ISSUE EIGHTEEN : SPRING 2021
OPEN RIVERS :
RETHINKING WATER, PLACE & COMMUNITY

WATER FUTURES

http://openrivers.umn.edu
An interdisciplinary online journal rethinking water, place & community from multiple perspectives within and beyond the academy.
ISSN 2471-190X

The cover image is by Ivan Bandura, https://ivan.graphics/.

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

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

FEATURE

HIDDEN WATERWAYS: BASSETT CREEK

By Trinity Ek

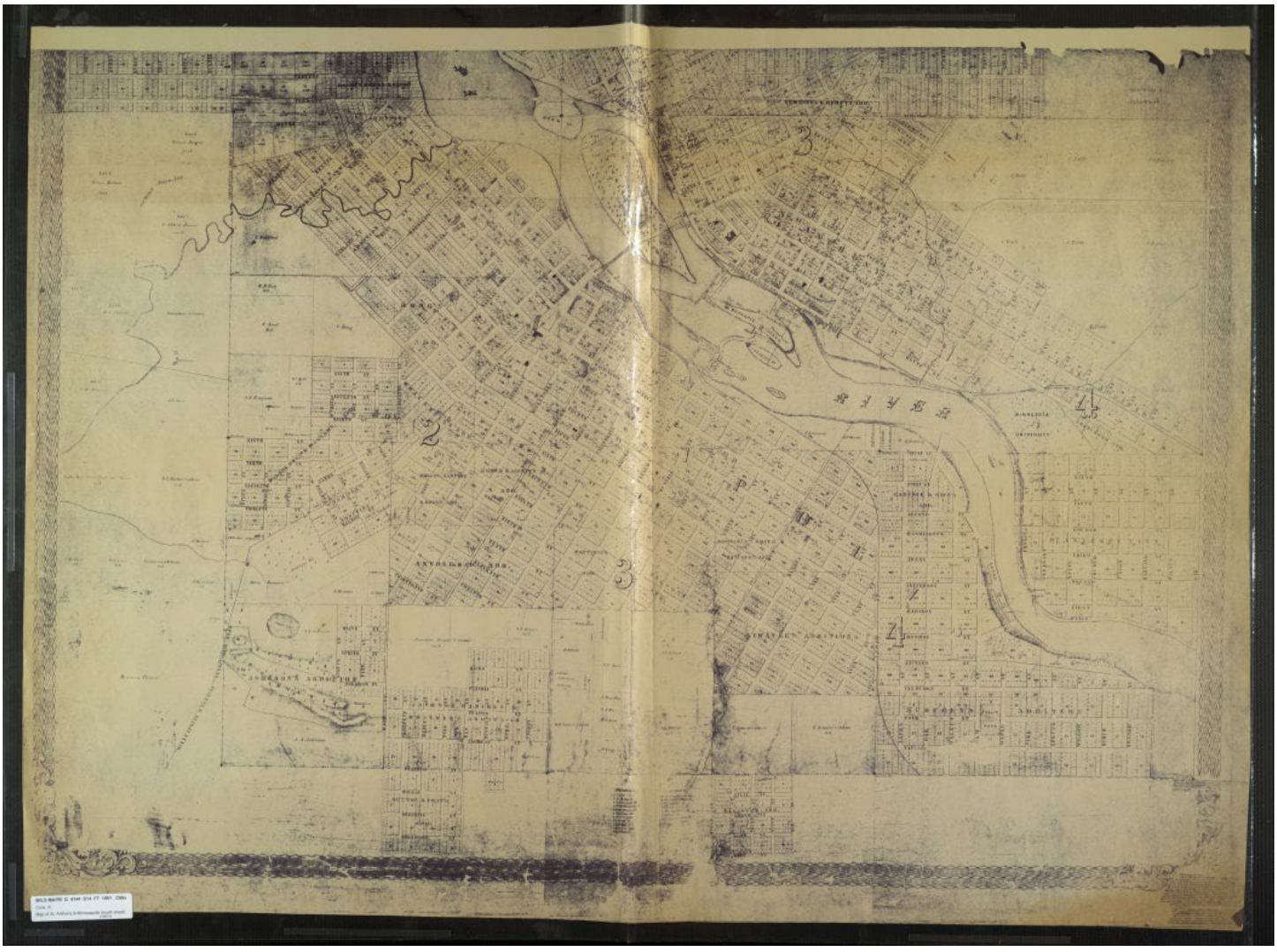
Bassett Creek, a meandering waterway separating North Minneapolis from the rest of the city, was ignored, piped, and hidden from the landscape over the course of the nineteenth and twentieth centuries. The creek's main stem begins downstream of Medicine Lake. The North Branch and the Sweeney Lake Branch join it in the 1.7-mile long tunnel that runs through Minneapolis (Bassett Creek Watershed Management Commission, n.d.). Unlike many of the other water features in Minneapolis such as the Chain of Lakes and Minnehaha Creek, Bassett Creek was not seen as an amenity.

Today, Minneapolis, like many cities across the nation, is reembracing its natural environment.

Where Bassett Creek meets the Mississippi River. Image courtesy of Patrick Nunnally.

Polluted rivers are becoming beloved waterfronts and abandoned industrial sites are being remade into commercial corridors with beautiful green spaces. For example, the reopening of the Stone Arch Bridge, formerly carrying railroad tracks, as a pedestrian and cyclist bridge signified the reorientation of Minneapolis to the Mississippi River. It became a site of recreation and engagement with "nature" rather than a site that primarily fueled capitalist endeavors of the past such as sawmills, flour mills, and breweries. As these former environmental hazards transform into amenities, it is necessary to ask who is at the table making these decisions, who these amenities are for, and who benefits and loses.

Throughout history, unnavigable waterways and natural wetlands have been piped, filled, and drained to accommodate urban living. When hidden, the original waterway is often forgotten, but continues to influence the landscape and the communities that live within it. Detrimental effects for the community appear in the form of bad soils, polluted waters, and flooding. Additionally, these waterways are often turned into neighborhood dump sites. Patterns of inequity and environmental injustice align with these historic hidden waterways. The people who live in these places are typically communities of color or of lower socioeconomic status. These spaces with hidden urban waterways are defined by the intersection of race, place, and hydrology.



A meandering Bassett Creek outlined on an 1861 plat map by R. & F. Cook.

Today, hidden urban waterways pose a major redevelopment opportunity for cities. Jason King's (n.d.) work explores select "lost rivers, buried creeks & disappeared streams," how we continue to see them in today's urban landscapes, and how we might reconnect with them. The potential for reconnection to the landscape is an opportunity for previously neglected urban spaces to attract new residents and development, which in turn increases a city's tax base. Bassett Creek is one waterway that displays how in landscapes where race, place, and hydrology intersect, there is potential for infrastructural development that may combat or exacerbate inequities.

The History of Bassett Creek

Ecological Changes

As Minneapolis grew in the 1860s and 1870s, a major railroad corridor ran along Bassett Creek and became central to the warehouse district. John R. Borchert notes that the creek demarcated "the north side of Minneapolis from the rest of the city" (1983, 11). Further, due to its regular flooding in the spring, it proved difficult to cross and build around. A series of streets and bridges were built over the creek to connect North Minneapolis with the rest of the city (67).

In addition to Bassett Creek as a barrier between North Minneapolis and the rest of the city, it was also an environmental hazard. The noise and air pollution from sawmills near Bassett Creek caused residents to move away from the

1892 plat maps stitched together which reflect straightening efforts. Maps published by C. M. Foote & Co.

area in the 1860s and 1870s. The creek itself was characterized as a problem by elected officials and city engineers. Mayor Albert Ames in a letter from 1876 called it "that mammoth sewer called Bassett's Creek," and in that same year, city engineer Thomas Rosser also described it as the "sewer known as Bassett's Creek" (Smith 2011). During this time, the creek was less a waterway and more the neighborhood's place to dump anything and everything, including "ashes, dead animals, garbage, glass bottles, car tires, bedsprings, tin cans and other rubbish" (Friends of Bassett Creek, n.d.). It was recommended by the *Minneapolis Tribune* in 1882 to turn "the creek into a sewer, the outlet of which should be below the falls" (Smith 2011). This perception and reality of the creek as an environmental hazard would persist for decades to come.

The creek subsequently was reshaped and hidden in an effort to create a more amenable, developable landscape. It was straightened as seen in the difference between the 1861 and 1892 plat maps. A proposal also recommended "build[ing] a wall on each side seven feet high" in order to control the flooding from the creek (Smith 2011). While the walls may not have been built, the creek and its wetlands were increasingly filled with sewage and eventually with 10 to 15 feet of construction fill (Friends of Bassett Creek, n.d.). By the 1930s, the original creek was lost with the numerous changes that occurred from the late 1800s to the early 1900s.

Social Impacts

In 1937, the urban renewal public housing project, Sumner Field, was built along the straightened creek. The project provided low-income housing. The residents were predominantly Black from 1960 to 1980 and by 1990, it was heavily populated by Southeast Asian refugees (Crump 2002, 587). As a result of the creek being filled in for the development of Sumner Field, the land was unstable and the soils were poorly packed. It led to severe issues with the foundations of buildings and contributed to the flooding of basements (587). These health, environmental, and physical harms of water and sewage contamination were relegated to Black residents and residents of color. In addition to harms to the community, the buried and piped creek led straight to the Mississippi River, meaning that all the pollutants from residential and urban living directly impacted the river and its ecosystem.

Further, there was a considerably high volume of runoff due to freeway and other development in the area, exacerbating these issues. The wetlands were once able to absorb and filter high levels of runoff from rain events when they were clear of sewage, debris, and fill. However, they no longer could serve that purpose due to all the alterations to the landscape. The waste combined with the construction fill prohibited the wetlands around the creek from serving nature's intended functions (EPA, n.d.). Among those functions are improving water quality, providing wildlife habitat, and protecting against floods.

Around this same time, at the turn of the twentieth century, the practice of redlining, which was the systematic denial of financial services such as mortgages and business loans to people of color, especially Black populations, appeared across the country's urban spaces—Minneapolis included (Mills 2020a). Redlining's insidious legacy is a factor that contributed to the environmental degradation and hazard associated with Bassett Creek. It worsened disinvestment and economic stagnation in these neighborhoods, negatively impacting their value and disproportionately harming Black and Southeast Asian communities. Work done by the Mapping Prejudice Project shows how the spread of racial covenants throughout South Minneapolis shifted

the city's Black population to North Minneapolis from 1910 to 1940 (Mills 2020b, 2020c).

The demolition of Sumner Field began in 1998, 60 years after Sumner Field was built. With the slow pace of construction for new housing in Minneapolis paired with the quick demolition of hundreds of low-income units, many residents were left with few options for relocation. In 1999, a group of Black ministers protested the demolition of the remaining 300 units of public housing at Sumner Field (Crump 2002, 591). Mayor Sharon Belton Sayles agreed to delay the demolition of 70 units in response to protestors. However, that still did not meet the need for affordable housing for the displaced residents. Today, affordable housing in this region remains a concern of residents (Hankerson et al. 2020).

Throughout the nineteenth and twentieth century, the series of developments, changes, and alterations to the creek and its surrounding landscape resulted in lasting impacts for people and place. The view of Bassett Creek as a burden and hazard led to its burial. And yet, even though it was hidden from the landscape, it continued to appear in the form of floods and unstable land. The hidden creek's convergence with racially motivated planning in this landscape meant that the harms associated with reshaping and filling the creek unfairly impacted low-income populations and communities of color.

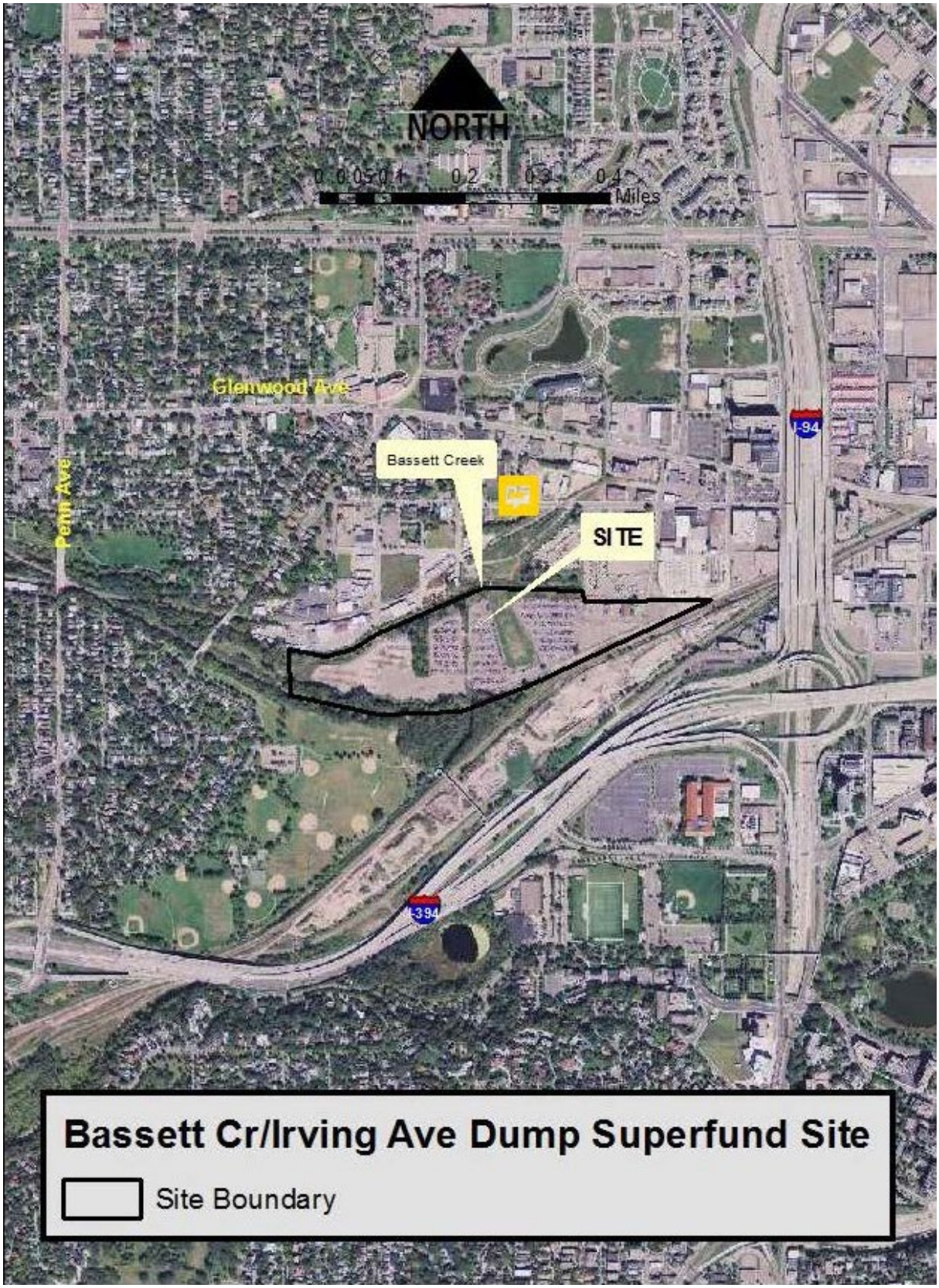
Google Maps satellite image of Heritage Park and surrounding area.

Bassett Creek Today

Today, Heritage Park stands where Sumner Field once was. It is described by the Heritage Park Neighborhood Association as "a stable, affordable and sustainable urban neighborhood on the western doorstep of the Minneapolis' downtown area" (Bayerl, n.d.) The neighborhood has been retrofitted with a new, state-of-the-art stormwater system that seeks to showcase an earlier version of Bassett Creek and its associated wetlands.

According to the Minnesota Pollution Control Agency (MPCA 2016), the project uses "a combination of engineered and natural systems" in park and open space amenities to filter water and rainfall at several levels. The creek has been daylighted in select areas that can be seen from satellite imagery on Google Maps. What once was an environmental nuisance is now seen as an amenity.

Stormwater management pond in Heritage Park facing the grate that leads to the Mississippi River. Image courtesy of Trinity Ek.



The Bassett Creek/Irving Avenue Dump Superfund Site is on the Minnesota Permanent List of Priorities due to its elevated concentrations of lead, polynuclear aromatic hydrocarbons (PAHs), and volatile organic compounds (VOCs). Map published by MPCA (2013).

South of the Heritage Park development is the 230-acre Bassett Creek Valley project area. It is largely industrial and encompasses portions of the Harrison and Bryn-Mawr neighborhoods. Minnesota Compass data reveals that Harrison's population is 47.3 percent white (n.d.[b]) and Bryn-Mawr's is 89.3 percent white (n.d.[a]). The project area was established in 1998 by the Minneapolis City Council. It also includes the Bassett Creek/Irving Ave Dump Superfund Site, which is located along the creek itself. Due to decades of poor treatment, the soils, surface water, and groundwater are polluted by "lead, polynuclear aromatic hydrocarbons (PAHs), and volatile organic compounds (VOCs)" (MPCA 2013, 1). The site is currently mostly an impound lot with industrial facilities surrounding it.

Land uses such as the impound lot continue to separate the creek from the residents who live near it. Once the creek leaves Theodore Wirth and Bassett's Creek Park, it is separated from residential areas by railroads, abandoned mills, and industrial sites. While trails exist along the creek in these parks, they are relatively few and far between compared to the parkways and walking paths present around Minnehaha Creek and the Mississippi River. Bassett Creek is still largely hidden in the landscape.

Bassett Creek near the abandoned Fruen Mill. Image courtesy of Trinity Ek.

It takes a trek over unpaved trails and through railroad tracks to reach the creek near Fruen Mill. Here, the creek runs next to the abandoned Fruen Mill which it once powered (Painter 2015). The railroad tracks, cement blocks, and the mill itself show an older version of the creek. Further, because Bassett Creek is not maintained like other waterways in the city, debris such as snack wrappers, bottles, and even car batteries are present on inaccessible stretches of the creek.

The Bassett Creek Valley Master Plan "advocates redevelopment of this outmoded industrial landscape into more than three thousand housing units, 2.5 million square feet of commercial space and the establishment of nearly 40 acres of new open space" (City of Minneapolis, n.d., 1). It was prepared by Hoisington Koegler Group, Inc. (HKG) in 2007 for the Redevelopment Oversight Committee (ROC). It also puts specific emphasis on changing the idea of Bassett Creek as a barrier and instead thinking of it as "the symbolic knitting thread of the Valley's urban fabric" (1). The City of Minneapolis explains that the ROC is composed of residents from both neighborhoods, business owners in the Valley, a City Council member, and mayoral representatives. Ryan Companies is the master development partner.

As with other redevelopment projects across the nation, gentrification is a major concern of residents. In the plan, HKG explains the redevelopment proposals will increase "the Valley's real estate value from roughly 50 million dollars today to well over 1 billion dollars" (Hoisington Koegler Group, Inc. 2007, 1). This dramatic increase in real estate value alone predicts the rising costs of living and rent commonly associated with gentrification, a sentiment many residents explained in *Beneath the Surface* by the Center for Urban and Regional Affairs (CURA 2018, 10). However, unlike other instances of gentrification, large numbers of residents are not being displaced, as there was not a large amount of existing housing stock. Another concern involves the change in population and demographics. When asked about the signs of gentrification residents were seeing, "they all cited the increased presence of young white families and new economic investment that did not match the historic character of the area" (11). This demographic change also has led to a tension between Harrison residents who stated there is a need for more affordable housing and Bryn-Mawr residents who want to see more high-end shops and green space (11).

The change in the landscape can already be seen. Before the COVID-19 pandemic, developers had already begun buying up land and replacing houses with condos. The Harrison Neighborhood Association (n.d.) is tracking this neighborhood development on their website and through ArcGIS Story Maps.

Going Forward

As plans move forward and this landscape is altered both physically and socially, conflict will arise as it already has. The orientation of the community toward the creek instead of away from it signifies how neighborhoods and cities are prioritizing natural features to take advantage of ecosystem services. In this case, these beneficial ecosystem services include managing stormwater and runoff as well as creating a means to increase both real estate value and potentially the tax base. During this change, it is necessary to consider who these changes are for—the residents who already live here or the new and future ones?

The history of the place as a site of systemic inequality must also be considered so the practice of harm does not repeat itself in the form of gentrification. The ideal goal is to create a place where both current and future residents can have their needs met and have access to opportunities

to grow and thrive. When rectifying the fraught history of these landscapes, Ujijji Davis (2018) emphasizes it is necessary to "elevate marginalized residents into key players in the turnover of their neighborhoods" to avoid gentrification. Not only listening, but implementing the desires and needs of the existing residents will lead to a more livable and welcoming community.

The concern surrounding gentrification echoes sentiments about the Upper Harbor Terminal further north on the Mississippi River. Similar to Bassett Creek, the Upper Harbor Terminal was also once an environmental hazard (The CREATE Initiative 2020; O'Connor Toberman 2020). It is now in the process of being redeveloped with focuses on new park space, housing, office space, and an amphitheater. The proposed redevelopment of the former barge terminal has sparked heated debate and controversy, especially surrounding the amphitheater, about who the development is for and who it will benefit. Many Northside residents welcome access to the river that other parts of the city have long benefited from, but not the private ownership of lands that may attract a demographic that would alter the feel and community of the Northside and eventually push out lower-income residents.

The intersection of race, place, and hydrology continues to define the landscapes surrounding hidden waterways today. Waterways that are being remembered and resurfaced offer landscapes full of potential—potential to break harmful cycles or perpetuate them. As Bassett Creek is increasingly seen as an amenity and an ecosystem service, there will be a heightened desire to restore, and where possible, daylight it. Changing the landscape not only physically alters places, but the people and communities within them as well. These processes foster a reciprocal relationship between the places people live in and the people themselves.

References

Bassett Creek Watershed Management Commission. n.d. "About Main Stem Bassett Creek." The Bassett Creek Watershed Management Commission. Accessed January 21, 2021. https://www.bassettcreekwmo.org/lakes-streams/main-stem-bassett-creek.

Bayerl, Victoria J. n.d. "Welcome!" Heritage Park Neighborhood Association. Accessed January 21, 2021. http://www.heritageparkneighborhood.org/.

Borchert, John R. 1983. *Legacy of Minneapolis*. Minneapolis: Voyageur.

City of Minneapolis. n.d. "Bassett Creek Valley Master Plan." *Minneapolis 2040*. Accessed January 21, 2021. https://minneapolis2040.com/small-area-plans/bassett-creek-valley-master-plan/.

M. Foote & Co. 1892. *City of Minneapolis* Plates 4, 5, 6, 18, and 19. 1 inch:2000 feet scale. Minneapolis: C. M. Foote & Co. University of Minnesota Libraries, John R. Borchert Map Library. http://geo.lib.umn.edu/collections/digitizedplatbooks/minn1892index.htm.

Cook, R. & F.. 1861. *City of Minneapolis, South Sheet* [map]. University of Minnesota Libraries, John R. Borchert Map Library. http://geo.lib.umn.edu/map_images/G4144.M5G46_1861_C66_south.jpg.

The CREATE Initiative. 2020. *A Timeline for Understanding the Upper Harbor Terminal Development in Historical Context*. https://create.umn.edu/wp-content/uploads/2019/09/UHT-Timeline3.pdf.

Crump, Jeff. 2002. “Deconcentration by Demolition: Public Housing, Poverty, and Urban Policy.” *Environment and Planning D: Society and Space* 20, no. 5: 581–96.

CURA (Center for Urban and Regional Affairs). 2018. *Beneath the Surface: A Snapshot of CURA’s Gentrification Interview Data*. Minneapolis: The Regents of the University of Minnesota. http://gentrification.umn.edu/sites/gentrification.dl.umn.edu/files/general/north-2-23-18v2.pdf.

Davis, Ujijji. 2018. “The Bottom: The Emergence and Erasure of Black American Urban Landscapes.” *Avery Review* 34. Accessed January 21, 2021. https://www.averyreview.com/issues/34/the-bottom.

EPA (United States Environmental Protection Agency). n.d. “Why Are Wetlands Important?” *EPA*. Accessed April 15, 2021. https://www.epa.gov/wetlands/why-are-wetlands-important.

Friends of Bassett Creek. n.d. “A Brief Description and History of Bassett Creek.” Friends of Bassett Creek. Accessed January 21, 2021. http://www.mninter.net/~stack/bassett/descript.htm.

Hankerson, Stefan, Kelsey Poljacik, Rebecca Walker, Alexander Webb, and Aaron Westling. 2020. “Popular Education for Environmental and Racial Justice in Minneapolis.” *The CREATE Initiative*. https://create.umn.edu/wp-content/uploads/2020/01/Final-Report_PA-5262-Neighborhood-RevitalizationTheories-andStrategies.pdf.

Harrison Neighborhood Association. n.d. “Harrison Neighborhood Development.” Accessed April 20, 2021. http://www.hnampls.org/glenwood-revitalization-team.

Hoisington Koegler Group, Inc. 2007. *Bassett Creek Valley Master Plan*. https://minneapolis2040.com/media/1502/bassett-creek-valley-master-plan.pdf.

King, Jason. n.d. *Hidden Hydrology*. Accessed January 21, 2021. https://www.hiddenhydrology.org/.

Mills, Marguerite. 2020a. *Hennepin County Racially Restrictive Covenants* [map]. The Mapping Prejudice Project. https://conservancy.umn.edu/bitstream/handle/11299/217471/HennepinCountyRaciallyRestrictiveCovenants.pdf?sequence=1&isAllowed=y.

———. 2020b. *Minneapolis Black Population 1910* [map]. The Mapping Prejudice Project. https://conservancy.umn.edu/bitstream/handle/11299/217473/MinneapolisBlackPopulation1910.pdf?sequence=1&isAllowed=y.

———. 2020c. *Minneapolis Black Population 1940* [map]. The Mapping Prejudice Project. https://conservancy.umn.edu/bitstream/handle/11299/217476/MinneapolisBlackPopulation1940.pdf?sequence=1&isAllowed=y.

Minnesota Compass. n.d.(a). “Bryn-Mawr Neighborhood Data.” Accessed January 21, 2021. https://www.mncompass.org/profiles/city/minneapolis/bryn-mawr.

———. n.d.(b). “Harrison Neighborhood Data.” Accessed January 21, 2021. https://www.mncompass.org/profiles/city/minneapolis/harrison.

MPCA (Minnesota Pollution Control Agency). 2013. *Update on Bassett Creek/Irving Avenue Dump Superfund Site, Minneapolis*. St. Paul: MPCA. https://www.pca.state.mn.us/sites/default/files/g-27-22a.pdf.

———. 2016. "Heritage Park – An Urban Retrofit." *Minnesota Stormwater Manual*, June 1, 2016. https://stormwater.pca.state.mn.us/index.php/Heritage_Park_-_an_urban_retrofit.

O'Connor Toberman, Colleen. 2020. "Upper Harbor Terminal: North Minneapolis Voices." Friends of the Mississippi River, April 30, 2020. https://fmr.org/river-corridor-and-land-use-updates/upper-harbor-terminal-north-minneapolis-voices.

Painter, Kristin Leigh. 2015. "Developers buy troubled Fruen Mill and plan a makeover." *Star Tribune*, July 31, 2015. https://www.startribune.com/developers-buy-fruen-mill-lure-to-trespassers-and-plan-a-makeover/320355641//.

Satellite view of Minneapolis. n.d. Google Earth. Accessed April 2, 2021. https://www.google.com/maps/@44.9868664,-93.2956462,1703m/data=!3m1!1e3.

Smith, David. 2011. "The Myth of Bassett's Creek." *Minneapolis Park History*, November 27, 2011. https://minneapolisparkhistory.com/2011/11/27/the-myth-of-bassetts-creek/.

Recommended Citation

Ek, Trinity. 2021. "Hidden Waterways: Bassett Creek." *Open Rivers: Rethinking Water, Place & Community*, no. 18. https://editions.lib.umn.edu/openrivers/article/hidden-waterways-bassett-creek.

DOI: https://doi.org/10.24926/2471190X.7977

About the Author

Trinity Ek is an Honors student at the University of Minnesota, Twin Cities pursuing a B.S. in Urban Studies. She is passionate about the environment, community building, land use, and sustainability. Her past and current projects, such as Lost Waterways and Women of the Mississippi River, focus on waterways, land, and justice.

PERSPECTIVES

CREATING OUR WATER FUTURES

By Teresa Opheim, Douglas Snyder, Kate A. Brauman, and Valerie Were

This issue of Open Rivers *invites us all to envision the kind of future we hope to have with water. It encourages us to see the possibilities. By imagining the relationships we want with water, imagining the water conditions we want to see in our future, we begin to see both the challenges and potentials in our present and the steps necessary to move us to these desired and desirable water conditions.*

As a way to start the conversation about water futures, we asked community partners, researchers, faculty, and students, people connected to policy work and people creating change in the field, in their communities, and

Climate Land Leaders are learning that soil health is needed for healthy waters. Image courtesy of Sharing Our Roots.

in the classroom, to share their response to the following question: What knowledges, practices, and perspectives do we need in order to create the water futures we imagine and want? Here we share four responses to this question that all speak to the ways our values are entangled with water and to the value of water itself. We hope this collection will spur an ongoing conversation to which you, our readers, may contribute. We welcome anyone who is interested in responding to this question to share your perspective via our google form (z.umn.edu/waterfutures). Periodically, we will include a collection of responses in subsequent issues of Open Rivers. *By drawing together a variety of ways of imagining more equitable, sustainable, hopeful water futures, we begin to create these futures together.*

-Laurie Moberg, Managing Editor

Teresa Opheim, Love the Soil, Protect the Waters

After farmers harvested corn and soybeans last fall, most left their fields bare. Soil will blow away and erode into our waterways until planting again later this spring.

But not at the Sharing Our Roots Farm near Northfield. This 100-acre farm is covered with grasses and trees. Life in the soil is increasing. Carbon is being drawn out of the atmosphere and into the ground where it belongs. And the soil is becoming sponge-like, slowing the movement of water and keeping it in place.

Sharing Our Roots Farm is a member of the Climate Land Leaders, a group of farmland owners who are working collaboratively and creatively for the land and water, and for those who grow our food. Landowners have tremendous power and responsibility to steward our land. As Climate Land Leader Helen Gunderson says, "Land is a limited resource, and people who own it are in a unique position to make a difference."

The Climate Land Leaders know that we will improve our waters and make our land more climate-resilient by implementing some basic principles:

- Cover the soil.
- Keep living roots in the ground year round.
- Minimize soil disturbance.
- Increase the diversity of crops and livestock.

The Climate Land Leaders are learning so much! They now know that climate change is resulting in increasingly volatile weather, including more intense rainfalls. They also are discovering that re-greening the land is a climate change solution because it helps restore the water cycle. Perennial landscapes can help moderate temperatures; land stripped of vegetation cannot.

The Sharing Our Roots Farm is a vision of the land regeneration we could achieve across the Midwest. The Farm's land stewards and all the Climate Land Leaders are strengthening their own commitment to place and sense of awe about nature. Building the soil means improving the water and addressing with compassion and commitment our climate crisis.

Sharing Our Roots acquired 100 acres of degraded cropland in October 2016 and has since been transitioning it to a resilient, regenerative system. Images courtesy of Sharing Our Roots.

Douglas Snyder

Stated simply, the perspective I would want everyone to have is that water is indeed precious and provides innumerable benefits to us. We must work to ensure that these benefits are brought front and center, rather than remain hidden or underappreciated, by all of us who benefit from clean water when experiencing nature, when living our urban lives, and when undertaking our economic activities. If everyone understood this and incorporated it into their decision-making, their purchasing decisions, and their work life, water would have a better chance of being valued and protected, and not endangered though ignorant actions or unintended consequences.

I would have people understand that water decisions are ubiquitous. When you purchase a new pair of pants, your food, or products for managing your yard, you are making a decision that impacts water. How was the fabric grown or created? Were pesticides used? How it was manufactured? How far did it travel? How much and what kind of energy was needed? The answers to all of these questions have water consequences, and the issue today is that we do not take those consequences into account. Rather, they are viewed as externalities. Very soon, I think we will not have the luxury to see the interconnectedness of things as externalities. We need to acknowledge the connections between our decisions and their impact on water.

I am optimistic that this is beginning to happen. In my work-world of stormwater management, rainwater was for many years viewed as waste—something that needed to be moved off the urban landscape as quickly as possible. Unfortunately, it also carried nutrients and pollutants with it, unintentionally causing problems for the lakes, streams, and rivers collecting it. Now we are seeing rainwater, snowmelt and other forms of precipitation being viewed as a resource that can be collected, cleaned, and used in place of potable water for numerous commercial, home, and landscape needs. It's a start. By no means have we solved how to deal with all the connected processes and externalities of the current system.

Water provides life to us, and is in many ways a living thing itself. It should be respected and honored as such. Only then will we make decisions that keep water clean and available to our environment and ourselves.

Kate A. Brauman

To build a future in which limited water supplies are used equitably, productively, and resiliently, we need to understand not just what people are directly using water for, but what the purpose of that water use is. A green lawn in an arid region could be a status symbol or a place to play, a memory of home or a statement of what home could mean. Keeping the lawn green will always require a certain amount of water, but those real purposes, the deeper needs, might be met in other, less water-intensive ways. Once we shift our thinking and management to focus on achieving end goals, not just on providing water for specific activities, there is a wide world of water alternatives that go way beyond increasing efficiency or raising prices. Instead of fighting about reallocating the same supply among more users, we could make the pie bigger by finding ways to achieve our goals in entirely different ways. Doing this requires talking to people, really understanding their values and needs and goals. Fun new technology is, well, fun, and we will need technical solutions. But even new technology can't be deployed effectively until we understand what water users are trying to achieve.

Green lawn highlights outdoor sculpture at the Villa Panza in Varese, Italy. Image courtesy of Kate A. Brauman.

Valerie Were

We need more refined knowledge on how water security is experienced across the globe. Our imprint on the natural water cycle, which many in the United States begin learning about in elementary school, is profound and affects water security. The United Nation's proposed definition for water security is "The capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well-being, and socio-economic development, for ensuring protection against water-borne pollution and water-related disasters, and for preserving ecosystems in a climate of peace and political stability" (UN Water 2013). Can anyone say they are completely water secure? Dr. Indrani Pal, a Research Scientist and colleague at the NOAA Cooperative Science Center for Earth System

This aerial photo, released by the California Department of Water Resources, shows the damaged spillway with eroded hillside in Oroville, California during the dam crisis in 2017 during which the dam threatened collapse. This crisis remains emblematic of greater issues of water security globally and in California. Image by William Croyle, California Department of Water Resources.

Sciences and Remote Sensing Technologies, and I were discussing this issue recently. She said that although the northeastern United States is projected to receive more precipitation due to climate change, much of it will likely be unavailable because of changes in how water flows.

A group of us wanted to address the urgent need to find better ways to predict water availability. We are developing a tool that predicts the availability of renewable freshwater resources in California's rivers using a combination of computer modeling and prediction, data visualization, and social sciences. The tool is unique in that we use actual river water data rather than basing predictions on components of the water cycle. The tool will also take into account the socio-economic factors that influence how much water is available at a given location at a given time. Advances in computer modeling make it possible to deal with missing data, which is often a limiting factor in understanding water. Learn more about our work here: https://www.hydrodetectus.com/ and stay tuned for more!

We need to advance our knowledge around the value of water. We often think of value purely in economic terms but there are other ways to value water beyond assigning a dollar amount. Water has cultural value, it has aesthetic value, and those perspectives need to be included in conversations about valuation. That means inviting a variety of participants to conversations about water. The process takes time, commitment, and recognition that the current project cycles we use run counter to a meaningful engagement process. A big part of the engagement is making sure justice, equity, diversity, and inclusion are part of the process.

Perhaps I am just late to the game, but there also needs to be more focus on chronic issues. Sea level rise, for example, will have a profound impact on coastal communities. We still struggle to communicate that risk. We need deeper conversations about the realities of the displacement that sea level rise will bring. Climate migration is already happening in other parts of the world and the United States will be no different.

Recommended Citation

Opheim, Teresa, Douglas Snyder, Kate Brauman, and Valerie Were. 2021. “Creating Our Water Futures.” *Open Rivers: Rethinking Water, Place & Community*, no. 18. https://editions.lib.umn.edu/openrivers/article/creating-our-water-futures.

DOI: https://doi.org/10.24926/2471190X.8041

About the Authors

Teresa Opheim is the Director of Climate Land Leaders, which is an initiative of Sharing Our Roots. Climate Land Leaders own almost 7,000 acres of farm and forest land in Minnesota, Iowa, and Wisconsin. For more information: https://sharing-our-roots.org/our-initiatives/climate-land-leaders/.

Doug Snyder is the executive director for the Mississippi Watershed Management Organization. He has worked in various capacities in water management at the state and local level for the past 30 years.

Dr. Kate A. Brauman is a ’20-’21 AAAS Science Technology Policy Fellow working on water resilience at the U.S. Department of Defense. At the University of Minnesota’s Institute on the Environment, Dr. Brauman is the Lead Scientist for the Global Water Initiative and part of the Natural Capital Project.

Dr. Valerie Were is the Social Science Lead at the NOAA Cooperative Science Center for Earth System Sciences and Remote Sensing Technologies (CESSRST). In that role, she infuses human dimensions into the research, training, and education at the Center. Dr. Were received her Ph.D. in Natural Resources Science and Management from the University of Minnesota Twin Cities. Thanks are due to Dr. Indrani Pal also from CESSRST for her contributions to the piece.

TEACHING AND PRACTICE

TEACHING THE HISTORY OF AMERICAN RIVERS

By Scot McFarlane

Like *Open Rivers*, I have long tried to answer the question of the value of river history and how can it be put to work to achieve environmental justice. While we each have a home or favorite river that captivates us, there is a broader, if unspoken, understanding of rivers and the role they play in shaping our history. Last fall I organized a conference that attempted to address this challenge. Called *All Water Has a Memory: Rivers and American History*, the conference featured presenters from academia, nature writing, and environmental and community activism who shared their history and experience of individual rivers in three sessions: Slavery and Freedom, Indigenous Resistance, and The Environmental Movement. I hoped that we could all learn something about each of these topics individually and show how river history's perspective offers a uniquely effective approach to restorative justice for people and places. This conference, now available as online videos, is part of a larger project to teach river history in

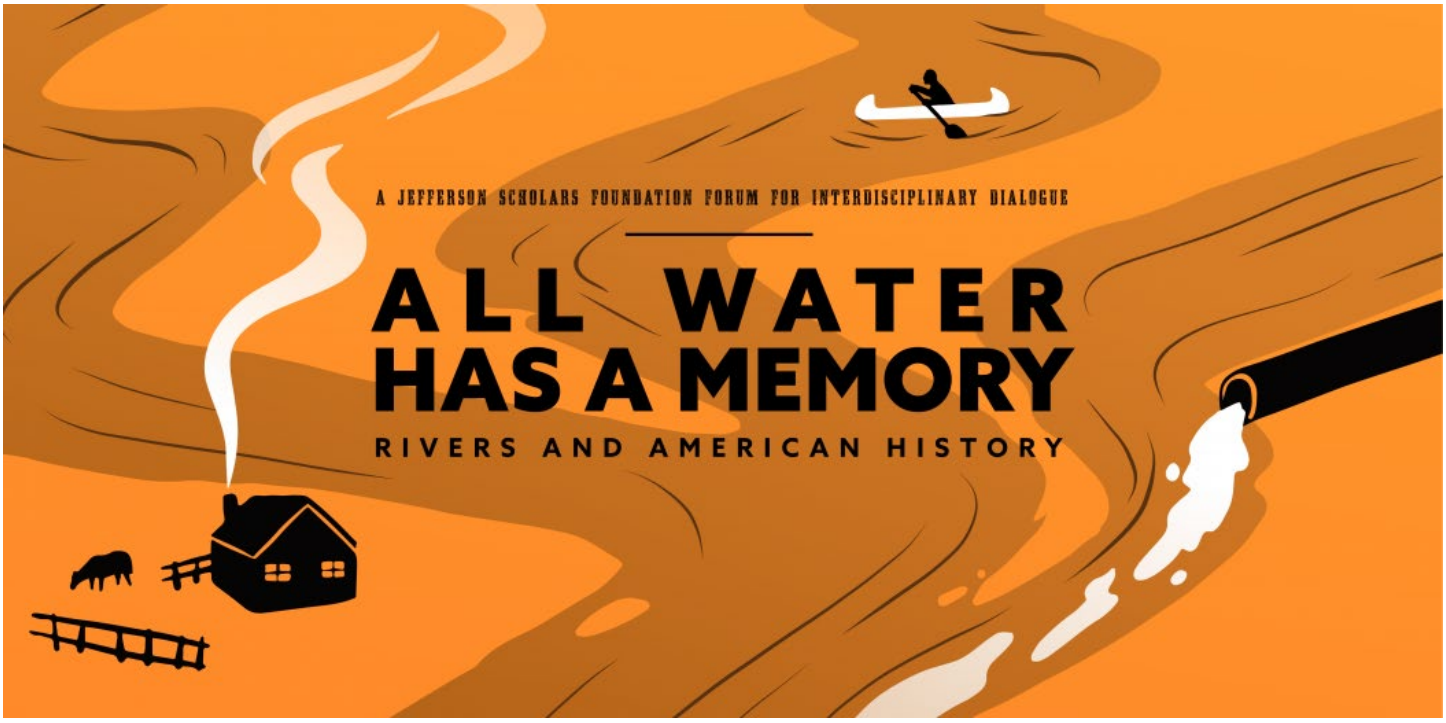
Illustration of major rivers for 'Confluence: The History of North American Rivers' courtesy of Robert Szucs, www.grasshoppergeography.com.

classrooms and communities across the country that goes beyond a strictly scientific perspective on rivers and helps individuals understand how waterways have shaped our societies and relationship with the natural world.

The Slavery and Freedom session featured Adrienne Troy Frazier, J. T. Roane, and Tony Perry discussing the Combahee, James, and Potomac Rivers. In the Indigenous Resistance session Dustin Mack, Zachary Bennett, and Ashley Smith focused on the Mississippi and Kennebec Rivers. The final session on the Environmental Movement featured Janisse Ray, Fred Tutman, and Chris Manganiello presenting on the Altamaha, Patuxent, and Savannah Rivers. To have as much continuity as possible between the three different panels, I asked the same guiding questions for all of the speakers to consider in their presentations and discussion. They were: What can river history tell us about this particular theme in American history? And, how might river history contribute to both a stronger environmental movement and environmental justice?

See the Slavery and Freedom session here.

A thousand people registered and several hundred attended each session, with a roughly even mix of people from conservation, academia, and the specific places being discussed. Without the necessity of having a virtual conference it would have been impossible to bring so many people together for an unproven concept. The large turnout suggests that there is an audience for this type of event and these conversations about the complex histories of rivers. Many of the audience members, especially those from the environmental community, attended with a sense of urgency following last summer's protests against racism and inequality, which made it clear that supporting movements like Black Lives Matter required action rather than public relations statements. The attendees looked to the intersection of people and place for ways to make their work more



Conference poster for 'All Water Has a Memory: Rivers and American History' courtesy of Edyta Lewicka.

inclusive and committed to justice. The speakers challenged many of the audience members' preconceptions. For example, the idea of giving legal personhood to rivers has generated a lot of excitement among environmental activists. Yet in the Slavery and Freedom session, J. T. Roane and Tony Perry pushed back against this enthusiasm: if American history suggests that many people have been long denied their own rights to protection, then why not solve that problem first?

See the Indigenous Resistance session here.

Together the three sessions highlighted another contradiction about American rivers. On the one hand, many people can look at an image of any of these rivers and their blood pressure instantly drops. On the other hand, the terrible violence of enslavement, massacres, and toxic pollution takes place on these rivers. These histories suggest a great ambivalence: the rivers served as a source of resistance but could not end slavery or colonialism. Rivers represent both tragedy and hope, and it remains for individuals, communities, and organizations to use narratives of individual and ecological resilience to sustain themselves and take action. The history of struggle shows that such emotions as despair are inevitable but also fleeting in the face of crisis. As the anthropogenic causes of climate change have become widely understood over the past two decades, people are becoming more open to river history's possibilities. If the engineering of the floodplain, development, and even rainfall that all contribute to causing a river to flood have been shaped by human beings, then the solution must take into account each river's history. Environmental justice is explicitly political because of the ways in which communities have been unequally affected by environmental degradation; river history makes clear how we are all connected to our waterways and also that environmental change and decisions about how to manage these waterways are always political.

See the Environmental Movement session here.

With the exception of two individuals, all the speakers for the *All Water Has a Memory* conference focused on different rivers, and yet they often arrived at the same conclusions. Following their individual presentations on a specific river, panelists participated in discussions at the end of each session. These dialogues highlighted how new ideas could be generated through the framework of river history and these understandings will lead to a search for more knowledge. I approached the conference discussion much as I would a classroom. I provided some guiding questions and then I gave the speakers as much space as possible. The fact that the presenters came from a range of backgrounds in academia, community organizing, or environmental activism and converged on the power of water to shape the possibilities for social and environmental justice exceeded my hopes for the conference. Finally, audience members also grappled with how to apply river history to their own work in the policy and conservation world. Several people asked questions such as whether frameworks beyond the existing language of watersheds would be needed to consider the parallels of water networks and human networks. Though the video recordings of each session do not allow for further questioning and engagement with the speakers, the discussions make clear the utility of river history for promoting diverse perspectives on our relationship with the natural world and for highlighting best practices to support both people and places.

Rivers can shape our cultures, economies, and perspectives, but rarely do we have an opportunity to center our relationship with them. One of the major goals of my work creating the river history site *Confluence*, of which this conference is a part, is finding ways to teach river history in the classroom. In K-12 settings, often the only time students may learn about or visit a river would be in the context of a biology or environmental studies class rather than through the humanities. If we don't teach students to understand the connections between people

and place, then it will be much more difficult for them to contribute to environmental justice or conceive of climate change as a scientific *and* political problem. Eventually I plan to work with organizations to create river history curriculums that align with state standards. In the meantime, however, students continue to study the history of slavery or Native American history and the presentations from *All Water Has a Memory* will be a great way for them to learn about that history regardless of its emphasis on rivers. All of the sessions have been uploaded to *Confluence* where people continue to watch them, and hopefully, teach these histories too.

Recommended Citation

McFarlane, Scot. 2021. "Teaching the History of American Rivers." *Open Rivers: Rethinking Water, Place & Community*, no. 18. https://editions.lib.umn.edu/openrivers/article/teaching-the-history-of-american-rivers.

DOI: https://doi.org/10.24926/2471190X.8018

About the Author

Scot McFarlane is a river historian who collaborates with conservation groups and educators on river history projects. His writing on rivers has appeared in *Environmental History, Slavery & Abolition*, and major newspapers such as the *Washington Post*. You can learn more about Scot's dissertation on Texas' Trinity River, watch his documentary on the Neches River, and explore his digital scholarship by visiting http://www.wsmcfarlane.com.

GEOGRAPHIES

COMMUNITY-MANAGED TRADITIONAL MEANS OF IRRIGATION IN THE SEMI-ARID ARAVALI LANDSCAPE

By Sayanangshu Modak

Earthen channels winding like serpents across a hilly landscape are not a common sight everywhere. They appear quite misplaced in a terrain that is highly undulating and rugged, covered with dry deciduous forests and dotted with rocky outcrops. Such a terrain is hardly conducive for agriculture, and irrigation seems unfeasible in villages located in the back of beyond. Yet the sheer will and determination of humans to challenge the impossible and put forth remarkable and ingenious works should never be underestimated.

Children washing fruit in a dhora. Image courtesy of the author.

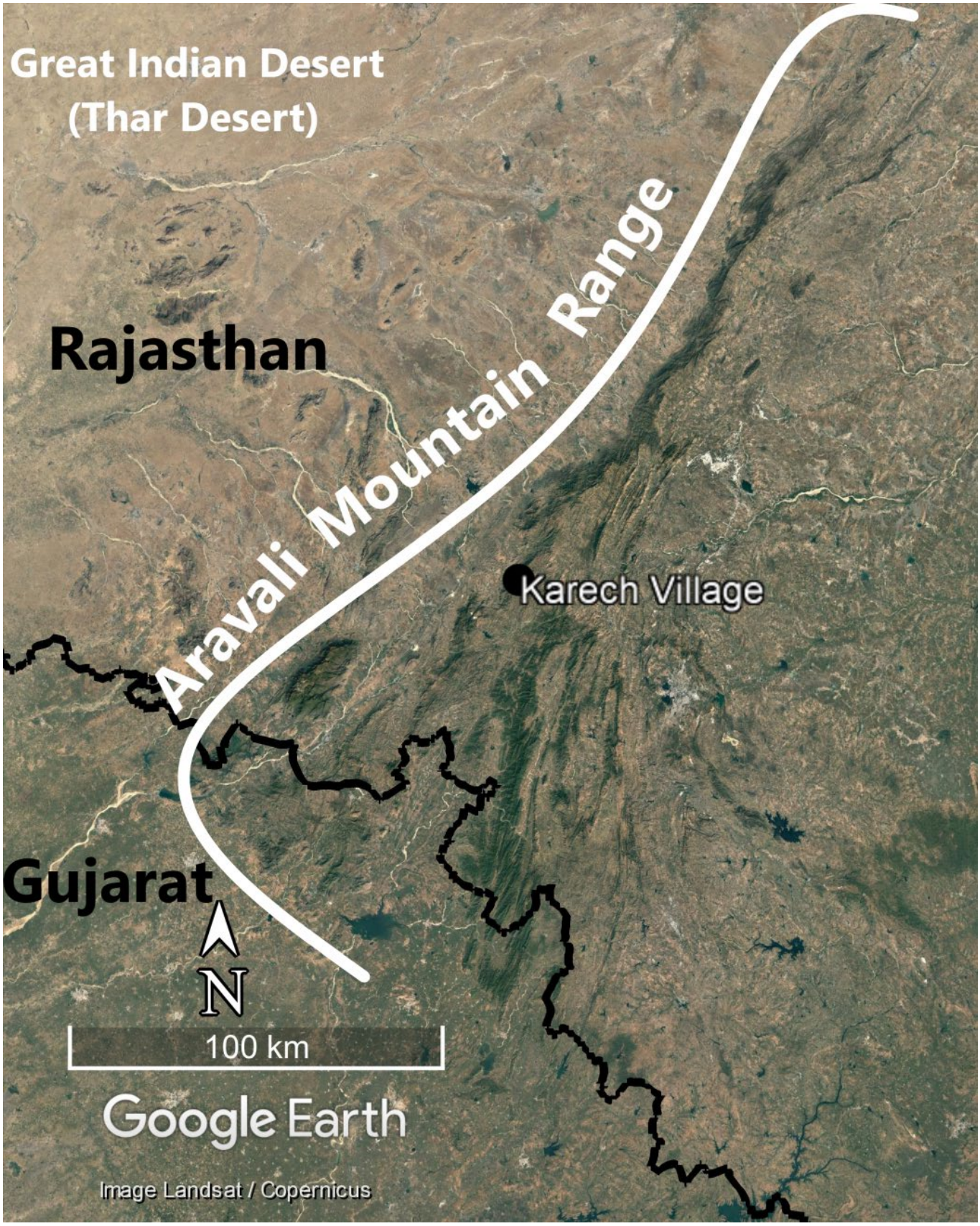
The collective action over water commons is equally impressive, helping transform a hostile landscape into one where agriculture becomes foundational to rural livelihoods. This could be achieved by diverting water from the river through earthen channels. Locally known as *dhoras* in the Aravali landscape of northwestern India, these channels are a living memoir of acts of innovation, facilitating the transport of water across this difficult terrain with the help of gravity. Therefore, it should not be an exaggeration when one connotes the possibility of them resembling the veins and arteries of agricultural productivity in this region, providing a bountiful harvest despite the difficult conditions. The case studies that follow are provided to demonstrate and emphasize the utility of collective, community efforts to build and manage *dhoras* and identify them as a cornerstone of decentralised governance of water resources.

Spotlight on *Dhoras*

Using a range of Participatory Rural Appraisal (PRA) tools including resource and social mapping, focus group discussions, and semi-structured interviews, I carried out a field-based research study to understand the use of *dhoras* and the management practices associated with it. As a part of my professional involvement in Foundation for Ecological Security (FES)—an Indian nongovernmental organization (NGO) committed to strengthening collective rights over common pool resources in diverse social, economic, and ecological setting (FES 2015, 2017), I had the opportunity to stay with the local community and observe their way of life from close quarters. This study was conducted between 2016 and 2018 as part of a larger study to understand the role of local communities as water stewards and to carry out a scoping exercise for advancing the Alliance for Water Stewardship (AWS) Standard in Karech where FES has been engaged for the past two decades. This data and evidence demonstrates that the earthen channels are not just physical infrastructures that have been fueling the productivity of small-scale farming, but are also social infrastructures providing affordance for social connections and collective action.

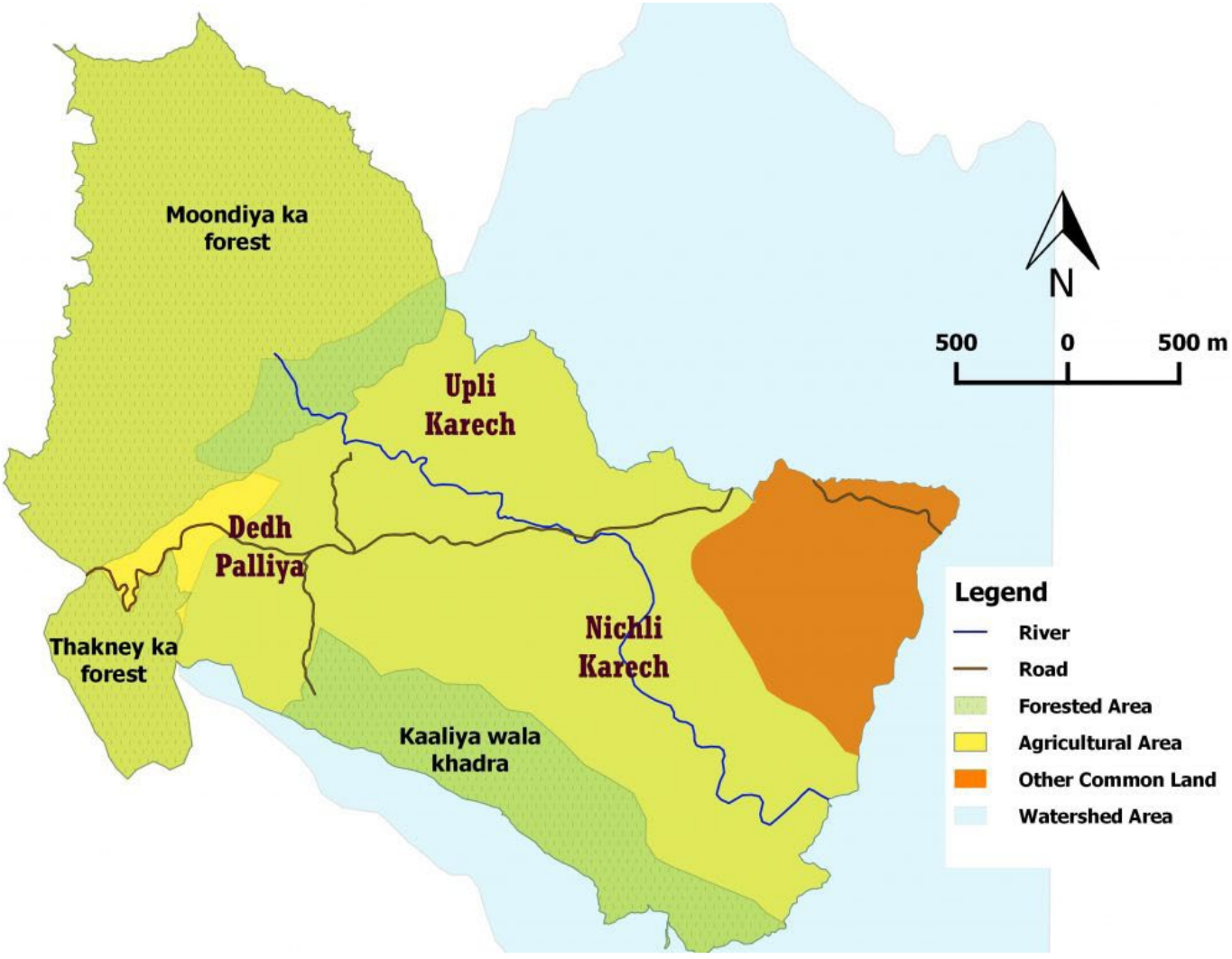
Karech, a far-flung and rather nondescript village, presents one such opportunity to witness this traditional means of irrigation and acknowledge the community's contribution in managing and maintaining the time-tested arrangements of water sharing and distribution. Nestled in the old fold Aravali mountain range of northwestern India and located at the periphery of the Great Indian Desert (Thar Desert), Karech has a rich legacy of collective action for restoring the degraded commons in the village. Consisting of three hamlets—Upli Karech, Nichli Karech and Dedh Paliya—the Indigenous, tribal community organized itself by forming a *samiti* in 2002, a village-level institution and has since initiated a process for conserving the commons that includes the three forest patches (Rathore 2019).

All the *dhoras* in Karech are located within the hamlet Nichli Karech. There are five *dhoras* in the hamlet and one Diversion Based Irrigation system (DBI). A pre-existing *dhora* was converted into a DBI network in 2013 with aid from FES. Even though this is a concrete channel and allows for more efficient conveyance of water, it still follows the same pathway as that of the earthen *dhora* which had existed for many years. The importance of these structures can be adequately established by documenting the sheer number of farmers using them within the village for fulfilling their subsistence needs. The total area irrigated through these structures was 39.54 hectares in 2017, which was about 80 percent of the total irrigated area in Nichli Karech at that time, with as many as 72 farmers benefiting from them. Some of these *dhoras* are quite long and



Location of Karech Village with respect to the Aravali Mountain Range, Gujarat, and Rajasthan. Map prepared by the author.

traverse large tracts of land, dissecting rivulets and undulations all along. Others can be short with lesser irrigation coverage, owned and maintained by a single household. The arrangements needed to maintain these *dhoras* and regulate the water use and distribution are also quite varied. Having evolved over time, they are molded and structured according to the needs of the users and reflect their experiences and aspirations.



Watershed map of Karech. Prepared by the author.

A dhora cuts across a natural drainage in Karech. Torrential rains and consequent high flow in the channels often destroy these structures and they have to be constructed again. Image courtesy of the author.

The evolution of rules

Mahadev Ka Dhora of Nichli Karech hamlet is a case in point; it has the most elaborate and well-structured rules needed to maintain its two-kilometer long earthen channel. All the rules are unwritten and have developed based on need; they remain amenable to change as per the requirement of the time. It is the longest *dhora* cutting across forested areas and streams. There are some stretches where it flows on a raised platform made with stones and boulders. These stretches are prone to disruption as flowing water or rolling stones regularly disturb the structure and break it down. Therefore, meticulous care is needed to construct it and to carry out the repair work. All the users assemble to carry out the repair work at the beginning of the *Rabi* cropping season (October–March) and a penalty of 250 Indian rupees (INR) is imposed when a member fails to show up to contribute. The process of repair and restoration begins with all the members assembling at the site of origin. They keep walking until they reach the first few farms, at which point the individual owners of those farms leave the group and the rest of the group continue with the repair work. This way, the group progressively diminishes with only those farmers owning land at the last leg of the channel continuing to the very end.

Mahadev Ka Dhora also exemplifies the spirit of equity in sharing the limited supply of water. This was made evident through my in-depth interaction through semi-structured interviews with water users and elaborate mapping of farming and irrigation practices. This entailed creating a detailed map to locate each parcel of farmland drawing water from the *dhora* and identify their ownership. This map was further used as an aid while conducting the semi-structured interview with member(s) of the family that owned the irrigated farmlands. On the whole, the scarcity of water in the village and its cruciality during

A representative diagram of irrigation practices. Image courtesy of the author.

the *Rabi* cropping season dictates the irrigation practice among users of *Mahadev Ka Dhora*. As a well-accepted principle, the irrigation cycle during the *Rabi* cropping season begins with the tail-end users getting the first share of water. Irrigation cycles per season are the number of times water must be provided to the crop. Irrigation cycles differ based on the type of crops and their variety. For example, the two main *Rabi* crops in Karech—wheat and chick-pea—require five to six and two to three irrigation cycles respectively.

The tail-to-head arrangement came into existence from a shared understanding of being more considerate toward the tail-end users who had their fields at a disadvantageous location. The system has continued for many years. This mutual feeling of sharing and caring also extends to the way the irrigation cycles are arranged. Along the *Mahadev Ka Dhora*, there are five primary parcels of land and each parcel comprises smaller patches which may be owned by a single household or by different households. The duration of one rotation cycle is decided on the basis of both the size of the primary parcel and its relative position with respect to the others along the *dhora*. For example, the first parcel of 1 hectare is jointly owned by three farmers who can avail themselves of water for only 3 days. However, the second patch, despite being only marginally greater than the first one—consisting of 1.3 hectares—gets water for 6 days owing to its relatively disadvantageous location as compared to the first one. Similarly, by virtue of both the size and the location along the *dhora*, 12 days of irrigation are permitted to the owners of the fourth patch for irrigating 5.5 hectares of agricultural land. Furthermore, within these primary patches, the duration of irrigation for each patch is decided based on need and through mutual consent of all the owners. This rule is also quite fluid, and an extra day of irrigation can be taken whenever a farmer feels the need for it. However, the farmer must seek the permission of all the other users.

An emphasis on collective action

Other *dhoras* also exhibit certain unique traits of governance based on the need of the users. However, often the absence of a collective feeling and the heterogeneous social composition of users make matters complicated. *Panchayat Ka Nala* of *Nichli Karech* provides a good example for highlighting this case. This *dhora* is collectively owned by 17 users who irrigate a little over 7 hectares of land. One of the users belongs to the *Gameti* tribe, while the other users are *Garasiyas*. The rules for rotation are not strictly adhered to and the *Garasiyas* often allege that the *Gameti* user takes water out of turn. This hinders the development of a collective for managing the structure. Moreover, it is only after the third or fourth rotation, when the water availability dwindles, that the users begin paying attention to the three-day rotation period and strictly enforce it. All this leads to an unequal apportionment of the resource, and some of the tail-end users are left with no water after the third or fourth cycles of irrigation when they are expecting five or six cycles for the health of their crops.

It is a common practice by all the users of *dhoras* to come together and assess the water availability at the beginning of the season for deciding the choice of crops. The users of *Anganwadi Ka Dhora* also decide the choice of the crop, as well as the duration of each irrigation cycle, by taking stock of water availability. For example, during a year of surplus rainfall, each irrigation cycle can comprise two days whereas, during a year of low rainfall, this increases to four days because there is very little residual moisture in the field following the season of rain-fed agriculture or *Kharif*. The choice of crop is also quite homogeneous, and all the farmers collectively decide it before the beginning of the *Rabi* season. This collective

initiative paves the way for removing the need to maintain an irrigation cycle that is bound by a fixed number of days. An important aspect of this form of governance is that the feeling of collective engagement is quite strong, and it often overrides the individualistic need to maintain a fixed irrigation cycle. The fulfilment of irrigational requirement is the only limiting factor in such a case and if tail-end farmers continue to get water, which is most often the case, harmony is maintained. Further interaction with water users of *Anganwadi Ka Dhora* through semi-structured interviews revealed that the next person up the *dhora* stays vigilant and watchful while the one before uses water, to ensure that no water is wasted.

Irrigation is often done during the night-time to eliminate the possibility of evaporation losses. In some cases, it is also done as a prerequisite for fulfilling the water needs during a fixed cycle of irrigation. In contrast, users of *School Wala Dhora*, which is the first *dhora* to emerge out of the stream, prefer not doing night-time irrigation until the third or fourth cycle of irrigation. This norm has emerged from the prolonged experience of facing a water surplus, and night-time irrigation would lead to waterlogging in the fields.

Community members participating in the construction of a boribund in Karech. Image courtesy of the author.

Improvisations

There are opportunities for increasing the irrigation coverage through innovations and improvisations over traditional systems like *Haran Bandhana*. In this traditional system, the water is obstructed within a stream by constructing a *Haran*. The water that gets collected is then diverted for irrigation through *dhoras*. Haran is a structure made of soil and stones mixed with Palash (Buteamonosperma) leaves to check the shallow water flow. This traditional structure is made of loose materials so there is always a lot of water seepage and the structure is also prone to breaking down due to the impact of high-water flows.

This problem had a very simple and cost-effective strategy. FES suggested and promoted the construction of *boribunds* to check the water seepage. *Boribunds* are structures that are made of *boris* (plastic bags filled with sand and soil) piled on top of one another. The benefits of constructing a *boribund* are immediate and have been strongly felt by all water users. By 2017, the third year of this intervention in Karech, most of the users attributed an extra cycle of irrigation to the construction of *boribunds*. Moreover, a lot of time and effort that was previously devoted to repairing the *Haran* and keeping it standing could now be saved. The pocket of water that gets collected within the stream also acts as a steady source of water for livestock, thereby effectively expanding the reach of benefits.

Conclusion

Irrigation through *dhoras* is integral to the indigenous agricultural systems in the hilly tracts of South Rajasthan. This age-old and time-tested form of irrigation needs to be given its due share of acknowledgement for not just being resilient, but also cost-effective. The continued use and management of *dhoras* are a testimony to decentralized governance of water commons in far-flung villages and build a strong case for the adoption in the larger policy framework. Research on the contemporary use of *dhoras* and practices of community-engaged management in the village of Karech provide supporting data to suggest that communities dependent on shared water resources can evolve codes of behavior that are agreeable to all users, frame rules to check individualistic behavior, and promote mutual cooperation for using the scarce resource equitably. Such roles played by local communities are often undermined in the dominant discourses of water governance, which are tilted toward greater centralization and operate within the binaries of state and individual property regimes.

Certainly, it cannot be claimed that the system of governance is infallible and does not require improvements. In fact, perhaps, the biggest strength of such a decentralized system at local levels is that it is dynamic and adaptive, responding quickly to emerging situations and enabling a mutually agreeable outcome for all users. Instances like those in Karech can be found throughout the semi-arid regions of South Asia where local institutions have played an enabling role in fostering cooperation over conflict. Such forms of water tradition and cultures need to be used as evidence and pushed up the policy ladder to strengthen these systems and allow for experiential learning at the local levels. It is imperative that we support such arrangements as we move into uncertain times with the onset of climate change. The accumulated wisdom of the community needs to be harnessed and adopted for establishing good water stewardship for a better tomorrow.

Acknowledgements

The data was collected by the author during his stint with FES between 2016 and 2018. The author would like to acknowledge FES's support in carrying out the studies and thank Subrata Singh and Pratiti Priyadarshini for their guidance and Sohanlal Garasiya, Liya Thomas, and Richard Phillips for their assistance.

References

FES (Foundation for Ecological Security). 2015. "Community as Local Stewards. A Learning Document." https://fes.org.in/studies/community-local-stewards-learning-document.pdf.

———. 2017. "Water Commons—Influencing Practice and Policy." Social Return on Investment Report 2016–17. https://fes.org.in/impact/internal/water-commons-influencing-practice-and-Policy-social-return-on-investment-report-2016-17.pdf.

Rathore, Vaishnavi. 2019. "Preventing Desertification, One Common Land at a Time." *The Bastian: Development in Depth*. October 28, 2019. https://thebastion.co.in/politics-and/environment/preventing-desertification-one-common-land-at-a-time/.

Recommended Citation

Modak, Sayanangshu. 2021. "Community-managed Traditional Means of Irrigation in the Semi-arid Aravali Landscape." *Open Rivers: Rethinking Water, Place & Community*, no. 18. https://editions.lib.umn.edu/openrivers/article/traditional-means-of-irrigation.

DOI: https://doi.org/10.24926/2471190X.8024

About the Author

Sayanangshu Modak is a junior fellow at the Kolkata Centre of Observer Research Foundation (ORF). His research experience spans the semi-arid western part of India as well as the flood-prone fluvial landscapes of eastern India, thereby straddling the hydrological extremes and the issues thereof. His current research focus is at the interface of science and policy for the effective governance of river basins. Sayanangshu has previously worked as a project manager in the Foundation for Ecological Security (FES) and holds a B.Sc. (Hons.) in geography from Presidency University, Kolkata and an M.Sc. in Water Policy and Governance from the Tata Institute of Social Sciences, Mumbai.

IN REVIEW

WHY CANOES? AN EXHIBIT AT THE UNIVERSITY OF MINNESOTA'S NORTHROP GALLERY

By David Morrison

Minnesotans love boats, and canoes are a particular favorite. The state has the highest per capita rate of recreational boat ownership in the nation, according to the Department of Natural Resources.[1] Consequently, the current exhibit, *Why Canoes? Capacious Vessels and Indigenous Futures of Minnesota's Peoples and Places*, at the Northrop Gallery should find an

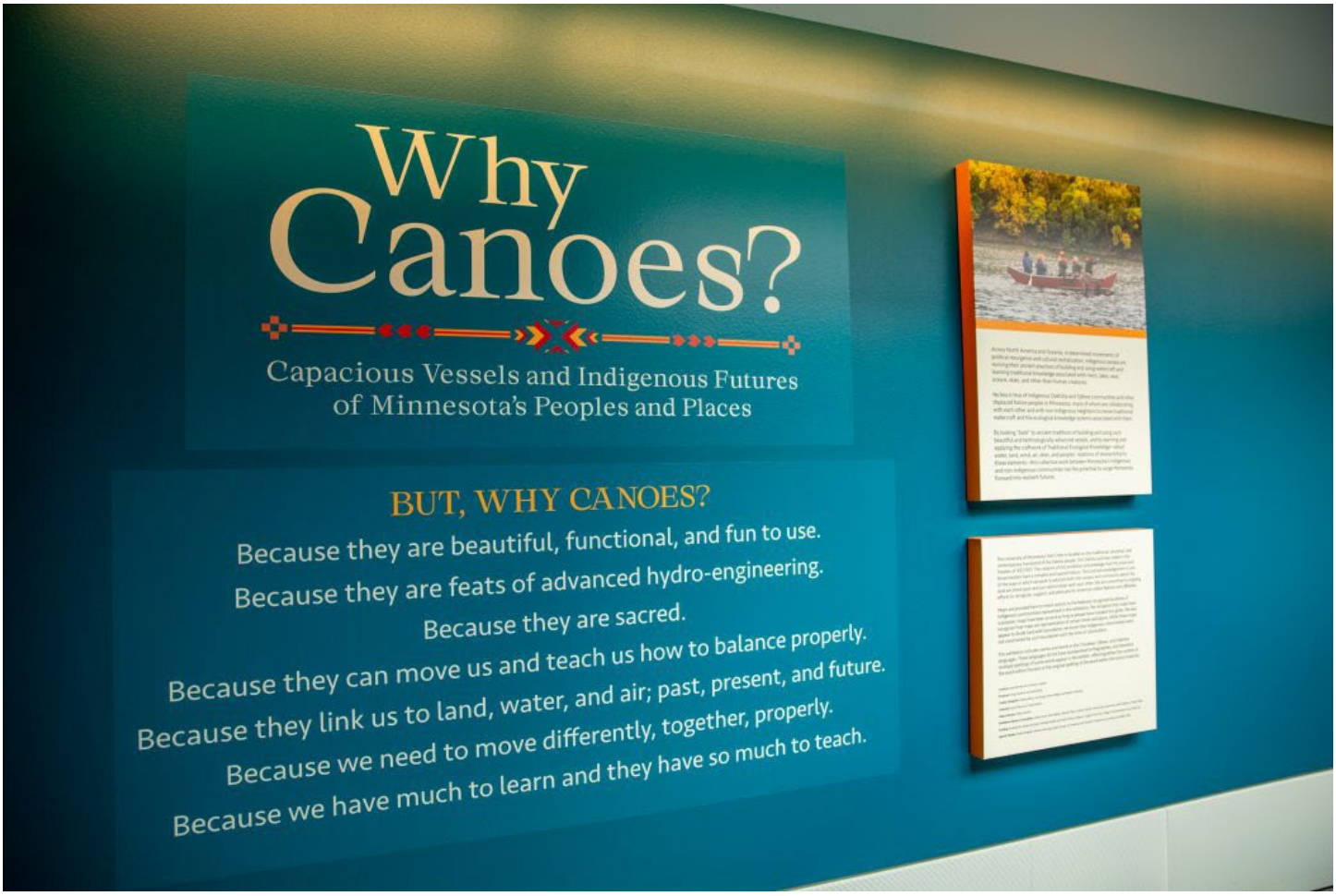
From the exhibit, a birchbark canoe, paddle, and creation stories from the Asabiikone-zaa'igan (The Bois Forte Band of Chippewa). Image by Laura Mazuch, UMN Printing Services.

interested audience. The exhibit reflects the desire of three Indigenous peoples—Dakota, Anishinaabe, and Micronesian—to revitalize their canoe-building traditions, and to pass them on to the next generation.

Why Canoes? is a small and beautiful exhibit. Full-sized canoes are unfortunately not on display, but detailed models of the boats of the three groups are featured, as are full-sized, newly carved paddles in the traditional Dakota, Anishinaabe, and Micronesian (Polowat) styles. Paintings by Indigenous artist Angela Richards grace the entrance to the gallery, and many maps and photos throughout offer historical and cultural context as well as documentation of present-day canoe building efforts.

Minnesota is, as we know, a well-watered landscape where geology and climate have produced an abundance of permanent lakes and streams. It was formerly what Professor Vicente Diaz, of the exhibit's advisory committee, likes to call the kind of terrain "where to travel at all was to travel by water."[2]

Why Canoes? illustrates how the birchbark canoe—*wiigwaasi jiimaan*—of the Anishinaabe was developed in response to that environment. It is a sophisticated piece of engineering created from available materials: spruce roots, pine pitch, cedar, and birchbark. For centuries before Teddy Roosevelt wrote, "Do what you can, with what you've got, where you are," Indigenous people in Minnesota were doing just that, and doing it beautifully.[3] The birchbark canoe, light in

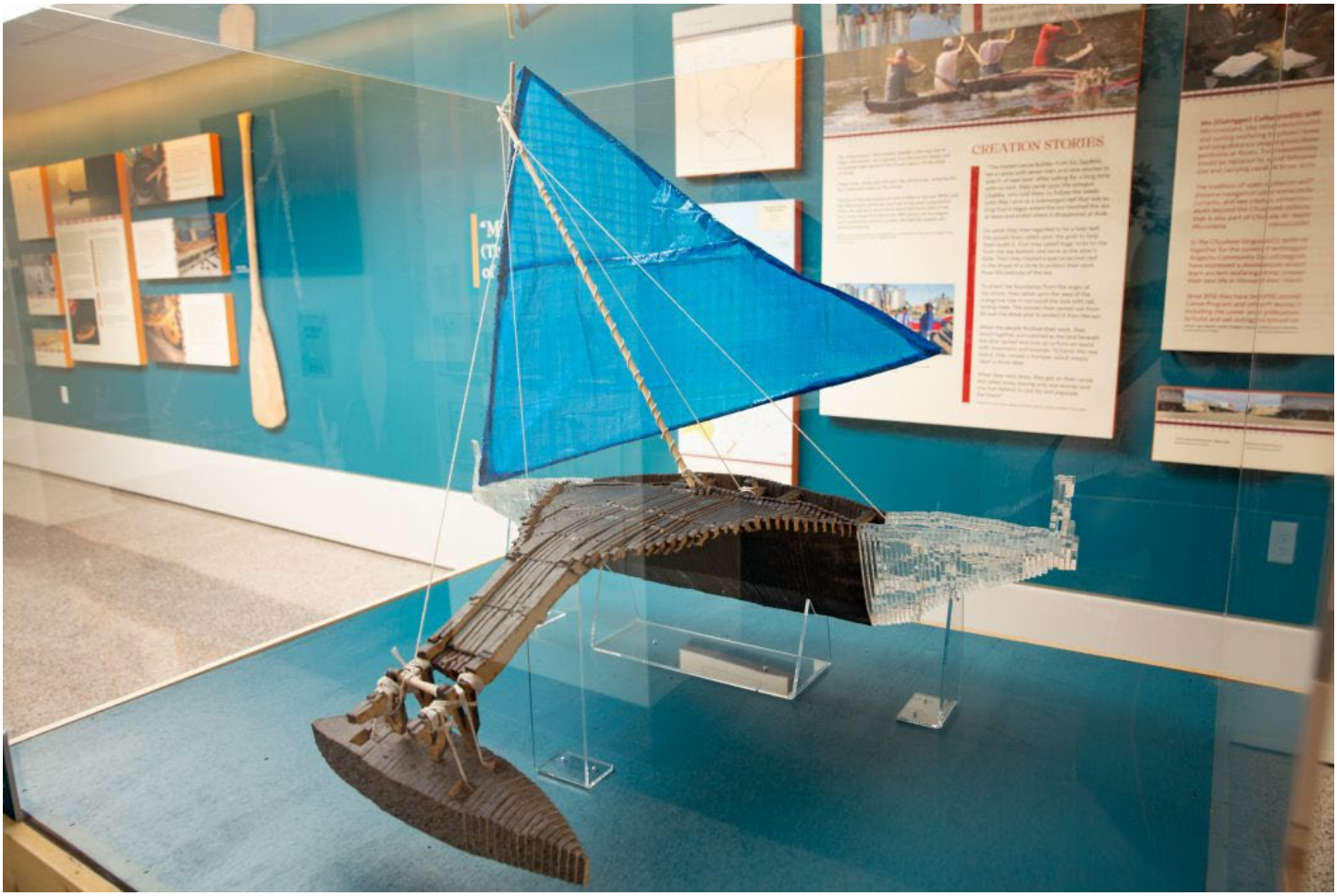


Why Canoes? Capacious Vessels and Indigenous Futures of Minnesota's Peoples and Places. Image by Laura Mazuch, UMN Printing Services.

weight, capacious, and easy to propel, was a great quality-of-life enhancement, useful for wild rice harvest, fishing, hunting, and movement between seasonal camps. The exhibit makes the case for the canoe's central importance to the Indigenous people's ways of doing and being—their cultural identity, and relationship to the environment in which they live.

Watch the video "Why Canoes?" A New Exhibit at the University of Minnesota.

Although not a large exhibit, ***Why Canoes?*** has quite a lot of content, and may offer the visitor new information and insights on familiar topics, as it did for me. I was previously unaware of the Dakota tradition of making dugout canoes. I had been in dugouts made by the Indigenous Guna Yala people on the coast of Panama, but I had not imagined that technology also existing here in my own back yard. The exhibit tells of the dugout's antecedents here in the land that the Dakota call Mni Sota Makoce, including a nearly thousand-year-old dugout canoe pulled from Lake Minnetonka. We learn that this canoe and other dugouts found submerged in local lakes prompted Mat Pendleton of the Bdewakantunwan Community at Lower Sioux, where he is Recreation Director, to revive the Dakota tradition of the ***chanwata***, "wooden boat." Pendleton sees the revival of this tradition as offering the youth of the Dakota Indigenous community the tools and support system, in his words, "to walk with a good heart and a good mind" as they learn about who they are as Dakota.



A model of the Micronesian wa, an outrigger canoe. Image by Laura Mazuch, UMN Printing Services.

For some visitors the exhibit may serve as an introduction to the Micronesian community of Milan, Minnesota, where over half the population stems from Chuuk State in the Federated States of Micronesia. It should be no real surprise that the renowned outrigger canoe heritage of Oceania remains culturally important to them. The "Milanesians," as they call themselves, have been working since 2016 in the Native Canoe Program to revitalize the tradition here by building and sailing outrigger canoes. Collaborating with other Indigenous groups including the Upper and Lower Sioux Communities, the Milanesians have helped to build not only their own Micronesian outriggers, but also Dakota dugout canoes. The exhibit includes construction photos of both kinds of boats as well as photos of the finished boats being paddled on local waters.

Several other programs and initiatives related to Indigenous peoples' canoes, culture, and ecological knowledge are showcased in the exhibit in text and images. Among them are Navigating Indigenous Futures, Dakota Wata UMN Regional Sustainable Development Program, and the student organization Canoe Rising.

Why Canoes? is a fascinating exhibit exploring the background and meaning of what for Minnesota has become an icon—the image of the canoe important enough to the state's identity to appear on our license plates since 1978. *Why Canoes?* beautifully offers insights—through the lens of Indigenous peoples' experience—into the centuries-old story and present-day significance of small boats here in the Land of 10,000 Lakes. A video preview of the exhibit can be seen online

A model of a Dakota chanwata, a wooden dugout canoe. Image by Laura Mazuch, UMN Printing Services.

at http://northrop.umn.edu/events/why-canoes, and a more in-depth discussion at the University of Minnesota's Institute for Advanced Study at https://ias.umn.edu/events/why-canoes.

The Why Canoes? Capacious Vessels and Indigenous Future of Minnesota's Peoples and Places *exhibit is currently open at the Northrop Gallery at the University of Minnesota through Fall 2021. An online,* virtual tour *is also available.*

References

[1] "Boating, canoeing and kayaking," Minnesota Department of Natural Resources, updated September 26, 2016, dnr.state.mn.us/faq/mnfacts/boat_canoe.html.

[2] Kenneth G. Robert and Philip Shackleton, *The Canoe: A History of the Craft from Panama to the Artic* (Camden, ME: International Marine, 1983), quoted in Diaz, Vicente, "Oceania in the Plains: The Politics and Analytics of Trans-Indigenous Resurgence in Chuukese Voyaging of Dakota Lands, Waters, and Skies in Miní Sóta Makhóčhe," *Pacific Studies* 42, no. 1/2 (April/Aug. 2019): 5.

[3] Theodore Roosevelt, *An Autobiography* (New York: Scribner & Sons, 1920) 337.

Recommended Citation

Morrison, David. 2021. "Why Canoes? An Exhibit at the University of Minnesota's Northrop Gallery." *Open Rivers: Rethinking Water, Place & Community*, no. 18. https://editions.lib.umn.edu/openrivers/article/why-canoes.

DOI: https://doi.org/10.24926/2471190X.7988

About the Author

David Morrison is a graphic designer and visual artist. For years, he has kept his old aluminum canoe on the banks of the river that the Dakota call Hogan Wanke Kin. Countless hours paddling among its islands have made that landscape the main focus of his artwork for several decades. With an abiding interest in native plant communities, he has converted his small, urban yard into pollinator-friendly gardens—to the apparent satisfaction of local buterflies and bees. A University of Minnesota alumnus, he enjoys increasing his understanding of the geology, ecology, history, and culture of the spot on earth where he resides in Mni Sota Makoce.

PRIMARY SOURCES

GHOST FORESTS

By Emily Ury

Sea level rise is killing trees along the Atlantic coast, creating 'ghost forests' that are visible from space

Trekking out to my research sites near North Carolina's Alligator River National Wildlife Refuge, I slog through knee-deep water on a section of trail that is completely submerged. Permanent flooding has become commonplace on this low-lying peninsula, nestled behind North Carolina's Outer Banks. The trees growing in the water are small and stunted. Many are dead.

Throughout coastal North Carolina, evidence of forest die-off is everywhere. Nearly every roadside ditch I pass while driving around the region is lined with dead or dying trees.

As an ecologist studying wetland response to sea level rise, I know this flooding is evidence that climate change is altering landscapes along the Atlantic coast. It's emblematic of environmental changes that also threaten wildlife, ecosystems, and local farms and forestry businesses.

Like all living organisms, trees die. But what is happening here is not normal. Large patches of trees are dying simultaneously, and saplings aren't growing to take their place. And it's not just a local issue: Seawater is raising salt levels in coastal woodlands along the entire Atlantic Coastal Plain, from Maine to Florida. Huge swaths of contiguous forest are dying. They're now known in the scientific community as "ghost forests."

Ghost forest panorama in coastal North Carolina. Image by Emily Ury, CC BY-ND.

The insidious role of salt

Sea level rise driven by climate change is making wetlands wetter in many parts of the world. It's also making them saltier.

In 2016 I began working in a forested North Carolina wetland to study the effect of salt on its plants and soils. Every couple of months, I suit up in heavy rubber waders and a mesh shirt for protection from biting insects, and haul over 100 pounds of salt and other equipment out along the flooded trail to my research site. We are salting an area about the size of a tennis court, seeking to mimic the effects of sea level rise.

After two years of effort, the salt didn't seem to be affecting the plants or soil processes that we were monitoring. I realized that instead of waiting around for our experimental salt to slowly kill these trees, the question I needed to answer was how many trees had already died, and how

Deer photographed by a remote camera in a climate change-altered forest in North Carolina. Image by Emily Ury, CC BY-ND.

much more wetland area was vulnerable. To find answers, I had to go to sites where the trees were already dead.

Rising seas are inundating North Carolina's coast, and saltwater is seeping into wetland soils. Salts move through groundwater during phases when freshwater is depleted, such as during droughts. Saltwater also moves through canals and ditches, penetrating inland with help from wind and high tides. Dead trees with pale trunks, devoid of leaves and limbs, are a telltale sign of high salt levels in the soil. A 2019 report called them "wooden tombstones."

Researcher Emily Ury measuring soil salinity in a ghost forest. Image by Emily Bernhardt, CC BY-ND.

As the trees die, more salt-tolerant shrubs and grasses move in to take their place. In a newly published study that I coauthored with Emily Bernhardt and Justin Wright at Duke University and Xi Yang at the University of Virginia, we show that in North Carolina this shift has been dramatic.

The state's coastal region has suffered a rapid and widespread loss of forest, with cascading impacts on wildlife, including the endangered red wolf and red-cockaded woodpecker. Wetland forests sequester and store large quantities of carbon, so forest die-offs also contribute to further climate change.

Assessing ghost forests from space

To understand where and how quickly these forests are changing, I needed a bird's-eye perspective. This perspective comes from satellites like NASA's Earth Observing System, which are important sources of scientific and environmental data.

Since 1972, Landsat satellites, jointly operated by NASA and the U.S. Geological Survey, have captured continuous images of Earth's land surface that reveal both natural and human-induced change. We used Landsat images to quantify changes in coastal vegetation since 1984 and referenced high-resolution Google Earth images

A 2016 Landsat8 image of the Albemarle Pamlico Peninsula in coastal North Carolina. USGS.

to spot ghost forests. Computer analysis helped identify similar patches of dead trees across the entire landscape.

The results were shocking. We found that more than 10% of forested wetland within the Alligator River National Wildlife Refuge was lost over the past 35 years. This is federally protected land, with no other human activity that could be killing off the forest.

Rapid sea level rise seems to be outpacing the ability of these forests to adapt to wetter, saltier conditions. Extreme weather events, fueled by climate change, are causing further damage from heavy storms, more frequent hurricanes and drought.

We found that the largest annual loss of forest cover within our study area occurred in 2012, following a period of extreme drought, forest fires and storm surges from Hurricane Irene in August 2011. This triple whammy seemed to have been a tipping point that caused mass tree die-offs across the region.

Google Earth image of a healthy forest on the right and a ghost forest with many dead trees on the left. Emily Ury and Google Earth.

Should scientists fight the transition or assist it?

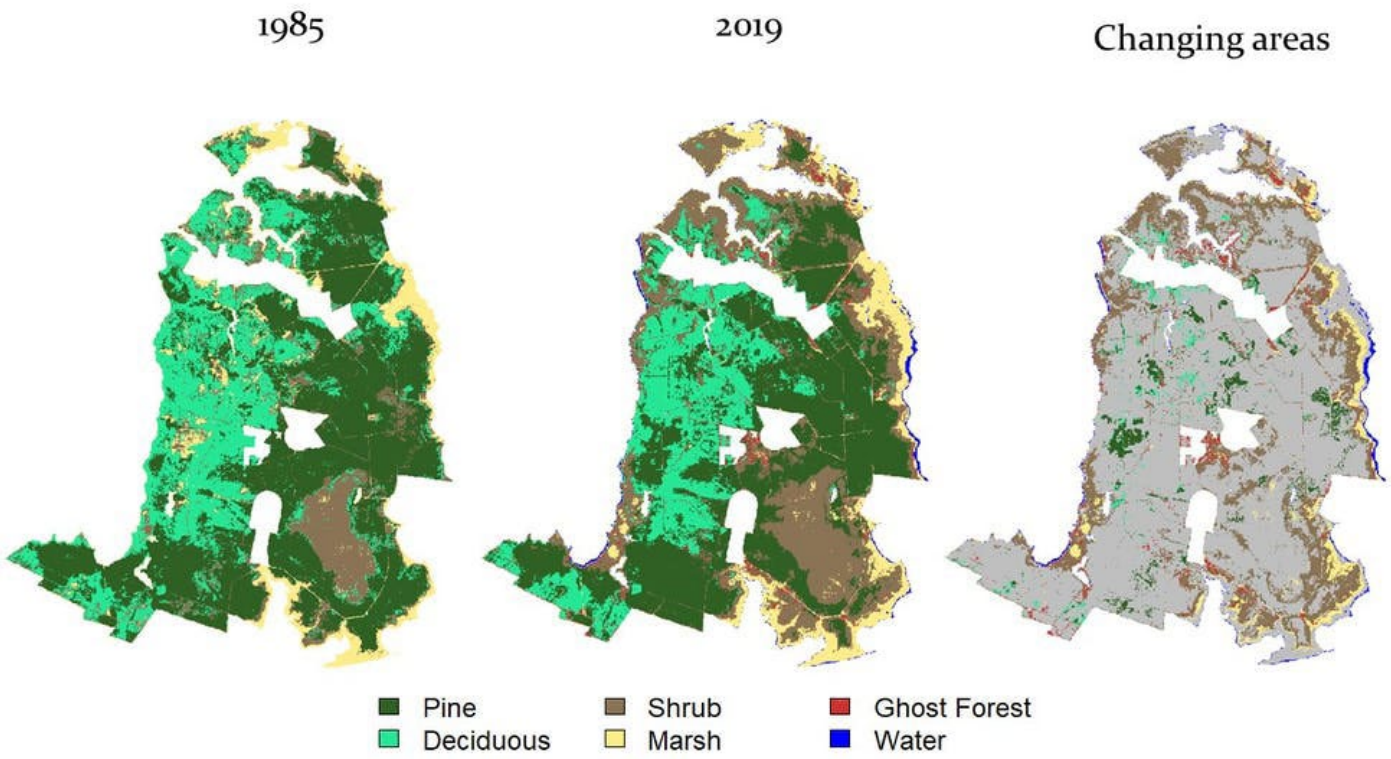
As global sea levels continue to rise, coastal woodlands from the Gulf of Mexico to the Chesapeake Bay and elsewhere around the world could also suffer major losses from saltwater intrusion. Many people in the conservation community are rethinking land management approaches and exploring more adaptive strategies, such as facilitating forests' inevitable transition into salt marshes or other coastal landscapes.

For example, in North Carolina the Nature Conservancy is carrying out some adaptive management approaches, such as creating "living shorelines" made from plants, sand and rock to provide natural buffering from storm surges.

A more radical approach would be to introduce marsh plants that are salt-tolerant in threatened zones. This strategy is controversial because it goes against the desire to try to preserve ecosystems exactly as they are.

But if forests are dying anyway, having a salt marsh is a far better outcome than allowing a wetland to be reduced to open water. While open water isn't inherently bad, it does not provide the many ecological benefits that a salt marsh affords. Proactive management may prolong the lifespan of coastal wetlands, enabling them to continue storing carbon, providing habitat, enhancing water quality and protecting productive farm and forest land in coastal regions.

This article is republished from The Conversation *under a Creative Commons license. Read the* original article.



Habitat maps we created for the Alligator River National Wildlife Refuge showing the change over time and the prevalence of ghost forests. Ury et al, 2021., CC BY-ND.

Recommended Citation

Ury, Emily. 2021. “Ghost Forests.” *Open Rivers: Rethinking Water, Place & Community,* no. 18. https://editions.lib.umn.edu/openrivers/article/ghost-forests.

DOI: https://doi.org/10.24926/2471190X.7880

About the Author

Emily Ury is a recent PhD graduate of the Duke University Program in Ecology. She received funding from the National Aeronautics and Space Administration (NASA) and the North Carolina Sea Grant. Additional support for this project came from the National Science Foundation.