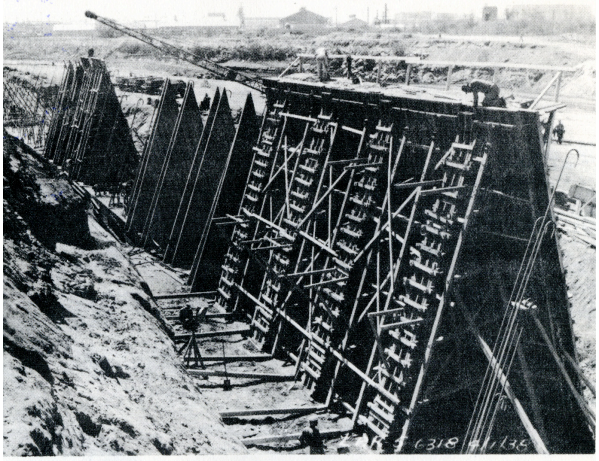
U.S. Engineer Office, *Flood Control in the Los Angeles County Drainage Area* (Los Angeles: U.S. Engineer Office, 1938).



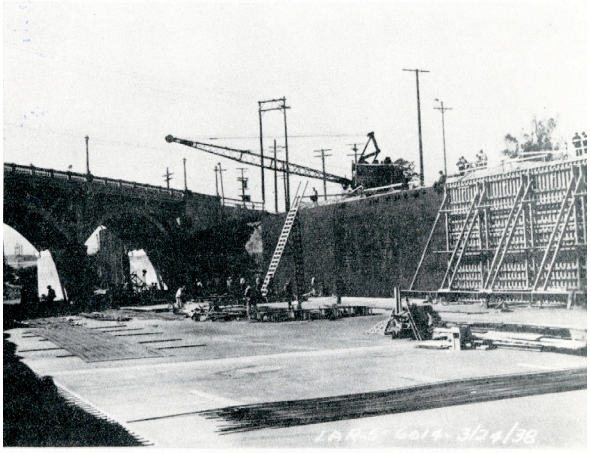
Removing cones from newly poured section of wall below Soto Street on Los Angeles River. Curing compound is being applied. Work is going forward rapidly at this point.



View downstream from Soto Street, showing work in progress on Los Angeles River. A rectangular concrete structure is being built to confine the river at this point.



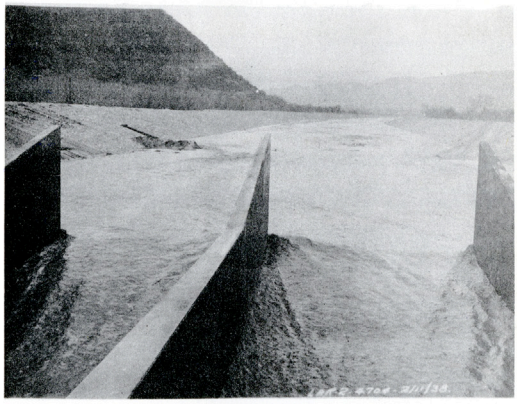
The cement finisher is applying the final touches to the first counter-forted walls poured on Los Angeles River just below Soto Street.



Pouring concrete channel invert just below Soto Street bridge, on Los Angeles River. This section of the channel will have vertical walls.

Photographs showing local streams before and after the Army Corps' intervention.

U.S. Engineer Office, *Flood Control in the Los Angeles County Drainage Area* (Los Angeles: U.S. Engineer Office, 1938).



CHANNEL CONDITIONS BEFORE AND AFTER IMPROVEMENT ARE DEPICTED IN THE ABOVE PICTURES. THE UPPER PICTURE SHOWS THE SECTION OF LOS ANGELES RIVER JUST ABOVE LOS FELIZ BOULEVARD AS IT WAS IN APRIL 1936, BEFORE CONSTRUCTION OF IMPROVEMENTS. NOTE THE PILING AND FENCE AT LEFT WHICH PREVIOUS TO PRESENT IMPROVEMENTS WAS THE ONLY TYPE OF CONFINEMENT PROVIDED FOR CONTROLLING THE STREAM. THE LOWER PICTURE SHOWS THE SECTION WHEN THE BANKS HAD BEEN BUILT UP, AND RIP-RAP PAVING IN PROGRESS ALONG THE RIGHT BANK.

These photographs show the old natural Rubio Wash Channel as it existed at the start of construction and as it appeared after the concrete storm drain channel was completed.

years of explosive growth. Thus, Mike Davis places the blame for destroying the region's scenic and ecological resources squarely on planners, not engineers. He cites a lawsuit brought against the Los Angeles County Regional Planning Commission in the 1970s, which alleged that "the commission had historically functioned as 'expediters for fringe growth' whose planning documents had seldom been more than 'blueprints for sprawl.'"[106] The lawsuit, brought by the Coalition for Planning in the Public Interest, sought to block the Planning Commission's 1973 master plan. In 1979, the suit blossomed into a grand jury investigation that "dramatically exposed the inner workings of a regional planning system dominated and corrupted by development interests."[107] The investigation revealed that planning officials, many of whom were developers themselves, had advised other developers on methods for sidestepping land use regulations in environmentally sensitive areas. Because of the historically weak role of planning in Southern California, Davis argues, "there have been no unqualified victories for open space preservation, just the accumulation of worthless environmental impact reports and toothless development guidelines."[108] If we accept at face value Davis's grim portrayal of planning in LA, where does that leave us as we look to the future?

106 Davis, "How Eden Lost Its Garden," 175.

107 Ibid., 176.

108 Ibid., 177.

3
The Present & Future

The metamorphosis [109]

Today, the river's metamorphosis from natural system to infrastructural system is complete. A drop of rain falling high in the San Gabriel mountains can reach the sea in less than one hour, travelling down the river at speeds of up to 45 MPH.[110] "I fell into a river in California and came out all dusty," Mark Twain once said, but in fact some six to ten people drown each year when they fall into the LA River and are trapped in its high-velocity engineered flows.[111] Many more are saved by the county's swiftwater rescue squad (part of the "Urban Search and Rescue" unit). "They were always there, we could never really figure out why," the sister of a drowning victim says about the city's flood control channels, in a public service announcement produced by the Flood Control District, titled "No Way Out." The video features dramatic footage of rescue professionals straining to pull people out of violent, churning whitewater. "The power of the water is absolutely unbelievable," a weary rescuer says; "this is horribly nasty water that flows through here," he adds. Those who are lucky enough to survive falling in "look like they got in a fight with a lawnmower." "In the channels, there's nobody to hear you call help," says another rescuer, expressing incredulous disbelief that anyone would venture to explore this part of their urban environment.[112]

The river's infrastructural transformation is particularly evident along its lower reaches, running from downtown LA to the ocean at Long Beach. For much of the way, the river runs parallel to

109 Friends Of Vast Industrial Concrete Kafkaesque Structures exists as an ironic counterpart to Friends of the LA River. See: http://seriss.com/people/erco/fovicks/.

110 Gumprecht, *Los Angeles River,* 224.

111 "No Way Out: The Dangers of Flood Control Channels," Los Angeles County Department of Public Works, http://dpw.lacounty.gov/services/water/nowayout.pdf.

112 "No Way Out, Part 1" and "No Way Out, Part 2," Los Angeles County Office of Education (1993), http://www.youtube.com/watch?v=QDEbj3ve8Ds and http://www.youtube.com/watch?v=FoS_yCBWDv8.

the Alameda Corridor, a rail line that lies in a below-grade trench, designed to move freight from the port at Long Beach to large sorting and warehouse facilities east of downtown LA.[113] Together the river and the corridor (as well as the parallel 710 and 110 freeways), constitute a vital arteries in the region's circulation system. The corridor siphons goods up from the port (like a straw), while the river ejects unwanted water out to sea (like a hose). This is the metabolism of the city – goods in, waste out.

Even as they constantly perform this work in the background, the LA River and the Alameda Corridor are both virtually invisible to the people who live here. In this sense they are like all of the region's infrastructure, upon which our modern lifestyles are entirely dependent, and which is all around (above, beneath, beside, through) us, and yet goes entirely unnoticed. It is hardly a surprise that when Kevin Lynch probed the environmental perceptions of Angelenos, as one of three case studies in *Image of the City*, the river did not once appear on any of the resulting maps. The maps show downtown Los Angeles distinctly bounded on the north and west by the Hollywood and Harbor freeways, respectively. To the south and east, however, downtown peters off into a vague gray area. If the river were to appear on these maps, it would be somewhere just beyond the "bus depot," "gas tanks," "skid row," and "manufacturing area."[114]

There are a few possible reasons for this invisibility. One is that for the most part these systems seem to work *automatically* without requiring any input or attention from the public. One almost imagines that if the apocalypse ever did arrive in LA and wiped out the entire human population (as has been fantasized in numerous books and movies over the years), these systems would just keep on running.

Part of the reason must also have to do with how most people in LA move through the city. Like the power lines, fiber optic cables, freeway ramps, aqueducts, and freight corridors, the river (or "flood control channel") is passed by in a split-second blur while moving from one carefully land-

113 Lane Barden, "The Trench: The Alameda Corridor," in *The Infrastructural City: Networked Ecologies in Los Angeles*, ed. Kazys Varnelis (Barcelona: Actar, 2008), 238–41.

114 Kevin Lynch, *The Image of the City* (Cambridge: MIT Press, 1960), 150–51.

scaped enclave to another. Usually during these intervals, your focus is entirely consumed by the task of navigating across lanes at high speeds through dense traffic while trying to follow the highway signs' complex instructions.

I believe that there is another reason still: that this lack of perception is in fact semi-deliberate – the close proximity of so many individual Edens requires a kind of willed blindness in order to sustain the illusion. Southern Californians have traditionally taken great pains to cover up their infrastructure. This is the land of cell phone towers disguised unconvincingly as palm trees, oil derricks hiding behind the hollow facades of imitation campaniles, freeway noise barriers elaborately draped in flowering tropical vines. It is hardly surprising to learn that someone once proposed to paint the bed of the river blue (presumably the hyper-saturated tint of a Beverly Hills swimming pool, bluer than the sky itself). This never happened though, and today the river, with its exposed concrete bed barren and vast in the strong white light of the midday sun, is probably the most honest piece of infrastructure in the entire region. It makes no apparent effort to pretend that it is something other than a flood control channel.

Future challenges

Can we conclude, then, that these systems are humming along just fine, working as the engineers designed them to, out of sight and out of mind? That this infrastructure will continue to serve our needs, and we can all go back to watering our gardens? Not quite. Due to a combination of factors, the 20th century's mega-works of single-purpose infrastructure have begun to fail us. The latest version of the California Water Plan does not mince words in stating the magnitude of the interrelated challenges now facing the nation's most populous state: "California is facing one of the most significant water crises in its history."[115] Though LA has come up against limits in the past, those it will face in the years ahead appear to be more intractable than ever.

115 California Department of Water Resources, *California Water Plan, 2009 Update*, http://www.waterplan.water.ca.gov/cwpu2009/index.cfm, 2.

The Los Angeles River is engineered quite literally from beginning to end. Start of the river at the confluence of Bell Creek and Arroyo Calabasas.

Los Angeles River Revitalization Corporation, http://thelariver.com/gallery/aerials/

The confluence of the LA River and the Arroyo Seco, near the site where the Pueblo was founded, is today a complex tangle of infrastructure.

Los Angeles River Revitalization Corporation, http://thelariver.com/gallery/aerials/

The unchannelized Santa Clara River, sixty miles northwest of Los Angeles, offers a stunning contrast with the channelized lower Los Angeles River.

Google Maps Street View, http://maps.google.com/

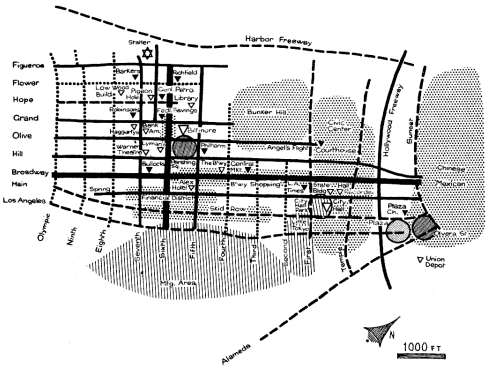


FIG. 43. *The Los Angeles image as derived from verbal interviews*

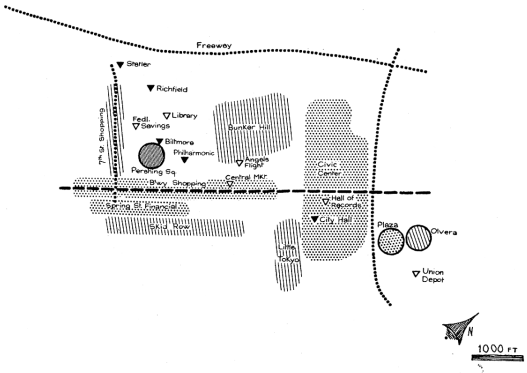


FIG. 45. *The distinctive elements of Los Angeles*

FIG. 44. *The Los Angeles image as derived from sketch maps*

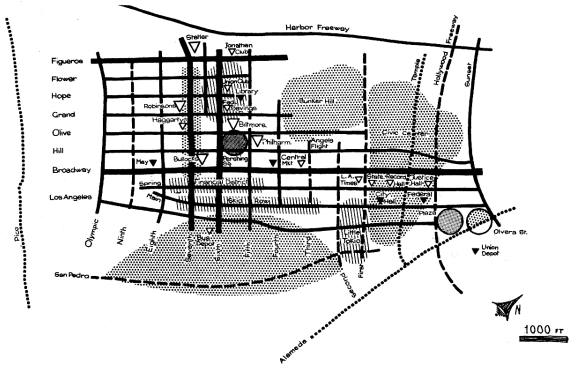
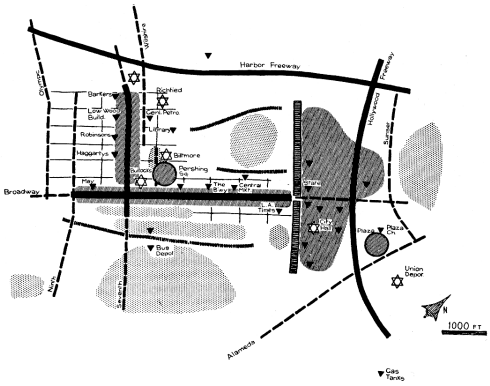


FIG. 46. *The visual form of Los Angeles as seen in the field*



The river did not figure into the "images" of Los Angeles as surveyed by Kevin Lynch.
Lynch, *Image of the City*, 150-51.

First there are a set of environmental problems. Top among these is the one that threatens not only Los Angeles, but the entire western United States, and arid regions throughout the world: water supply. This issue has created a longstanding urban/rural divide that threatens to grow wider in the 21st century; in California, it pits the state's multi-billion-dollar agriculture industry against the still-growing urban regions. The state's population is projected to continue growing through 2050, and all signs indicate that people will continue to use water, even with conservation measures in place. Yet as demand continues to grow, supply is increasingly constrained. Recently implemented legal restrictions, intended to undo some of the environmental damage that has resulted from Los Angeles's appropriation of water from across the west, have reduced the amount available to the city. There is also evidence that across the Southwest, climate change will lead to longer, more severe droughts than

any experienced in the recent past.[116] This could have the compound effect of increasing water demand (as people need to water their lawns more), and reducing the amount available for taking from watersheds such as the Colorado. Furthermore, aging infrastructure is at risk of failure, notably the system of levees protecting the California Aqueduct, which potentially could collapse in the event of a large earthquake. Not only would this submerge vast areas of below-sea-level farmland, it could potentially take the California Aqueduct offline for an extended period of time. The California Aqueduct is also threatened by saltwater intrusion in the Delta due to rising sea levels.

In addition to hotter and drier summers, climate change also threatens to cause increased flooding from more extreme winter storms.[117] During a storm in February 1980, a storm caused the LA River to nearly overtop its levees in Long Beach. The Army Corps carried out a study on the flood control system it had finished building barely more than a decade before, and concluded that it only provided protection from a 40-year flood. The Corps' original assumptions about the ultimate degree of urbanization in the watershed, as well as the lack of historical climate records, had now come back to haunt them. When the flood insurance maps were redrawn, 82 square miles of urbanized area, half a million people and billions of dollars of property fell within the revised 100-year floodplain. Under the Flood Disaster Protection Act of 1973, properties in the 100-year floodplain with mortgages from federally-backed lending institutions (over 95% of all mortgages) are required to purchase flood insurance through FEMA's National Flood Insruance Program.[118] This direct financial impact on thousands of working-class homeowners meant that a large section of the public suddenly took quite a bit of interest in flood control. In public meetings, angry crowds assailed FEMA officials. Some residents

116 Daniel R. Cayan et al, "Future Dryness in the Southwest Us and the Hydrology of the Early 21st Century Drought," Proceedings of the National Academy of Sciences 107, no. 50 (2010): 21271-76, doi:10.1073/pnas.0912391107.

117 Michael Dettinger, "Climate Change, Atmospheric Rivers, and Floods in California – a Multimodel Analysis of Storm Frequency and Magnitude Changes," *JAWRA Journal of the American Water Resources Association* 47, no. 3 (2011): 514-23, doi: 10.1111/j.1752-1688.2011.00546.x.

118 "National Flood Insurance Program Description," US Federal Emergency Management Agency, accessed December 2, 2011, http://www.fema.gov/library/viewRecord.do?id=1480.

Many have questioned the effectiveness of the federal flood insurance program at its basic goal of reducing of damages from flooding. Mount, in *California Rivers and Streams*, points out how the large degree of uncertainty in flood risk estimates is obscured by the precise delineations implied by flood insurance maps.

said that they had never witnessed a flood, and believed that they were being taxed to pay for floods in other parts of the country.[119] Local politicians decried the economic impact of the insurance requirements, and demanded action from above. In response, the Army Corps undertook a project involving the raising of parapet walls along the 21 miles of the river's lower reaches.[120] Completed in 2001, the project cost roughly $225 mil. (2012: $292 mil.)[121]

Apart from water supply and flooding, another water-related problem is pollution from the diverse array of contaminants that wash off lawns, streets, and parking lots, into storm drains, rivers, and eventually the ocean. Like the distant ecological damage in the watersheds tapped by the city for its water supply, this local ecological damage is increasingly being targeted by regulations, such as the Clean Water Act's 'National Pollutant Discharge Elimination System' (NPDES). In addition to the problems relating to water quantity and quality, the transformation of the riparian corridor into a flood control channel has had deleterious effects on habitat. The "lack of spatial and textural diversity" within the engineered channel means the absence of an essential prerequisite for the survival of many species, and the "impact affects virtually all trophic levels," Robert Mount notes.[122]

The problems also extend to the quality of life that the city offers its inhabitants; today the "park crisis" that Olmsted & Bartholomew highlighted in 1930 remains unresolved. The city still suffers from a general lack of open space and recreational opportunities, a shortcoming which is most egregious in low-income areas, including many of the communities along the lower LA River between downtown and Long Beach. While Boston has 9% of its land in parks, and New York has 17%, the number in LA is around 4%, and in the working-class communities south of downtown it drops as

119 Douglas P. Shuit, "1,200 Protest Costly Change in Flood Maps," *Los Angeles Times*, March 13, 1998, http://articles.latimes.com/1998/mar/13/local/me-28468.

120 Orsi, *Hazardous Metropolis*, 142-49.

121 "Los Angeles County Drainage Area Project," Los Angeles County Department of Public Works, http://ladpw.org/general/awards/2002/LACDA.cfm?showTemplate=True.

122 Mount, *California Rivers and Streams*, 308.

Some studies have reported that trash has now partly taken over the role of providing a structural substrate for plant growth to take hold in the river channel.

low as 0.8%.[123]

The potential of decentralized stormwater capture

It is clear that simply building higher levees and longer aqueducts cannot form the basis of an effective response to these problems; another way is needed. One approach that appears to hold promise in addressing many of these problems is appealing in its conceptual simplicity: capturing rain where it falls. Once captured, the water can either be stored for direct use (e.g. irrigation), or allowed to percolate into the aquifers underlying the basin, thereby recharging groundwater supplies. While other measures are also being explored to address future water supply, such as desalination and recycling wastewater, these methods are energy intensive, whereas capturing stormwater is not. More significant to this story, only stormwater capture offers the additional benefits of reducing peak flows on the river. The potential of the decentralized approach derives from the power of small changes multiplied by large numbers. In this regard, its strategy is analogous to Community Development by Design's vision for a "Los Angeles River Urban Wildlife Refuge," which noted that a discontinuous patchwork of thousands of individual backyards across the city collectively constituted a significant amount of habitat for birds.[124]

In 2000, the Council for Watershed Health began its "Water Augmentation Study" to explore the potential of using stormwater to boost local water supplies and reduce dependence on imports, as well as reducing pollution in local water bodies. The potential of stormwater as a resource is evident in the numbers in the study findings: capturing and infiltrating the first ¾" of rainfall from each storm on all parcels across the region could increase groundwater supplies by up to 384,000 acre-feet per year, enough to supply the needs of 1.5 million people.[125] The study also sought to address previously

123 Jenny Price, "In the Beginning: An introduction to and brief history of the river," *LA Weekly*, August 16, 2001, http://www.laweekly.com/content/printVersion/33886/.

124 Community Development by Design, "Los Angeles River Urban Wildlife Refuge: A Vision for Parks, Habitat, and Urban Runoff," *Places* 19 no. 3, 24-29, http://places.designobserver.com/media/pdf/Los_Angeles_Ri_478.pdf.

125 Los Angeles and San Gabriel Rivers Watershed Council, *Water Augmentation Study* (2010), ES-3, http://www.usbr.gov/lc/socal/reports/LASGwtraugmentation/report.pdf.

PROBLEMS		SOLUTIONS
environmental problems	future water supply / drought	decentralized stormwater capture to reduce peak flows on the river and recharge groundwater
	future flooding	
	water pollution	
	air pollution	
	habitat loss	spaces serving this purpose can also serve as habitat and parks; trees help reduce air pollution and heat island effect
quality of life problems	lack of open space / recreational opportunities	interconnected regional network of multi-use trails
	obesity / public health	
	traffic congestion / overburdened transportation network	
structural / institutional problems	fragmentation (political, social, economic, and ethnic)	river as unifying thread / common ground

expressed concerns that using stormwater to recharge groundwater posed a risk of contamination. The study effectively dispels this notion, finding "no evidence of groundwater quality degradation from the infiltration of stormwater." At industrial sites, pre-treatment filtration was found to remove contaminants of concern, and the results suggested further that at sites with shallow groundwater, stormwater infiltration actually led to improved water quality.

What does a system of decentralized stormwater capture look like in practice? It must happen at a combination of scales, from individual properties to neighborhoods. And it must include better design standards for new development, as well as addressing the more daunting challenge of retrofitting hundreds of square miles of existing, largely impervious urbanized area. The former recently took a significant step forward with the city of Los Angeles's new LID Ordinance, which became effective on May 12, 2012. The ordinance expands the existing requirements of the Standard Urban Stormwater Mitigation Plan (SUSMP) to a larger variety of projects. Whereas the SUSMP rules applied only to projects in a handful of categories, such as gas stations and parking lots larger than 5,000 square

feet, the new ordinance extends the regulations to all projects that add 500 feet or more of hardscape, requiring that they capture all rainfall from a ¾" storm and infiltrate or use it on site.[126]

While the LID Ordinance will help ensure that future development is designed in ways that are more sensitive to the needs of the watershed, it does not address the issue of retrofitting, which is important considering that the LA basin is already largely built out; the days of wholesale conversion of virgin land to parking lots are largely behind us, though the parking lots remain. However, two recent projects offer examples of how it is possible to take advantage of underutilized, interstitial spaces throughout the city, weaving "green infrastructure" into the existing urban fabric.

The first project, the Elmer Avenue Neighborhood Retrofit, was initiated by the Council for Watershed Health in partnership with a large number of public agencies and nonprofits. The project was conducted in tandem with the Council's Water Augmentation Study, and its intent was to test out and publicly demonstrate the study's initial findings in the context of a typical residential neighborhood, an otherwise unremarkable block of 24 single-family homes, representative of the dominant typology across much of the region. Several aspects of the projects stand out. First, it was made possible by a strategic redirection of funding that had been allocated for improvements to the conventional storm drain system. The nonprofit organization TreePeople successfully persuaded the county's Department of Public Works that an alternative approach could meet the same flood management goals, for the same amount of money, while also providing a number of additional benefits.[127] Second, the project brought together a wide range of partners. These included government agencies at the federal (Bureau of Reclamation), state (Department of Water Resources), regional (Metropolitan Water District), county (Department of Public Works), and city levels (Bureau of Sanitation, among others). Third, a monitoring program assessed both the effectiveness of the designs implemented (quantity of water infiltrated and pollutant load reductions), and changes in perceptions among local residents.

126 City of Los Angeles, Board of Public Works, *Development Best Management Practices Handbook, Part B Planning Activities, 4th edition*, http://www.lastormwater.org/wp-content/files_mf/lidhandbookfinal5.3.12.pdf.

127 "Sun Valley Watershed," TreePeople, http://www.treepeople.org/sun-valley-watershed.

Fourth, the project included components both on private property (rain barrels, permeable paving, drought-resistant landscaping) and in the public right-of-way (swales between the curb and sidewalk, two infiltration galleries beneath the street).[128]

The second recent project of note is the South Los Angeles Wetlands Park. Funded the by the Proposition "O" water quality bond that voters approved in 2004, the nine-acre park was formerly a "underutilized and blighted" bus maintenance yard.[129] This is an excellent example of repurposing a space that no longer served its original purpose. In the new park, a sinuous series of constructed wetland ponds treats runoff from the surrounding neighborhood before it moves on to the LA River. The park also brought green space to a community severely in need of it, and on a visit by the author barely a month after it opened in February 2012, the park was full of people, for whom it apparently took little time to discover and claim this new space as their own.

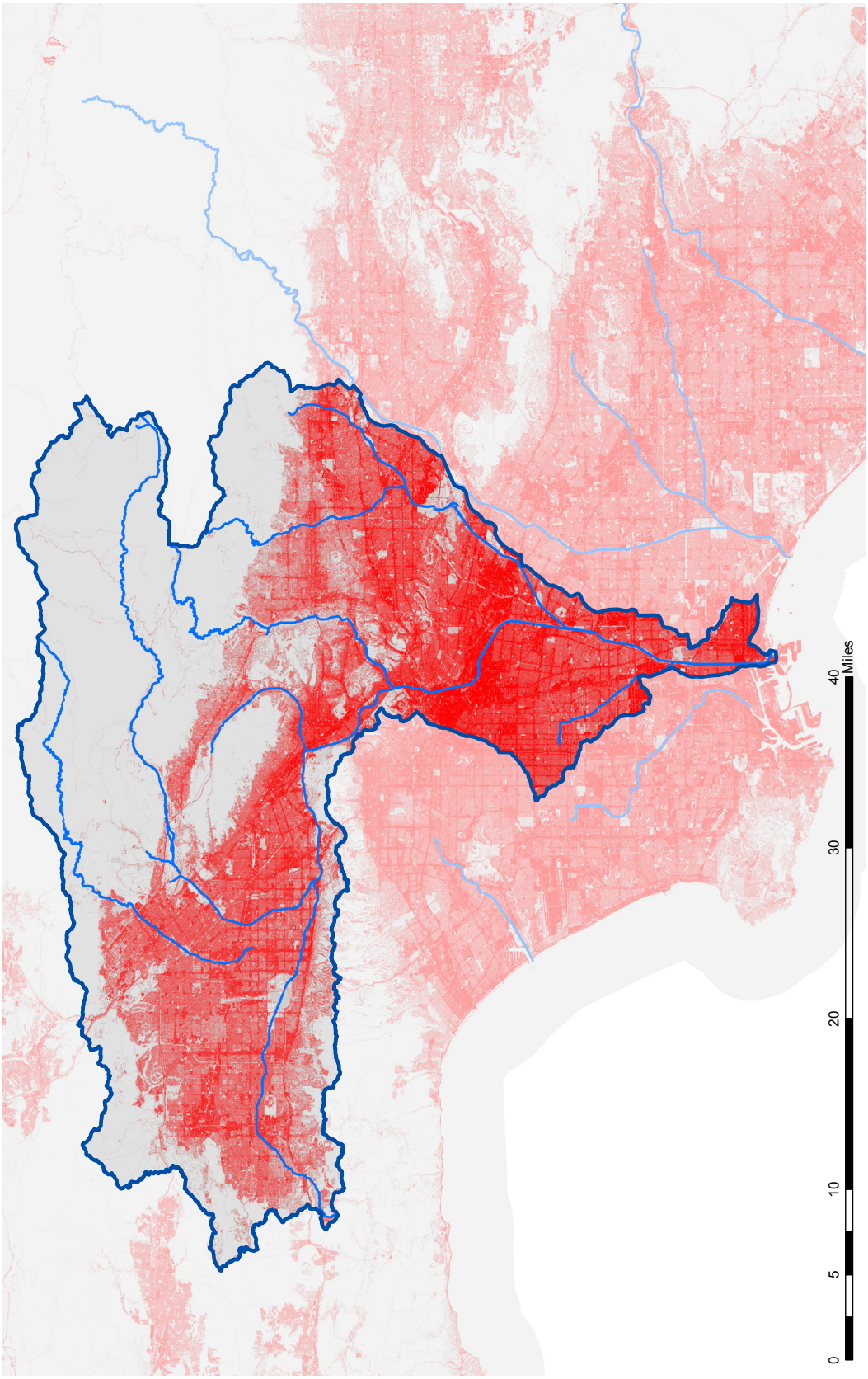
Connecting the dots, searching for values

Major efforts to revitalize the LA River are now underway, and today many more Angelenos (not to mention people outside the city) have heard of the river, even if they may not be able to locate it on a map. However, as we move forward towards the goal of a revitalized river, we should focus more on seeing the links between interrelated issues (such as water supply / flooding / open space), and using this understanding to change how we manage the flow of water through the built environment. This is a very different thing than the much easier, but much less effective approach of beautifying the engineered channel with landscaping treatments (which is more of the cell-tower-as-palm-tree).

Radically rethinking how we design our watersheds will require changes on the institutional/ governance side, for example in how we conduct cost/benefit analyses. The Olmsted plan would prob-

128 "The Elmer Avenue Neighborhood Demonstration Project: Measuring the Success of Green Infrastructure," Council for Watershed Health, http://watershedhealth.org/Files/document/651_Stormcon2011Elmer_Final.pdf.

129 "Adel Hagekhalil on Significance of South LA's Wetlands Park," *The Planning Report*, http://planningreport.com/2012/02/26/adel-hagekhalil-significance-south-la-s-wetlands-park.



The problem: impervious surface (red) covers vast areas of the LA River watershed (outlined).

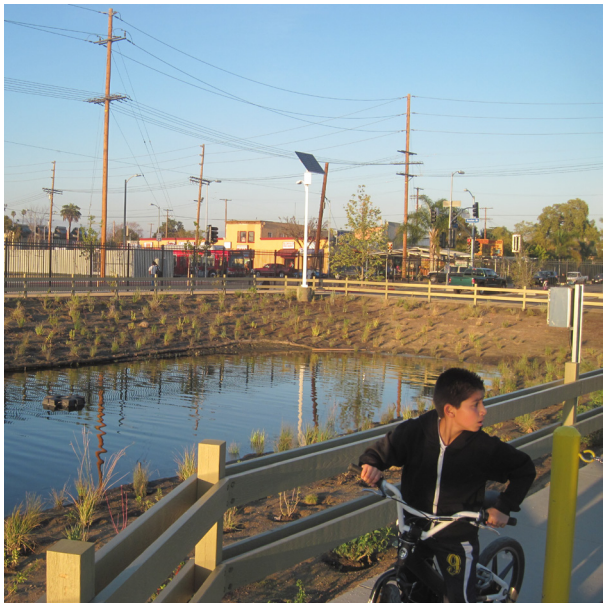
Map by author.

The solutions: decentralized stormwater treatment and infiltration.

Photographs by author (March 2012).

Elmer Avenue neighborhood retrofit

South LA Wetlands Park



ably not fare well if it were to be evaluated by the so-called "national economic development" (NED) model historically used by the Army Corps to decide which projects to invest in. The methodical, quantitative approach to project evaluation embodied by the NED model arose out of a desire for more rational decision-making and efficient use of funds. In recent years, however, many have criticized this approach for being too rigidly formulaic and too narrowly quantitative. While the method is intended to offer an objective assessment of a project's relative merits, many now argue that it makes implicit assumptions about what we as a society value ('economic development'), without ever making those values explicit. As Kevin Lynch argues in *Good City Form*, "Short-range or long-range, broad or selfish, implicit or explicit, values are an inevitable ingredient of decision…When values lie unexamined, they are dangerous."[130] A study commissioned by the White House following the Mississippi River floods of 1993 study found that:

> The principal federal water resources planning document, *Principles and Guidelines*, is outdated and does not reflect a balance among the economic, social, and environmental goals of the nation. This lack of balance is exacerbated by a present inability to quantify, in monetary terms, some environmental and social impacts. As a result, these impacts are frequently understated or omitted. Many critics of the *Principles and Guidelines* see it as biased against nonstructural alternatives.[131]

The search for a better method of evaluation pivots on a fundamental question: what is that we value in our environments? According to Laurie Olin, "J.B. Jackson said that every American is entitled to a landscape that is biologically sound, socially just, and spiritually rewarding…These are the values that we hold self-evident."[132] Kevin Lynch proposed five basic "performance dimensions" ("vitality," "sense," "fit," "access," and "control") and two "meta-criteria" ("efficiency" and "justice"), and devotes a chapter of his book to each of these terms, elaborating on their meaning by way of illustrative cases.[133]

130 Kevin Lynch, *Good City Form* (Cambridge: MIT Press, 1981), 1.

131 Quoted in University of Washington / Evans School of Public Affairs, *Principles and Guidelines for Evaluating Federal Water Projects: U.S. Army Corps of Engineers Planning and the Use of Benefit Cost Analysis*, 17, http://evans.washington.edu/files/Principles_and_Guidelines_for_Federal_Water_Projects.pdf.

132 Olin, "The Power of Diction," in *Eden by Design*, 308.

133 Lynch, *Good City Form*.

The Los Angeles nonprofit TreePeople has proposed its own method of cost-benefit analysis, in order to establish that its vision of an "urban forest retrofit" was economically feasible, and to ensure that its proposals "would be given reasonable consideration as alternatives to conventional design strategies."[134] The TreePeople model attempts to quantify benefits in a range of areas, including air and water quality, energy savings, and job creation. Because the model encompasses "the full range of environmental and economic benefits that result from any particular strategy, it makes evident other possible funding sources," and highlights opportunities for combining the objectives of multiple individual agencies and organizations. As the Elmer Avenue project has demonstrated, this kind of collaboration is integral to bringing projects into fruition.

River revitalization concept envisioned in the city's 2007 master plan.

Los Angeles River Revitalization Corporation, http://thelariver.com/gallery/revitalization-concepts/

134 TreePeople, *Second Nature: Adapting L.A.'s Landscape for Sustainable Living*, 15, http://www.treepeople.org/sites/default/files/images/learn/Second%20Nature%20.pdf.

In her keynote address to the American Planning Association's national conference in April 2012, held in Los Angeles, Renée Jones-Bos, the Dutch ambassador to the US, describes how cost-benefit analysis has been conducted in the Netherlands over the last fifty years. In 1953, a major flood hit the country. The government's response, however, stands in marked contrast with the response to the Los Angeles floods of 1914 and 1938. As in the US, the Dutch response centered on a massive piece of infrastructure, the Delta Works. Unlike in the US, however, this infrastructure "was designed to permit dynamic salt-fresh water exchange." This doubled the up-front cost; but Jones-Bos claims that a motto posted near the Amsterdam Stock Exchange, "De cost gaet voor de baet uyt," (rough translation: "the cost comes before the benefit") is "part of Dutch DNA."

The result of adopting such a long-term perspective, said Jones-Bos, is that today "instead of having a degraded, compromised back-swamp, our delta has a vibrant local fishing industry, robust regional tourism and abundant recreation." A similar philosophy is guiding large projects currently underway, such as "Room for the River," a floodplain restoration project aimed at reducing reliance on structural measures such as dikes and improving ecosystem connectivity. "Engineering alone is not a sufficient response to complex landscape challenges," Jones-Bos concluded. "Planning and design and function and form must also inform investment decisions…only by comprehensively defining the problem can we design an optimal solution."[135]

I would argue that the Olmsted plan was not implemented largely because the integrated perspective it espoused was fundamentally at odds with the fragmented structure of agency jurisdictions and funding. As compelling and enticing as its vision was, the plan was not powerful enough in itself to bring about such change. In fact, some eighty years later, the structure is still fundamentally fragmented. The web of specialized bureaucracies, which are the institutional legacy of modernism and the counterparts of the single-purpose built infrastructure, have proven to be remarkably resilient. The technocratic worldview survives today in the guise of environmental stewardship, as demonstrated

135 "New Paradigm - Living with Water," The Netherlands Embassy in Washington DC, http://dc.the-netherlands.org/key-topics/water-management/more-information/water-management-apa-conference-2012.html.

by the large vocabulary of jargon and dozens of unpronounceable acronyms that have resulted from our society's efforts to regulate its relationship with nature. "Will the protection of water quality and endangered species be driven mostly by lawsuits, creating a patchwork of legal requirements?" frets the California Water Plan.[136]

"Navigating" the LA River

Demonstrating again the importance of semantics and legal frameworks in shaping the river's destiny, there was a point in the recent past when much of the river's future appeared to hinge on whether or not it was "navigable." The strange importance given to this issue, particularly on a river where people are forbidden by law from trespassing, and where the base flow consists primarily of treated sewage, stems from language in the Clean Water Act that limit its protections to the "navigable waters," but rather unhelpfully defines this term as meaning "the waters of the United States, including the territorial seas." The navigability provision has an obscure history that harkens back to the Act's early lineage in the Rivers and Harbors Act of 1899, and in the legal theory that the Act's authority derives from Congress's power to regulate interstate commerce.[137] Over the years, the vagueness of this language has given rise to debates over the Act's original intentions, and a variety of interpretations as to what constitutes "navigability." Until the 2000s, guidance from the Army Corps and the EPA took a broad view, extending protection to wetlands adjacent to "navigable waters." Intrastate waters providing habitat for migratory birds were protected, on the grounds that the billions of dollars spent annually by birdwatchers were a significant contribution to interstate commerce. However, in two recent 5-4 Supreme Court decisions, S*olid Waste Agency of Northern Cook County v. United States Army Corps of Engineers* (2001) and *Rapanos v. United States* (2006), conservative justices adopted a more limited, literal interpretation. In the latter case, Justice Scalia wrote that:

136 California Department of Water Resources, *California Water Plan, 2009 Update*, 14.

137 Susan Harris, "'Pigs Will Fly': Protecting the Los Angeles River by Declaring Navigability," *Boston College Law Review* 39, no. 1 (2012), 198-99, http://lawdigitalcommons.bc.edu/ealr/vol39/iss1/7.

> The phrase "the waters of the United States" includes only those relatively permanent, standing or continuously flowing bodies of water "forming geographic features" that are described in ordinary parlance as "streams," "oceans, rivers, [and] lakes," Webster's New International Dictionary 2882 (2d ed.), and does not include channels through which water flows intermittently or ephemerally, or channels that periodically provide drainage for rainfall.
>
> … the CWA authorizes federal jurisdiction only over "waters." The use of the definite article "the" and the plural number "waters" show plainly that §1362(7) does not refer to water in general, but more narrowly to water "[a]s found in streams," "oceans, rivers, [and] lakes,"… Those terms all connote relatively permanent bodies of water, as opposed to ordinarily dry channels through which water occasionally or intermittently flows.[138]

Thus, the very definition of what constitutes a river was the among the central questions in this case. And, as indicated by the fact that there were no fewer than five opinions written in the *Rapanos* case (one plurality, two concurring opinions, and two dissenting), the subtleties of language have yet to be definitively resolved, now or perhaps ever.

Scalia's dismissive reference to "channels that periodically provide drainage for rainfall" appeared to spell trouble for the LA River. The Supreme Court's decisions threatened to roll back Clean Water Act's protections from thousands of previously-protected waterways, and left agencies such as the EPA scrambling to respond to this apparent legal loophole.[139] Repeated efforts to remove the "navigability" provision from the Act, however, have so far been foiled by the strident opposition of groups such as the American Farm Bureau Federation.[140] Faced with this situation, LA River advocates sought an official declaration of the river's navigability. In its response, however, the Army Corps (perhaps influenced by the court's recent rulings) found that only two two-mile segments of the 51-mile river qualified as "navigable."

In 2008, with a declaration of navigability for the river as a whole appearing doubtful, a biologist who worked for the Corps, conspiring with river activist George Wolfe, conceived of the idea of

138 "RAPANOS v. UNITED STATES," http://www.law.cornell.edu/supct/html/04-1034.ZS.html.

139 "Clean Water Act Definition of 'Waters of the United States'," US Environmental Protection Agency, http://water.epa.gov/lawsregs/guidance/wetlands/CWAwaters.cfm.

140 Charles Duhigg and Janet Roberts, "Rulings Restrict Clean Water Act, Foiling E.P.A.," *New York Times*, February 28, 2010, http://www.nytimes.com/2010/03/01/us/01water.html?_r=1&pagewanted=all.

organizing a kayak trip down the river as a vivid, literal demonstration of the river's navigability. When her superiors at the Corps found out, they apparently did not look kindly on this act of subversion by an insider and threatened her with suspension, saying that she had undermined the Corps' authority by making her case publicly without authorization from the chain of command. "I got treated as some kind of disloyal traitor," she later said, reminding one that the Army Corps does have its origins in the military.[141] Still, the ploy apparently had the desired effect, for in July 2010 the head of the EPA, Lisa Jackson, standing on banks of Compton Creek (a tributary of the LA River), declared the entire length of the river to be "navigable," overturning the Corps' prior determination. "We're moving away from the concrete," said Jackson on the occasion. Lewis McAdams, founder of Friends of the LA River, also saw it as a significant moment: "It is a day when the EPA has essentially redefined the LA River and its values. In other words, starting today, a flood control channel is only one of its many characteristics."[142] In explaining its decision, the EPA seemed to push back on the Supreme Court's limited view, noting that it had considered multiple factors "including the ability of the Los Angeles River under current conditions of flow and depth to support navigation by watercraft; the history of navigation by watercraft on the river; the current commercial and recreational uses of the river; and plans for future development and use of the river which may affect its potential for commercial navigation."[143] Still, there were naysayers. "My impression is it's a ditch, a concrete ditch," said an attorney who criticized the EPA decision as an example of regulatory overreach. He continued, "Whether it is or was a navigable body of water is a fact. [Jackson's] declaration doesn't change that fact. It's like her saying, 'I'm going to declare that pigs will fly.' You can, but it doesn't change the fact." [144]

The fact that the EPA specifically cited both the city's revitalization plan and the kayaking

141 Hector Tobar, "A gamble on the river pays off," *Los Angeles Times*, July 16, 2010, http://articles.latimes.com/2010/jul/16/local/la-me-tobar-20100716.

142 Louis Sahagun, "L.A.'s River clears hurdle," *Los Angeles Times*, July 8, 2010, http://articles.latimes.com/2010/jul/08/local/la-me-Compton-Creek-20100708.

143 "Special Case Evaluation Regarding Status of the Los Angeles River, California, as a Traditional Navigable Water," US Environmental Protection Agency (Region IX), http://www.epa.gov/region9/mediacenter/LA-river/LASpecialCaseLetterandEvaluation.pdf.

144 Paul Quinlan, "EPA Declares L.A. River 'Navigable,' Stretches Regulatory Reach," *New York Times*, July 9, 2010, http://www.nytimes.com/gwire/2010/07/09/09greenwire-epa-declares-la-river-navigable-stretches-regu-42022.html.

excursions highlights the somewhat circular nature of progress on the river. The navigability declaration was premised on the existence of a plan for revitalizing the river, and on visual proof that the river could in fact be navigated by kayak. At the same time, the revitalization and efforts to expand public access needed the navigability declaration in order to move forward. It is conceivable that this chicken-egg cycle could have resulted in a deadlock, had the kayakers not engaged in their strategic act of civil disobedience.

Amidst the legal haggling over subtle nuances of language, such as whether the Clean Water Act is meant to protect "water" or only "waters," we risk losing sight of the big picture, not to mention common sense. In other words, so far we've been trying to achieve greater self-regulation through micro-management. Specific, enforceable regulations governing the design of the urban environment are undoubtedly important, and indeed the present search for new approaches has largely been driven by the advent of new regulations. But can we supplement this approach with alternative, less technocratic ways of negotiating our society's relationship with nature? I believe (like Laurie Olin) that greater public awareness and involvement in these issues is essential if we are ever to really move forward.

Gyorgy Kepes, the founder of MIT's Center for Advanced Visual Studies and a sometime-collaborator with Kevin Lynch, authored an essay titled "The Artist's Role in Environmental Self-Regulation," in which he argues that "one can hope to turn the tide only through full civic awareness of conditions and their social and physical causes and the technical possibilities of their abatement. Only an informed public can be instrumental in applying the present knowledge through legislative action and budget priorities." Kepes believed that artists have a valuable contribution to make in cultivating such public engagement, by raising people's awareness of what could be. "There is a need to bring into the cities nuclei of high experiences, forms, or patterns of sights and sounds that can serve awareness of potential ecological climax. Herein rests the genesis of a deep ecological consciousness and a new ecological ethic," Kepes argued. Particularly interesting is the way that Kepes believed this could be accomplished, by bringing the infrastructural systems on which we depend out into the open, making

their workings visible to the public. He focused on water-purification facilities, positing a new design method of artists working in collaboration with engineers. Such a model, Kepes believed, could combine pollution abatement with "vital aesthetic experiences." These civic works could "serve as symbolic forms of man's attempt at collective self-regulation…public monuments directed toward the future and not the past."[145]

It is significant that Lewis McAdams, the founder of Friends of the Los Angeles River (FoLAR) and the single person to whom all the current revitalization efforts can arguably be traced back, has considered himself first and foremost as an artist and a poet. Since 1985, when McAdams founded FoLAR, there's been a slow but steady build-up of momentum, as more and more organizations, agencies, politicians, and city residents have joined the cause. Along the way, there's been the master plan published by the county in 1996, the one published by the city in 2007, and most recently President Obama's "America's Great Outdoors" initiative and the Urban Waters Federal Partnership, which carry with them the resources of the federal government and the promise of coordinating efforts among the dozens of different agencies working on the river at a variety of levels and from a variety of disciplinary perspectives. And yet the impetus for all this came from outside the system, from an artist wielding a pair of wirecutters, cutting through the chainlink fence that lines the river, breaking the law in order to save the river.

Kayaker exploring an off-limits urban environment.

Los Angeles River Revitalization Corporation, http://thelariver.com/gallery/activities/

145 Gyorgy Kepes, "The Artist's Role in Environmental Self-Regulation," in *Arts of the Environment*, ed. Gyorgy Kepes, (New York: George Braziller, 1972), 167-171.

To a skeptical observer, it might seem that the 'photo op's and media buzz surrounding the revitalization have been out of proportion with the amount of actual physical change that has taken place on the river. For example, it was not until last year that, for the first time, public kayaking on the river was legally allowed to take place. Even then, it was only a small, tightly supervised "pilot program," running on seven weekends with forty participants per weekend who were willing to pay $50 a head and were lucky enough to sign up in the ten minutes before all the spots filled up.[146] Despite the small scale, the sheer novelty of kayaking on the LA River attracted coverage from such distant news organizations as the BBC.[147]

But to be fair, fundamentally changing a whole paradigm requires some patience. Scaling up these initial successes – the revolution in water management that needs to take place throughout the region – will require the involvement and commitment of the public. Awareness of the river as a place is a critical first step, and that is the value of the kayaking program, of river tours led by the Los Angeles Urban Rangers, and of the annual river cleanup organized by FoLAR. Marcia McNally describes how when she and Randy Hester arrived in Los Angeles in the 1980s to begin working on a master plan for Runyon Canyon Park, they found that residents of the surrounding neighborhoods, "like citizens in almost every place I have worked…were alarmingly uninformed about their native landscape." The designers' first step, then, was to lead a series of walking tours that familiarized these citizens with the place they inhabited, which naturally generated dialogue about what they wished it to become.[148]

Jenny Price has eloquently argued that it is time to move beyond the extremely polarized images that have long characterized perceptions of nature in Los Angeles: sunshine/noir, paradise/dystopia. She urges Angelenos to "cherish our mundane, economic, utilitarian, daily encounters with

146 "Paddle the LA River!," http://www.paddlethelariver.org/Paddle_the_LA_River/about.html.

Last year's program operated from seven weekends, from August 13 to September 25. There were two trips per day and ten participants per trip, for a season total of 280 participants.

147 Alastair Leithead, "Los Angeles learns to love its river," *BBC News*, August 26, 2011, http://www.bbc.co.uk/news/world-us-canada-14690082.

148 Marcia J. McNally, "Nature Big and Small: Landscape Planning in the Wilds of Los Angeles," *Landscape Journal* 30 no. 1 (2011), 21, doi:10.3368/lj.30.1.19.

nature—so that what car you drive and how you get your water and how you build a house should be transparent acts that are as sacred as hiking to the top of Point Mugu in the northern Santa Monica Mountains and gazing out over the Pacific Ocean to watch the dolphins leap, the ducks float, and the sun set."[149] We need to expand our awareness of nature, big and small, visible and invisible, and understand how it is impacted by every choice that we make.

Having become aware of the river as a place, the public and their elected representatives must now learn to make the connection between the visible changes they desire to see there, and the invisible, systemic changes upon which the visible changes depend. In his call for a new era of "ecological democracy," Randy Hester notes that "for over a hundred years…our government was run increasingly by professionals and less by lay citizens. Representative government freed us from the obligations of local involvement. Urban specialization freed us from dependence on local ecology."[150] These years of outsourcing the management of our environment to "professionals," who applied a one-size-fits-all approach and addressed each problem in hermetic isolation, have left us with today's legacy of missed opportunities and looming environmental crisis. Now, we (the public) must reengage with the ecosystem we inhabit, and take personal responsibility for the environmental problems we collectively face. Even the Army Corps agrees: "This is not the Corps of Engineers' River. This is the Los Angeles River. This is your river."[151]

149 Jenny Price, "Thirteen Ways of Seeing Nature in L.A.," *The Believer*, April 2006, http://www.believermag.com/issues/200604/?read=article_price.

150 Randolph T. Hester, *Design for Ecological Democracy* (Cambridge: MIT Press, 2006), 5.

151 "Los Angeles River History & Revitalization" (video), U.S. Army Corps of Engineers, Los Angeles District, http://www.dvidshub.net/video/140200/los-angeles-river-history-revitalization#.T72tdkWm9Kh.

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