

An aerial photograph of a city, likely Minneapolis, Minnesota, showing a dense urban skyline with various skyscrapers and buildings. In the foreground, a wide river (the Mississippi) flows through the city. A large barge is visible on the river. A bridge with a red and white structure spans the river. The city is surrounded by green spaces and trees, with a large parking lot filled with cars in the lower right quadrant.

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OPEN RIVERS : RETHINKING THE MISSISSIPPI

PROVOCATIONS

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from multiple perspectives within and beyond the academy.

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The cover image is aerial view of University of Minnesota East and West Bank campuses and the Mississippi River. Photographer Patrick O’Leary. Image via University of Minnesota.

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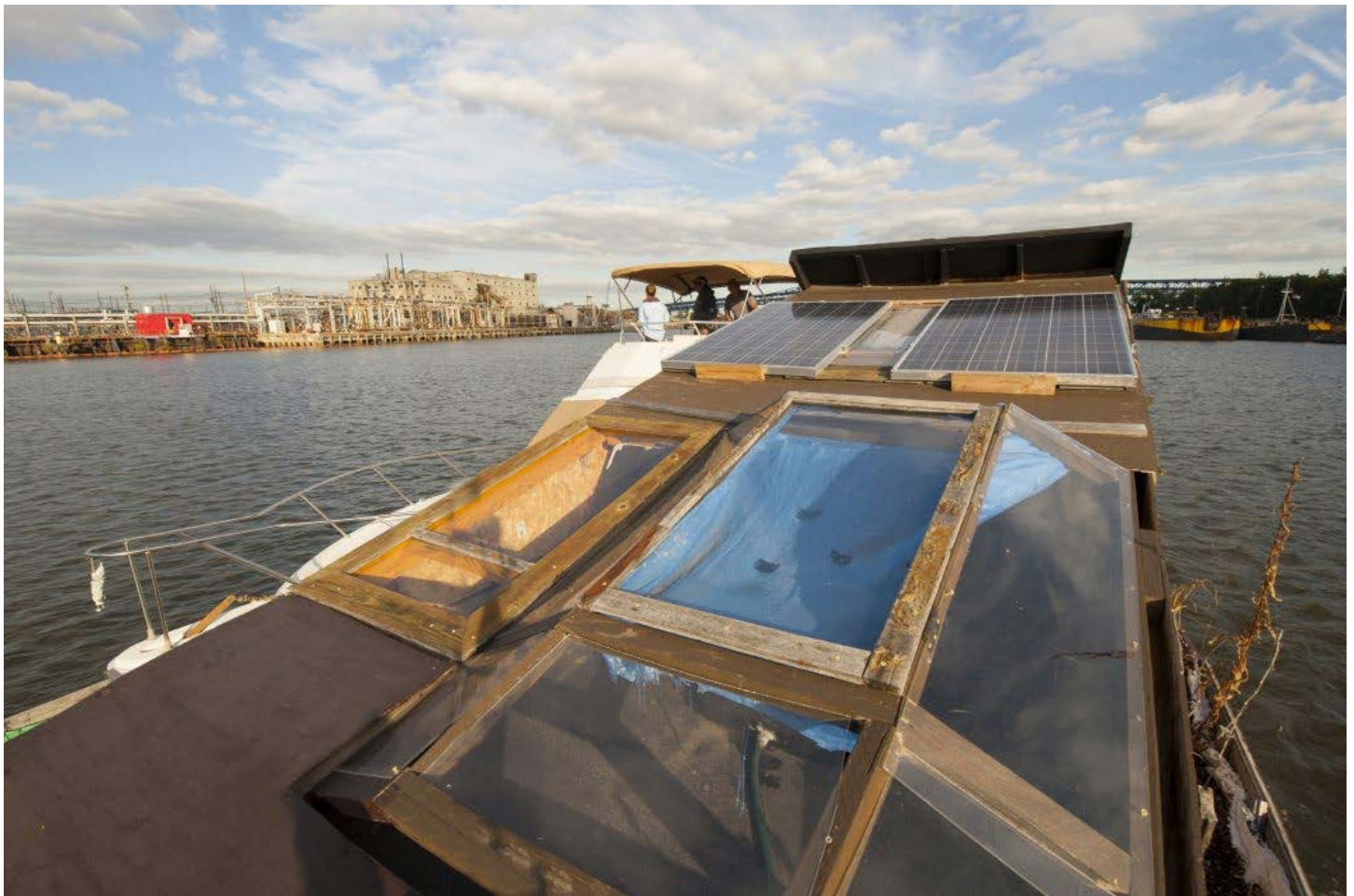
FORGOTTEN PLACES AND RADICAL HOPE ON PHILADELPHIA'S TIDAL SCHUYLKILL RIVER

By Bethany Wiggin

How do we see an urban, industrial river? How do we hear its stories? Who gets to tell them?

I first got *on* the lower, tidal Schuylkill River on October fifth, 2015. With a boat captain, a first

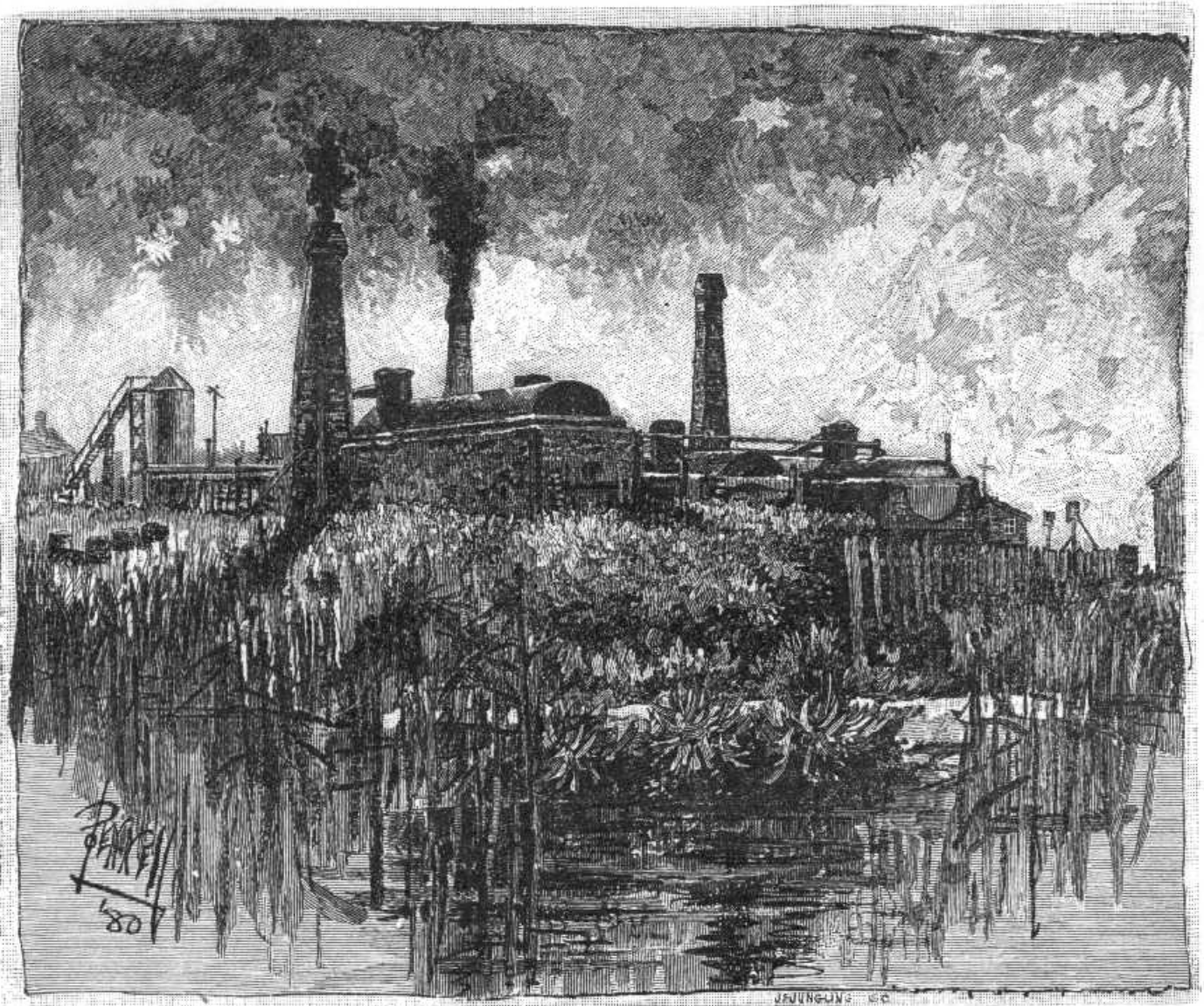
mate, and a photographer, I was helping push a floating lab for experiments in sustainability into position. Since that day, these questions about how to see and to listen for Philadelphia rivers' stories have occupied me, a historian trained



WetLand + Refinery: View from The WetLand Project's floating lab motoring up the Schuylkill River. Image by Phil Flynn. Image courtesy of Bethany Wiggin.

originally in European literature and in the print culture of the colonial Atlantic world. They are not questions I, or indeed I think perhaps anyone, can answer alone, but will best be answered by many voices. Here, I'll sketch some of the ways that we—a loose network of researchers whose fields span the arts and sciences in partnerships with an array of non-profit community organizations and individuals—have begun researching our city's urban rivers. We're focusing our efforts on the lower, tidal Schuylkill River.

This stretch of the river can be described by what Ruth Wilson Gilmore calls a “forgotten place.” Such places, Gilmore explains, “are not outside history. Rather, they are places that have experienced the abandonment characteristic of contemporary capitalist and neoliberal state reorganization.”[1] Outside official history, this particular forgotten place is everywhere marked by energy regimes; it is a “sacrificial landscape,” in the evocative phrase of energy historian Brian Black, a landscape sadly typical of what Stephanie LeMenager calls “petromodernity.”[2] The river



OIL-REFINERY.

Joseph Pennel, “Oil Refinery.” Scribner’s Monthly. 22.3 (July 1881).

is inseparable from the refinery complex in operation there since the 1860s.

Yet this section of the river also teems with personal and local histories that intersect with histories of land use and social and environmental

justice in and along the lower Schuylkill River and further afield. In researching them, in the acts of their recall and remembering, collaborators in the group we have come to call the Lower Schuylkill River Corps also aim to voice alternative futures.

The *WetLand* Project

I direct the Penn Program in Environmental Humanities (PPEH) at the University of Pennsylvania in Philadelphia, and I first got on the river to install a collaborative, public art project built around sculptor and social practice artist Mary Mattingly's floating, habitable, sculpture *WetLand*. As we pushed *WetLand* up

the river that early October day, I was astonished by the riparian landscape. Although I had seen it hundreds of times *from above*—while whizzing on the train or in a car to the airport or even from a plane, I had never seen the river *from the water*.



Piloting WetLand up the Schuylkill. Image by Phil Flynn.

We were motoring slowly, guiding the top-heavy barge across the Delaware River and up the Schuylkill; it seemed it would take forever to get past the repurposed navy yard and then up miles of river whose banks house the eastern seaboard's largest refinery complex.[3] On our slow-moving trip, we also saw herons and ducks, a small fleet of fire boats and some tugs, as well as the occasional security guards on foot or driving white pick-up trucks and mildly interested in what surely must have looked unusual. We were on our way to Bartram's Garden on the western bank of the tidal Schuylkill, the oldest botanical garden in the Americas and home to a public dock where *WetLand* could tie up before and after we had been granted and paid for permissions to use a public dock further upriver and closer both to Penn's campus and to a much larger public audience.

Forced by our low speed to slow down and really look, I couldn't understand what I was seeing. At that time, I couldn't even figure out how to begin to decode what I was seeing and to understand how that strange and unfamiliar land- and waterscape had come to be made. Did we know anything, I wondered, about the water quality? And what was under its surface?

Mary Mattingly, *WetLand*'s creator, has called it a "total institution" and an "experiment in sustainability."

See the video [WetLand](#).

She built *WetLand* in the summer of 2014 with repurposed materials, many from the waste stream, as a commission for a theater festival, funded by the Knight Foundation. Docked during the festival's three weeks at the Independence Seaport Museum on the Delaware River in Philadelphia, Mattingly—and other artists, scientists, gardeners, beekeepers, boat builders, students, community activists, and water enthusiasts—worked and lived aboard the retrofitted houseboat—and were visited by some

40,000 people. I was among *WetLand*'s many visitors, and I began to talk with Mattingly about collaborating together to move *WetLand* to the Schuylkill River, closer to my university's campus and closer too to the popular Schuylkill River Trail. [4]

Prior to launching *WetLand* on the Schuylkill, I had spent hours *along* the river, walking and biking on the award-winning Schuylkill River Trail. The trail begins in Center City and travels upriver, past the dam at the historic Fairmount Waterworks, now managed as an interpretive center by the Philadelphia Water Department. Above the fall line marking the meeting of the low-lying Atlantic Coastal Plain with the Piedmont, the Schuylkill has long provided the city's primary source of drinking water.[5] It has also long been an industrial river. Parts of this history provide the basis for legislation enacting the Schuylkill Valley as a National Heritage Site. Championed by the Commonwealth of Pennsylvania's then senators, Democrat Arlen Specter and Republican Rick Santorum, the Schuylkill became a Heritage River in 2000. As the Act's Findings and Purpose outline, "there is a longstanding commitment to—(A) repairing the environmental damage to the river and its surroundings caused by the largely unregulated industrial activity; and (B) completing the Schuylkill River Trail along the 128-mile corridor of the Schuylkill Valley." [6] All this is true, subject too of Chari Towne's *A River Again: The Story of the Schuylkill River Project*. [7] But it is only true above the fall line. The official history of the Schuylkill River enacted by this legislation provides no mention of the refinery complex in place for over 150 years. This is a history of the river as if the river itself stopped short and pulled up its courses at the fall line; the tidal river has effectively been forgotten.

Below the fall line, the river flows southeasterly to the confluence with the Delaware River, at the city's southern tip. From there, it's a short 30 miles to the head of the Delaware Bay—and then

you're out onto the open Atlantic. The colonial city's founder, English Quaker William Penn, sited what he projected to be a city of brotherly love between the two rivers to ease settlement and trade and to live alongside the Lenape (or Delaware) whose villages had long flourished in these rivers' valleys.[8] Like nearly all European colonial outposts in the Americas, Philadelphia was sited to take advantage of the rivers. The area's natural abundance, especially its birds, was featured in advertisements since the earliest days of the region's European settlement and attracted ever more colonists. In the 1630s, the vast tidal marshes are estimated to have covered some 5,700 acres. As first Swedish and Dutch and then, increasingly after 1700, English and German settlers began to dike and drain low-lying lands for agricultural use, that acreage decreased at an accelerating rate. By the end of the twentieth century, a mere 200 acres remained. Since 1972, these comprise the country's first urban wildlife refuge, the John Heinz National Wildlife Refuge at Tinicum.[9] The region's rivers and their remaining wetlands remain crucial, if precarious, stopovers on the Atlantic migratory flyway and provide habitat for many native birds, mammals, and plants, including endangered species.

The consequences of this dramatic wetlands loss—including the city's increased susceptibility to storm surge—and the needs for its care and cultivation in what all climate models agree will be a hotter, wetter Philadelphia lay at the heart of our decision to install the PPEH Lab at *WetLand* on the lower Schuylkill River.[10] These dangerous mixes of flows of water and carbon-intensive energy sources have co-mingled on Philadelphia urban waters since mining for anthracite (or stone) coal began upriver in Schuylkill County in the 1820s. It was a new energy regime that itself built on existing uses of the river's water as a source of energy, including for the shipping of more energy (wood) and of agricultural products. The watery-mineral mixtures only thickened after the nation's first oil rush began in 1859 in Titusville, Pennsylvania; they are becoming still more dense as trains connect Bakken oil to the lower Schuylkill River and more pipelines come online to transport Marcellus Shale gas to the greater Philadelphia area (the refinery at nearby Marcus Hook was re-configured and is now online).[11]

The PPEH Lab at *WetLand*

WetLand resembles a timber frame house set on a tilt atop a mud-brown hull. For some, the slope of the roof might evoke homeowners upside down in their mortgages; for most, it evokes rising sea levels and experiences of precarity.[12] But as in the disaster utopias whose stories Rebecca Solnit beautifully understands as widespread human responses to crisis and catastrophe, *WetLand* aims to imagine and foster alternatives to this human-natural dis-ease.[13] While *WetLand* was at the theatre festival, regional networks of exchange had sprung up to support its several

full-time residents to maintain their three-week experiment living off the grid with supplements to the food produced by the modest floating gardens and chicken coops. By the conclusion of the festival, Mattingly and I had agreed she would become an Artist in Residence with PPEH. Together we planned to move *WetLand* to the Schuylkill. There, I hoped it would become a rich environmental humanities zone, that is, a place supportive of research and learning on the productive edge of science and the humanities.

After 13 months of negotiations, first with the university and then with the city, the PPEH Lab at *WetLand* on the Schuylkill finally launched. With support from Danielle Redden, Director of

Riverfront Programming at Bartram's Garden, and from Penn's Sustainability Director, Dan Garofalo, we began what was to be the first of three pilot phases.

First Pilot, Fall 2015

During our first six-week pilot in the fall of 2015, we moved *WetLand* between the dock at Bartram's Garden to a public dock one mile upriver, closer to campus in Center City. There we held two multi-day open houses. Next to the

popular river trail, *WetLand* hosted hundreds of guests, including city park and recreation officials happy (at long last!) to partner with us, as [this on-board interview](#) conducted by Mary Mattingly shows.[14] Other guests included artist collective



"We the Weeds" on WetLand: artists Zya Levy (r.) and Kaitlin Pomerantz (m.) talk about native and invasive plants with a guest (l.) for the first WetLand Project Open House under the Walnut Street bridge on the Schuylkill, October 2015.

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We the Weeds, who provided public workshops on invasive plant species that grow in the train tracks along the river as well as cocktails made of those same plants.

Landscape architect Kate Farquhar organized an entire day of co-learning and co-making. Participants could help Danielle Toronyi amplify the river's underwater sounds; others made seed bombs packed with native plant seeds, while artist Jacob Rivkin also made a stop-motion guide.

See the video [*"How to Make Seed Bombs"*](#).

PPEH graduate and undergraduate student Fellows led tours of the boat for the general public. Ph.D. candidate Carolyn Fornoff writes about how the Fellows took public engagement

onto new terrain on [*the Floating WetLand blog*](#). We organized lectures, films, and readings, and several Penn seminars used the boat in lieu of their regular classroom. In Professor Marcia Ferguson's theatre directing seminar, students worked with guest scholar and director, Sarah Standing, to create site-specific devised performances.

Ferguson and I talk about these experiences in this short film, which also features one particularly melodramatic performance.

See the video [*Marcia Ferguson in conversation with Bethany Wiggin*](#).

We also interviewed Philadelphia-based writer, Nathaniel Popkin, and theatre director Anisa George.



Bartram's Robot, 2016, Mason Rosenthal Photographer Austin Bream.

See the video [Anisa George in conversation with Bethany Wiggin](#).

Over the course of this six-week pilot, I remained haunted by the questions about how best to learn to see and hear this river's stories. With Danielle Redden and Mary Mattingly as named partners, I wrote a grant proposal, "Floating on Warmer Waters" which the Whiting Foundation generously funded. As the grant's award details:

Based jointly at Bartram's Garden, the oldest botanical garden in the Americas, and the

University of Pennsylvania, *Floating* will engage historians, scientists, and visual artists to create new programming for the public—including the more than 10,000 middle- and high-school students who visit the Garden each year. Events will explore ecologically friendly living by placing it in the historical perspective of Philadelphia's Quaker past; consider the role of utopian ideologies in shaping development and conservation; and invite the public to engage in experiments in sustainability on a floating science lab created by artist Mary Mattingly.[15]

Second Pilot, Spring 2016

WetLand returned to the Schuylkill River in April 2016 after months in dry dock. For this second pilot, Mattingly, Redden, and I decided to keep *WetLand* at Bartram's Garden. The Garden sits

directly across the river from Philadelphia Energy Solutions' refinery complex; its location, its river access, its grounds and plant collections, as well as its library make it a unique vantage point to



Professor Nikhil Anand taking part in Lower Schuylkill River Research seminar on the river. May 2016. Image by Bethany Wiggin.

research the Schuylkill's past, present, and future. Under Redden's stewardship, the Garden now also has a community boathouse with a growing fleet of kayaks and wooden rowboats; the demand for public boating is increasing rapidly and cannot yet be met by the free, public sessions offered every Saturday from April to November.

During this second pilot, we offered a modest commission for the production *Between a Boat and a Green Place*, a series of dramatic readings curated by Gillian Osborne and directed by Anisa George. One reading, of excerpts from William Bartram's *Travels Through North & South Carolina, Georgia, East & West Florida, the Cherokee Country, the Extensive Territories of the Muscogulges, or Creek Confederacy, and the Country of the Chactaws*, was preceded by original text authored by Mason Rosenthal and read by Bartram's Robot.

Listen to the audio recording of Bartram's Robot.

Beyond the Pilots

After the successful conclusion of the second pilot of the Lab at *WetLand*, a new phase of the *WetLand* Project began in October 2016 when the cooperative Schuylkill River Corps Research Seminar began meeting regularly. In conjunction with the academic conference and anticipated book, *Timescales: Ecological Temporalities across Disciplines*, the *WetLand* boat returned again to the river; and the river itself starred in a mobile installation, *Date/um*, curated by Patricia Kim.

First installed in Penn's Libraries, *Date/um* prompts consideration about what are the dates, the data, and the individual data points (a *datum*) needed to understand a river. It showcases work by River Research Seminar members. Subsequently, it's been installed in two

In April 2016, we also held a visioning meeting exploring the future of *WetLand* on the Schuylkill with participants from universities, city and federal agencies, arts and nature education. At that meeting, we announced the launch of the public Schuylkill River Corps. Co-convened by Redden, atmospheric chemist Peter DeCarlo (Drexel University), and me, this all-volunteer group researches the river, both from kayaks and from university classrooms.

Seminar members have begun work on a suite of digital tools that we hope will form the basis for tours, both self-guided and guided by River Corps members and partner organizations. A grant from Drexel University's ExCITE Center permits the development of a mobile app that will pull information from a public Omeka platform created and hosted by the University of Pennsylvania Libraries Division of Digital Scholarship.

other locations in Philadelphia, and three future installations in the Schuylkill River Valley are in the works.[16]

The work of getting to know the river's stories and histories is now also continued by PPEH's first micro-grant awards. In connection with another academic conference, Philadelphia artists, teachers, and researchers were invited to submit proposals for "Ecotopian Tools for *WetLand*." A jury of eight made six awards, to proposals for floating glass panels (Carolyn Hesse); an herbarium and guide to native river plants (Mandy Katz); submerged fiber art installations that measure the river's salinity and light saturation (Joanne Douglas); a "bio-pool" whose charcoal filters river water (Jacob Rivkin and Eric Blasco); floating bio-habitats for plants and

animals (Gabriel Kaprielian); and participatory maps, both “real” and conceptual, of the lower Schuylkill River (Cecily Anderson). Each designer will host a public workshop on the Schuylkill at Bartram’s, introducing and developing their tool, between April and July 2017.

The landscape of the Lower Schuylkill River might indeed be a “sacrificial landscape,” to return to Black’s phrase. It’s a description that gets at a historical trauma that seems to defy remembrance—mentioned nowhere in the legislation enacting the Schuylkill River as a National Heritage area while effectively erasing the tidal river from that history. What or who was sacrificed, and who or what sanctioned it? This landscape—so hard to see because of the privatization of the river banks and the building of interstate highways high above it—provides

the stage for a story about what Cathy Caruth has called the “unclaimed experience” of trauma.[17] This one, however, is intergenerational, born of slow-moving storms: the extractive regime’s slow and silent leakage—punctuated by the staccato of a spill, plume, explosion, or fire.[18] These are the slow processes of what Rob Nixon has called “slow violence”: long, slow processes that exceed a single human lifetime and stretch across hundreds of years.

I have not yet figured out how (or really even if) to write a history of this ecological crisis so long in the making. Instead, it seems wiser to continue learning to hear, and in some cases to elicit, the many different voices living along—and in some cases *on*—the river. ? Amplifying their voices today and locating others in the historical record can lend powerful claims to build more expansive

SENSING RIVERS

“There’s no right way to use Wetland. You can use it whatever way you like. In fact, that’s one of the real challenges of the project. It’s meant to be a non-prescriptive utopia. I wouldn’t say it’s a negative utopia—but it certainly isn’t a positive one. It doesn’t tell you how to live sustainably. Instead, it invites you to think about how you might like to use this space.”

—Bethany Wiggins, RPEH Director

In the Anthropocene, the proposed name for an age of the human, perspectives on the Schuylkill River not only foster a sensitivity to ecological vulnerabilities in Philadelphia, but also offer new possibilities for sensing different kinds of data from and of the waterways. Mary Mattingly’s Wetland is a floating lab that invites people to experiment with what it means to be sustainable in a city and afloat on urban waters. Artists, scientists, writers, and activists have used this “wetland urban ecospa” as an experimental space for collaboration and generating new kinds of knowledge across the arts and sciences in order to engage multiple publics. The floating lab has hosted conversations about sustainable living, specifically in Philadelphia, and served as a lab for various experiments. Such perspectives on the river offer new kinds of information about our urban ecology, economy, and experiences.

The featured photographs and conversations each offer different kinds of histories, knowledges, and temporalities that have been gleaned from being on the river. Interviews with artist Mary Mattingly, scholar-activist Bethany Wiggins, and Philadelphia-based author Nathaniel Popkin, for instance, are displayed alongside the visual perspectives of photographer Philip Flynn along the LSR. These experiments offer different visions of how our waterways have been—and might continue to be—greenways of the future.



Credit: Philip Flynn



Credit: Philip Flynn

HEARING RIVERS

Sensing and repositioning ourselves on the Schuylkill River demands alternative modes of accessing data and encourages an engagement with different haptic senses. In historian of science Danna Haraway’s explanation of situated knowledges, she argues

for politics and epistemologies of location, positioning, and siting, where partiality and not universality is the condition of being heard to make rational knowledge claims. These are claims on people’s lives, the view from a body always a complex, contradictory, structuring and structured body, versus the view from above, from nowhere, from simplicity.

With Haraway’s formulation of knowledge production in mind, how then, might deep listening and storytelling offer transgressive, rich, and nuanced knowledges of a place?

The Eastwick Oral History Project documents the experiences and memories, both personal and collective, of different Eastwick residents through interviews and storytelling. Neighboring wedges of the mouth of the Schuylkill have been cut off to expand Philadelphia’s airport and the massive oil refinery complex, while runoff from unlicensed dumps led to an EPA Superfund designation on the neighborhood’s western edge. The residents share their life stories through the lens of place, reflect on the cultural landscape of their own Eastwick, and trace the history of the community through personal memories and family narratives.

Daniella Torony’s sound and visual installation, Poak Discharge, translates water quality and pollution data from the US Geological Survey into an embodied experience. Environmental data from the LSR are represented by an acoustic underwater system of sound waves. The resulting piece offers the listener a multi-sensory illustration of the impact of human development on our natural systems. Together, these projects demonstrate how deep listening is another mode of knowing a river.

WITNESSING RIVERS

To know the Schuylkill River requires intimate practices of looking, or witnessing. Witnessing a river goes beyond traditional modes of observation and recording to include more capacious and embodied forms of extended looking, slow documentation, and collaboration. Moreover, transdisciplinary and participatory practices in collaborative spaces have the potential to reveal the LSR as a dynamic ecological space and energy landscape. How might witnessing, or new ways of seeing, reveal different histories and narratives about the river? From patient and extended looking emerge new ways of imagining and understanding our relationship with and to an urban river.

Peter DeCarlo’s Streaming Velocities is a series of timelapse videos that offer a new experience of witnessing a watery landscape that is relatively obscure. Set up at various points along the LSR, the cameras capture the river, refinery, and tides, as well as the human and non-human animals that call the watery urban home. The patience and boredom that are part of the experience of sitting along the river is condensed and lapsed into shorter amounts of time that a human audience can bear.



Credit: Lower Merion Historical Society



Credit: Philip Flynn

DIGITAL RIVERS

How do we digitally archive a river, and in what ways do rivers function as archives? What does the digital ecology look like? And how might a digital archive-as-digital river produce, catalogue, and circulate data sustainably?

We ask computers to help us make connections because of their efficiency and speed, yet they can only work in these ways when humans define the rules of those connections with clarity and precision. Consistent description in the form of structured metadata is a powerful way to do that. However, each field has its own practices for describing and classifying its objects of study, identifying what is either essential or superfluous to the material for future purposes. When we try to bring together data across disciplines to allow for a greater variety of stories, our computer systems ask us to find a common language to describe those materials.

A variety of metadata fields emerge when documenting the digital and archival river’s ecology. What is the time that we associate with different kinds of objects? How does one create different dates and enter them in one field? In what ways can we define the temporalities of the river’s geological, material alongside that of 16th century riverine maps?

Although we attempt to address the challenges of digitally archiving a river, we do so by grounding these questions in a display of objects that are all from or about the river. The volume not only foregrounds the materiality and geology of digital media, it also emphasizes the age-old challenges of creating time fields for the Schuylkill River and its watershed, ultimately asking: when is the Schuylkill River?

Date/um, Ecological Temporalities of the Lower Schuylkill River, Philadelphia.

refuge, in the present. It is too early to know how this project will turn out. For now, it is propelled by the radical hope of Crow Chief Plenty Coups, described by psychologist and philosopher Jonathan Lear, and we conclude with it:

For what may we hope? Kant put this question in the first-person singular along with two others—What can I know? And What ought I do?—that he thought essentially marked the human condition. With two centuries of philosophical reflection, it seems that these questions are best transposed to the first-person plural. And with that same hindsight: rather than attempt an *a priori* inquiry, I would like to consider hope as it might arise at one of the limits of human

existence ... [Crow Indian Chief] Plenty Coups responded to the collapse of his civilization with *radical* hope. What makes this hope radical is that it is directed toward a future goodness that transcends the current ability to understand what it is. Radical hope anticipates a good for which those who have the hope as yet lack the appropriate concepts with which to understand it. What would it be for such hope to be justified?[19]

All images and videos courtesy of the author unless otherwise noted.



*From the Lower Schuylkill River Corps Cooperative Public Research Seminar.
Image courtesy of Peter DeCarlo.*

Footnotes

[1] Ruth Wilson Gilmore, “Forgotten Places and the Seeds of Grassroots Planning.” *Engaging Contradictions: Theory, Politics, and Methods of Activist Scholarship*, ed. Charles R. Hale (Berkeley: University of California Press, 2008), 31-61. Here p. 31.

[2] Brian Black, *Petrolia: The Landscape of America’s First Oil Boom* (Baltimore: Johns Hopkins University Press, 2000); Stephanie LeMenager, *Living Oil: Petroleum Culture in the American Century* (New York: Oxford University Press, 2014).

[3] This claim is made by the refinery’s current operators, Philadelphia Energy Solutions. Their homepage states, “PES is the tenth largest refiner in the United States,” and “PES processes approximately 335,000 barrels of crude oil per day, making it the largest oil refining complex on the eastern seaboard,” <http://pes-companies.com>. Regionally, as the University of Delaware’s Sea Grant program explains, “the Delaware River and Bay is home to the fifth largest port complex in the United States in terms of total waterborne commerce. Every year, over 70 million tons of cargo move through the tri-state port complex [...] It is the second largest oil port in the United States, handling about 85% of the East Coast’s oil imports,” <http://www.ceoe.udel.edu/oilspill/shipping.html>.

[4] The Trail now extends as far downriver as Bartram’s Garden and there are plans to connect it via more river boardwalks to the confluence.

[5] Today, the Delaware River system provides water for both the Philadelphia and New York metropolitan areas, supplying some fifteen million people, <http://www.delawariverkeeper.org/delaware-river/remember-delaware-river.asp>. The Schuylkill supplies an additional 1.5 million people, http://www.phillywatersheds.org/doc/Schuylkill_SWPP_2006.pdf (p.2), with drinking water treated at one of Philadelphia Water’s three intake plants.

The region’s “reclaimed” wetlands at the confluence of the Delaware and Schuylkill Rivers also lie under the Philadelphia International Airport which, just in October 2015, saw 35,536 plane movements, including the transportation of 2,721,598 passengers, a 3% dip from the previous month likely because of the severe fall storms that increasingly regularly visit extreme rain on the region, <http://www.phl.org/Business/ReportsPlans/Documents/AAR1015.pdf>. Two major arteries for car, bus, and truck traffic, interstates 95 and 76, ride atop former wetlands. Some 1,294 million vehicles exit daily from I-95’s Philadelphia exits, http://www.interstate-guide.com/i-095_aadt.html#pennsylvania. (This figure aggregates the AADT composites for the ten Philadelphia exits on I-95, beginning with exit 10 for the Philadelphia International Airport in the south on the Chester-Philadelphia border to exit 32 for Academy road in the north on the Philadelphia-Bucks County border, http://www.interstate-guide.com/i-095_aadt.html#pennsylvania.) I-76 runs along the Schuylkill River in Center City, carrying (as of 2012) over 180,000 vehicles every day, <http://www.dvrpc.org/reports/10072.pdf> (Fig.2, p.5). The wetlands have also been covered with miles of freight and passenger rail lines, including long stretches of rail along the rivers owned by two class 1 rail operators, CSX and NS (Norfolk Southern) as well as passenger rail owned by Amtrak and the regional SEPTA. (Class 1 rail is defined as “line haul freight railroads with 2013 operating revenue of \$467.0 million or more,” <https://www.aar.org/Documents/Railroad-Statistics.pdf>.)

Footnotes Continued

[6] The full text of the Act is available *here*.

[7] Chari Towne, *A River Again: The Story of the Schuylkill River Project* (Bristol, PA: The Delaware Riverkeeper Network Press, 2012).

[8] Amy C. Schutt, *Peoples of the River Valleys: The Odyssey of the Delaware Indians* (Philadelphia: University of Pennsylvania Press, 2007).

[9] These numbers draw from the history published on the Refuge's website: http://www.fws.gov/refuge/John_Heinz/about/history.html.

[10] In November 2015, the City of Philadelphia released its climate adaptation plan entitled *Growing Stronger: Toward a Climate-Ready Philadelphia*. It emphasizes the hotter, wetter city we are already living in. See particularly, pp. 5-6. <https://alpha.phila.gov/media/20160504162056/Growing-Stronger-Toward-a-Climate-Ready-Philadelphia.pdf>.

[11] This summary of the region's energy history draws on Christopher F. Jones, *Routes of Power: Energy and Modern America* (Cambridge, Massachusetts: Harvard University Press, 2014) as well as on Brian Black, *Petrolia: The Landscape of America's First Oil Boom* (Baltimore: Johns Hopkins University Press, 2000). I am indebted throughout to the exceptional article by Fredric L. Quivik, "Abundance, Dependence, and Trauma at Philadelphia's Point Breeze Petroleum Refinery: A Mirror on the History of Pennsylvania's Oil Industry." *The Pennsylvania Museum of History and Biography*, 139.3 (October 2015): 265-292. Equally invigorating has been Beth Kephart's more experimental, lyrical river history, *Flow: The Life and Times of Philadelphia's Schuylkill River* (Philadelphia: Temple UP, 2007). See also Susan Phillipps, "Philadelphia's Energy Hub: A Renaissance for the Delaware Valley or a Pipedream?" State Impact Pennsylvania for WHY? broadcast available via <https://stateimpact.npr.org/pennsylvania/2016/04/01/phillips-energy-hub-a-renaissance-for-the-delaware-valley-or-a-pipe-dream/>.

[12] This interpretation was suggested by local NPR-affiliate reporter Peter Krimmins. Before making *WetLand*, Mattingly had previously made the *Waterpod*; it plied New York Harbor in 2009. On the pod, see Eva Diaz, "Dome Culture in the Twenty-first Century." *Grey Room* 42 (Winter 2011): 80-105. Since 2016, Mattingly has been leading another waterborne project in New York Harbor, the floating food forest, *Swale*.

[13] Rebecca Solnit, *A Paradise Built in Hell: The Extraordinary Communities That Arise in Disaster* (New York: Penguin, 2009).

[14] Blog post with Barry Bessler.

[15] Further award details are available from the Whiting Foundation.

[16] Danielle Toronyi's fascinating contribution, "Peak Discharge," was featured in [this radio story](#). In the absence of any pollutant load data for the tidal Schuylkill, Toronyi uses the sound of the combined sewer overflow pouring into the river as a suggestive and emotionally moving proxy.

Footnotes Continued

[17] Cathy Caruth, *Unclaimed Experience: Trauma, Narrative, and History* (Baltimore: Johns Hopkins University Press, 1996).

[18] Rob Nixon, *Slow Violence and the Environmentalism of the Poor* (Cambridge, Massachusetts: Harvard University Press, 2013).

[19] Jonathan Lear, *Radical Hope: Ethics in the Face of Cultural Devastation* (Cambridge, Massachusetts: Harvard University Press, 2008).

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About the Author

Bethany Wiggin is the founding director of the Penn Program in Environmental Humanities. A cultural historian of Europe and the Atlantic world, she has worked on the history of the novel and the rise of reading as entertainment in Europe, globalism and the birth of fashion, "untranslatables," multilingualism, and ecological temporalities across disciplines. At present, she is working on a monograph, *Utopia Found, Lost, and Re-Imagined*. She is committed also to public humanities; in addition to leading the Lower Schuylkill River Research seminar, she also co-founded and co-directs the public [Data Refuge](#) project.