Embracing Nature

Norfolk is defined by its relationship to water—bordered by rivers, wetlands, and coastline that offer residents daily access to nature. But our rivers, shorelines and wetlands also pose our city's greatest risk. As sea levels rise, Norfolk must lean into the wisdom of its landscape, adapting with nature rather than against it. To truly embrace nature, we must build resilience in a way that restores our ecosystems and strengthens our communities.

Norfolk's natural systems are powerful tools in managing risk. By leveraging its natural assets, protecting habitat corridors, bridging fragmented green spaces, and restoring shorelines, the city has a unique opportunity to create a continuous network of blue and green infrastructure that both absorbs stormwater and connects people to nature. These ecological investments can double as community assets: parks that can soak up floodwaters like a sponge, trails that follow resilient waterfronts, and tree canopies that cool neighborhoods and improve health.

But resilience also starts small. Households and neighborhoods can play a transformative role, whether through rain gardens, retrofitted roofs, or community-led greening efforts. Schools and community centers play a pivotal role in supporting both emergency response and everyday well-being. Increasing access to the water, particularly in communities long excluded from its edges, ensures that the work of adaptation also becomes a force for equity.

Norfolk's future depends not only on its ability to reduce risk, but on its willingness to reimagine what kind of city it can become: a city that protects those who are most vulnerable, restores what has been lost, and invites everyone to participate in shaping a more natural, livable, and enduring place.

> **If nothing gets done, we are going to see more flooding, susceptibility to storm surges like Katrina, and hurricanes. I don't want the city that I love to not be here in another 75 years or so. We, the city and us together, need to do as much as we can to save it."**
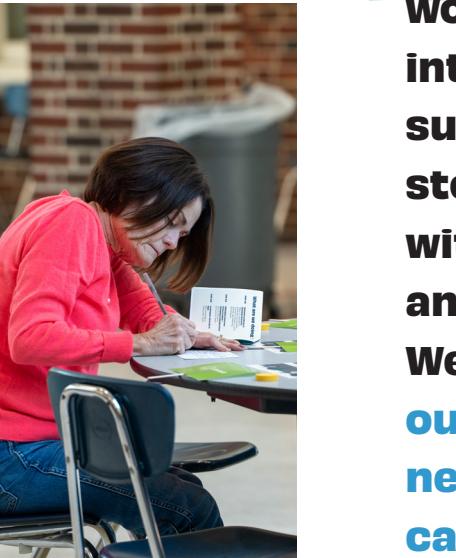>
> — Norfolk resident, Phase 1 Engagement

(City of Norfolk)

(WRT)

(WRT)

> " I think the city is doing a wonderful job of planning interventions to make sure that the impact of storms aren't as severe with sea walls, levees and natural shorelines. We want to **make sure our most vulnerable neighbors are taken care of** as well.

— Norfolk resident, Phase 1 Engagement

What We Heard:

Norfolk residents understand the challenges and opportunities presented by their city's relationship with water.

By 2050, they hope to see their thriving community as a model for resilience and environmental stewardship. Improved stormwater infrastructure, permeable driveways, and living shorelines should transform neighborhoods into resilient havens, while restored wetlands and oyster reefs could blend ecological restoration with public access.

These efforts should protect homes, generate green jobs, and establish Norfolk as a leader in climate resilience. Nature should be woven into the fabric of daily life. An expanded Elizabeth River Trail could connect neighborhoods and Downtown, creating a ribbon of outdoor exploration. Tree-lined streets and shaded parks should reduce urban heat and encourage community gathering. Kayak launches, pedestrian-friendly trails, and bike networks could offer accessible ways to experience Norfolk's natural beauty while promoting sustainability.

Norfolk's future is one where environmental care and community well-being intersect.

> " **By 2050, Norfolk will be known for finding equitable, just, and innovative ways for living with water and climate change impacts.**

— Norfolk resident, Phase 1 Engagement

(WRT)

Thoughtful investments in clean watersheds, park programming, and green infrastructure should foster pride and belonging. In this vision, **Norfolk is not only resilient but a vibrant example of how to embrace nature and inspire future generations.**

Goals:

GOAL 1:
Preserve and Enhance Natural Systems

GOAL 2:
Build and Maintain a Network of Green and Blue Infrastructure

GOAL 3:
Protect and Adapt Communities from Flooding and Other Risks

GOAL 4:
Integrate Resilience and Sustainability in Capital and Infrastructure Planning

GOAL 5:
Support a Comprehensive and Coordinated Approach to Building Resilience

Big Ideas!

- **Implement wetland design changes** that allow for the landward migration of wetlands, for resilience to sea level rise.

- Pursue opportunities to **daylight (re-surface) creeks** that have been buried to expand channel capacity and provide natural amenities for communities.

- Support continued **public access** along shorelines and waterfronts.

- Develop **coastal infrastructure as a waterfront amenity**, including blue parks, living shorelines, and waterfront trails.

- Develop **natural blue and green corridors**, such as a blue belts network of nature-based infrastructure in areas subject to chronic floods, prioritizing native plants, habitat corridors, and wetland restoration and enhance biodiversity.

- Locate new **"spongy" parks** in flood-prone areas so recreation spaces can provide additional storage for runoff, mitigating flooding during extreme rainfalls.

- **Increase the extent of natural areas along the waterfront**, using shoreline restoration projects such as living shorelines, and incentivize their use.

- **Address properties that are subject to recurrent flood events** or future sea level rise through voluntary buyouts, home elevation, etc.

- Strengthen infrastructure and apply best practices for long-term **sustainability, diversity of energy, and redundancy.**

- Evaluate whether existing public facilities, as well as clustered private businesses and facilities, can serve as **"Resilience Hubs".**

- Consider designating **"Resilience Districts"** that can be eligible for targeted infrastructure and resilience projects to consolidate existing efforts.

- Encourage building owners to **retrofit existing roofs** for stormwater treatment.

GOAL 1:

## Preserve and Enhance Natural Systems

Protect and expand Norfolk's natural systems at the site, neighborhood, and citywide scales to enhance resilience and promote biodiversity of Norfolk's ecosystems.

As a coastal community and a part of the Biophilic Cities Network, Norfolk values the presence of nature in our diverse neighborhoods and waterfronts. Natural resources extend along its Chesapeake Bay beaches and dunes and in its rivers and wetlands. City parks, recreational fields and trails, open green spaces, and street trees are the fabric that connects the natural spaces. By leveraging our parks and trails and incorporating nature-based planning practices, we can protect environmental quality, reduce hazards, and create more diversity and habitat throughout the city.

1. Continue to **protect and preserve water quality** by implementing *Chesapeake Bay Preservation Area (CBPA)* regulations as outlined in the Code of Virginia, including maintaining existing zoning regulations and protections, and incorporating any new requirements or guidance from the Virginia Department of Environmental Quality.

Chesapeake Bay Preservation Area (CBPA) is a specific area within the Chesapeake Bay watershed that is designated to protect and improve its water quality. It consists of a Resource Protection Area (RPA) and a Resource Management Area and/or an Intensely Developed Area (IDA)

2. Continue to protect, enhance, restore, and **maintain the viability of critical wetlands and fisheries,** including the protection of waterfowl and wildlife habitats.
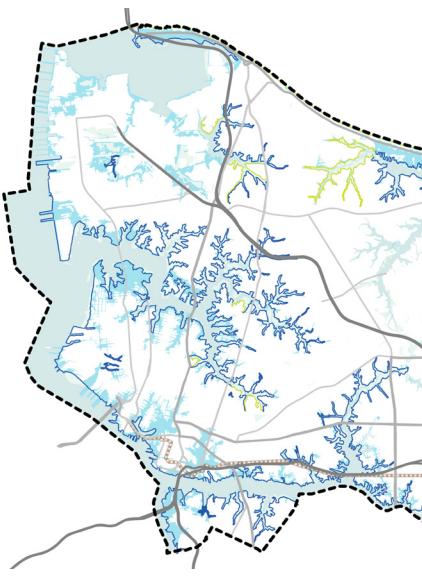
Chesapeake Bay Preservation Area (CBPA)
- Resource Protection Area (RPA)
- Intensely Developed Area (IDA)
- 100 Yr Flood Zone

3. Reaffirm and support the policies contained in the City of Norfolk *Chesapeake Bay Preservation Area Program Supplement.*

NOTE: Additional supporting maps can be found in Norfolk's CBPA Program Supplement.

Chesapeake Bay Preservation Area (CBPA) Program Supplement was adopted by Norfolk City Council in 2003 to assist in meeting all mandated requirements set forth in the Chesapeake Bay Preservation Act, enacted by the Virginia General Assembly in 1988, and is included in the list of adopted plans and policies in Chapter 5, Building to 2050 and Beyond.

4. Improve water quality through the **reduction of existing pollution sources** and the redevelopment of *Intensely Developed Areas (IDAs)* and other areas targeted for redevelopment.

Intensely Developed Areas (IDAs) are areas where development is concentrated and little of the natural environment remains and where one of the following typically exist: development that has severely altered the natural state of the area such that it has more than 50 percent impervious surface; public sewer and water systems, or a constructed stormwater drainage system, or both, have been constructed; or housing density is equal to or greater than 4 dwelling units per acre. IDAs are designated as an overlay on the Chesapeake Bay Preservation Area, as depicted in the Chesapeake Bay Preservation Areas Supplemental Working Map, as periodically amended.

a. Catalog existing and potential water pollution sources, including *nonpoint source pollution*.

Nonpoint source pollution generally results from land runoff, precipitation, or other events whereby rainfall moves across a land surface and carries natural and human-made pollutants, depositing them into the surrounding waterways. It contrasts with "point source pollution" via storm drains or pipes that discharge directly.

b. Encourage voluntary adoption of pollution prevention practices.

5. Protect the potable water supply and groundwater from existing and potential sources of pollution.

6. Explore non-regulatory approaches for protection of the *Resource Protection Area (RPA)* buffer area, including expanded **public education efforts and the use of conservation easements**.

Resource Protection Area (RPA) is the component of the Chesapeake Bay Preservation Area adjacent to water bodies that have an intrinsic water quality value due to the ecological and biological processes they perform or are sensitive to impacts which may result in significant degradation to the quality of state waters.

7. Identify specific **water quality improvement projects** when neighborhood and commercial plans are prepared throughout the city to comply with the Federal Clean Water Act regulations for storm water discharges.

8. Implement the *Sand Management Plan (SMP) Guidance Document* to **promote sand dune and beach stability**, functionality, and resiliency while promoting the economic vitality and ecological resiliency of the Ocean View urban beach community.

Sand Management Plan (SMP) Guidance Document provides guidance and a long-term strategy for dealing with sand and dune issues along the Chesapeake Bay shoreline. It is intended to promote sand dune and beach stability, functionality, and resiliency consistent with local, state, and federal regulations.

9. Continue to **work with colleges and universities**, such as Old Dominion University (ODU) and Norfolk State University (NSU), research institutions, such as the Virginia Institute of Marine Science (VIMS), and local environmental organizations to **improve water quality** in Norfolk's waterways.

(Wetland Watch, Living Infrastructure Program)

10. Coordinate with the VIMS and local colleges and universities when conducting any studies involving marine sciences, industries and resources, problems pertaining to the maritime economy, marine pollution, the Chesapeake Bay and its tributaries, tidal waters, and tidal shoreline erosion. Utilize the VIMS' comprehensive guidance to **foster the sustainability of shoreline resources.**

11. Consider further revisions to the *Resilience Quotient* to support conservation of water resources, protection of water quality and management of stormwater.

Resilience Quotient (RQ) is a scoring system used to evaluate the resilience of new development and redevelopment projects against environmental and infrastructural threats such as flooding, stormwater surges, and energy disruptions. It serves as a minimum threshold of required points that a project must achieve to comply with resilience-oriented municipal ordinances.

12. Continue to **implement wetland design changes** that allow for the landward migration of wetlands for resilience to sea level rise.

13. Pursue opportunities to **daylight (re-surface) creeks** that have been buried to expand channel capacity and provide natural amenities for communities.

14. Encourage the use of *native species*, for sustainability and drought resistance purposes, on public and private lands wherever possible and develop programs to control *invasive species*.

○ *Native species are plants that evolved in Virginia's ecosystems, supporting local wildlife and natural processes like water filtration. Virginia and Norfolk prioritize native species through biophilic design.*

○ *Invasive species are non-native plants introduced to Virginia that spread aggressively, often harming the environment, economy, or human health by outcompeting native plants and disrupting habitats. They tend to spread aggressively, damaging ecosystems, and increasing flood risks.*

15. Develop an **"existing biophilic conditions assessment"** to understand the abundance and distribution of nature within the city, as well as gaps in infrastructure, and include an assessment of current community habitat projects and areas that need projects (e.g., via mapping).

16. Promote **soil management** best practices that enhance stormwater infiltration capacity.

17. Promote the **reuse of water** through strategies such as rain barrels, rain gardens, and grey water recycling.

18. Enhance existing forested areas through **removal of invasive species** and aggressive vines, allowing for improved viewsheds, walking trails, and native habitats.
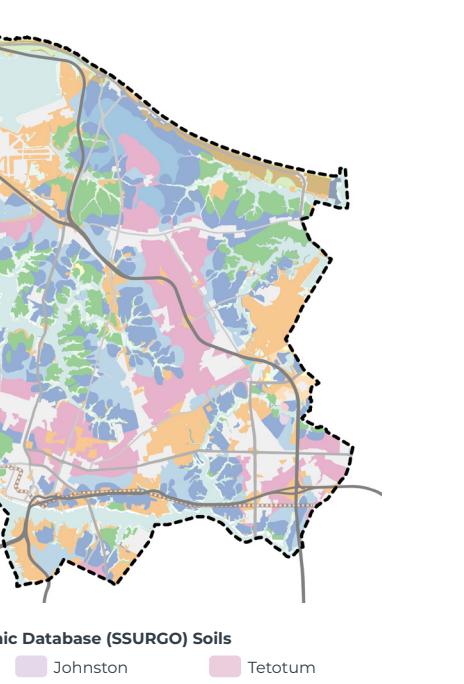
Soil Survey Geographic Database (SSURGO) Soils

Altavista	Johnston	Tetotum
Augusta	Lawnes	Tomotley
Beaches	Munden	Tomotely-Nimmo
Bohimet muck	Nawney	Udorthents
Bojac	Nimmo	Urban Land
Chapanoke	Psamments	Water
Dragston	Seabrook	
Duckston	State	

19. Protect intact *habitat patches* in the city and connect or reconnect them with green pathways to support people, plants, and animals.

○ *Habitat patches are a defined area used by species for breeding, socializing, or obtaining resources such as food, water, or shelter.*

20. Identify major points of *habitat fragmentation* and opportunities for bridging fragmentation.

○ *Habitat fragmentation is a process by which large, contiguous habitat is divided into smaller isolated fragments due to human activities like roads, development or agriculture.*

21. Consider developing **bird-safe design standards** or guidance that show how new and existing buildings can utilize tools like fritted glass and bird-safe window treatments.

22. Update the *Resilience Quotient* to incorporate bird-safe building treatments.

23. Consider creating a plan to manage and **coexist with urban wildlife**, to educate residents and businesses on the balance between animal control and coexistence.

BEST PRACTICES:

WILDLIFE MANAGEMENT AND COEXISTENCE PLAN, CHICAGO, IL

Urban wildlife can cause property damage, transmit disease, create a safety hazard, and even attack pets or people. This plan outlines the best practices, based on the best available science, to reduce conflicts and help people coexist with wildlife and nature in the Chicago area. In addition to profiling 16 urban wildlife species from bats to bees and explaining new coexistence-focused management strategies, the plan also explains the shift in philosophy from control to coexistence.

24. Support incentive programs that encourage the **recycling and reduction of plastics** and support legislation at the Virginia General Assembly allowing local governments to regulate the distribution, sale, or offer of disposable plastic bags and other single-use products (e.g., bottles, straws, and food or beverage containers).

25. Support regional efforts to **reduce greenhouse gas emissions** and meet emission reduction targets.

GOAL 2:

Build and Maintain a Network of Green and Blue Infrastructure

Build a robust network of green and blue infrastructure to help the city design the coastal community of the future, improve environmental and community health, protect infrastructure, and provide recreational and scenic beauty.

Just as the city plans for its "gray infrastructure," such as roads, sidewalks or storm drains, it also needs to plan for its "blue" and "green" infrastructure, including the marshes, creeks, parks and trees that provide habitat, filter the air and water, moderate air temperatures, and provide recreation and scenic beauty.

Our green infrastructure will focus on protecting, connecting and re-greening the city to provide pathways for people and wildlife, treat stormwater and reduce flooding, and beautify the city. Our blue infrastructure will help restore shoreline habitats to support aquatic life, buffer areas from storm surge, and foster recreation, including birding, kayaking, boating, and fishing.

1. Increase the quantity, density, and diversity of trees to achieve and maintain a goal of 30% tree canopy cover.

a. Continue and expand existing street tree planting efforts (e.g., tree adoptions and right-of-way plantings), especially in neighborhoods where canopy is less than 30 percent.

b. Pursue amendments to the Zoning Ordinance that enhance tree protection, conservation, planting, and replacement requirements to help meet stormwater requirements and pollution reduction targets.

c. Develop an *Urban Forest Management Plan (UFMP)* for the city.

Urban Forest Management Plan (UFMP) is a city strategy that guides how Norfolk cares for, protects, and expands tree canopy through planting, preserving, and connecting trees and green spaces to improve air and water quality, support wildlife, reduce flooding through stormwater uptake models, and promote nature-based design for a healthier, more resilient community. The UFMP sets goals, tracks progress and involves residents and partners to ensure the urban forest benefits people and nature over the long term.

2. Support continued **public access** along shorelines and waterfronts.

a. Review coastline/riverline projects for the appropriateness of adding shoreline/waterfront access in the form of promenades, piers, parks, or other public spaces.

b. Ensure fully accessible multiuse pathways along waterfronts to connect neighborhoods and offer bike, pedestrian, and wheelchair access.

3. Create a citywide **waterfront access and enhancement plan** to improve and maintain public access to city waterways using marinas, boat ramps, public beaches, parks, and natural areas while minimizing impacts to water quality.

a. Identify and promote existing water access points, particularly those with parking, along the Southern Coast Paddling Trail or along the Elizabeth River Trail.

b. Add new water access points where needed, with priority given to existing parks without meaningful physical access.

c. Pursue opportunities to provide new boat ramps for motorized and non-motorized boats, including adequate parking and staging areas.

d. Promote access points and expand fishing-related infrastructure (e.g., piers, signage with fishing regulations, etc.) and education for residents and visitors of all abilities, particularly in underserved neighborhoods.

e. Promote and enhance the legal rights-of-way (ROWs) where public waterfront access already exists while balancing habitat and conservation needs.

4. Encourage **community amenities** and interventions at waterfront ROWs, like lighting, benches, trash cans, and access piers/boardwalks.

5. Create and distribute **accessible, public-facing publications** (physical and virtual) for community champions and partner organizations to understand potential improvements and improve their access points as possible/fundable.

6. Develop **coastal infrastructure as a waterfront amenity**, including blue parks, living shorelines, and waterfront trails.

7. Pursue opportunities to develop **natural blue and green corridors**, such as a *blue belts network* of nature-based infrastructure in areas subject to chronic floods and *ecological continuity areas* that prioritize native plants, habitat corridors, and wetland restoration, enhancing biodiversity.

A blue belts network is a planned system of connected waterways, wetlands, and natural green drainage corridors designed to manage stormwater, reduce flooding, and improve water quality, while enhancing habitat and public access. This network uses nature-based solutions to support resilient, healthy neighborhoods to connect people and nature along its waterfronts, enhancing biodiversity using natural hydrology and biophilic design principles.

Ecological continuity areas are connected networks of natural habitats, protected and managed to support wildlife movement, maintain healthy ecosystems, and link people with nature. They ensure that patches of habitat remain intact and are reconnected to support wildlife movement, promoting biodiversity, clean water, and climate resilience across the city.

BEST PRACTICES:

POLLINATOR PATHWAY PROJECT, SEATTLE, WA

Founded in 2007, the Pollinator Pathway began as an evocative civic design project that brought several elements together. By uniting land fragments, it supports the connection of biological life and contributes to walkable cities that produce less sprawl, more ecology, and less climate change.

Pollinator Pathway (Mike Kane, Sarah Bergmann)
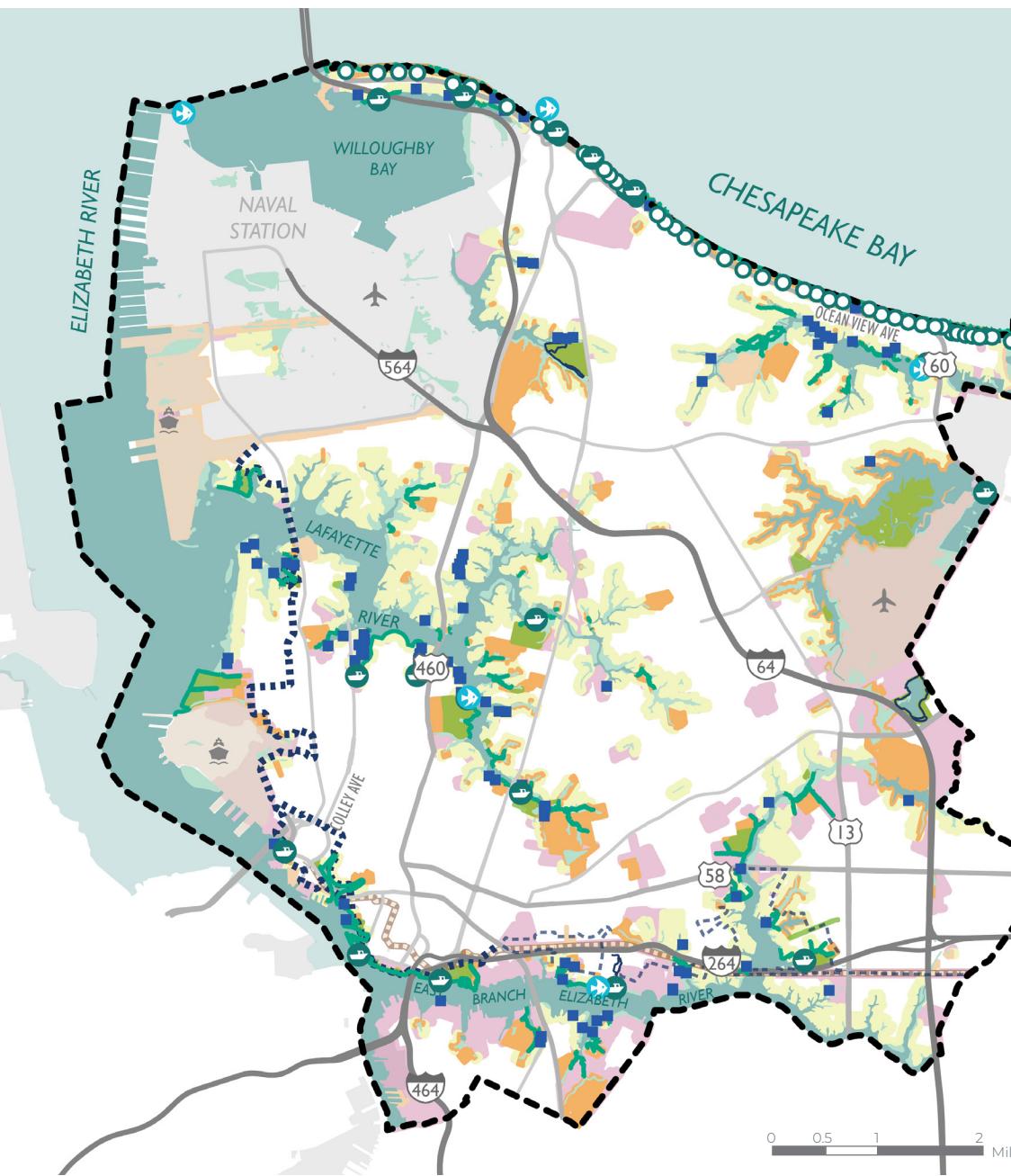
Figure 8: Public waterfront access and proximity to residential areas

Source: City of Norfolk

CURRENT WATER ACCESS
- Boat ramp
- Fishing pier
- Beach access
- Publicly accessible shoreline
- Waterfront parks

PUBLIC/PRIVATE COAST
- City owned
- Other public
- Private residential
- Private other

TRAILS
- Elizabeth River Trail
- Park trail
- Proposed Elizabeth River Trail extension
- Roads ending at water

- City limits
- Military
- Seaport/Airport
- Light rail
- Water
- Wetlands

8. Explore locating new **"spongy" parks** and public spaces in areas prone to stormwater flooding so recreation spaces can provide additional storage for runoff, mitigating flooding during extreme rainfalls.

LOCAL SUCCESS:

OHIO CREEK WATERSHED PROJECT

In 2016, Norfolk was awarded a $112 million federal grant from the National Disaster Resilience Competition for the Ohio Creek Watershed Project. The project explores various landscape and hardscape options to improve flooding, public access to the waterway and connections to the rest of the city. The project includes a Resilience Park that includes a flood berm, a restored tidal creek and wetland and other environmental features as well as a multi-use sports field and places for community gatherings, sports and play. Resilience Park strives to be a model for resilient open space.


Ohio Creek Project (Waggonner & Ball)

LOCAL SUCCESS:

ST. PAUL'S BLUE/GREENWAY

Part of the St. Paul's Transformation Project, the St. Paul's Blue/Greenway treats and stores stormwater runoff while doubling as a community park. A key component of the HUD Choice Neighborhoods Initiative development, the Blue/Greenway improves resilience for the neighborhood, considering long-term outlook on storm events and sea level rise. The project vision returns the site to its pre-development function as a creek inlet. Natural systems manage water to reduce flooding, while creating open spaces for the community.
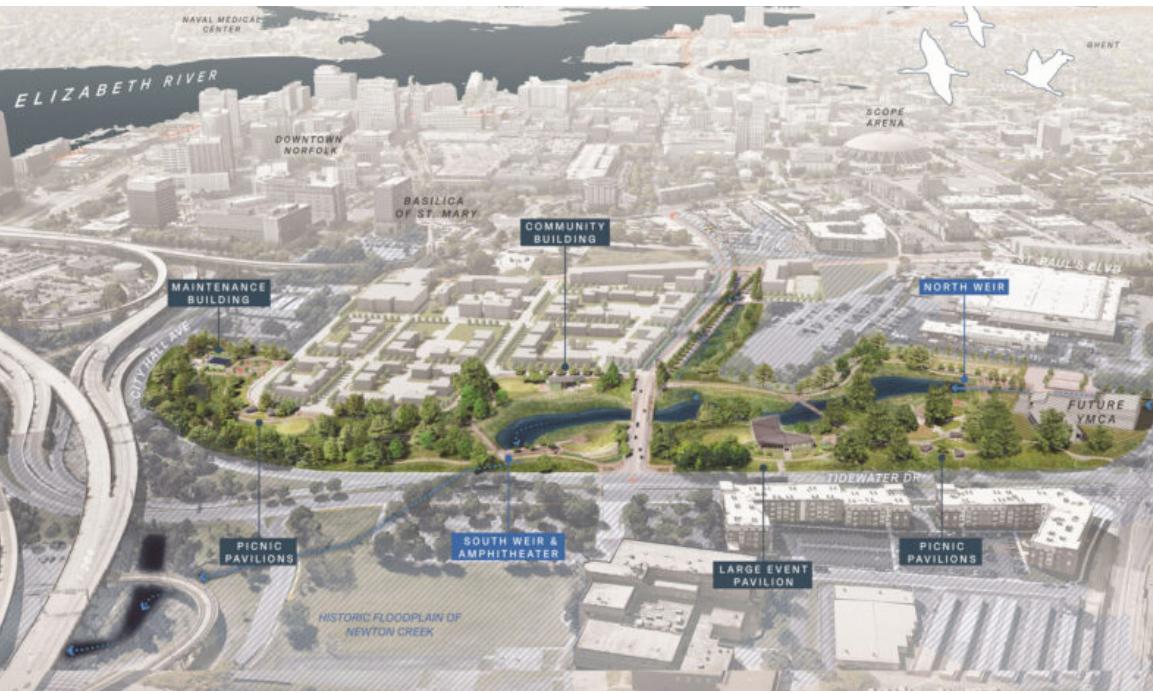
St Paul's Blue/Greenway (Waggonner & Ball)

BEST PRACTICES:

RESILIENCY PARK, HOBOKEN, NJ

The Southwest Resiliency Park in Hoboken is a prime example of tying public spaces to critical stormwater functions, providing detention for up to 300,000 gallons to alleviate urban flooding and protect the quality of Hoboken's receiving waters.

Southwest Resiliency Park (Starr Whitehouse)

9. Explore updating the *Resilience Quotient* program to enhance natural systems and native vegetation, including green roofs and urban farming.

10. Consider creating a pattern book/toolkit for developers and citizens to implement **green infrastructure** effectively and with appropriate context to the ecosystems and communities they inhabit, focusing on living shorelines and other resilience measures along waterfronts.

11. Develop an inventory of existing **oyster resources and potential reef restoration** sites in all tidal waterbodies, similar to ongoing work in the Lafayette River, and add areas for oyster habitat creation to shoreline restoration projects where possible.

12. Utilize natural and *biophilic design* principles into street design wherever possible and integrate these principles into all subsequent updates to city and street design guides/manuals.

Biophilic design is a methodology for designing buildings and landscapes with a stronger connection between humans and nature within the built environment.

13. Expand the "Park Ranger" program with Parks & Recreation to include **waterfront guides** that help connect Norfolk residents to public access points, incorporating education, safety, and water-based events in recreation.

14. Consider creating or supporting **neighborhood-led "regattas"** for fun boating competitions.
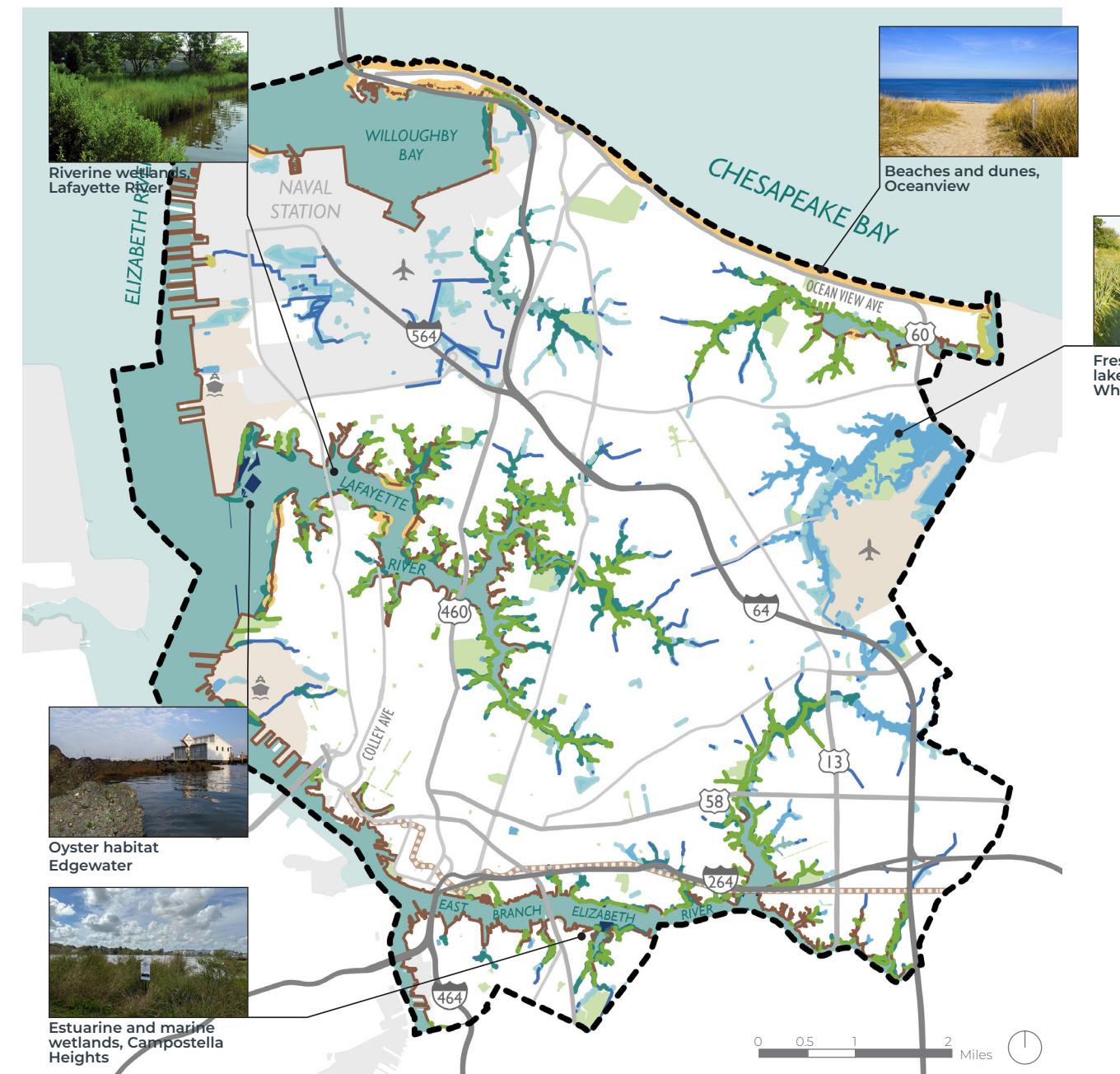
Figure 8: Living waterfronts: wetlands and shoreline types

Source: City of Norfolk; USFWS National Wetlands Inventory; The Virginia Geographic Information Network

Riverine wetlands, Lafayette River

Beaches and dunes, Oceanview

Fresh water pond and lake wetlands, Lake Whitehurst

Oyster habitat Edgewater

Estuarine and marine wetlands, Campostella Heights

TYPES OF WETLANDS

- Riverine wetland
- Freshwater pond and lake wetland
- Freshwater emergent wetland
- Estuarine and marine wetland
- Oyster habitat

SHORELINE TYPE

- Armored embankments
- Beaches and dunes
- Mud and sand flats
- Vegetated shore

- City limits
- Military
- Seaport/Airport
- Light rail
- Water
- Wetlands

15. Create a widespread all-ages **culture of stewardship** and conservation of our water resources and recreation.

The LA Urban Rangers are an arts and advocacy organization that mimic National Park Rangers to guide residents to underused public spaces. The Malibu Public Beaches program installs signage on public ROWs and guides the public past private property to demonstrate where they have a legal right to occupy.

Malibu Public Beaches (Samantha Bravo)

16. Pursue opportunities to provide **access and views of the water** by creating new pocket parks, green spaces, or vistas, especially for those areas which will lose open spaces due to future sea level rise.

17. Continue to **install and extend natural areas along the waterfront** using shoreline restoration projects, such as *living shorelines*, and consider incentives that could encourage their use.

Living shorelines are nature-based coastal protections integrating native vegetation, oyster reefs, and organic materials to stabilize shorelines, reduce flooding and erosion. These projects use biophilic design to connect people and nature, help manage stormwater, and create healthier, more resilient waterfronts for people and wildlife.

18. Increase cultural cohesion through a **public outreach program** to share the environmental benefits of green infrastructure, best management practices for its maintenance, and learn from the residents how to improve the program.

19. Explore **sustainable funding mechanisms** for water access and shoreline stabilization infrastructure, including construction and long-term maintenance.

20. Promote the use of **alternative energy** through supportive code changes to permit and incentivize the use of new technologies, such as solar and wind power, while ensuring such technologies are compatible in established residential areas.

Norfolk's many streets that dead-end into water provide an opportunity for their nearby residents: improved access for recreation and fishing, and daily time with the nature all around us.

By 2050, Norfolk will have restored access to water for all."

— Norfolk resident, Phase 1 Engagement

Gotta love this pier! Caught a nice speckled trout last week. Might get another before the sun drops.

Now, remember the marsh is like a sponge! It soaks up water and lets the fish thrive. We learned a lot today, huh?

This is my favorite place after school - the ducks come so close. I can hear them say hello!

Funny how this was always here, just blocked off! And now it's where I feel most like myself. The water calms me.

Wetland Walk

GOAL 3:

Protect and Adapt Communities from Flooding and Other Risks

Adapt to changing climate impacts through coastal protection, heat mitigation, urban water management, and other risk reduction and adaptation projects. Enhance and upgrade existing plans, and build on the Vision2100 framework, empowering government, investors and communities to make risk-informed decisions.

Communities within Norfolk are at differing levels of risk due to the impacts of sea-level rise and climate change. Though Norfolk is a leader in resilience projects and green infrastructure, further adaptation measures are still needed. Adaptation policies should take into consideration the difference in risk exposure and need between communities, creating equitable solutions for the full range of our neighborhoods and residents. These policies should also be informed by the development of a robust toolkit to support stakeholders pursuing informed and sustainable land use, infrastructure, and development measures.

1. Coordinate citywide emergency planning with regional, state, and federal agencies, in alignment with the Emergency Operations Plan and the Hampton Roads Hazard Mitigation Plan.

a. Evaluate after-action reports to gauge response times and isolate areas for improvement following emergencies.

b. Enhance the City's ability to provide residents with timely information and mitigative actions, both prior to and during emergent events.

c. Support the Department of Emergency Management's efforts to implement its Short-Term/Intermediate Recovery Plan and Long-Term Pre-Disaster Recovery Framework, which provide an organizational framework and proactive guide by which the city and its partners can begin an effective recovery to any incident or catastrophic disaster in Norfolk.

2. Support the implementation of the *Resilient Norfolk Coastal Storm Risk Management (CSRM)* Project, which will reduce the city's risk from coastal flooding and damage from nor'easters, hurricanes, and other significant storm events.

> *Resilient Norfolk Coastal Storm Risk Management (CSRM): includes structural, property-specific, non-structural, natural and nature based features such as storm-surge barriers, floodwalls, levees, home elevations, oyster reefs and living shorelines, to mitigate flooding from major coastal storms.*

3. Complete and implement strategies to **manage urban water within the city**, within the floodplain, and at the city edge through efforts such as the Stormwater Design and Construction Manual, Floodplain Management Plan, and the Coastal Storm Risk Management (CSRM) project.

4. Explore a range of options to **address properties that are subject to recurrent flood events** or future sea level rise.

a. Programs may include a *Transfer of Development Rights* program, funds for voluntary buyouts, and elevating homes out of the floodplain, directing growth toward locations with reduced flood risk.

> *Transfer of Development Rights (TDR) is a process where property owners can move development rights from protected or environmentally sensitive sending areas, encouraging resilient, sustainable growth in receiving areas. This zoning mechanism allows landowners to preserve nature and water quality while directing new development to areas better suited for it, in line with local resilience and biophilic goals.*

b. Longer term strategies to explore include reinvesting revenue from new developments into climate initiatives, sustainable development, and transit.

Elevated coastal homes (WRT)

5. Continue to implement programs that maintain and further **improve the City's rating** in the National Flood Insurance Program's Community Rating System.

6. Continue improvements to the **stormwater management system** and provide regular maintenance of features; continue inspecting structures to ensure compliance with state permit requirements.

a. Prioritize public spaces and large facilities for improved stormwater management, effectively reducing runoff.

b. Explore Stormwater Management Fee reduction credits for new developments that implement *groundwater recharge* at the individual site scale.

Groundwater recharge is a process where rainwater or treated water soaks into the ground and refills underground aquifers, helping maintain water supplies, reduce flooding, and support healthy ecosystems. The process involving replenishing underground aquifers through methods like injecting highly treated wastewater or retaining stormwater via biophilic-designed systems is essential to mitigate subsidence, saltwater intrusion, and support water resilience.
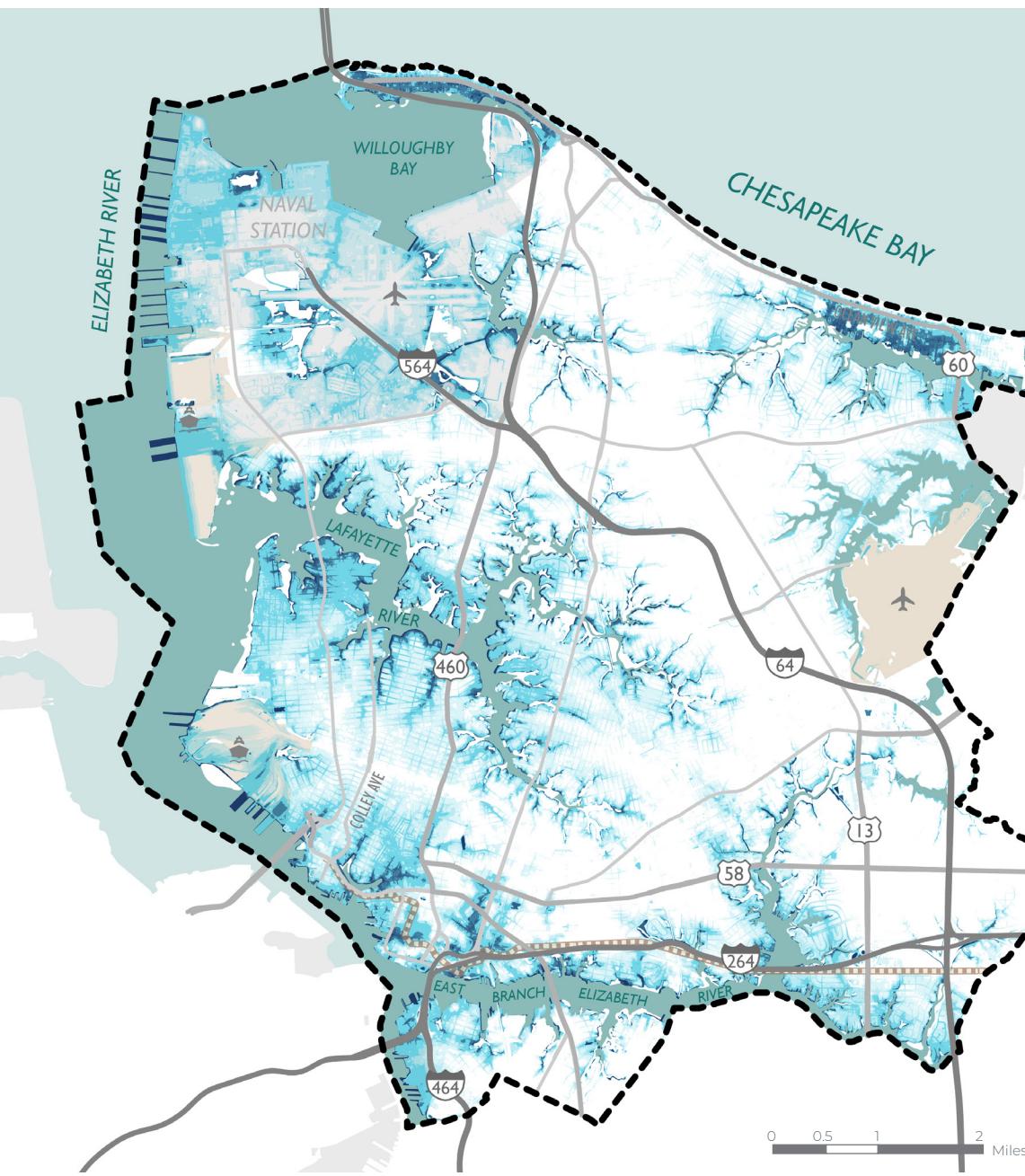
BEST PRACTICES:

NJDEP STORMWATER REQUIREMENTS FOR GROUNDWATER RECHARGE, NEW JERSEY

The State of New Jersey's groundwater recharge requirements protect aquifers by requiring that either the pre-development groundwater recharge volume be maintained, or that the increase in runoff volume from the site's post-development 2-year storm be infiltrated.

NJDEP Groundwater recharge vegetated swale (Princetonhydro)

Figure 10: Future Coastal & Tidal Flood Risk

Source: City of Norfolk; NOAA, 2022

COASTAL FLOOD RISK
- 100-yr storm with SLR 1.44 ft, 2050
- 100-yr storm with SLR 2.82 ft, 2080
- 100-yr storm with SLR 4.2 ft, 2100

TIDAL FLOOD RISK
- 100-yr storm with SLR 1.44 ft, 2050
- 100-yr storm with SLR 2.82 ft, 2080
- 100-yr storm with SLR 4.2 ft, 2100

- City limits
- Military
- Seaport/Airport
- Light rail
- Water
- Wetlands

7. Protect the city's **existing public potable water supply** infrastructure by assessing and planning for groundwater impacts and risks, such as saltwater intrusion.

8. Incentivize development by reducing *Resilience Quotient (RQ)* requirements in low-risk areas.

9. Explore **funding mechanisms** to implement neighborhood protection and flood improvements (e.g., dune management, beach replenishment/renourishment, channel dredging, benefit water quantity banking/market-based incentives, etc.).

BEST PRACTICES:
STORMWATER RETENTION CREDIT TRADING PROGRAM, WASHINGTON, D.C.

Washington D.C. implemented its Stormwater Retention Credit (SRC) trading program in 2013 as part of a comprehensive approach. The program, established through stormwater regulations, requires all new developments and major renovation projects to install green infrastructure to retain stormwater on-site, or purchase SRCs to meet all or part of their stormwater retention requirements off-site.


Washington DC Mount Olivet rain garden (Matt Kane)

BEST PRACTICES:
CLIMATE RESILIENCE FUND IN SEAPORT DISTRICT, BOSTON, MA

The Boston developer-funded Climate Resiliency Fund in Seaport District uses land value capture as a mechanism for stacking financing for resilient infrastructure in a high land value area of Boston that still has development opportunities.
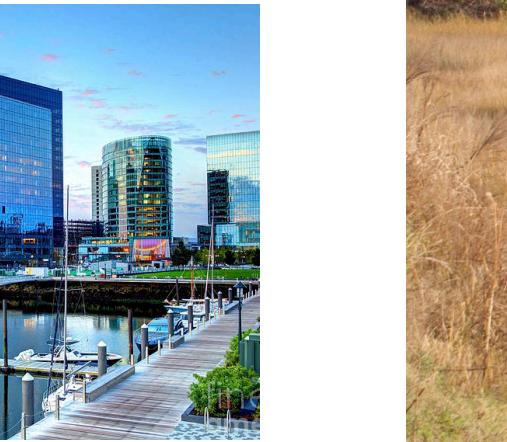
Boston Seaport district (Denis Tangney Jr)

GOAL 4:

Integrate Resilience and Sustainability in Capital and Infrastructure Planning

Incorporate best practices in energy, resilience, and sustainability in city infrastructure, and develop a pipeline of resilience plans and projects at all scales that leverage a diverse range of funding sources.

Through tools encompassing public works and private incentives, Norfolk's resilience initiatives can benefit all current and future stakeholders. Planning and sustaining resilient infrastructure and capital improvements will need to be responsive to a variety of future funding, energy, and climate scenarios.

1. Strengthen infrastructure and apply best practices for long-term **sustainability, diversity of energy, and redundancy.**

a. Reduce energy consumption through the application and promotion of energy efficient design features and technologies.

b. Encourage new infrastructure to be built to minimum requirements to ensure that it will meet the needs of communities during their entire lifespan, considering future climate conditions.

c. Continue to prioritize maintenance and upgrade needs of existing critical infrastructure and public utilities.

d. Explore the incorporation of green and blue roofs and walls into public buildings wherever possible.

e. Encourage the use of solar on municipal and school facilities.

2. Support the City's **Commercial Property Assessed Clean Energy (C-PACE) program**, which enables owners of multifamily, commercial, and industrial properties to obtain low-cost, long-term financing for energy efficiency, renewable energy, water efficiency improvements, resiliency, and stormwater management projects.

3. Continue efforts to **expand clean energy options** and upgrades in city-owned buildings and facilities (e.g., Better Buildings Challenge), such as replacing city equipment with energy efficient upgrades when equipment is refreshed (LED lights, HVAC, etc.).
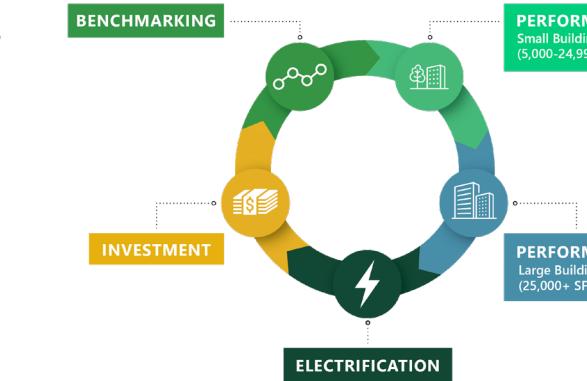
4. Advocate for policy changes in the building code that **promote diversity of energy** and redundancy of options.

BEST PRACTICES:

DENVER BUILDING CODE UPDATES, DENVER, CO

By 2027, Denver is requiring that 50% of all new space and water heating needs to be accomplished with electric heaters, and that air conditioning units are replaced with units that can both heat and cool, like heat pumps.

BENCHMARKING

PERFORMANCE
Small Building
(5,000-24,999 SF)

INVESTMENT

PERFORMANCE
Large Building
(25,000+ SF)

ELECTRIFICATION

GOAL 5:

Support a Comprehensive and Coordinated Approach to Building Resilience

Build individual, citywide, and regional capacity to withstand external shocks or stresses and adapt to change.

Norfolk has been adapting to a changing climate with large scale flood protection, green stormwater infrastructure, and other public investments in our shared spaces. To ensure long-term sustainability and resilience, the City also supports and encourages opportunities for coordination with individual actors and property owners, as well as regional partners to pursue adaptation and sustainability measures.

1. Continue to participate in the development and implementation of the Hampton Roads Hazard Mitigation Plan to **address potential hazards on a regional basis** as well as floodplain management planning at the local and regional levels.

2. Continue to assess community needs for flood-related information and develop resources that **convey information to residents**, businesses, students, commuters, and other audiences in and around Norfolk (e.g., Norfolk's Program for Public Information (PPI) & Flood Insurance Coverage Improvement Plan (CP)).

3. Evaluate whether existing public facilities, as well as clustered private businesses and facilities, can serve as *"Resilience Hubs."*

A resilience hub is a community-serving facility, equipped to provide social services, resources, information, and a safe gathering place before, during, and after emergencies. These hubs help neighborhoods prepare for and recover from storms and climate impacts, advance equity, and support city resilience goals with sustainable energy and nature-based stormwater management interventions.

BEST PRACTICES:

COMMUNITY RESILIENCY HUBS, BALTIMORE MD

Baltimore's network of non-profit and faith-based community organizations are key partners in providing resilient spaces and services in the case of emergency or disaster. 18 Hubs throughout the city create spaces for residents to receive food, water, and charging capabilities, and serve as staging areas for supplies.

Baltimore Resiliency Hub (Maryland Energy Administration)

4. Consider designating *"Resilience Districts"* that can be eligible for targeted infrastructure and resilience projects to consolidate existing efforts.

A Resilience District is a geographically defined area implementing coordinated strategies to address flooding and climate risks while enhancing ecological and community health and improving environmental sustainability, economic and social resilience. These districts create safer, healthier, and more adaptable neighborhoods for the future by ensuring adaptive, equitable resilience planning across public and private sectors.

LOCAL SUCCESS:

NORTH COLLEY ECODISTRICT

The Elizabeth River Ryan Resilience Lab, opened on June 1, 2024, serves as a community space for education in resilience and headquarters of Elizabeth River project. It has catalyzed the formation of an EcoDistrict along North Colley Avenue - collaboration with local community, academic institutions, and the city aimed at securing funding for resilient revitalization of the neighborhood and mitigating the risks of displacement.

The Elizabeth River Ryan Resilience Lab

5. Provide citizens with pathways to adapt to changing **risks at the parcel level** (e.g., *Retain Your Rain*, Celebrate Trees, SolSmart, etc.).

Retain Your Rain is an initiative by the City of Norfolk to encourage residents to reduce the amount of rainwater that goes into street drains and underground pipes by capturing it with small-scale green infrastructure at home, including rain gardens and help mitigate flooding.

6. Create incentives for tree planting by citizens and businesses.

7. Expand existing recognition programs for **community tree planting** projects to include categories for businesses, religious institutions, schools, and others.

8. Seek new **community partners** to provide guidance, support, and grant cost-sharing to private property owners in areas of the city not served by current community environmental organizations.

9. Partner with local nonprofit groups to encourage residents to **plant "3Bs" (birds, bees, butterflies) pathways** and add more information to the city website about the importance of habitat.

10. Use schools and parks as **demonstration sites** for low impact development, including constructed and natural green infrastructure, and continue to engage students as designers.

11. Encourage building owners to **retrofit existing roofs** for stormwater treatment.

12. Expand or create volunteer programs to **maintain** the aesthetics and health of green infrastructure projects.

13. Work with local land trusts, such as the Coastal Virginia Conservancy, to champion the **preservation of land for public recreation and education.**

14. Work with varied marine stakeholders (e.g. recreation and industrial users) to help **resolve potential conflicts** in waterways and along waterfronts.

a. Consider, implement, and manage No Wake Zones in areas of public or ecological sensitivity.

15. Encourage residents and businesses to work with local nonprofit groups to protect or **expand wetlands on private property.**

16. Coordinate with Norfolk Public Schools to promote and facilitate opportunities to incorporate **nature-based curriculum.**

17. Explore opportunities for additional collaboration with the HRPDC to **address regional energy** and sustainability needs, such as the creation of a new committee.

18. Incentivize **water reuse in private development** to reduce the amount of water withdrawn from the Potomac Aquifer and bolster water supply reliability.

BEST PRACTICES:

DOMINO DISTRICT WATER REUSE, BROOKLYN, NY

At the Domino Sugar Redevelopment Project, rainwater captured on site is treated before reuse in non-potable applications such as toilet flushing, water tower cooling, and irrigation. This serves to both reduce the carbon footprint of operations while also increasing the resiliency of the building's water supply.

Domino Park (Barrett Doherty)

Embracing Nature:
Putting Actions in Place

Norfolk's low-lying neighborhoods face some of the city's greatest climate challenges, but they also present a powerful opportunity to lead with resilience. Through targeted investments in nature-based infrastructure, risk-informed planning, and community-driven adaptation, Norfolk can protect our most vulnerable areas while creating a wide range of additional benefits, for residents and nature alike.

By expanding public access to the waterfront, restoring natural systems, and integrating green and blue infrastructure across all scales - from household rain gardens to regional stormwater networks - our city can embrace its identity as a water city. In doing so, Norfolk will not only adapt to a changing climate, but set a new standard for living in harmony with it.

Public water access infrastructure (WRT)

Where in the city could these ideas go? ?

2.4 Encourage **community amenities at waterfront ROWs** like lighting, benches, trash cans and boardwalks.

2.7 Develop natural **blue and green corridors,** or blue belts network of nature-based infrastructure that prioritize native plants, habitat corridors and wetland restoration

2.8 Locate new **"spongy" parks** and public spaces in areas prone to stormwater flooding to provide storage for runoff and mitigate floods in extreme rainfall.

1.13 Pursue opportunities to r**esurface buried creeks** to expand channel capacity and provide natural amenities.

2.2 Support **continued public access** along shorelines and waterfronts in the form of promenades, piers and parks

3.4 Explore programs to **address recurring flooding** (eg: elevating homes, voluntary buyouts, Transfer of Development Rights)

2.6 **Develop coastal infrastructure as a waterfront amenity**, including blue parks, living shorelines, and waterfront trails.
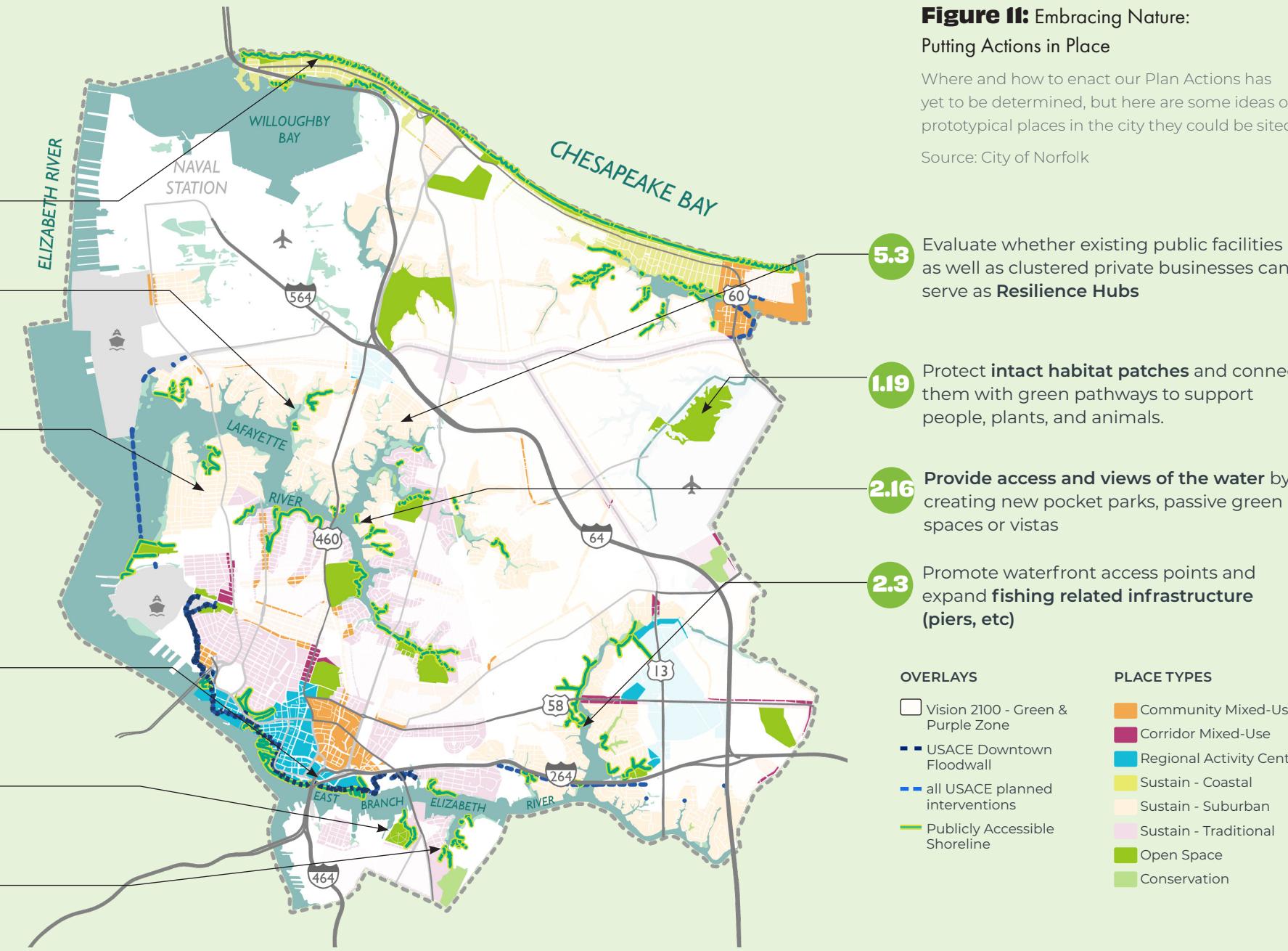
Figure 11: Embracing Nature: Putting Actions in Place

Where and how to enact our Plan Actions has yet to be determined, but here are some ideas of prototypical places in the city they could be sited.

Source: City of Norfolk

5.3 Evaluate whether existing public facilities as well as clustered private businesses can serve as **Resilience Hubs**

1.19 Protect **intact habitat patches** and connect them with green pathways to support people, plants, and animals.

2.16 **Provide access and views of the water** by creating new pocket parks, passive green spaces or vistas

2.3 Promote waterfront access points and expand **fishing related infrastructure (piers, etc)**

OVERLAYS

▢ Vision 2100 - Green & Purple Zone

▪▪ USACE Downtown Floodwall

▪▪ all USACE planned interventions

— Publicly Accessible Shoreline

PLACE TYPES

▮ Community Mixed-Use

▮ Corridor Mixed-Use

▮ Regional Activity Center

▮ Sustain - Coastal

▮ Sustain - Suburban

▮ Sustain - Traditional

▮ Open Space

▮ Conservation