Designing for Urban Coastal Resilience

Phoebe Crisman

University of Virginia

Follow this and additional works at: https://digitalcommons.odu.edu/hraforum_17
Designing for Urban Coastal Resilience

Prof. Phoebe Crisman AIA
Director, Global Environments + Sustainability
University of Virginia / Crisman+Petrus Studio
Money Point Sustainable Revitalization Plan

Crisman+Petrus Architects
Ten-year plan includes actions for revitalizing the 330-acre peninsula known as Money Point in Chesapeake, Virginia.

Composite Map of Proposed Restoration Projects

- Sediment cleanup site
- Onshore cleanup site

Stormwater Management
- Bioswale/habitat corridor
- Retention Ponds (BMPs)
- Pervious Paving

Wildlife Habitat
- Riparian Buffers
- Tidal Wetlands Restoration
- No-mow-urban forest area
- Street Trees
- Shellfish restoration

Community Quality of Life
- Public park/playground
- Learning Barge
- Pervious Sidewalks
- "Dark skies" Street lighting
- River Star Industries:
  - Current
  - In the making
  - Future target

Site 1: Epping & Russell sediment cleanup site
Site 2: Republic Creosoting sediment cleanup site
Southern Branch, Elizabeth River
Onshore remediation site
Residential neighborhood
Commonwealth Quality of Life
- Public park/playground
- Learning Barge
- Pervious Sidewalks
- "Dark skies" Street lighting
- River Star Industries:
  - Current
  - In the making
  - Future target
Explore the Learning Barge!

Learning Barge Educational Director published in International Magazine
Robin Dunbar's article about The Learning Barge in Green Teacher magazine tells the fascinating story of the Learning Barge and the impact it is having.

Read the article...

2012 RiverFest Wants YOU!
"Never been to a better environmental festival" said visitors to 2011 Lafayette RiverFest! Now's YOUR chance to get in on the big 2012 RiverFest and help make it bigger and better than ever. Sign on as a sponsor, artist or vendor now! See details here...

Big Grant Helps Lafayette via River Star Homes

Join the non-profit that works to make your Elizabeth River safe for swimming and fishing!

- Fish and otters are coming back. Donate to keep the momentum going!
- Sign up to do your part as a River Star...at home, work and school.
- Book a school trip on world's first floating wetland classroom...The Learning Barge

Privacy by SafeSubscribe™
For Email Marketing you can trust

Make Your Donation TODAY!

UPCOMING EVENTS
Saturday November Any Saturday 2011
Explore the Southern Elizabeth aboard the Victory Rover for Half Price!

WTKR.com June 9 2011
Toxic Sludge Found in the Elizabeth
The Goo is Going!

Money Point Sediment Remediation

Source of Goo – Historic operations at former creosote plants.
Contaminant (Goo) – Creosote used to treat lumber and piles.
Environmental impact – Toxic to fish and marine life.
Solution – Dredge “hot spots,” apply clean backfill and enhance shallow areas with wetland grasses and oyster reef (“Living Cap”).

Phase 1 – Dredge 800 cubic-yard southern hot spot and begin Living Cap.
Phase 2 – Dredge northern hot spots (80,000 cubic yards); complete Living Cap, adding oyster shell and clean sand.

Balancing Industry and the Environment
How to Achieve Win-Win on the Industrial Waterfront

A Guide to Sustainable Redevelopment Practices by The Elizabeth River Project
Prepared under contract to the U.S. Environmental Protection Agency, Region 3
Suggestions for Atlantic Wood include: redeveloping the Western part of the property as a small industrial park, planting a buffer along the street, and integrated stormwater practices.
Atlantic Woods Superfund Site

Crisman+Petrus Architects with WEG
Paradise Creek Nature Park

Site Plan | Paradise Creek Nature Park, Portsmouth, VA
Eastern Branch Restoration

New Focus: Eastern Branch

Stakeholders helped us set a new plan for restoring the Eastern Branch, one of the river’s most polluted stretches.

Find your role: Eastern Branch Strategy
The Making of the New Norfolk, Norfolk Redevelopment and Housing Authority, 1961.
Downtown Norfolk and Harvest Park district 1940s
New urban design strategies are essential as climate change and sea level rise threaten coastal communities. An environmental NGO, the Elizabeth River Project, commissioned C+PA to create adaptive design proposals for the storm surge-threatened Harbor Park district in Norfolk, Virginia—one of the most threatened coastal cities in the United States. Nearly 25% of city land lies in the 100-year floodplain, including downtown Norfolk and its waterfront. Tidal tributaries and wetlands have been filled or piped below ground, the shoreline has been hardened with concrete bulkheads, and extensive dredging has transformed river flow. Typical high tides annually overflow stormwater infrastructure and the City of Norfolk is finding it difficult to attract business or development to the site. C+PA is examining several intertwined scalar considerations for the Harbor Park District and the role that a new ERP headquarters and environmental education center could play in the sustainable revitalization process. This plan follows a “let it flood” approach that minimizes infrastructure investments that levees bring. We are currently working on a levee-based approach as well.

Until the 1970’s, the Norfolk waterfront along Water Street continued in a strong urban edge to the eastern edge of what is now identified as Harbor Park. This lesson from history may help in reconnection of what now seem separate entities.

6’ storm surges annually swamp Harbor Park. The most recent event was in October 2015, when a Category 2 hurricane passed the coast more than 200 miles out to sea. A direct or near hit would easily cover the site with 9 or more feet of water.
Retaining Water

Hunter’s Point South Park, Queens, New York
Weiss/Manfredi, 2013

Hunter’s park creates a recreational space that has the ability to be flooded in heavy rain event and high water events. The park also returns a more natural shoreline to the river. The highly visible sight helps spread awareness of how the city can work with the river and environment in a way that's beneficial to the community, businesses, and the ecosystem.
Living with Water|Resilient Spaces

Yanweizhou Park, Jinhua City, China
Turenscape, 2014.

The architects described their design as “making friends” with the River, which floods annually during monsoon season. A cut-and-fill strategy is used for creating a water-resilient terraced river embankment that is covered with flood adapted native vegetation. The paths and pavilions are all constructed to be flood resistant and the ground surface are water permeable to allow the landscape to absorb waters during the flooding season.

The park when the river is at normal levels (above) and during a 20 year flood event (below).
Flood Prevention Strategies

**Natural - green**
- living shorelines
- riparian buffers
- Wetlands
- green streets

**Synthetic - gray**
- vertical or sloped floodwalls
- earthen berms
- piers + jetties
Harbor Park: Crisman Studio
UVA Crisman Studio: Scott Levine
How would Norfolk have to change urbanistically to take a green rather than gray infrastructural approach?

Evaluating the benefits of living shorelines to mitigate SLR impacts:

What are the criteria?

What is the value of open space, water access, views + those things not included in the City’s calculations?
Broad Creek Ingleside Coastal Resilience Study

Source: City of Norfolk
Broad Creek
Ingleside
Coastal
Resilience
Study

Source: City of Norfolk
WORRIED ABOUT FLOODING & WATER POLLUTION IN BROAD CREEK?

INGLESIDE, WE WANT TO HEAR FROM YOU!

JANUARY 28, 2017 FROM NOON-3PM
INGLESIDE CHURCH, 925 INGLESIDE RD.

Light lunch will be provided to attendees!
Let your voice be heard to develop a community plan to reduce flooding and improve the health of Broad Creek in conjunction with the Elizabeth River Project, Wetlands Watch, and the University of Virginia.

For more information, contact Ingleside Civic League President, Amelia Coppage, inglesidecivicamelia@gmail.com or 757-630-1319
GOAL

To create a holistic vision, in collaboration with your ideas and knowledge, for a sustainable future for Ingleside.

Focusing on:
- Improving Flood Management in Ingleside
- Improving Water Quality in the Elizabeth River and Broad Creek
GREENING
INGLESIDE
FRONT-TO-BACK

Seeking Sustainable Solutions for Sea-Level Rise,
Flood Management, and Water Quality Challenges

Prepared by the University of Virginia:
Allison Owens, Ashley Cappo, Walker Strick, Sam Friday,
Katherine Wilkin, Katherine Phillips, Hung Truong

For:
The Ingleside Community

In Collaboration with:
The Ingleside Civic League, Wetlands Watch, the Elizabeth River Project

May 8, 2017
MEETING SUMMARIES

Three Saturday meetings held at Ingleside Baptist Church brought together local residents with members of the UVa team, Wetlands Watch, the Elizabeth River Project, the City of Norfolk, and the Ingleside Civic League to refine this proposal.

JANUARY 28TH
Following a presentation from Wetlands Watch and the ERP regarding the present state of Ingleside and Broad Creek, residents were asked to mark areas of high-risk for flooding and stormwater backup, as well as possible sites for intervention on three large maps. Brief, informal surveys were also distributed in order to supplement this feedback.

MARCH 18TH
After the UVa team introduced the “three-pronged approach” and several proposals for “living” solutions to stormwater management and flood mitigation, the attending residents began to inspire a holistic vision for the future of their community as a sustainable neighborhood – what would be the first of its kind in Norfolk.

APRIL 22ND
The UVa team presented their final set of interventions and received community feedback. Observations brought up by new attendees provoked constructive conversations regarding the future feasibility of maintaining these interventions.

CONTINUING THIS PROCESS
Following the conclusion of this initial stage in the process towards “Greening Ingleside,” the UVa team recommends continuing a conversation-driven, community-centric approach while gradually implementing these interventions on private and public sites throughout the neighborhood.

LEGEND
- Rain Flooding
- Misc.
- Pollution
- Surge/Tidal Flooding

Problem Areas
THREE-PRONGED APPROACH

LIVING SHORELINES
Living shorelines are coastal barriers constructed of native, organic materials such as vegetation, coral reefs, mangroves, and seagrasses. These solutions seek to build back the natural man-made and wetland ecosystems historically displaced by heavy, coastal development. The Elizabeth River in particular has seen an estimated 50% loss in these tidal wetlands since the 1950s.

Integrating living barriers along unprotected shorelines and in lieu of more traditional, “harder” solutions such as bulkheads and seawalls will prove holistically more sustainable for coastal neighborhoods such as Ingleside. Layers of porous materials such as vegetation and sand absorb wave energy and excess water, slowing and diminishing the impacts of surge flooding and coastal erosion. By comparison, hard, concrete barriers such as bulkheads often contribute to coastal erosion, making flooding worse in the long-term. Furthermore, living shorelines are both less expensive to implement and more resilient, making them more fiscally sustainable over time. While vegetation gradually adapts to inevitable rising sea levels, hard barriers frequently experience water damage and will ultimately prove obsolete when water exceeds their finite height. Lastly, living solutions serve to filter water and provide habitat for wetland species, improving the biodiversity and health of neighboring coastal ecosystems.

STORMWATER MANAGEMENT INFRASTRUCTURE
If living shorelines serve to embrace flooding at the water’s edge, tactics in stormwater management infrastructure seek to offer solutions to disruptive flood waters on land. Like living shorelines, these solutions utilize layers of native, organic materials such as vegetation, mulch, and sand, to collect, absorb, filter, and safely channel excess water into local waterways. These vegetated stormwater management basins can be implemented in diverse forms and locations based on site-specific needs. This proposal includes rain gardens, bioswale trenches, street-side bump-outs, curb extensions, tree trenches, and permeable pavement.

The porous qualities of vegetated buffers retain and slow the movement of heavy storm surges more effectively than paved surfaces. In this process, the organic layers absorb many of the pollutants present in stormwater runoff before they reach local waterways and impact coastal ecosystems. Finally, the integration of vegetated solutions and expansion of sidewalk networks in order to house elements of green street design is likely to increase a neighborhood’s aesthetic value, accessibility, and residential engagement.

COMMUNITY ENGAGEMENT STRATEGIES
Over the course of the three meetings, the UVa team observed that the majority of attending residents had lived in Ingleside for generations, intended to remain in the neighborhood indefinitely, and demonstrated active engagement in developing the community’s future. Therefore, the proposal seeks solutions which will integrate communal participation in the design and implementation of creative strategies to beautify and “rebrand” Ingleside as a center of sustainable investment.

These solutions will attempt to continue the conversation-based design strategies that proved successful during this initial phase throughout future implementations. Design charrettes will allow residents to take ownership over the development of community rain gardens, parks, a potential public water access point, and a neighborhood entrance sign for Ingleside Road. Other projects to be implemented by individual groups or families, such as storm-drain paintings and public art installations will further empower residents to impact their community on their own accord. Solutions will also make use of strong existing partnerships with the Ingleside Civic League and Elizabeth River Project. Overall, these solutions offer relatively accessible, immediate, and cost-efficient means to make Ingleside more aesthetically and socially vibrant and maintain residential engagement in the neighborhood’s vision for the future.
LIVING SOLUTIONS FROM "FRONT TO BACK"

1. Mitigate the impact of localized flooding
2. Develop a holistically sustainable community
3. Strengthen livability and communal engagement

1. Ingleside Rd
2. Fontaine Ave and Townsend Pl
3. Kentucky Ave
4. Westminster Ave
INGLESIDE RD

PROPOSED SOLUTIONS
Just as Ingleside Road serves as an internal spine and major thoroughfare for the neighborhood as a mode of transit, it offers an opportunity to create a central hub for the community's efforts in sustainable solutions to coastal resilience.

GREEN STREET DESIGN
- These efforts will begin with the implementation of a vegetated bioswale within the existing stormwater trench which begins outside Ingleside Baptist Church and continues south for several blocks until ending at Seay Road.
- Stormwater planters and rain gardens will be implemented further north, outside Ingleside Elementary school and will engage classroom participation.
- In seeking to address disconnected patches of sidewalks and problematic sites for flooding around curbs, sidewalks will be extended and retrofitted with stormwater planters and tree trenches. Provided available funding, these expanded, sustainable sidewalk networks will branch off onto smaller, residential streets.

COMMUNITY ENTRANCE SIGN
- The need for a new community sign at the entrance on Ingleside Road provides an opportunity to define Ingleside as a ‘Green’ neighborhood to residents, visitors, and passerby alike.
- The design should therefore integrate natural materials and a surrounding garden of native plants to indicate residential use of living solutions.
- Designing the sign through a series of community design charrettes and workshops will further exemplify Ingleside’s deep, residential commitment.

FONTAINE AVE AND TOWNSEND PL

PROPOSED SOLUTIONS
These strategies will seek to address the conditions of flooding and persistent standing water that occurs along the bend on Townsend Pl. Following storms, the severity of these conditions often leave several households isolated for days at a time, posing a direct safety concern which requires intervention.

ELEVATE THE STREET
- Provided sufficient funding, the street could be elevated to better channel flooding and excess stormwater outward.
- Upon looking into resources between Ingleside, grant funding, and the City of Norfolk, the neighborhood can consider purchasing the property on the inside corner in order to develop an open, vegetated green space which will absorb standing water and provide public, green space.

EMERGENCY EXIT ROUTE
- In reopening the closed portion of Fontaine Ave with an unofficial thoroughfare constructed of shallow permeable pavers, the community can develop an exit route for emergency flooding.

LIVING SHORELINES
- A more immediate and cost effective solution to these flood levels will rely on residential investment. If private homes on Townsend Pl, that back up to Broad Creek implement living shorelines on their respective portion of the coast, it will both mitigate flooding and erosion levels and improve water quality.
**KENTUCKY AVE**

**PROPOSED SOLUTIONS**
Investment in the dead end on Kentucky Avenue will serve to improve the livability and property value of homes currently facing a jersey wall and highway. Furthermore, following the April 22nd debate, this invigorated space will offer a new potential location for the public water access point and boat launch.

**COMMUNITY ART INSTALLATIONS**
- Granted permission by the Virginia Department of Transportation and City of Norfolk, community members can design and implement a vibrant mural on the portion of the jersey wall exposed at the end of the Kentucky Avenue cul-de-sac
- The empty center of the cul-de-sac offers an additional opportunity to exhibit the work of local artists, likely in the form of a statue.

**INTEGRATED BUFFER ZONES AND LIVING SHORELINES**
- Work with residents along Kentucky Ave and Riverside Dr to integrate living shoreline solutions within the narrow waterway. Living shorelines along the government-owned portion at the end of the cul-de-sac can be implemented using government resources or grant awards.
- Developing a planted buffer area between the living shoreline and the roadway will further reduce flooding and erosion, diminish air quality pollution from the neighboring highway, and improve the aesthetic value of the the cul-de-sac’s dead end.
- The end of Kentucky Ave can additionally serve as a public water access point and boat launch during high tide.

**WESTMINSTER AVE**

**PROPOSED SOLUTIONS**
Westminster Avenue was proposed as the initial site for a public water access point, community park, and boat launch. However, following valid concerns drawn from neighboring stakeholders during the April 22nd meeting, the site now serves as a point of conversation regarding conflicts in the respective needs and visions of Ingleside residents.

**PUBLIC ACCESS POINT**
- This proposal sought to meet residential and city government visions for a public access point to Broad Creek by proposing a community park developed in joining government-owned land at the end of the street and the purchase of a neighboring vacant house.
- The park would be designed with direct residential engagement and would place emphasis on public safety and engagement.
- Proposed design elements included a kayak launch, playground, trash and recycling bins, bike racks, and picnic tables.

**OTHER POTENTIAL SOLUTIONS**
- Place a conservation easement on the land which would stimulate maintenance and upkeep from local government. Signage marking this conservation status would seek to curate the current practice of dumping waste on what is now a seemingly vacant lot.
- Continue pursuit of a public water access point to meet residential desires.
- Installing living shorelines along the private and government lot, using regional resources or grant funding for the latter, and undergoing a collective process to clean out major waste from the tidal basin, will improve ecosystem health, as well as smell and aesthetic value on Westminster.
Broad Creek Neighborhood Goes for “Fully Sustainable”

UVA, Elizabeth River Project, Wetlands Watch, Norfolk Help Ingleside Plan Innovative Future on Eastern Branch

Ask Ingleside residents if they have flooding issues, and they’ll show you photos of “people swimming in the streets” and report being trapped in their homes by high water as many as 10 times a year.

Ask scientists about water quality in their neighborhood waterway, and you’ll be shown an F on the latest Elizabeth River Scorecard. That’s for Broad Creek on the Eastern Branch—pretty much the “worst of the worst” of the Elizabeth River these days. The Eastern Branch is our top focus for some of the river’s poorest trends, and Broad Creek, along with Indian River, hold the branch’s worst scores.

Thus imagine our delight, and Ingleside residents’ excitement, when together with the University of Virginia (UVA) and Wetlands Watch, Elizabeth River Project this spring helped the neighborhood identify a suite of “green” innovations that could reduce flooding and improve the environmental health of Broad Creek.

“We’re the first neighborhood in Norfolk to have a light rail stop. We should be the first to have a fully sustainable neighborhood, front to back,” said Nikki Southall, resident, expressing excitement over ideas polished into a plan by students of UVA’s School of Architecture.

The special focus on Ingleside is one of a dozen initiatives Elizabeth River Project is spearheading to improve the Eastern Branch with multiple partners including three cities, working on stormwater issues, and HRSD, donating water quality monitoring. Working primarily with residents participating in our free River Star Homes program (now 4,100 strong), Elizabeth River Project is hard at work building “rain gardens” to absorb runoff and restoring “living shorelines” to reduce erosion and restore water quality, wetlands and oyster habitat throughout the Eastern Branch.

Thank you for your membership support, which we’ve matched with a grant from the federal Chesapeake Bay Program to coordinate the massive Eastern Branch initiative.

Here are two ways you can help restore Broad Creek or your part of the Elizabeth: Join River Star Homes at RiverStarHomes.org to follow our 7 simple steps and learn about projects like living shorelines. And consider a special donation today at elizabethriver.org.

Long beleaguered by flooding and poor water quality, Ingleside residents meet with project partners to plan improvements.
NOAA awards $2.5 million in environmental literacy grants to build community resilience

Five projects will build the educational foundation for resilient communities in Chicago, Brooklyn, Norfolk, Tucson, Phoenix, and Fairfield County, Connecticut

September 19, 2016 — NOAA’s Office of Education awarded $2.5 million in Environmental Literacy Grants to support five projects focused on helping communities build the environmental literacy necessary for resilience to extreme weather events and other environmental hazards.
Youth Resilience Strategy Roundtable

Preparing Norfolk Area Students for America’s Second Highest Sea Level Rise

Youth Leaders for Resilience, Chesterfield Academy, Norfolk

Thursday, July 27, 2017
Grandy Village Learning Center, 2971 Kimball Loop, Norfolk, VA 23504

10-11:15 AM Optional Tour of Learning Barge Resilience Program
11:30-12:15 PM Lunch and Networking
12:15-2:30 PM Roundtable Meeting
- Review DRAFT Youth Resilience Strategy for targeted audience
  elementary students
- Year 2 targeted audience of middle and high schools
- Review community resources to include

Presented by:
Resilient Youth
A Pioneer Strategy of Hope and Action
For Those Who Will Inherit Hampton Roads’ Rising Seas

Made possible by:
NOAA Environmental Literacy Grant to the Elizabeth River Project,
In partnership with Norfolk Public Schools & Chesterfield Academy, Portsmouth Public Schools,
City of Norfolk – Office of Resilience, Old Dominion University, University of Virginia, Chrysler
Museum of Art, Virginia Sea Grant, Wetlands Watch, HRSD, Groundwork Hudson Valley

Preliminary Outline – July 19, 2017
Industrial Land Use
Hampton Roads Cancer Incidence
COLLABORATING
for Coastal Climate Resilience