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Fairmount Water Works and its Water Stories

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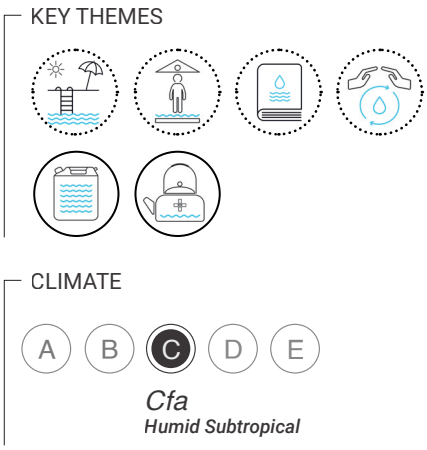
The Fairmount Water Works of Philadelphia has many stories to tell that span its rich 200-year history. It speaks to the history of technology in America, urban water systems, public health and civic architecture. Although struggling with the increasing impact of climate change, it still has a significant role to play today as a heritage site and as an iconic expression of architectural beauty, civic pride, environmental education and protection and the stewardship of water for all.



< *Fig. 1 Contemporary view of the Fairmount Water Works looking southeast with the Philadelphia Museum of Art and Philadelphia skyline as backdrop (Source: Fairmount Water Works Interpretive Center photographer).*

History of Fairmount Water Works: Philadelphia's Public Water Supply System

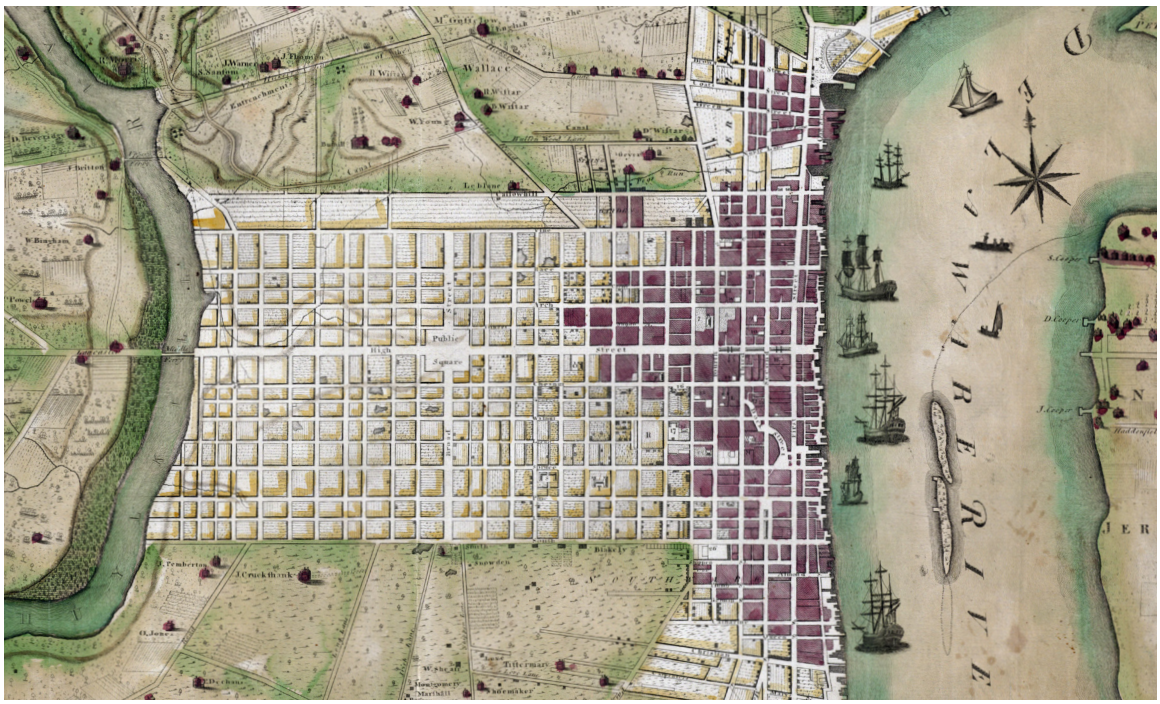
The Fairmount Water Works is a "landmark" in many ways (fig. 1). It was named a National Historic Civil Engineering Landmark in 1975, a National Historic Landmark in 1976, and a National Historic Mechanical Engineering Landmark in 1977. It also serves as a significant landmark for a kind of environmental education that connects the natural world with the built environment. As a cultural landscape, it asserts the principle that access to clean, safe water is a human right and therefore, a civic responsibility.

Water Works: The Arc of History

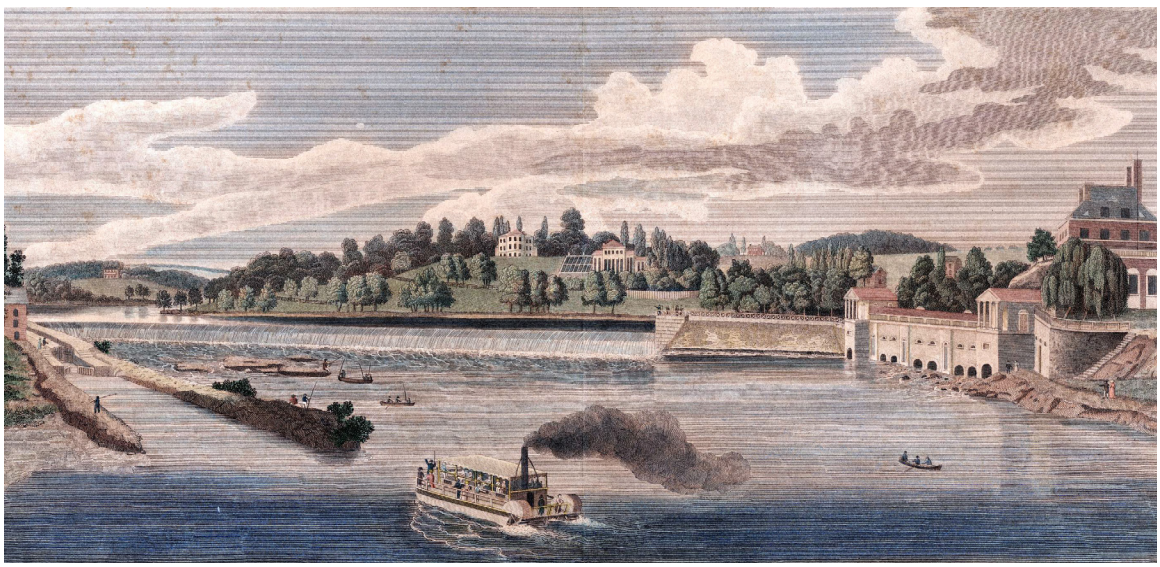
In 1683, William Penn's vision for Philadelphia was to create a grid pattern of streets laid out from river to river - a city of 2 square miles between the Delaware and the Schuylkill (fig. 2). The Delaware River, wider and navigable, became home to the city's active port, and development emanated from its docks and piers. The Schuylkill River was a pristine, more sublime waterway with rapids and elevation changes and it was late to develop along its shores. With the growing plague of yellow fever epidemics of the late 18th century (blamed erroneously on fouled water), increasing waste in the streets and contamination of groundwater, the city became desperate for a clean, reliable source of water. The relatively undeveloped and bucolic Schuylkill River, far away from the active port, appeared the best option (Smith 2013). As early as 1801, with its first pump house at Centre Square, Philadelphia made a commitment to engineering a water system that would be public, reliable and healthy. Soon the larger and more reliable Fairmount Water Works (1815–1909) was designed (fig. 3). It came to be admired as a successful experiment for the city and the nation, creating a public water distribution system renowned for what was called its water of uncommon purity (Smith 2013).

The Fairmount Water Works stands as a remarkable collection of white temple-like structures that rise from the eastern embankment of the Schuylkill River and yet it functioned as a public utility. These iconic buildings are now part of Philadelphia's public park system and once housed pioneering technology that supplied drinking water to Philadelphia. Pumped from the Schuylkill River to a high spot, water was then conveyed by gravity through an underground infrastructure system. This engineered system of engines, water wheels, pumps and pipes was originally steam powered (1815) , but the steam system was quickly replaced with water power created by a spillway just upstream that raised the level of the river and redirected the flow behind and through the buildings to drive water wheels inside. Pumps forced the water nearly 90 feet above to fill reservoirs on the adjacent hill called the Faire Mount. Gravity conveyed the water downhill in an underground system of hollowed out logs, which were soon replaced by cast iron pipes, to reach homes, businesses, public pumps and fountains (Gibson 1998).

In its heyday (1820–1840s), the Water Works was one of the most visited sites in the United States, second only to Niagara Falls. People came from around the world to witness its unrivaled scene of artistic expression for the public good, with its open-air pathways and gardens, and evidence of technological innovation (Gibson 1998). Prominent figures such as Mark Twain, Charles Dickens and Frances Trollope were among the numerous tourists. It was the prototype for water-supply systems around the globe (Gibson 1998).



^ *Fig. 2 The 1683 plan for Philadelphia was designed in a grid pattern from river to river. This c. 1796 map shows that the city grew instead from east to west along the Delaware River and expanded north to south along the riverfront. The large brown-ringed, rounded rectangle in the upper left corner is a high flat landform called the Faire Mount, the future sight of the reservoir and Water Works. Natural streams are delineated by winding black lines; many streams were eventually covered over and used as sewers and the infilled land became the foundation for building development, particularly of row home (Source: P. C. Varle, artist, and Scott, engraver).*



^ *Fig. 3 View of the dam and waterworks at Fairmount, Philadelphia, with pleasure boats in foreground (Source: Published by Edward Parker, 1824. Thomas Birch, artist, and R. Campbell, engraver [after painting by Birch]).*

In the early years of the republic, Philadelphia was at the center of design for high style civic institutions related to health, education, commerce and even prison reform as seen in other landmark buildings such as Pennsylvania Hospital, Girard College, the Second Bank of Pennsylvania and Eastern State Penitentiary (Bass Warner 1987).

Above all, it could be argued that a reliable, safe and accessible water system was at the very heart of the thriving city and what enabled Philadelphia to become a manufacturing powerhouse during the industrial age of the nineteenth century. The city was seen as such a forerunner in health, economy and commerce that it earned the name "Workshop of the World". (Bass Warner 1987)

Starting in the early nineteenth century, in an effort to protect the quality of the city's water, the city purchased large tracts of land bordering the Schuylkill River upstream of the Water Works to prevent unwanted development. As more and more land was purchased, the Fairmount Park Commission was created to oversee the property. Today Fairmount Park is 8,700 acres and one of the largest city parks in the world – and it all started in an attempt to protect the city's drinking water. However, despite these efforts, pollution from industry and coal mining upstream as well as outside the city began tainting the water supply. Growing industrial cities upstream, such as Norristown, Pottstown and Manayunk, used the river as a convenient sewer in an era when the economic benefits of industry outweighed any environmental concerns.

During this time, the growing drinking water system, with additional reservoirs to meet the exponential increase in population, did not supply filtered water, but rather relied on impurities settling out in large reservoirs. As the population grew and water pollution from both human and industrial unsanitary waste increased, thousands of people died from diseases such as typhoid and cholera, which were caused by contaminated drinking water. In 1890, Philadelphia suffered one of the worst typhoid epidemics in the nation. By 1909, the Water Works was decommissioned, replaced by several slow-sand-filtration plants constructed upstream on the Schuylkill as well as on the Delaware River. Filtration, along with the introduction of chlorine treatment in 1913, all but eradicated typhoid cases (Gibson 1998).

Saving the Fairmount Water Works: Adapt or Collapse

Between 1911 and 1972, no longer a functioning part of the drinking water system, the structures were transformed for new uses, first as a public aquarium (1911–1962) and then as a recreational pool facility, the Kelly Natatorium, (from 1962–1972). In 1972, flood damage from Hurricane Agnes caused the facility to shut down for good and the site was all but abandoned (fig. 4). After 180 years of constant use, and now threatened with complete deterioration, saving the Water Works buildings became imperative.
As Philadelphia prepared to celebrate the Bicentennial of the Declaration of Independence in 1976, the movement to showcase the "founding" city's significant landmarks and institutions gained interest. This included an effort to save the deteriorating Water Works. Recording and acknowledging the site's history was the first step. Around the time of the Bicentennial, research and a full set of drawings were recorded in the Historic American Engineering Record and the site was successfully nominated as a National Historic Engineering Landmark (Gibson 1998).

^ *Fig. 4 Interior view of aquarium looking south, showing display tanks aquarium located below north and south wings and pavilion, Fairmount Waterworks, east bank of Schuylkill river, Aquarium drive, Philadelphia, Philadelphia county, Pennsylvania, US (Source: HAER PA,51-PHILA,328--64).*

Documenting and designating the site was just a starting point to making it once again a vital part of the city's life. Without a plan for the buildings, the site languished and by 1984 it was listed as endangered by the National Parks Service and had become a vacant eyesore. Fortunately beginning in the 1980s, public/private partnerships between the park, the Junior League and other civic partners began the 40 years of strategic planning, adaptive reuse plans, and preservation fundraising that would save the Fairmount Water Works. The effort became a model for public-private partnership with its engagement of park leadership, through the Fairmount Park Commission (now called Philadelphia Parks and Recreation), public institutions as the Philadelphia Water Department, and numerous nonprofit partners including the Fairmount Park Conservancy, Women for the Water Works, and the Fund for the Water Works. These partnerships helped fundraise to match park capital dollars and promote long-term stewardship and use of the buildings. Moreover, committed leadership was key. A renowned philanthropist and park commissioner Ernesta Ballard, took on the project leadership in the late 1990s, and the entire site was transformed and over $30 million was invested. The buildings and terraces, historically significant sculptures, the Cliff Path Trail, South Garden and gazebos were restored in phases, followed by the 1926 Italian Fountain and subsequently the Boardwalk Trail and pedestrian bridge which led to improved wetlands along the bank of the river. Together these places formed an integrated environmental, recreational and historic landmark site, forming a kind of grand "gateway" of sorts.

The Fairmount Park Commission (now called Philadelphia Parks and Recreation) and the Philadelphia Water Department with the Fund for the Water Works, a nonprofit entity, worked to advance the long-term stewardship and use of the buildings.

Water Management: Commitment to Public Education

Civic commitment to public health beginning in 1801 and continuing to this day is both a legacy and constant pledge of the Philadelphia Water Department (PWD). In the early nineteenth century, the focus was on the provision of safe drinking water to its citizens and a reliable supply of water to the mills and factories that contributed to the prosperity of Philadelphia. Over the last 200 years, PWD has evolved from a single, iconic pumping station to a utility that protects Philadelphia's rivers, which are its drinking water sources, ensuring that stewardship activities are watershed wide. This legacy has evolved into a 3,000-mile system of pipes, pumping stations and treatment plants.

Today, the portfolio of water resource services that PWD provides, along with the regulatory requirements and aspired best practices for all facets of water resource management, is staggering. It provides safe and reliable drinking water, cleans wastewater and manages stormwater using a model program called Green City, Clean Waters, celebrated by the nation, which blends traditional infrastructure with nature inspired green stormwater infrastructure that seeks to engineer nature-inspired systems that better balance our natural ecological systems while collecting ever more challenging stormwater flows.

PWD recognizes that customers and residents need to be informed about and engaged in the stewardship of water resources to have confidence in the quality of services it receives and to affirm the value of their investment in their public utility. For PWD, education and engagement are an essential ethic. This is the reason PWD in the early 1980s, under the leadership of Ed Grusheski, made the commitment to transform the Fairmount Water Works into an Interpretive Center as part of the department. After two decades of effort, the Fairmount Water Works Interpretive Center (FWWIC) opened in fall 2003. Since then, passionate educators, interpretive exhibits, and a groundbreaking school curriculum use the power of place to increase understanding and transform visitors of all ages into ambassadors for our water environment.

Achievements and Challenges

Since its opening in 2003, the FWWIC has been operating as the educational center of the PWD. It has also become a regional and national destination for innovative water and watershed education programming, such as integrated STEAM (Science, Technology, Engineering, Arts and Math) education that fuses environmental education, scientific research and community engagement (fig. 5). People of all ages and backgrounds learn about the region's urban watershed ecosystem and sustainable technologies that improve water quality. Visitors are urged to take action to protect land and water resources. FWWIC is uniquely positioned to serve teachers and schools equitably throughout Philadelphia's urban watershed, connecting each school with locally relevant watershed projects in and around their neighborhoods.
More than 25,000 adults, 20,000 families and more than 7,000 school-aged children are served by the FWWIC's programs and exhibits each year. There is no admission fee and the site is partially

^ *Fig. 5 Adaptively reusing the landmark site for groundbreaking freshwater mussel research and public education (Source: GreenTreks, Courtesy of Habithèque Inc.).*

^ *Fig. 6 Aquatic scientist in the lab (Source: Fairmount Water Works Interpretive Center).*

^ *Fig. 7 Performance in the Kelly Pool space of Tributaries, a choral piece commissioned for the Fairmount Water Works Interpretive Center (Source: Kate Devlin; Courtesy of Habithèque Inc.).*

compliant with the American Disabilities Act.

The FWWIC 's commitment to place-based education has grown and flourished. As a field trip experience, education programming has been innovative and creative from the start. This National Engineering Landmark site has offered a unique and powerful setting for students to experience first-hand the dynamic ecosystem of the river, the evidence-based exploration of the technological innovations responsible for creating a successful drinking water system and discovery of cutting-edge architectural design in the context of the early republic (fig. 6). The FWWIC has received several awards for its innovative education accomplishments such as the Dr. Ruth Patrick Excellence in Education Award (2015), the Meaningful Watershed Education Experience Partner of Excellence Award (2020) and the Pennsylvania Environmental Council Special Places Award (2021). In 2021, Hurricane Ida brought record-breaking flooding to Philadelphia, and near catastrophic damage to the FWWIC. But the persistent challenge following severe storms is the repeated expense and burden associated with removing river debris and industrial cleaning. Despite this, FWWIC remains committed to cleaning, redesigning, restoring, and replacing needed elements – with a focus on making operations more flood resistant. The next major campaign is focusing on adapting to the increasing demands of climate change while continuing to interpret water history.

Innovative Exhibitions at the Fairmount Water Works Interpretive Center

In 2016, with a combination of private funding from the Pew Center for Arts and Heritage and the Mclean Contributionship and operational support from the PWD, the FWWIC installed a demonstration Freshwater Mussel Hatchery (Prizzia 2016). The working research laboratory and interpretive exhibits like this one offer education about the ecological benefits of freshwater mussel restoration within the Delaware River watershed. This site-specific living enclave was the first of its kind in the region, in addition to breaking new ground within the field of interpretation for its genuinely interdisciplinary approach to environmental education – integrating history, science and the arts (Prizzia 2016).

In 2019, the exhibition POOL: A Social History of Segregation was awarded an exhibition grant from The Pew Center for Arts and Heritage matched by on-going support from the PWD. A 4,700 square-foot, multidisciplinary seasonal exhibition, set in the Fairmount Water Works' former Kelly Pool (known as the "Aquarium Pool" by those who swam there), the exhibition explores the role of public pools in our communities, with the goal of deepening understanding of the connection between water, social justice and public health (Dawson 2018).

Through an inspiring collective of artists, swimming champions, aquatic activists, researchers and scholars, POOL weaves together history, site-specific artwork, storytelling, scholarship, and place-based learning (fig. 7) (Dawson 2018). The exhibit installations throughout the historic structure build on one another to illuminate a history of segregated swimming in the US and its connection to present-day drowning risks affecting Black communities. At this moment in time, the persistence of institutional racism has fueled a movement that has touched every major city and small town in the US. POOL's messages and experiential goals connect the Fairmount Water Works to this landmark time in American history and validate how important shared social and public spaces are to fostering social change.

The multidisciplinary stories told in the Mussel Hatchery and within POOL are framed by the site's unparalleled power of place – a thread that links the future with the past and connects visitors to the urban landscape and watershed of today. The FWWIC traces connections between individuals and our water sources, linking global water issues of the present to one of Philadelphia's greatest civic contributions: the engineering innovations of the historic Water Works site. Both projects advance the commitment to water for all – whether for drinking, swimming or agriculture.

What is the Future?

Today the parks department tries to make the site more resilient at a time of increasing natural disasters, while providing a welcoming environment for all Philadelphians. The Fairmount Water Works stands as an example of a civic commitment to safe, clean and reliable water access; it embodies engineering innovation and an aesthetic expression of the public good and the persistence and perseverance of water suppliers, public park managers and the people of Philadelphia who celebrate its legacy and power of place by not allowing it to deteriorate beyond repair. Will it survive the new threats brought on by climate change? The answer lies within the civic commitment to do what needs to be done to ensure the preservation of this legacy for generations to come.

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Ellen Freedman Schultz has developed and managed environmental education programs related to water quality, watershed management and the history of Philadelphia's municipal water system. In 2014, she spearheaded the watershed curriculum design project which resulted in the "Understanding the Urban Watershed" Curriculum. Since 2019, it is being implemented in partnership with the School District of Philadelphia, along with professional development training and coaching for teachers. She is the Co-chair of the Education for Sustainability Committee of the School District of Philadelphia's GreenFutures Plan and is currently a steering committee member of the Alliance for Watershed Education.

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Karen Young has more than 20 years of experience developing and implementing urban environmental programs with an emphasis on informal/experiential learning. She has worked with city agencies, non-profits and museums to develop programs, lessons and materials focused on urban water supply systems and resource management for students in grades 4–12 that engage both teachers and students in interactive, engaging experiences and take participants outside to explore the natural environment. She has been the executive director of the Fairmount Water Works since 2007.

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