A Brief History of Chicago's Water Management

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Today, Chicago stands as the third-largest city in the United States, but less than two centuries ago, the land it sits on was marshland, sparsely populated and bearing no semblance to the urban metropolis that it exists as in its current state. Chicago's evolution into a global hub for commerce, culture, and tourism can be linked directly to its geographic situation and development of rigorous infrastructure that managed waterways in novel and advantageous ways.

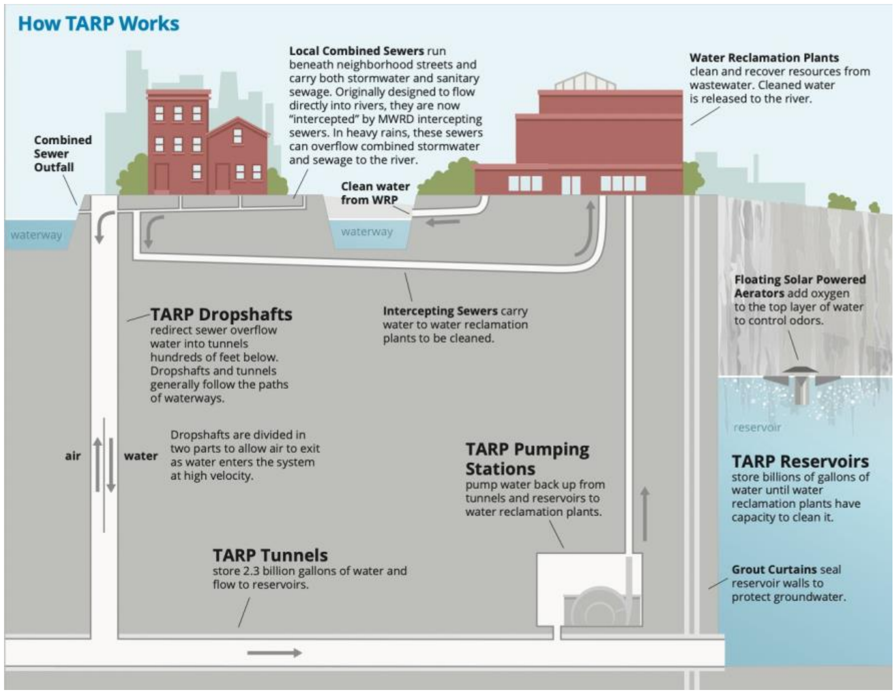
The Chicagoland area was originally inhabited by Native American people from diverse tribes including the Ojibwe, Odawa, and Potawatomi Nations, who settled along what is now known as the Chicago River. In 1673, French-Canadian explorer Louis Joliet passed through the region and recognized a portage that would bridge the gap between the Great Lakes and the Mississippi River, theoretically making way for travel between the Gulf of Mexico and areas north of the Great Lakes. Word of this portage and its ability to expand trading routes quickly made way, prompting a small non-native community to form at the mouth of the river, centered around a trading post built by Jean Baptiste Point DuSable's.

Trade proliferated and the community continued to grow, but the portage was not sustainable due to its high concentration of mud and danger of leeches and other parasites. To combat this issue, in 1836, the city proposed building a canal to facilitate commercial passage and recreational travel. After a decade-long struggle to gather funds for a canal, the Illinois and Michigan Canal (I&M Canal) was completed, successfully crossing the portage and stretching 97.2 miles, from the southern portion of the Chicago River to Peru, Illinois. Correspondingly, this spurred the population of Chicago to grow from 4,470 in 1840 to 1,698,575 in 1900.

One adverse effect of Chicago's rise in population and industry, namely meatpacking, was the mass amounts of waste that accumulated within the river. With no proper sewer system, all waste would eventually be deposited into Lake Michigan, the city's source of drinking water. Cholera and dysentery ravaged the city and in 1856, Ellis S. Chesbrough began leading the operation to build the nation's first comprehensive sewer system in Chicago. This first roadblock was due to the topography of the city. Because the city was so flat and level with Lake Michigan, there was no gravitational force to draw water down, away from the streets. The solution to this problem was to raise all buildings in the city about 14 feet off the ground over a series of 20 years. Chesbrough also planned the construction of a 2-mile long tunnel, 60 feet underground to draw drinking water from further offshore. This project took 3 years but did not achieve its intended effects - heavy rain would continue to divert water towards the intake and contaminate city drinking water.

Chesbrough's ultimate solution to solving the problem of sewage, reversing the flow of the river, was radical, but upon completion, was marked as one of the greatest engineering feats in American history. Instead of water draining into Lake Michigan, sewage would be re-directed South towards the Mississippi. The first attempt towards this goal was the widen and deepen the I&M canal, but after that proved unsuccessful, the construction of a new canal began in 1892. Construction went year-round for 8 years until 42 million cubic yards of rock and soil were excavated and the canal spanned 28 miles long.

Chicago's current sewer system operates under a combined system (CSS). This means rainwater runoff, domestic sewage, and industrial wastewater are all collected and travel through one pipe, where they are transported to a treatment facility and then discharged into a larger body of water. In the event of very heavy rainfall or snowmelt, it's possible for the volume of wastewater to exceed the capacity of the CSS, causing overflow and discharge of contaminated water into local waterways. In an effort to reduce flooding and Combined Sewer Overflows (CSOs), the City of Chicago has designed The Tunnel and Reservoir Plan (TARP), also known as "The Deep Tunnel," to redirect stormwater and sewage into colossal holding reservoirs. Beginning in 1972 and first unveiled in 1984, these reservoirs hold excess storm and sewage water after heavy rainfall until the city is capable of treating the water, instead of immediately dumping the polluted water into our waterways. Ever since the introduction of TARP, the amount of CSOs has decreased from 100 days a year to 50 days a year.



The governing over water in Chicago is done through a bilateral system. The first notable organization is the Chicago Department of Water Management who is responsible for purifying and distributing water to commercial and residential properties across Chicago and 126 suburban communities. In order to achieve such a demanding task, the Department of Water Management operates the world's two highest-capacity conventional water treatment plants, processing nearly a billion gallons of water a day. All water distributed must meet strict standards set by the EPA in order to be classified as potable. The Department of Water Management is closely linked to the second primary water organization in Chicago, the Metropolitan Water Reclamation District of Greater Cook County (MWRD), in that they transfer all effluence over to the MWRD for treatment. The responsibility of the MWRD is to manage stormwater in order to protect the city from flood damages and ensure that wastewater is clean. Furthermore, the MWRD is currently developing and unveiling novel methods to recover and repurpose auxiliary resources from wastewater, such as biosolids, water, algae, phosphorus, nitrogen. Many of the notable aforementioned water projects, such as the reversal of the river and the TARP program have been directed by the MWRD.

There is yet to be a definitive scientific consensus on the effects of climate change on the Great Lakes, but at the moment, water levels have not risen such that they are wholly seen as a concern when compared against the previous decades. What has clearly changed are two things: volatility and erosion. The past decade has been defined by extreme weather, with hard rains and periods of drought, intense heat, and bracingly cold winters. Scientists predict that this pattern of fluctuation will soon apply to the water levels in the Great Lakes. While volatility is predicted to occur in the future, the lakefront is beginning to erode in real-time. The rising intensity of storms has caused the strength of waves to amplify, damaging buildings, bluffs, dunes, and the lakebed itself. Erosion is not just a structural issue, but it also damages and destroys the habitat of several endangered animals. In order to try and protect the lakefront from further erosion, the city has installed hundreds of yards of concrete jersey barriers along Lake Michigan to mitigate damage in flood-prone areas.

Alongside flooding by the river, heavy rainfalls have caused serious damage to many Chicago neighborhoods, in particular, Chatham on the city's South Side. Neighborhoods like Chatham are not equipped with the proper infrastructure to handle heavy rainfall, which causes water to back up in the streets and flood basements. Chatham is placed at a particularly disadvantaged position due to its position at the end of the sewer system, meaning water reserves fill up quickly before they are able to collect the water built up in Chatham and flood the neighborhood. This problem is aggravated by the development of urban environments over natural lands since concrete is impermeable and gives no place to store water. Local homeowners have begun to build gardens to try and absorb water and research points towards the effectiveness of building green spaces and restoring areas with their native plants in reducing the harm of floods.

Lake Michigan is not the only body of water experiencing erosion. Ever since the reversal of the Chicago River in 1900, the increase in water headed through the Illinois River has eroded the riverbanks and destroyed farmland and animal habitats in the region. In the instances where heavy rains cause sewage and agricultural waste to runoff into the Mississippi and down to the gulf, the newfound increase in phosphorus feeds algae, causing blooms, which when dead, consume much of the oxygen in the water, resulting in so-called "dead zones" throughout the Gulf. The MWRD has worked to reduce phosphorus discharge levels and pledges to further do so in the future, where TARP will play a necessary part in reducing hazardous runoff into waterways.

Another ongoing concern caused by the reversal of the river a century ago is the presence of invasive species, such as Asian Carp. First arriving from Alabama, Carp traveled up the Mississippi in the 1990s and have continued to outperform native species that perform necessary filter feeding. The ecosystems of these native species are deteriorating as a result of the carp and the fishing-tourism market is suffering as well. While expensive and unlikely, come are suggesting implementing permanent barriers between the watersheds to, in essence, re-reverse the river. If done, however, the city's sewage system would have to be overhauled and retrofitted as well.

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