Lunch

Domestication

Re-wilding the Riverfront

Phoebe Crisman

fig. 1 (facing)
Exterior perspective by Scott Levine

As climate change and sea level rise threaten coastal communities and their domesticated waterfronts, designers are compelled to rethink these territories of control. Resilient design strategies that embrace temporality and liminal land/water thresholds are a crucial response to the global challenge that "eleven of the world's fifteen largest cities lie along the coast or on estuaries. In the United States, around 53% of the population lives near the coast."[1] This essay examines an ongoing design research study in Norfolk—one of the most threatened coastal cities in the US. Sea levels in Norfolk and Southeastern Virginia are rising faster than anywhere else on the East Coast. With land in the region sinking at a rate of 0.12 inches per year, subsidence exacerbates the threat of rising seas.[2] The Virginia Institute of Marine Science and the Center for Coastal Resource Management predict that sea level in Norfolk could rise as much as 7.5 feet by 2100. Widespread practices of control have filled and piped tidal tributaries and wetlands; concrete bulkheads have hardened shorelines, and extensive dredging has transformed river flow. Yet amidst this domesticated urban landscape, high tides overwhelm stormwater infrastructure and future threats are dire. As part of this larger coastal resilience research, my fall 2015 undergraduate studio at the University of Virginia collaborated with the City of Norfolk and the Elizabeth River Project to develop adaptive design proposals for the flood-threatened Harbor Park district (fig. 2). Most of the site was a wetland and tidal tributary of the Elizabeth River's Eastern Branch before extensive landfill operations in the nineteenth century that created a bustling working waterfront. Today this vacant, 36-acre

1
Vivien Gornitz, "Coastal Populations, Topography, and Sea Level Rise," NASA (March 2000).

2
Jack Eggleston and Jason Pope, Land Subsidence and Relative Sea-Level Rise in the Southern Chesapeake Bay Region, Circular 1392 (USGS, 2013). The Chesapeake Bay: Geologic Product of Rising Sea Level (USGS Fact Sheet 102-98) http://pubs.usgs.gov/fs/fs102-98/ accessed 9/12/15. Nathalie Baptiste, "Atlantic Surging, Virginia Sinking," The American Prospect (Winter 2015).

fig. 2
Norfolk's Harbor Park district (City of Norfolk, 2014).

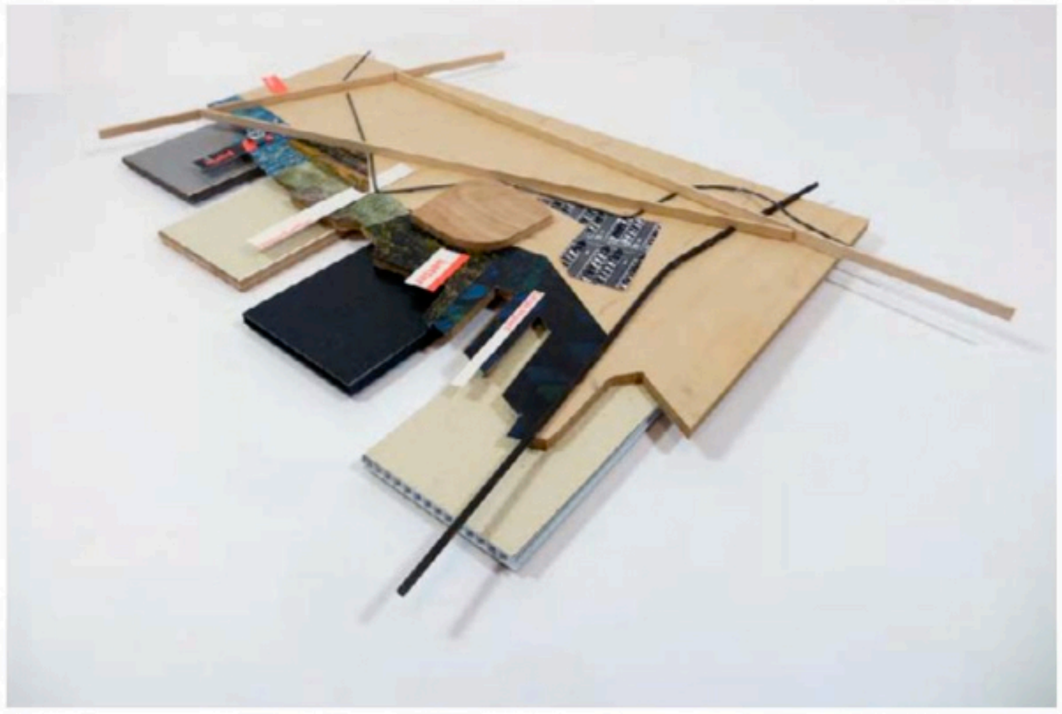


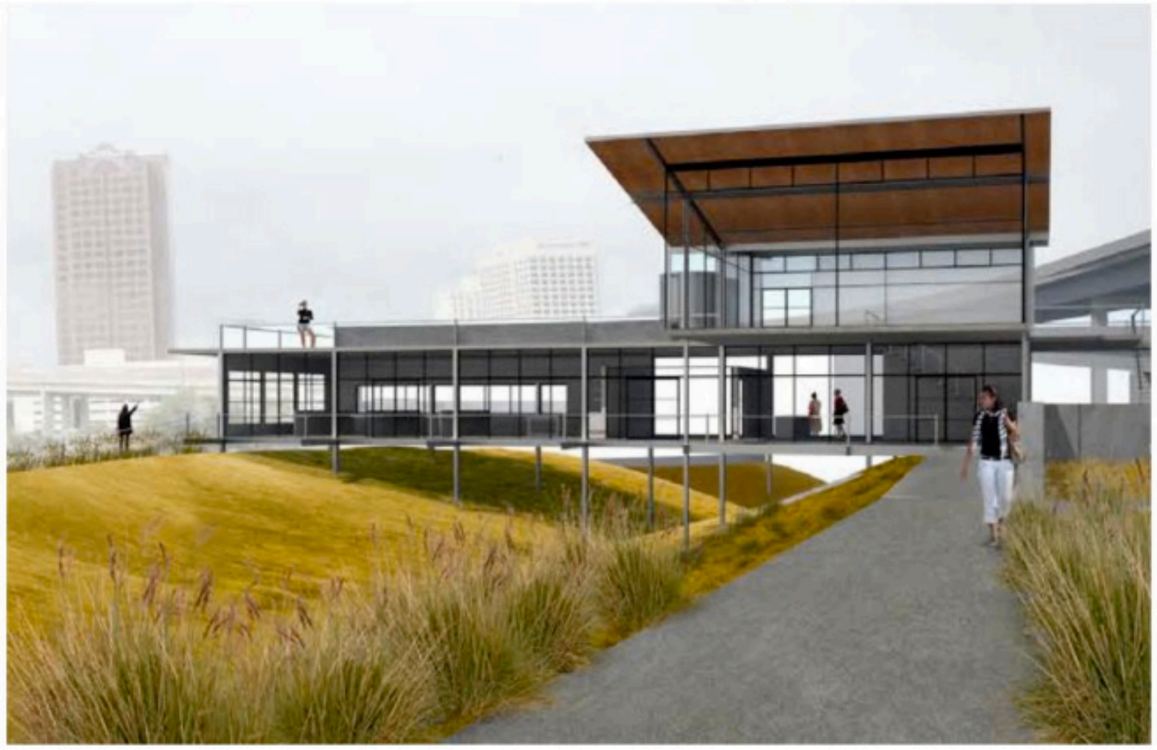
fig. 3
Aidan Garrity, study model

coastal brownfield is cut off from downtown Norfolk by a tangle of elevated highways. How can this crumbling post-industrial edge be reconceived as a publically accessible living shoreline? Beginning with ecosystem, culture, and precedent research, several strategies have emerged: wetland inundation parks, floating islands, integrated flood-wall riparian parks, canals, bio-retention, and underground cisterns. Demonstrating how to build on a wet site, we developed proposals for an off-the-grid environmental education center adaptive to fluctuating water levels by elevating habitable spaces on piers, designing lower levels to be inundated by occasional flooding, and integrating structures with elevated earth forms. By investigating the hybrid coexistence of human inhabitation and (re)wilded environmental restoration, the design research imagines resilient possibilities for this toxic stretch of liminal land while embracing Norfolk's rising waters.

Designing interconnected systems across territories and time is essential to our approach and requires critical consideration of social, economic, ecological, and aesthetic issues. Scalar interdependence has been theorized in publications about resilient or fracture-critical systems. In *Designing to Avoid Disaster*, Thomas Fisher argues, "Resilient systems…cannot exist in a vacuum. Unless redundancy and resistance to sudden failure occur at multiple scales, the system remains as vulnerable as its weakest link. The lack of resilience at one scale can cancel out an abundance of it at another; particularly if the fracture-critical systems exists at a larger scale or in support of the more resilient one."[3] In order to understand Harbor Park within a larger set of systems, for instance, the studio studied the Chesapeake Bay watershed, the Hampton Roads metropolitan area and Norfolk's place within it, the Elizabeth River and its Eastern Branch, the Harbor Park redevelopment area, and the Environmental Center architecture. We discovered that the Harbor Park "neighborhood" or "district" exists in name only. Harbor Park is currently a "site out of mind" whose disconnection results from interrelated physical, social, and economic transformations. Until the late nineteenth century, most of the 36-acre area was a large tidal water body known as Newton's Creek Basin. Norfolk grew on higher ground around this basin. With the introduction of new transportation modes, the "unnecessary" tidal wetland basin was filled to accommodate massive railroad marshaling yards that again blocked pedestrian, vehicular, and water movement across the area. Newton's Creek was channelized and connected to the Elizabeth River as Mahones Canal. The newly created land became a busy entrepôt and working waterfront between downtown Norfolk and eastward residential expansion. Between 1965 and 1980 Mahones Canal had been mostly culverted and rendered invisible. As part of Norfolk's twentieth century urban renewal efforts and changing transportation requirements, railroad lines and wharf buildings were demolished and the massive Harbor Park Stadium now floats within acres of surface parking. Severed from downtown Norfolk and the economically challenged, racially diverse public housing neighborhoods of Tidewater Gardens and Grandy Village, Harbor Park lacks both advocates and residents. Understanding and engaging local communities is an important aspect of literally and conceptually reconnecting interdependent systems and scales. As Paul Kibel notes in Rivertown: Rethinking Urban Rivers, "The current debates over the use of urban riverside lands therefore raise questions that are of particular concern in the post-urban-renewal era. If parkland and open space are going to be created, who will be the primary users and beneficiaries of these new resources? Will new riverfront proposals come from within the community where these lands are located or from developers outside the community? What role will governmental agencies and policies play in the process?"[4] This site is a study in shifting

3
Thomas Fisher, *Designing to Avoid Disaster: The Nature of Fracture-Critical Design* (New York: Routledge, 2013): 100.

4
Paul Kibel, Rivertown: Rethinking Urban Rivers (Cambridge: MIT Press, 2007): 3-4.



priorities—from Norfolk's focus on eradicating "urban blight" in the 1950's and 60's, to increasing the tax base in the 1980's and 90's, to current concerns about climate change, sea-level rise mitigation, and urban resilience. Like many older East Coast cities, Norfolk's riverfront is lined with vacant brownfield sites in need of regeneration. The combined challenge and opportunity of remediation, flood mitigation, and long-term sustainability require a radical rethinking of how to intervene.

Our research is in partnership with a non-profit, community based environmental group, the Elizabeth River Project (ERP), who has worked to restore the Elizabeth River for over twenty years. ERP convened local stakeholders to generate environmental restoration goals for the Eastern Branch and produced an excellent policy document, but specific physical proposals were not developed.[5] Currently three factors limit coastal resiliency on the Elizabeth: loss of 50% of tidal wetlands since 1945; intense urban development along a majority of shore that limits the ability of marshes to migrate as sea level rises; and a lack of regulatory and public acceptance of natural approaches to shoreline development. Flooding is already happening and the question is not if or when, but how much. Given these challenges, Norfolk was selected as a pilot municipality for the Rockefeller Foundation's 100 Resilient Cities initiative. Harbor Park is an important intervention area within the Norfolk Coastal Adaptation and Community Transformation Plan. Professional consultants to the City have proposed high-rise commercial and residential buildings protected by conventional floodwalls on this vulnerable site. As a critical alternative to that normative approach, the UVA research team reconceived the half-mile long, crumbling industrial edge as a living shoreline that demonstrates resilient strategies.

fig. 4
Jenny Adair, exterior perspective

5
The Elizabeth River Project convened a team of almost 90 stakeholders from government, science, business, and citizen groups to create the Eastern Branch Environmental Restoration Strategy (2014). The University of Virginia's Institute for Environmental Negotiation facilitated the process.

The Harbor Park Studio

I incorporated my Fall 2015 undergraduate architecture studio into the larger UVA research effort. Studio proposals ranged from reclamation of all 36 acres as an "inundation park" without new building development, to the creation of a narrow riparian buffer park with flood walls and levees that protect new midrise blocks. The proposed protective measures are designed to actively engage the people of Norfolk in restorative and recreational public places that reconnect this wasteland with downtown Norfolk and nearby neighborhoods. Along with urban strategies, the studio imagined new ways to live and educate in this watery landscape. The City has offered the Elizabeth River Project a prominent Harbor Park parcel for their Environmental Center that would attract visitors to the waterfront and make their efforts more visible to the public. The studio designed alternatives for a small, off-the-grid building that promotes health and wellness, connects outside and inside in provocative ways, employs sustainable materials and innovative details, and educates about resilient and zero-carbon architecture. Along with natural ventilation, daylighting, and water views, ERP sought architecture in harmony with the natural systems of the site. They also wanted the occupation of the building to be designed as a resilient system over time. These desires were situated within their larger concern for safety from floods and storms. The studio experimented with several building typologies that work with fluctuating water levels, while providing interactive exhibitions, workshops, and offices, along with outdoor classrooms, boat docks, constructed wetlands, and water filtration gardens. Architecturally, the most conventional and expensive approach is to build 'business as usual' buildings behind sea walls or earthen levees. The UVA studio proposed resilient strategies

that elevated habitable areas on piers above anticipated flood levels, designed lower levels to be inundated by occasional flooding, and used floating buildings that could adapt to rising waters.

Students proposed a self-sufficient Environmental Center, outdoor education spaces, and a living shoreline that together demonstrate resilient urban and architectural strategies. Going beyond a mitigation mindset, the studio sought to create an urban environment that truly embraces Norfolk's rising waters. They developed adaptive designs that explored several types of flood prevention for this stretch of Norfolk waterfront. Natural prevention approaches included living shorelines, riparian buffers, wetlands, intertidal islands, and other forms of new or restored ecologies. Synthetic prevention proposals included vertical or sloped floodwalls, berms, and jetties. In most cases, natural and synthetic strategies were combined in creative ways. For example, Zeph Ruggles designed a 200' wide living shoreline by regrading excavated fill into a gently sloping vegetated wetland (Figure 6). This intertidal zone creates healthy habitat, filters river sediments, and prevents erosion. A public pier projects through the wetland to the shipping channel, thereby allowing boat and pedestrian access to coexist with shoreline restoration. As series of demonstration basins step up to the education center and include an oyster bed, sedimentation pool, aquatic vegetation habitat, and dry grasses that filter stormwater onsite. Nicole Zaccack's proposal excavates a canal and uses the fill to construct a linear intertidal island. Located between the new island and shore, a half-mile long series of basins treat polluted river water and increase biodiversity and habitat. This restorative design strategy creates a protected place for kayaking and interacting with the River. An upland botanical garden and wet meadow surround the elevated environmental center, which serves as a public viewing tower directly connected to the Berkley Bridge pedestrian walkway. As one of the most at-risk areas in Norfolk, Harbor Park has the potential to ameliorate risk to nearby areas by foregoing new building development. In similar locations, for instance, adaptive migration or coastal unbuilding is underway. Residents are relocated and their property is purchased for public mitigation use. Costly building removal is not necessary here. Only the Harbor Park Stadium has been built since the area was cleared by urban renewal. Many students decided to protect the stadium for continued use, while creating a resilient wetland park that reduces the effects of future flooding and storm surge for the surrounding neighborhoods and downtown Norfolk.

Some proposals designed a flood prevention system of continuous walls or berms. Emmitt Moore's scheme cuts back the hardened shoreline and builds a twelve-foot berm to resist floodwaters. Integral to the berm, the environmental center becomes a threshold and public access point to the water. The building's river-facing wall is clad in aquarium glass to register and make tidal changes visible to visitors. This lower level and its gardens are vertically connected, via an outdoor amphitheater, to a rooftop terrace along a continuous elevated promenade. The building is both part of the flood prevention infrastructure and the popular Elizabeth River Trail. While also using a continuous berm, Caroline Kraska shapes the shoreline to create a sheltered wetland zone (Figure 5). Tightly situated between the berm and river's edge,

fig. 5 (facing)
Caroline Kraska, site plan and exterior perspective

fig. 6
Zeph Ruggles, axonometric view

the environmental center mediates vertically between land and water. Designed to be periodically inundated, the entire lower level contains outdoor learning labs, kayak storage, and interactive wetland basins.

Another crucial consideration is the collection and storage of flood and stormwater onsite. Combinations of urban bioretention, absorption and water treatment, canals, dry ponds, and underground cisterns were proposed. Scott Levine designed a network of canals to manage water, structure future urban development, and promote pedestrian and small craft movement throughout the Harbor Park area. The proposed environmental center fragments into three separate buildings on earthen berms that define and engage the intersection of two canals. The canals create a strong identity for the revitalized district. Jenny Adair cut a continuous dry swale to capture and filter stormwater for groundwater recharge (Figure 4). Excavated soil is used to form a linear protective berm parallel to the swale. During extreme weather events, this redundant system will offer additional flood protection. The environmental center is elevated on piers and spans the swale to connect with the restored riparian buffer and wetland beyond. An upper floor links the existing, elevated Berkley Bridge pedestrian walkway with a public rooftop terrace and access to the living shoreline park below. Both proposals effectively exploit normative water management systems to structure urban movement and instigate sectional complexity in the associated buildings. By studying relationships between environmental restoration and human dwelling at multiple scales, the research team has imagined new resilient possibilities for this toxic stretch of liminal urban land. During the next phase of this investigation, a funded team of University of Virginia faculty will work closely with the City of Norfolk and the Elizabeth River Project to analyze several approaches for implementation feasibility.

fig. 7
Aidan Garrity, exterior perspective

The faculty research project and associated studio proposals are assisting the City of Norfolk in their ambitious efforts to plan for sea level rise and climate change. Working within watery landscapes and environmental restoration processes, architects and landscape architects can reveal that which is often hidden: hydrological flow, tidal estuary ecology, invisible toxins, and the geology and settlement history of the Elizabeth River shoreline. In varied ways, these designs seek to reveal relationships between ecology and constructed systems from the infrastructural to the architectural scale. They tell stories about the inextricable link between water and land, the properties and environmental impact of building materials, and the balance between human activity and a living shoreline. While focused on the Harbor Park district of Norfolk, this research proposes translatable strategies for coastal resilience in vulnerable urban settlements threatened by sea level rise, environmental degradation, and the loss of cultural heritage. The intense global interest in the urban implications of climate change and sea level rise, as well as the poetic possibilities at the threshold of land and water, underscore the timely significance of architects making space for water.