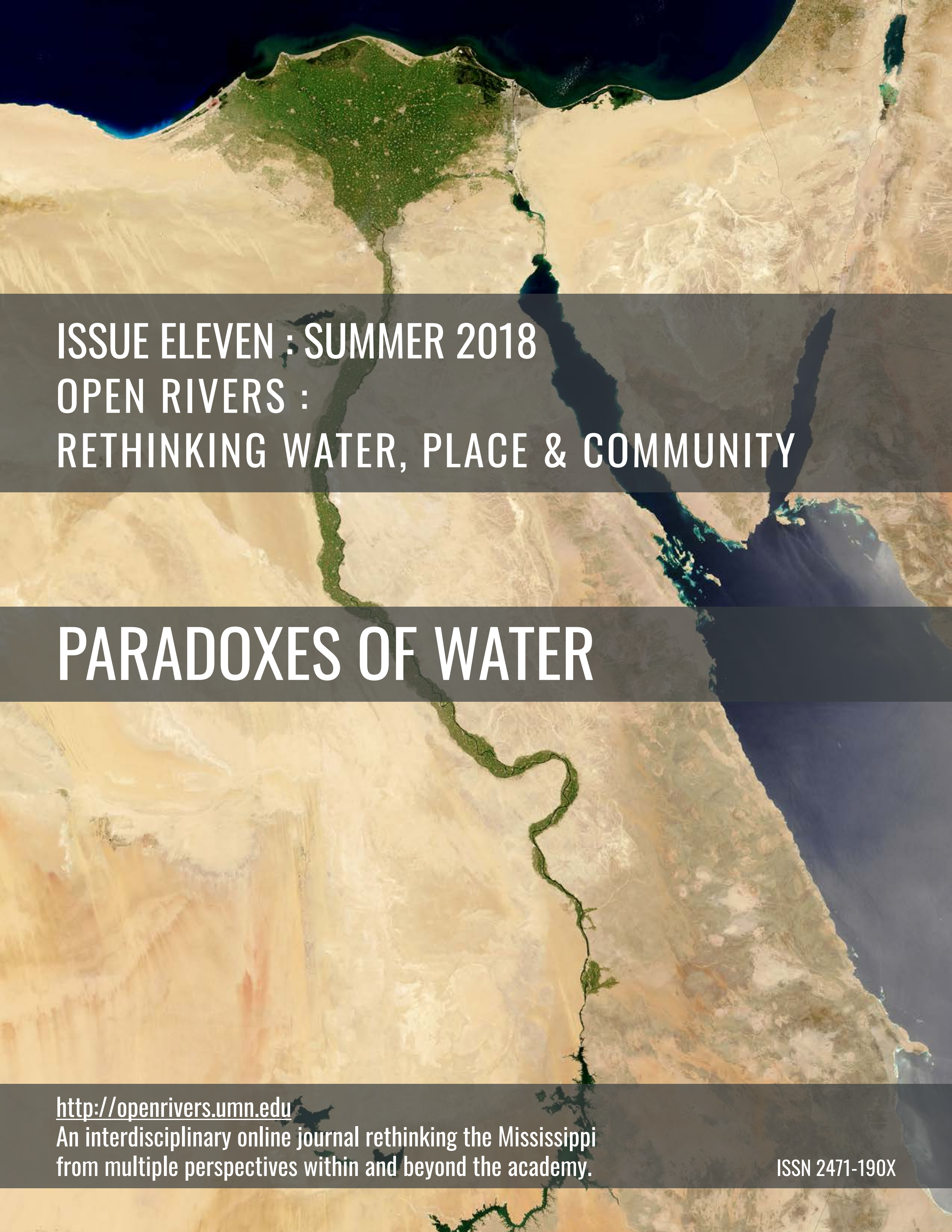


ISSUE ELEVEN : SUMMER 2018

OPEN RIVERS : RETHINKING WATER, PLACE & COMMUNITY

PARADOXES OF WATER

http://openrivers.umn.edu
An interdisciplinary online journal rethinking the Mississippi
from multiple perspectives within and beyond the academy.

ISSN 2471-190X

The cover image is of The Nile River, July 19 2004. To the right of the Nile is the Red Sea, with the finger of the Gulf of Suez on the left, and the Gulf of Aqaba on the right. In the upper right corner of the image are Israel and Palestine, left, and Jordan, right. Below Jordan is the northwestern corner of Saudi Arabia. Jacques Descloitres, MODIS Rapid Response Team, NASA/GSFC.

Open Rivers: Rethinking Water, Place & Community is produced by the University of Minnesota Libraries Publishing and the University of Minnesota Institute for Advanced Study.

Editors

Editor:
Patrick Nunnally, Institute for Advanced Study, University of Minnesota

Administrative Editor:
Phyllis Mauch Messenger, Institute for Advanced Study, University of Minnesota

Assistant Editor:
Laurie Moberg, Doctoral Candidate, Anthropology, University of Minnesota

Media and Production Manager:
Joanne Richardson, Institute for Advanced Study, University of Minnesota

Contact Us

Open Rivers
Institute for Advanced Study
University of Minnesota
Northrop
84 Church Street SE
Minneapolis, MN 55455

Telephone: (612) 626-5054
Fax: (612) 625-8583
E-mail: openrvrs@umn.edu
Web Site: http://openrivers.umn.edu

ISSN 2471-190X

Editorial Board

CONTENTS

Teaching and Practice

Geographies

In Review

FORUM

NEW ORLEANS WAS ONCE ABOVE SEA LEVEL

By Richard Campanella

Early one September morning in 1975, in a quiet Metairie subdivision west of Transcontinental Drive, a ranch house suddenly exploded in a fireball so powerful it damaged 20 neighboring buildings and broke windows a mile away. The house plus four adjacent homes were reduced to rubble, and 11 people were seriously injured.

Note from the Editor

New Orleans geographer and professor Richard Campanella is an astute observer of the land/water nexus of that deltaic city, which today straddles the level of the sea and is thus highly vulnerable to climate change and rising seas. Campanella is speaking at the September 2018 "Paradoxes of Peace and Water" forum at Augsburg University, and has graciously given us permission to reprint the following article. The piece included below captures all of the peril, complexity, and paradox of water and land management in New Orleans.

This article was originally published in the author's 'Cityscapes' column in NOLA.com|The New Orleans Times-Picayune, February 19, 2015, and is reproduced here with permission.

—Patrick Nunnally, Editor

New Orleans was once above sea level, but a century of storm-water drainage has caused the metro area to sink—with deadly consequences.

It had happened before, and it would happen again. At least eight times between 1972 and 1977, well-maintained homes in modern subdivisions, all within a mile of each other, exploded without warning. "Scores of Metairie residents," reported the Times-Picayune, "[wonder] whether they are living in what amounts to time bombs." Unnerved, Jefferson Parish authorities and Louisiana Gas Service Co. technicians investigated the smoldering ruins and determined the proximate cause to be a broken gas line.

But the number and density of the explosions suggested an underlying cause, one that went beyond shoddy workmanship or tragic happenstance. The culprit, it turned out, was soil subsidence.

Buried gas lines had twisted as Metairie's recently drained former swampland settled unevenly, causing concrete slab foundations to tilt and buckle. In extreme cases, the lines ruptured, and leaked gas accumulated in cavities beneath the slab or wafted up into attics. All that was needed to ignite an inferno was an electrical spark or cigarette lighter.

Amid a flurry of finger-pointing and lawsuits, parish officials eventually required slab foundations to be set upon a grid of pilings driven into sturdier, deeper earth, below the superficial level most prone to sinkage, and to require "goose neck" hook-ups designed to bend with shifting.

The pilings stabilized the foundations, and the flexible connections put an end to the gas line fissures.

But gardens, driveways and streets continued to sink, particularly in this central-western section of Metairie, which had an especially thick layer of subterranean peat—ancient marsh grass, swamp tree leaves and stumps integrated into the mud like coffee grounds, material prone to severe consolidation when dried. At least one researcher contended it was not broken gas lines but the rotting of this organic matter, following the removal of water and the introduction of air pockets (oxidation), that produced the deadly gas.

Exploding houses represent an extreme example of how soil subsidence can be a public health hazard, and we should be thankful that modern building codes effectively solved this frightening symptom. But the larger problem remains, and it represents a geophysical hazard shared by all areas, to greater and lesser extents, within the levee-protected, artificially drained metropolis south of Lake Pontchartrain.

Understanding how soil subsidence happened and why it is dangerous entails an understanding of our local geology.

Formed almost entirely by a channel-jumping, seasonally overtopping Mississippi River over 5,000 to 7,200 years, our underlying land comprises five components: sand, silt and clay particles; water; and organic matter.

The river and its distributaries deposited the largest quantities of the coarsest sediments (sand and silt) immediately, making the areas closest to its channels the highest, while dispersing smaller quantities of finer sediments (finer silts and clay particles) farther back, making the backswamp and marshes lower in elevation.

All of the metro area was above sea level, albeit barely in some spots. The lowest areas—today's Metairie, Lakeview, Gentilly, Broadmoor, New Orleans East and the fringes of the West Bank—accumulated the most runoff and thus preserved the most organic matter in their waterlogged soils. When that ground water was lowered (through manmade drainage systems) and the organic matter dried out, the soil shrunk.

Subsidence first started to occur naturally when the river no longer spread new dosages of fresh water and sediment onto its deltaic landscape. In prehistoric times, this would occur when the Mississippi jumped channels, leaving the old deltaic "lobe" to subside while building a new one elsewhere.

From the 1700s to the 1900s, residents erected artificial levees along the lower Mississippi to prevent springtime flooding. Those historical deluges, of course, represented disasters for humans, but they were naturally beneficial, and without them, the soils gradually settled.

The vast majority of our modern soil subsidence, however, is attributable not to the river levees but to the installation of drainage systems within metro New Orleans.

Starting in the 1890s, New Orleans developed a sophisticated system to direct runoff through gutters and underground pipes to a series of pumping stations, which would push the water through "outfall canals" and into surrounding water bodies, principally Lake Pontchartrain. Engineer Albert Baldwin Wood made the new system that much more efficient when he developed his patented Wood "screw pumps," which dramatically increased outflow speed and capacity while removing debris.

The basic design, with key modifications such as pumping station locations, was extended into eastern New Orleans in the 1910s and 1920s and replicated in adjacent parishes in subsequent decades.

The effect of municipal drainage on urban geography was nothing short of revolutionary. Wrote George Washington Cable in 1909, "there is a salubrity that could not be when the...level of supersaturation in the soil was but two and half feet from the surface, where now it is ten feet or more.... The curtains of swamp forest are totally gone[,] drained dry and covered with miles of gardened homes."

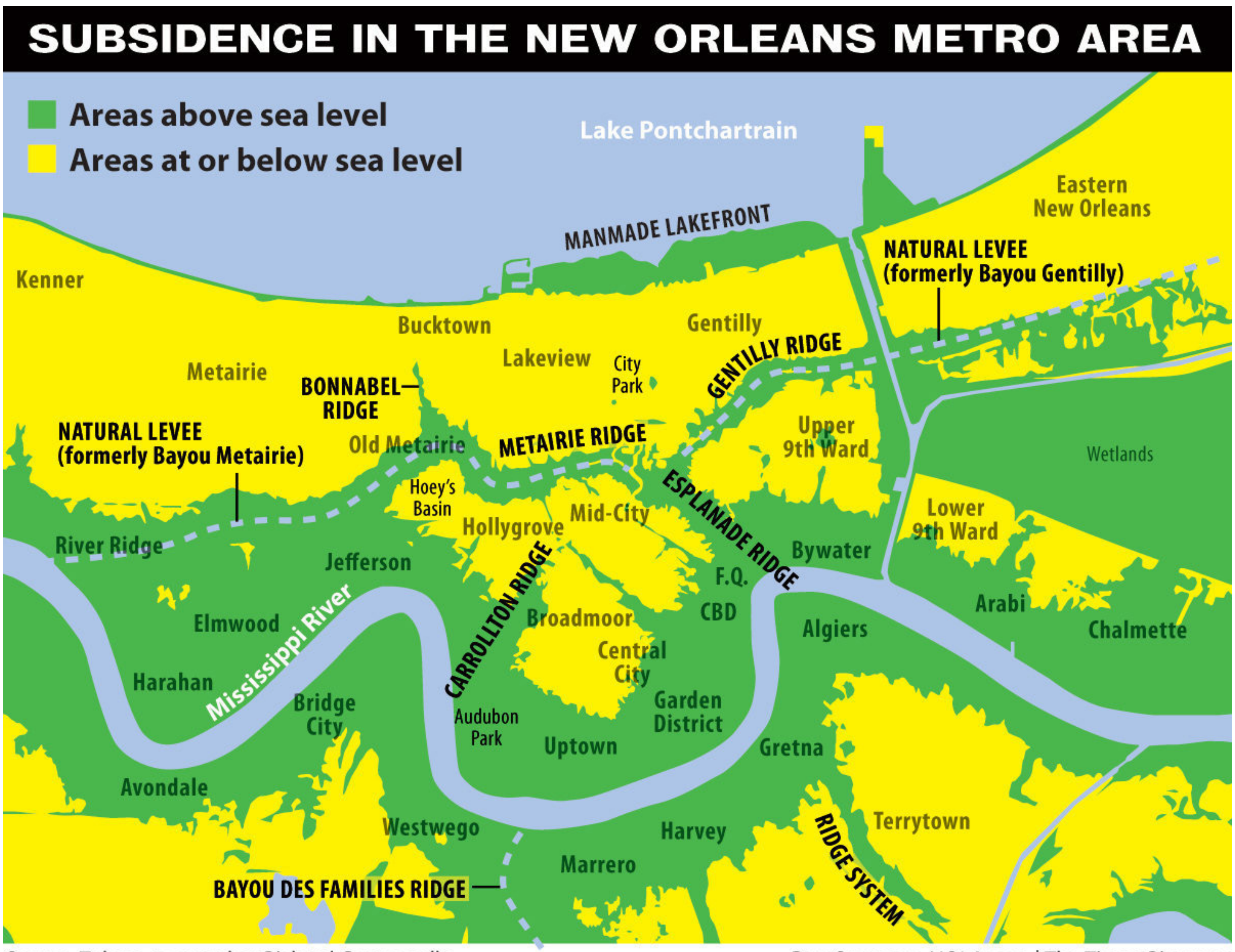
New Orleanians moved en masse off their historic high ground by the river and into new auto-friendly subdivisions on former swamps to the north, west and east. We no longer had to worry about topography.

There was one big problem. In removing unwanted swamp water, air pockets opened in the soil body, which oxidized the organic matter, which in turn opened up more spaces. Finely textured particles settled into those cavities, and the soil sunk.

Architects were among the first to notice the impact upon the cityscape. “Was the drainage of the city responsible for the settling of the old [St. Louis] cathedral wall a few days ago?,” pondered a 1913 article in the *Times-Picayune*. “Will similar breaks in the walls of all of the old downtown buildings occur, and will it force them to be rebuilt? These are two questions which are worrying New Orleans architects and engineers.”

By the 1930s, a metropolis that originally lay above sea level saw one-third of its land surface sink below that level. By the 2000s, roughly half of the metropolis was below sea level — by 3 to 6 feet in parts of Broadmoor, 5 to 8 feet in parts of Lakeview and Gentilly, and 6 to 12 feet in parts of Metairie and New Orleans East. Why those spots? Because they were the lowest to begin with, and thus had the most water to lose closest to the surface and the most peat to oxidize.

The good news is that 50 percent of our metro area remains above sea level. The bad news is that it used to be nearly 100 percent above sea level, and it was we humans who sank it. The worst news is that our absolute rate of land sinkage roughly doubles when we measure it relative to the level of the sea — which is indisputably



Source: Tulane geographer Richard Campanella

Dan Swenson, NOLA.com | The Times-Picayune rising. And, of course, it's the sea that makes this matter potentially deadly.

When Hurricane Katrina's surge ruptured the levees, it poured so swiftly and accumulated so deeply in so many areas because they had become bowl-shaped on account of manmade soil subsidence. Had a similar surge come upon an undrained and unsubsided landscape, say 200 years ago, it would have generally washed off the next day. And, of course, those landscapes would not have been populated.

Instead, the Katrina deluge sat for weeks, impounded, on top of fully developed neighborhoods. People drowned in part because of the unforeseen effects of swamp drainage and soil subsidence.

In urban areas, there is no true solution for soil subsidence; it is not feasible to "reinflate" soils with water while urban life continues above.

It is beneficial, however, to restore a certain level of water content to the soil in the interest of slowing future sinkage. The key is to absorb or retain as much stormwater runoff as possible through porous surfaces, retention ponds, bioswales, rain gardens and widened and landscaped grade-level outfall canals.

As for undeveloped and undrained areas along the lower Mississippi River, it is possible, indeed imperative, to reverse further subsidence and erosion through coastal restoration techniques, such as river diversions, sediment siphons and the beneficial use of dredged sediments.

While we can't truly solve the problem of urban soil subsidence, we can effectively treat the symptoms—by building on piers and pilings above the grade, such that water in our yard does not become water in our house. A local industry exists to counter the effects of subsidence on structures, including sand-pit operators supplying fill and shoring specialists who jack up houses. One such outfit has been in business consistently since 1840, the same year Antoine's Restaurant opened. Apparently house leveling and fine dining make for job security in this town.

We can also acknowledge that topography matters, and that our higher ground is a valuable resource which ought to host higher populations.

Finally, we can learn the lessons of history—and geography, and of the tragic explosions in Metairie in the 1970s—by thinking long and hard before building new levees or draining and urbanizing any additional wetlands on this deltaic plain.

Recommended Citation

Campanella, Richard. 2018. "New Orleans Was Once Above Sea Level." *Open Rivers: Rethinking Water, Place & Community*, no. 11. http://editions.lib.umn.edu/openrivers/article/new-orleans-was-once-above-sea-level/.

About the Author

Richard Campanella, a geographer with the Tulane University School of Architecture and a Monroe Fellow with the New Orleans Center for the Gulf South, is the author of "Bienville's Dilemma: A Historical Geography of New Orleans," "Bourbon Street: A History," "Lincoln in New Orleans," "Geographies of New Orleans," and other books. He may be reached through richcampanella.com, rcampane@tulane.edu or @nolacampanella on Twitter.