

# HOME PLACE

A Conversation Guide for the Windsor Community,  
Rebuilding After Hurricane Matthew.



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# EXECUTIVE SUMMARY

*Homeplace* is the result of interdisciplinary work by NC State University College of Design faculty and students, managed through the Coastal Dynamics Design Lab.

It reflects the combined expertise of NC State architects, graphic designers, and landscape architects who have applied best practices in design and planning to the development of architectural and landscape architectural typologies that reflect local character and history while building the future social and physical resilience of flood-prone communities.

This project is part of the Hurricane Matthew Disaster Recovery and Resilience Initiative, led by the Coastal Resilience Center, a U.S. Department of Homeland Security Center of Excellence.

## **COASTAL DYNAMICS DESIGN LAB (CDDL)**

The mission of the CDDL is to organize and lead transdisciplinary research and design teams to address critical ecological and community development challenges in vulnerable coastal regions, with a concentrated focus on the mid-Atlantic seaboard. The CDDL is operated within the NC State College of Design and works collaboratively with scientists, local stakeholders, and the professional design community to create innovative, sustainable, adaptable, and resilient design solutions that address the environmental and human needs of coastal communities.

## **COASTAL RESILIENCE CENTER (CRC)**

The mission of the CRC is to conduct research and education that enhance the resilience of the nation's people, infrastructure, economies, and natural environment to the impacts of coastal hazards, including the effects of future climate trends. The CRC is a consortium of universities, private companies, and government agencies focused on applied research, education, and outreach. The University of North Carolina at Chapel Hill (UNC-CH) leads the CRC.

# EXECUTIVE SUMMARY

## HURRICANE MATTHEW DISASTER RECOVERY AND RESILIENCE INITIATIVE (HMDRRI)

The primary focus of the HMDRRI is to provide six hard-hit communities with the technical assistance needed to address issues typically uncovered by post-disaster programs. Priorities identified by participating communities include the development of disaster recovery plans; the development and implementation of a housing relocation strategy; the creation of open space guidance; and the flood retrofit of historic downtowns. Other issues continue to be identified during the planning process and through ongoing dialogue with residents, community officials, and others. The HMDRRI is a project of the North Carolina Policy Collaboratory.

## HOMEPLACE: A CONVERSATION GUIDE FOR THE WINDSOR COMMUNITY, REBUILDING AFTER HURRICANE MATTHEW

*Homeplace* supports the efforts of the HMDRRI by providing Windsor residents with a menu of high-quality, community-specific designs and strategies at multiple scales, resulting in a coordinated post-disaster rebuilding effort that strengthens communities in the long run. This guide's primary focus is residential renovation and construction. It offers strategies for application from the household scale to the community scale, along with consideration for broader community infrastructures, development patterns, and population trends. The ultimate goal is to build the local capacity of North Carolina's flood-prone communities, providing them with tools and with design, planning, and policy strategies to promote the long-term function, health, and vitality of their residents and neighborhoods.

## IMPLEMENTATION OF HOMEPLACE GUIDANCE THROUGH PLANNING

The recommendations in this guide will be woven into participating communities' long-term recovery plans, allowing for the integration of these conceptual plans into a more operational set of actions tailored to each community.

# **USING THIS GUIDE**

This guide is for you, the residents of Windsor affected by flooding after Hurricane Matthew. It is designed to help inform your decisions as you and your community rebuild.

The guide will define important terms and principles that are driving the local, state, and federal rebuilding efforts.

It will provide you with high-quality, locally distinct options for the redesign or rebuilding of your house, along with design strategies for your yard, street, and community greenspaces. All of the designs work together toward the creation of responsive and resilient spaces that reflect local history and character.

The guide will also explain and illustrate key factors that you might consider when making decisions about how and where to rebuild your home—including accessibility, curb appeal, affordability, comfort, efficiency, and flexibility.

The Resources section at the back of this guide lists URLs that will connect you to additional information about building and flood-mitigation strategies at the house, neighborhood, and community scales. The Glossary provides definitions of flood- and design-related terms that you are likely to encounter in this guide and in other disaster-recovery materials.

If you are looking at this document digitally, you can click on links in the main text area to help direct you to specific points. To navigate back to the main sections, click on the links in the bottom right section of this document. You may also scroll through as you would a regular document—up and down, left and right.



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# HOMEPLACE

“

*When the money runs out, the anger subsides, the grief abates, we return—chastened, sated, or exultant—to that place of contentment, be it shack, castle, or hammock. North has a synonym, if not a definition, in the compass of our souls: The needle always points toward a homeplace.*

”

## Susan Stafford Kelly

“Home + Place = Homeplace. Or Not.: The multiple meanings of a single word.”

Our State Magazine, November 26, 2014

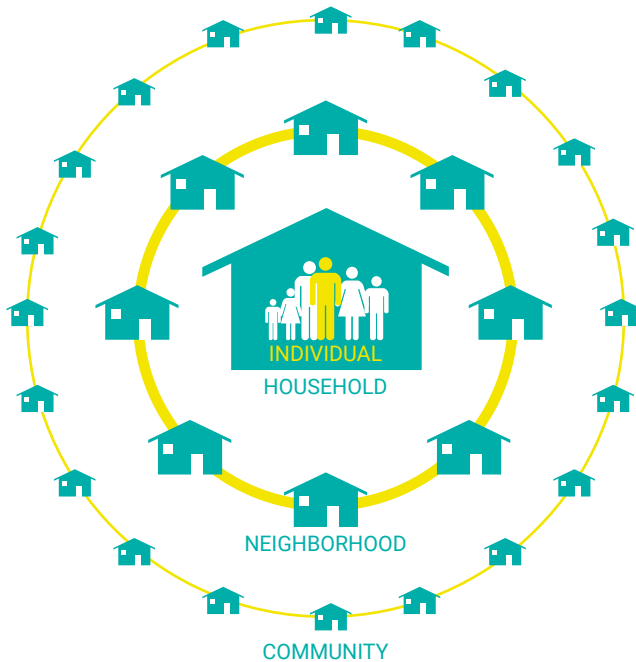
Accessed via:

<https://www.ourstate.com/homeplace/>

*Homeplace* is a term used across North Carolina to describe the place-based forces that cause people to form connections to their buildings, spaces, and landscapes. Homeplace cannot be reduced to any single element of a property or its architecture. Instead it hints at the intangible web of social, cultural, and environmental relationships that give a place meaning. It acknowledges that good design and good construction can only go so far: They set the stage for the community interactions and local expressions that make a place home.

In the development of this guide, homeplace helped to generate design approaches that reflect the distinct history, character, and attitudes of Windsor. It also was identified as a means of communicating the potentially significant roles that buildings, landscapes, and communities could play in disaster recovery, to include addressing the challenges and opportunities associated with the relocation of flood-prone housing.

# SCALES OF HOMEPLACE



Homeplace is expressed in different scales of the landscape. The first scale of homeplace is the **house and lot**—in this case, the property where a home was affected or will be built. The lot exists within a range of policies and decision-making structures that can determine costs and living standards for people facing the risk of recurring floods. Lots are the focus of careful analysis, planning, and design approaches that are meant to protect the health, safety, and wellbeing of people. The lot and the house are the primary unit whereby people create, sustain, and pass along intergenerational wealth, and it is the most common scale at which people maintain strong attachments to places.

The next scale of homeplace is the **community**. Ranging from an entire city to the group of friends and family relied upon in social networks, community for the purposes of this guide is place-based. Community can describe a neighborhood, a street, or any other defined unit where people regularly get to know and interact with each other in the landscape. Community is an important scale because it is the most important unit in disaster preparedness. Stronger communities respond better than weaker communities.

The last scale of homeplace is the **region**—in this case, eastern North Carolina, where intertwining cultural and ecological legacies are apparent in the identities and locations of cities and towns. Important considerations at the regional scale include development patterns—such as accelerating growth along the I-95 corridor at this region’s western edge—and watersheds, defined as the areas of land in which all the fallen water flows down to a common outlet, such as a stream or river. Watersheds generate the stormwater that causes flooding after major storm events, and the treatment and qualities of individual watersheds dramatically impact the ability of cities and towns to prepare for and withstand those events.



# RESILIENCE

“

*Improving the individual systems that make up a city will increase the resilience of the city overall. Resilient systems withstand, respond to, and adapt more readily to shocks and stresses to emerge stronger after tough times, and live better in good times.*

”

100 Resilient Cities—Pioneered by the Rockefeller Foundation

Accessed at:

<http://www.100resilientcities.org/resilience>

Resilience is a term used across the world to describe the 21st-century efforts of communities to overcome environmental, economic, and social challenges that stretch their capacity to survive and to thrive. The strategies in this guide are meant to build the physical and social resilience of Windsor and other eastern North Carolina communities.

After a natural disaster, it is easy to hone in on a community’s ability to ensure the physical safety of its residents and to prevent the destruction of its buildings, streets, bridges, and utilities. These are all examples of physical resilience. This guide addresses physical resilience through design and planning strategies such as land conservation, watershed management, place-based design, and the use of site-appropriate construction methods and materials.

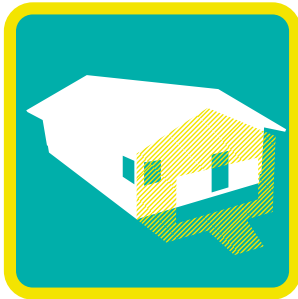
The guide also addresses social resilience. Communities are better equipped to withstand disaster when they have strong social networks, and when their capacity is not eroded by daily stresses such as poverty and high unemployment. The built forms of a community—its houses, yards, and streets—can be designed to afford social interactions that build broader social cohesion. A well-designed greenway can both prevent flooding and promote economic development and community identity. By offering interconnected strategies for good design at the lot, community, and regional scales of homeplace, this guide offers a starting point for resilient rebuilding in Windsor and other rural, flood-prone communities in eastern North Carolina.

# HOMEPLACE + RESILIENCE: THE ROLE OF DESIGN

This guide seeks to help Windsor and other eastern North Carolina communities build resilience through a place-based design and planning approach that reflects local people and traditions. The ultimate goal is the creation of physical spaces that promote individual and community **health and wellbeing**, **history and heritage**, and overall **quality of life**.

Design is the means by which these goals are translated into on-the-ground results and new lived realities for residents of Windsor. This guide provides a series of concrete strategies and templates for the construction of high-quality structures and landscapes that set the stage for community-driven regeneration and placemaking.

The following principles are applied throughout this guide, to designs at the house, yard, street, community, and regional scales.



## **ACCESSIBILITY:**

All places should serve the needs of all people, regardless of age or ability.



## **CURB APPEAL:**

Designs should vary and should reflect the distinctive and longstanding aesthetic traditions of eastern North Carolina communities.



## **AFFORDABILITY:**

Designs should provide high-quality construction and materials at a price that is affordable for eastern North Carolina residents, in the short and long term.



## **EFFICIENCY:**

Designs should make use of materials and methods that ensure the short- and long-term efficiency and sustainability of structures and landscapes.



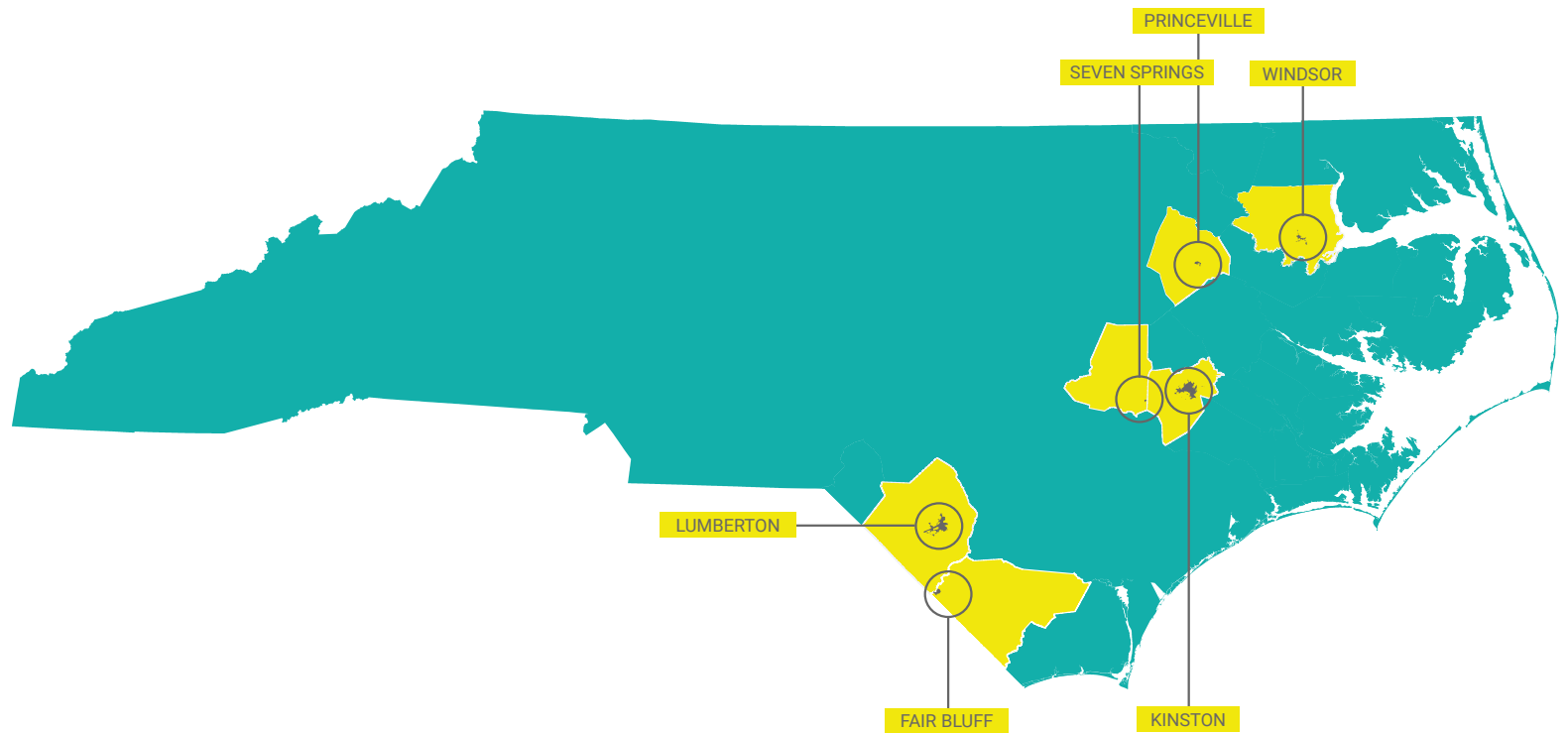
## **FLEXIBILITY:**

Designs should be varied and flexible to meet the current and future needs of residents and communities.

# THE SIX COMMUNITIES

This guide is one of six that were developed for communities affected by flooding after Hurricane Matthew: **Fair Bluff, Kinston, Lumberton, Princeville, Seven Springs, and Windsor.**

These communities span eastern North Carolina, from the gently rolling hills of the state's southernmost coastal plains, to the sluggish rivers, backwaters, and hardwood forests of the riverine floodplains. The region's estuarine system—its rivers, sounds, and seas—shaped the earliest histories of its inhabitants. The rivers continue to act as arteries, connecting geographically distant, rural towns by way of a common heritage.





# THE SIX COMMUNITIES

These communities have distinct cultures and histories, which form the basis for the design strategies in this guide. The communities also have a lot in common.

- The earliest origins and enduring identities of these communities lie in their **connection to rivers** and the ability to earn a living from the water. Those same rivers bring destruction and trauma during times of flood.
- All six communities experienced a **large, contiguous area of flooding** after Hurricane Matthew. For the most part, flooding in these communities was not sporadic, but was concentrated in large areas that stretch back from the river for some distance.
- They all saw **major, identifiable sectors of their communities impacted** by flooding. In some cases the flooded area was not only the heart of the town; it was virtually the entire community.
- All six communities face the **prospect of losing a significant number of residents** and significant tax revenue if people are unable or unwilling to return and rebuild.

This guide offers design strategies that allow residents to stay, to rebuild, and to envision a future in which the river is once again an amenity, and the community at large is safe, beautiful, and prosperous.

In crafting this guide, we drew lessons from the successes and ingenuity of each of the six communities. From the treehouses of Windsor to the trail planning of Lumberton, great ideas are shared and tailored to fit new contexts.

# COMMUNITY SNAPSHOT

The six HMDRRI communities are the focus of state and federal rebuilding efforts in eastern North Carolina. This moment offers a critical opportunity to rebuild in ways that increase resilience and provide new economic opportunities.



## FAIR BLUFF

Pre-Matthew population of 859, and approximately 109 homes damaged by flooding.



## KINSTON

Pre-Matthew population of 21,540, and approximately 200 homes damaged by flooding.



## LUMBERTON

Pre-Matthew population of 21,721, and approximately 400 homes damaged by flooding.



## PRINCEVILLE

Pre-Matthew population of 2,188, and approximately 450 homes damaged by flooding.



## SEVEN SPRINGS

Pre-Matthew population of 76, and 47 homes damaged by flooding.



## WINDSOR

Pre-Matthew population of 3,652, and approximately 60 homes damaged by flooding.

# WINDSOR



When Windsor was founded in 1768, the Cashie River basin was bustling with political and commercial activity. The town's location on the Cashie made it an ideal regional center and a home to merchants who imported goods from England and exported regional tar, pitch, and turpentine. As the regional agriculture and lumber industries grew, so did Windsor's importance as a river port, and the town remained a vibrant center of trade until highways and automobiles became dominant in the mid-20th century.

Though Windsor today is seeking to reinvent itself, its long-running prosperity created a core district of houses, businesses, and civic buildings that reflect high-quality architecture spanning multiple styles and eras. This historic downtown district—and the people and business owners who live and work there—endured four major floods in a 17-year span.

If design, planning, and architectural strategies can protect Windsor from floodwaters, the Cashie River could again be the community's lifeblood, rather than its menace. Already the town has trails, treehouses, and boat rentals that allow easy access to the Cashie. Its proximity to the coast and to other inland river communities is an asset. If its homes and downtown can be protected, Windsor could again be a vibrant river town and an eastern North Carolina destination.



# WINDSOR

## SNAPSHOT

Windsor is located on the Cashie River in Bertie County. It is approximately 2.8 square miles in size, with a pre-flood population of 3,652. The median age in the area is 37. Windsor has a total of 1,115 housing units and a median home value of \$93,800. After Hurricane Matthew, almost 58 of Windsor's single-family homes were impacted by the floodwater—one was destroyed, 33 sustained major damage, and 24 had minor damage.



All figures are from the 2015 American Community Survey by the U.S. Census Bureau.

# WHY DOES WINDSOR FLOOD?



Photo by Christian Kamrath

## **LOCATION**

Much of Windsor lies within the 100-year floodplain. In other words, based on historical data about local rainfall and river levels, hydrologists predict that—without some form of protection—those portions of Windsor have a 1% annual chance of flooding.

It is important to note that this percentage is only based on statistical probability, so it is possible for multiple 100-year flood events to occur within a single year. Windsor could conceivably see three or more such floods in any given year.

## **CLIMATE**

There are several reasons Windsor might flood more often than officially predicted. One reason is the natural unpredictability of weather events—just because past data suggest an average flooding rate of once every 100 years, storms will not necessarily follow that schedule. Another reason is the changing climate. As major storm events become more frequent, so do major flooding events.

## **DEVELOPMENT**

One more reason for increased flooding in Windsor is the impact of land development, particularly in upstream areas of the Cashie River watershed. Increased land development typically means that vegetated areas are replaced by impervious surfaces, such as pavement and buildings.

This is a problem because vegetated areas capture and absorb rainfall, preventing it from entering nearby waterways. But when these absorptive, pervious landscapes are replaced with impervious surfaces, rainfall can no longer infiltrate into the ground. Instead it quickly accumulates and runs off more rapidly, entering waterways that feed other, larger waterways. The cumulative effect of that unabsorbed water leads to rising river levels.

# WHAT ARE FLOOD- PLAINS?

Floodway and floodplain map designations indicate which areas in a community are most likely to flood, and they are used to create and enforce policies related to development and flood insurance at the local, state, and federal levels.

## **FLOODWAY:**

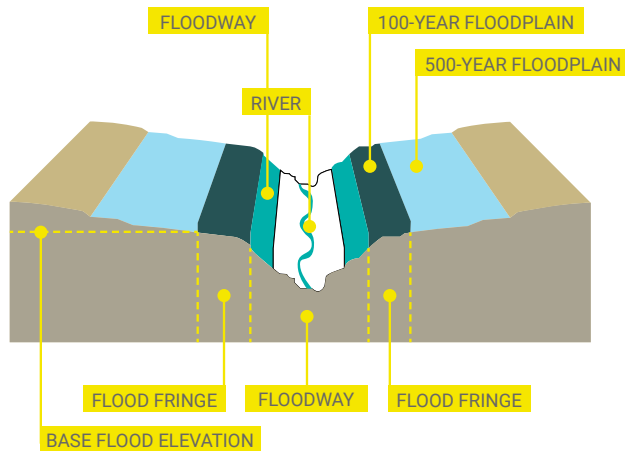
The channel of a river or other waterway, plus the land to either side that must remain undeveloped to accommodate typical fluctuations in river level.

## **100-YEAR FLOODPLAIN:**

The land beyond the floodway that, based on historical data about local rainfall and river levels, has a 1% chance of being inundated by river water in any given year.

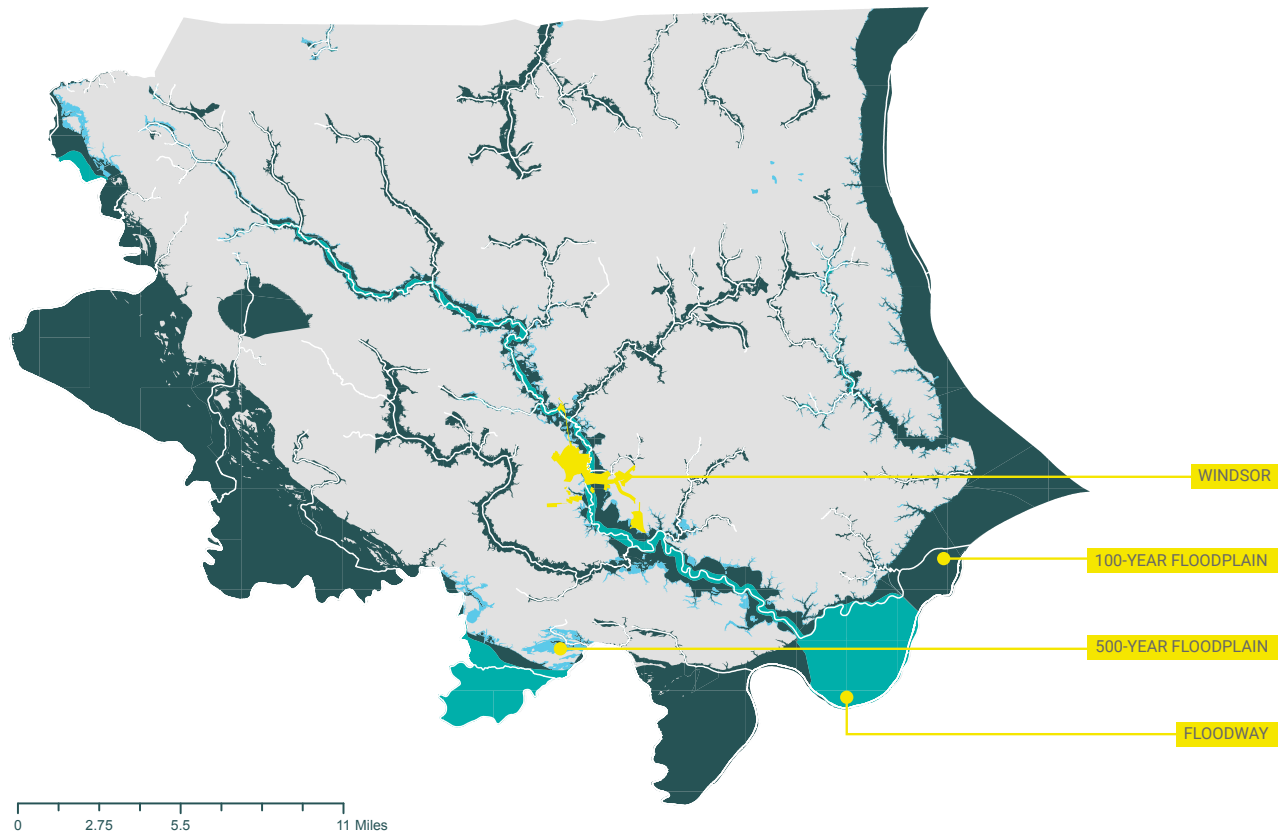
## **500-YEAR FLOODPLAIN:**

The land beyond the floodway and the 100-year floodplain that, based on historical data, has a 0.2% chance of being inundated by river water in any given year.



# BERTIE COUNTY FLOODPLAINS

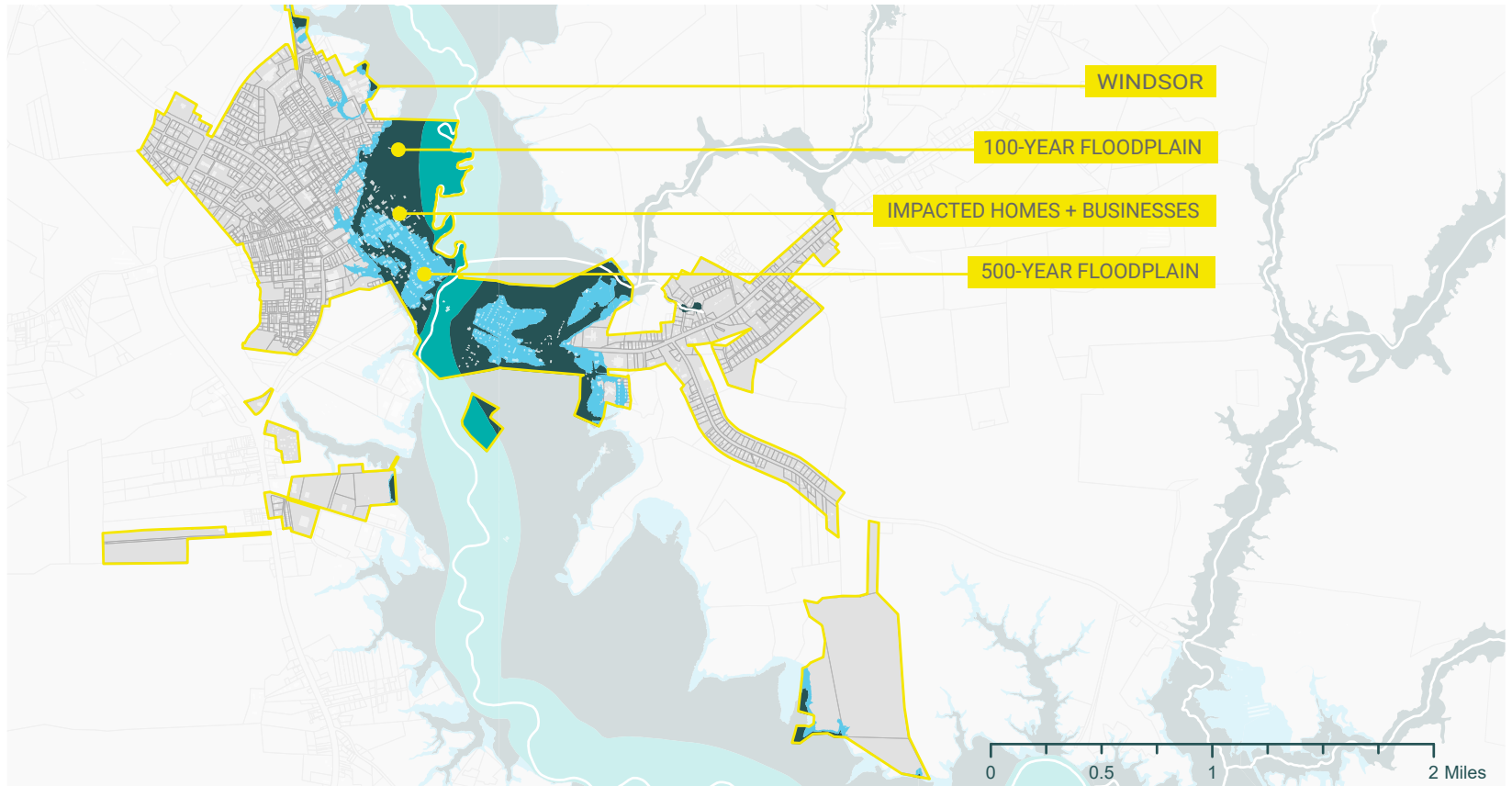
Bertie County is crisscrossed by waterways that make some communities more susceptible to flooding than others. Below is a map that shows floodway and floodplain determinations for the county. These areas are defined by a Flood Insurance Study, conducted for the federal National Flood Insurance Program (NFIP), overseen by FEMA.



# WINDSOR

# FLOODPLAINS

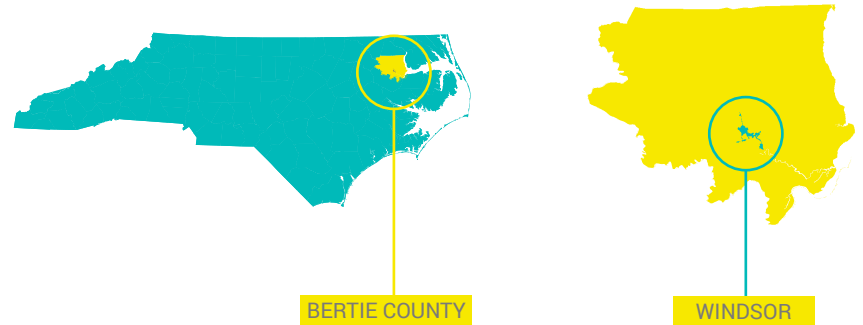
Large portions of Windsor are located within the 100-year floodplain. This map demonstrates the extent to which Windsor's houses, yards, streets, and communities are vulnerable to major flood events.



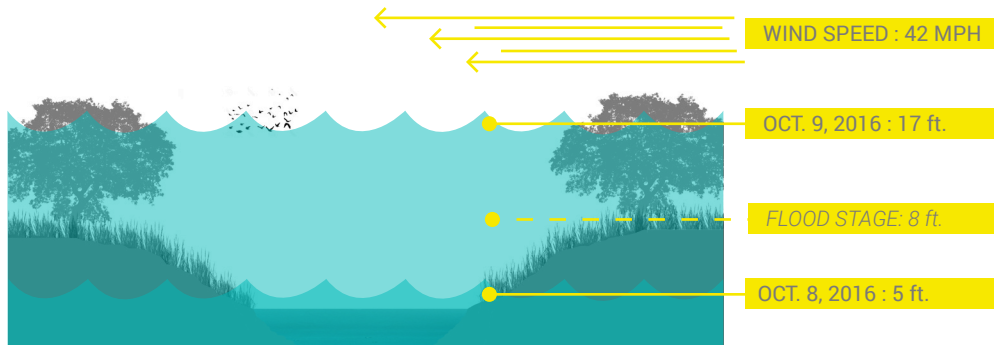
# WINDSOR

## EFFECTS OF

# MATTHEW



Windsor is situated on the Cashie River and has a total population of 3,652. Windsor is 2.8 square miles in area and is located in Bertie County.

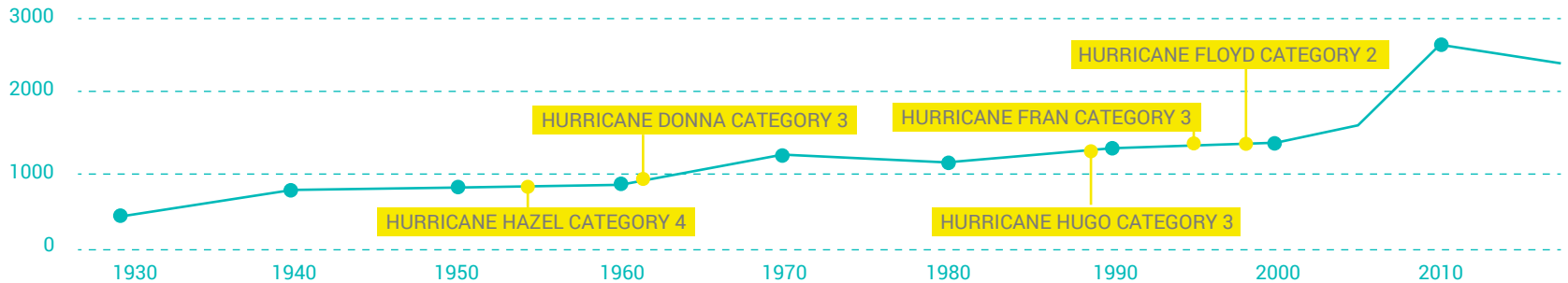


The above diagram demonstrates the changing river gauge height at the 'Cashie River at Windsor' station, as observed by the USGS in October 2016.



When Hurricane Matthew flooded Windsor, it was the sixth time Windsor has flooded since Hurricane Floyd.

This diagram shows the shifts in Windsor's population over time, along with the timing of some of the most destructive hurricanes to hit North Carolina.



# **RECOVERY + RESILIENCE**

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**Design can enable resilience at the scale of the house, yard, street, community, and region.** This guide gives careful consideration to the quality of homeplace in Windsor, and to the nature of the town’s challenges and its rich assets and opportunities. The following pages will guide you through a series of interconnected design strategies to help homeowners and the whole Windsor community to recover from Matthew and to **rebuild stronger.**

The first section will walk you through your options for rebuilding—whether you want to stay in place and elevate your house, or to relocate to a lot that is part of Windsor but out of the floodplain. The second section will show you how simple design decisions at the house, yard, and street scales—whether you’re staying in place or moving to a new neighborhood—can protect against flooding and bring neighborhoods together. The last section will offer a blueprint for how Windsor can take advantage of its river access, its unique history, and the housing buyout program to further protect itself from flooding while building an economic base that will make the community resilient and sustainable in the long run.

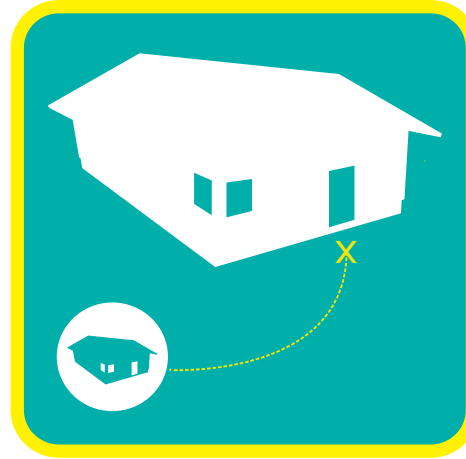
# BUILDING MORE RESILIENT HOMES

Design can enable **resilience** at the house scale to protect individual families from the threat of flooding. This section introduces house design and construction strategies to make your home stronger, and to give you and your family peace of mind.



# I WANT (OR WAS APPROVED) TO...

Relocation and elevation are two of the most common forms of FEMA- and state-funded hazard-mitigation and risk-reduction techniques. The choice to relocate or elevate can be one of the most important and stressful decisions faced by homeowners in flood-prone areas. This guide will walk you through your options.



## RELOCATE

In this scenario, the local government uses FEMA and state funds to purchase the home, demolish it, and turn the land into open space in perpetuity. Homeowners receive pre-disaster fair market value for their homes, and they move elsewhere.

**GO TO PAGE 24**



## ELEVATE

Before or after a disaster, homeowners can choose to have their current house elevated in place to meet the latest hazard safety standards. Safety standards and elevation options are explained in the following pages.

**GO TO PAGE 40**

# I WANT TO RELOCATE

## Where can I move?

For many property owners, the best solution might be to move to a site outside of the floodplain and to build new from the ground up. This is the primary solution for those who elect to participate in the buyout program, and it reduces the risk that your house will flood.

Part of the HMDRRI team's relocation strategy is to identify areas outside of the floodplain but within town boundaries where those pursuing a buyout may move. This would reduce flood risk while maintaining Windsor's tax base.

## What can I afford?

The cost of a house depends on many factors, including location, size, quality of materials and construction, complexity of details, site constraints, utility requirements, systems requirements, development and permitting fees, and general market and economic conditions. Housing affordability counseling can help those seeking to purchase a new home.

## What will my house look like?

The five house types in this guide are designed to fit comfortably into existing neighborhoods in Windsor or to form new cohesive, attractive neighborhoods. The styles, forms, materials, and details are contemporary, but they reference historical precedents from eastern North Carolina.

### FIVE HOUSING TYPES



BOGUE



CROATAN



PAMLICO

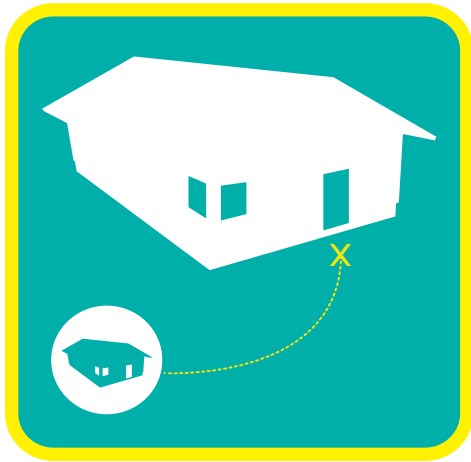


ALBEMARLE



CURRITUCK

# BUILDING A NEW HOUSE



## RELOCATE

Building a new house.

This guide provides several schematic designs for houses that are appropriate for many eastern North Carolina towns that are participating in the buyout program after Hurricane Matthew. These designs are not complete plans and do not provide adequate drawings for construction. They are intended, however, to provide residents and builders with examples of **resilient, affordable, efficient, flexible, and comfortable houses**. These house designs are inspired by historical examples from eastern North Carolina and are designed to respond to climate and weather conditions in Windsor. The houses have spacious and open interior plans that consider contemporary functional requirements. Street-facing porches provide outdoor living spaces and promote neighborhood interactions.

The next few pages describe the principles that drive all of the housing designs.

# RESILIENT

Houses in Windsor are exposed to severe weather conditions, particularly during the hurricane season from May to December. Intense weather that produces high winds and flooding poses difficult challenges for structures and sites, but resilient design strategies can mitigate damages.

The Federal Emergency Management Agency has published several guidebooks for resilient residential design and construction. See the Resources section of this guide for links to those materials.



## RESILIENT

The housing schemes in this guide incorporate the following techniques for resilient design and construction:

- Build with durable, low-maintenance materials that can withstand excessive winds and rain.
- Provide sufficient lateral structural bracing that is designed and approved by an engineer.
- Build with proper framing and connection details, including hurricane clips and corrosion-resistant fasteners.
- Use low-sloped roof designs, at a ratio between 3:12 and 6:12.
- Provide window protection such as hurricane shutters, or operable or removable solid panels.
- Build with materials and details that are easy for homeowners to maintain.

# **AFFORDABLE**

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# **+ EFFICIENT**

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The five house types are designed with proportions, dimensions, materials, and details that make the construction process efficient. Several key features are designed to increase the houses' performance and reduce energy consumption.



## **AFFORDABLE**

The five basic house types in this guide employ sound strategies to achieve affordability. Each house can be constructed with traditional wood framing techniques and clad with readily available, durable materials. The house forms are basic and elegant and are not complicated to build. Low-sloped roofs and single-sloped sheds can be constructed efficiently with manufactured trusses. As a group, the five house types provide a wide variety of options, but similar detailing between the various house types provides construction efficiency and repetition that can result in lower costs when assembled in volume.



## **EFFICIENT**

The compact schemes seek to minimize surface area and therefore reduce heat transfer through exterior walls. Ample windows provide daylight to interior spaces and reduce the need for electric lights. Roof overhangs, screens, and shading devices over windows reduce glare and temper sunlight. Porches provide temperate outdoor spaces. Operable windows with screens are arranged to allow cross-ventilation.

The houses can be equipped with high-efficiency HVAC units, ENERGY STAR rated appliances, and plumbing systems that regulate water flow. The houses can accommodate rooftop solar panels if site and budget conditions allow.

# **FLEXIBLE + ACCESSIBLE**

The five house types are designed to be flexible, to accommodate evolving needs of the homeowner and neighborhood. The houses make use of universal design principles, to allow access for people of all abilities and needs. Four of the five models in this guide are one-story schemes.



## **FLEXIBLE**

Most of the house models have several porch and entry options. The number of bedrooms and bathrooms can be increased to accommodate growing families or multi-generational living needs. Each model has multiple options for rooflines and exterior cladding materials to provide variety in appearance. Other flexible components include carports, screened porches, ramps, and decks. Many of the house types can be built with crawl space or elevated on piers.



## **ACCESSIBLE**

The houses are designed with appropriately scaled rooms, with open plans and spacious kitchen, dining, and living areas. Open floor plans eliminate many of the barriers that are associated with more traditional plans. Where possible, two dining options are included: a bar and space for at least a six-person table. Porches extend the social spaces to the outdoors. While bedrooms are modestly scaled, they are laid out with privacy and access to bathrooms in mind. Models that do not require excessive elevation can be built with wheelchair-accessible ramps. Houses that are elevated above three feet might require mechanical means of access such as a lift. Kitchen and bathroom plans allow for wheelchair turnaround space and can be equipped with cabinetry and fixtures that are accessible.

# CURB APPEAL

The five house types in the guide are designed to fit comfortably into existing neighborhoods in Windsor or to form new cohesive, attractive neighborhoods.



## **HOUSING STYLES**

The styles, forms, materials, and details are contemporary, but they reference historical precedents from eastern North Carolina. The porch faces the street and provides an open, welcoming appearance. The houses are designed with elegant proportions and functional details that give them character. Each house can be clad with a variety of durable materials such as lap siding and panelboard. Roofs are designed with affordable and long-lasting asphalt shingles, but they can also be clad with more expensive materials such as standing seam metal.



# HOUSING TYPES

There are five basic house types presented in this guide with multiple variations on each. The house models are named for some of North Carolina's well-known coastal sounds: the **Bogue**, **Pamlico**, **Albemarle**, **Croatan**, and **Currituck**.



## **BOGUE:**

A rectangular layout common in the region.

SEE PAGE 31



## **PAMLICO:**

A square layout featuring a large porch.

SEE PAGE 33



## **ALBEMARLE:**

A ranch house with an L-shaped plan.

SEE PAGE 35



## **CROATAN:**

A T-shaped layout with spacious living areas.

SEE PAGE 36



## **CURRITUCK:**

Two stories, for more space and larger families.

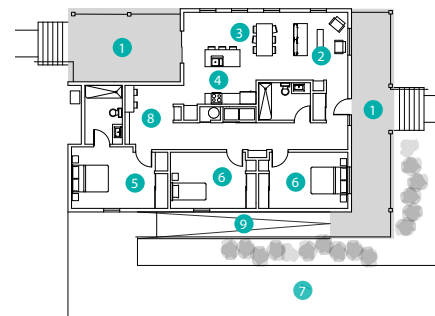
SEE PAGE 38





## BOGUE: TYPE 1

The Bogue plan features three bedrooms, a porch on the street side, and a porch off the dining room. Adjacent to the bedroom zone is a den/workspace with room for a desk and shelving. This house is designed to be built with or without accessibility features, such as wheelchair ramps, depending on the needs of the residents.



- 1 Porch
- 2 Living
- 3 Dining
- 4 Kitchen
- 5 Master bedroom
- 6 Bedroom
- 7 Driveway
- 8 Den/workspace
- 9 Ramp

### DETAILS

1500 SQ. FT

3 BEDROOMS

2 BATHROOMS

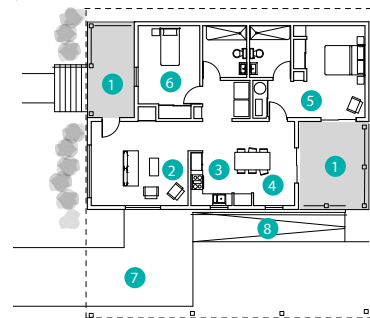
FRONT + BACK PORCH





## BOGUE: TYPE 2

This version of the Bogue plan includes two bedrooms and two baths. Its spaces are generously proportioned to accommodate family living. The bedroom zone is separated from the open living spaces to provide privacy. Covered porches are located on the front and back of the house. This house is designed to be built with or without accessibility features, such as wheelchair ramps, depending on the needs of the residents.



- 1 Porch
- 2 Living
- 3 Kitchen
- 4 Dining
- 5 Master bedroom
- 6 Bedroom
- 7 Carport
- 8 Ramp

### DETAILS

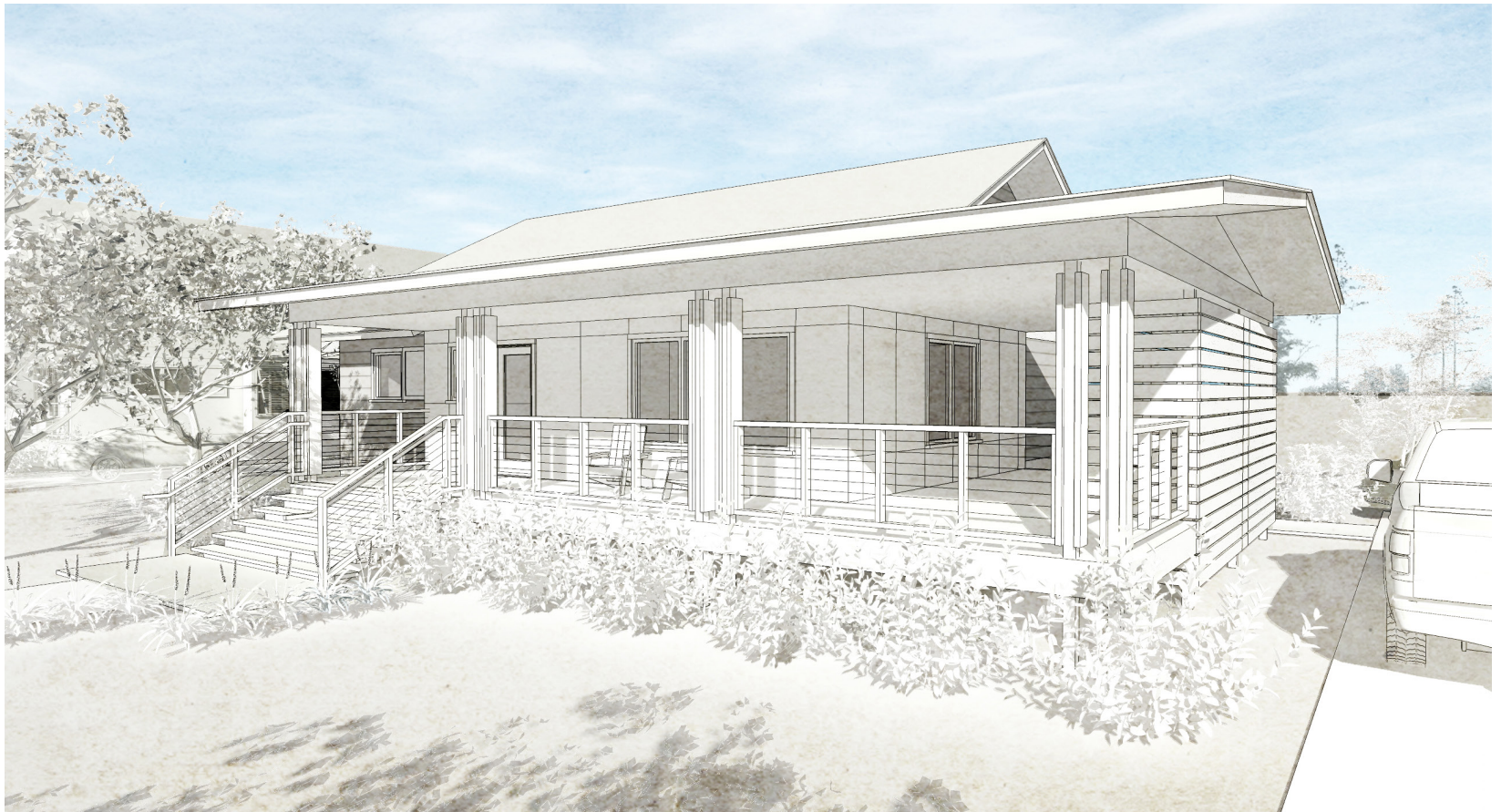
1300 SQ. FT

2 BEDROOMS

2 BATHROOMS

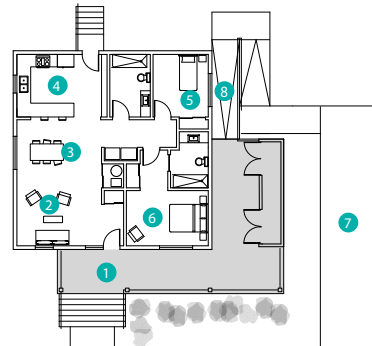
FRONT + BACK PORCH





## PAMLICO: TYPE 1

The Pamlico is a two-bedroom, two-bathroom house. One side of the house contains an open kitchen, dining, and living space. The other side contains bedrooms, bathrooms, and a full laundry closet. A generous front porch wraps the corner of the house to provide covered outdoor space and exterior storage space. This house is designed to be built with or without accessibility features, such as wheelchair ramps, depending on the needs of the residents.



- 1 Porch
- 2 Living
- 3 Dining
- 4 Kitchen
- 5 Bedroom
- 6 Master bedroom
- 7 Driveway
- 8 Ramp

### DETAILS

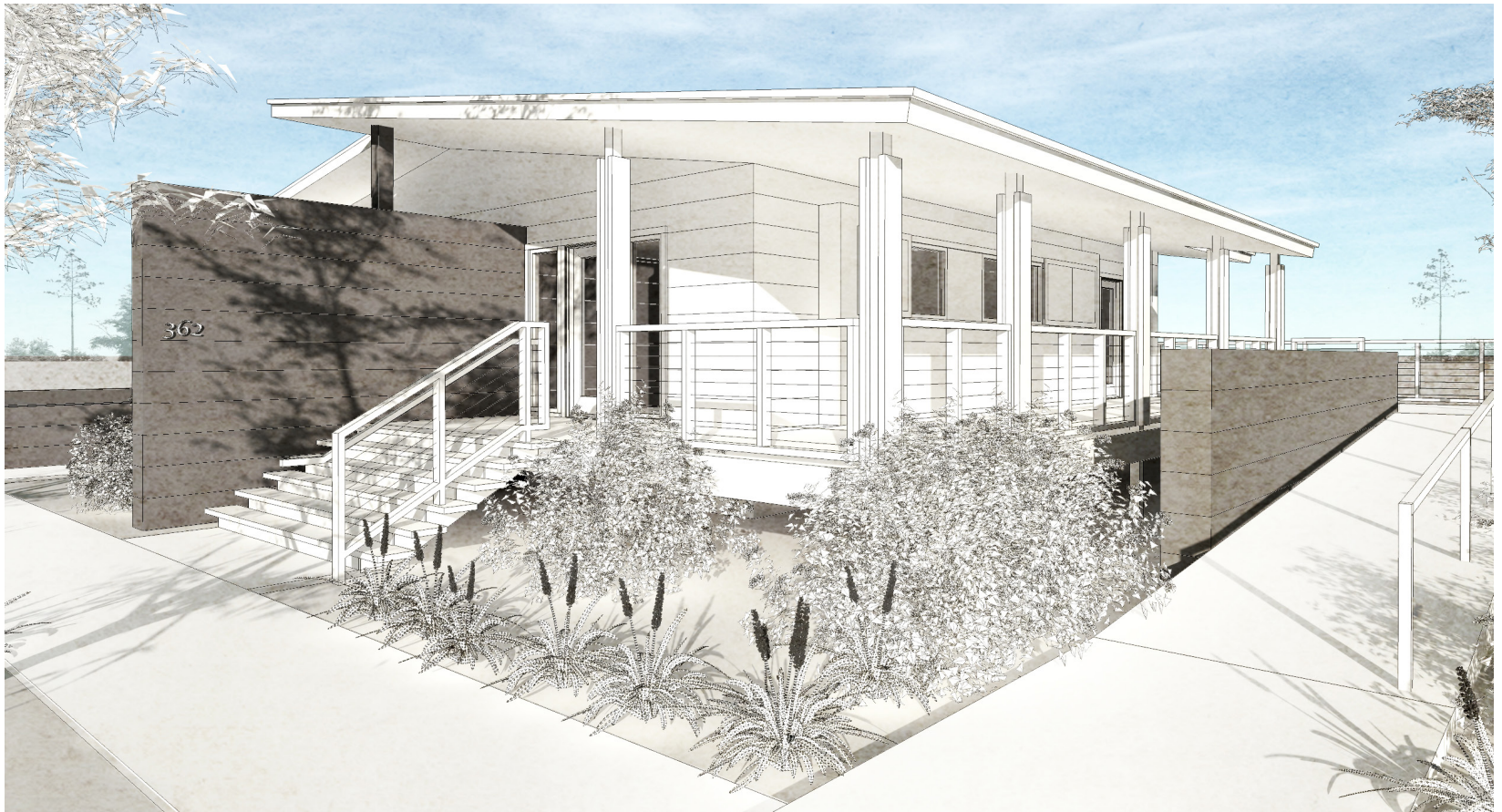
1300 SQ. FT

2 BEDROOMS

2 BATHROOMS

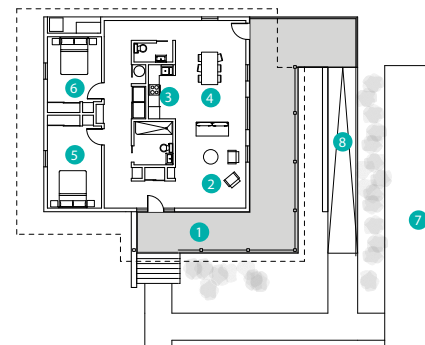
PORCH





## PAMLICO: TYPE 2

The Pamlico is a two-bedroom, one-and-a-half bathroom house. The core of the house contains the kitchen, bathrooms, and utilities. The core also separates the bedroom zone from the open living space. A covered porch on the corner provides shaded outdoor space. This house is designed to be built with or without accessibility features, such as wheelchair ramps, depending on the needs of the residents.



- 1 Porch
- 2 Living
- 3 Kitchen
- 4 Dining
- 5 Master bedroom
- 6 Bedroom
- 7 Driveway
- 8 Ramp

### DETAILS

1200 SQ. FT

2 BEDROOMS

1.5 BATHROOMS

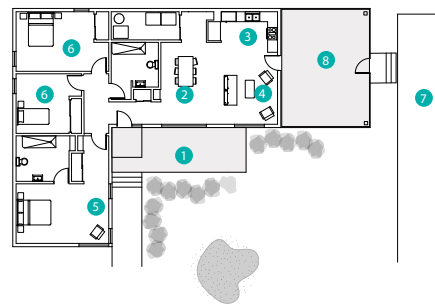
PORCH





## ALBEMARLE

The Albemarle house plan accommodates family living by featuring a bedroom wing connected to an open kitchen, dining, and living space. It includes a screened porch and prominent roof overhangs that reduce cooling needs in summer but allow natural light during the winter. This house is designed to be built with or without accessibility features, such as wheelchair ramps, depending on the needs of the residents.



- 1 Porch
- 2 Dining
- 3 Kitchen
- 4 Living
- 5 Master bedroom
- 6 Bedroom
- 7 Driveway
- 8 Screened Porch

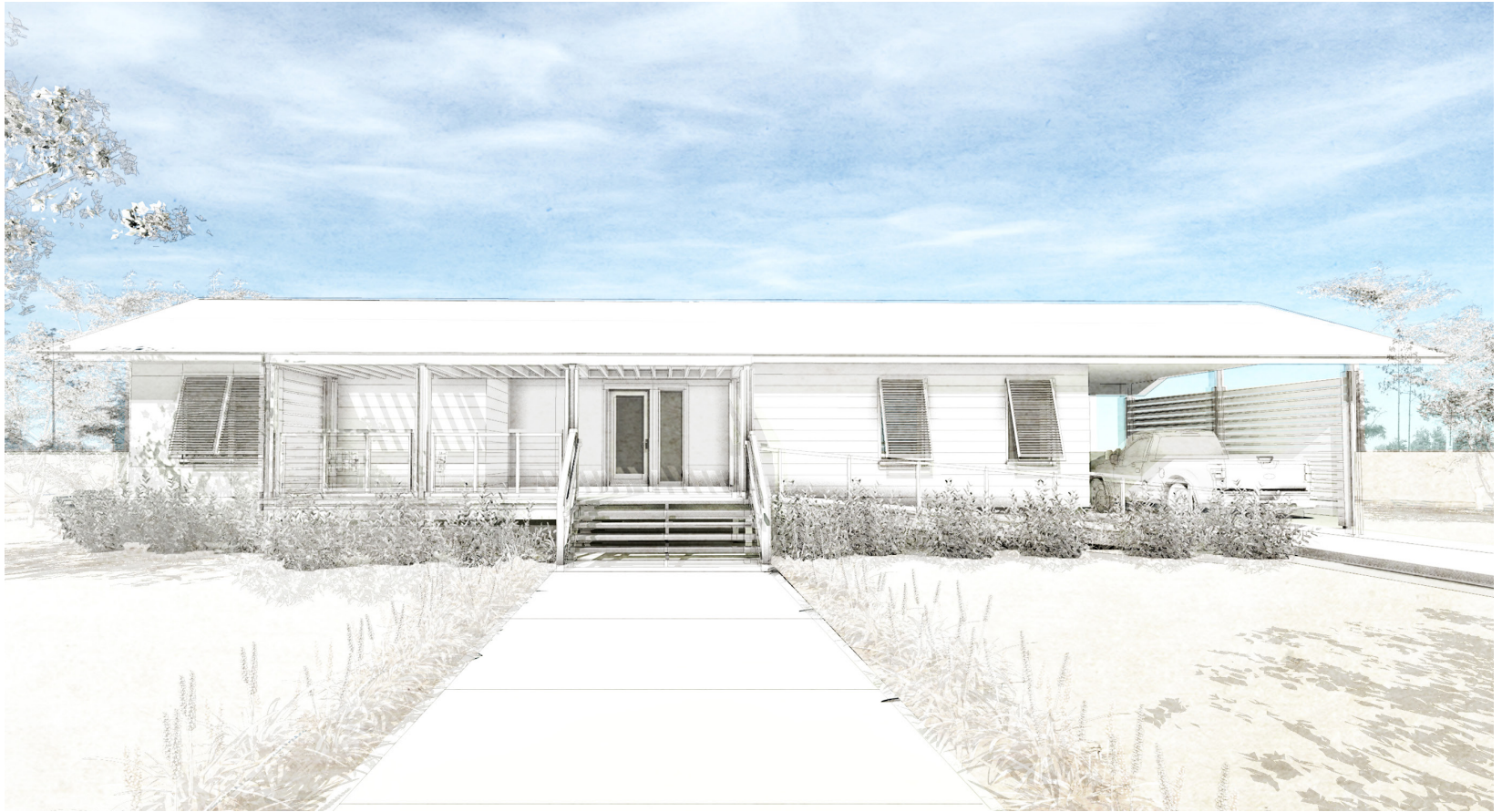
### DETAILS

1800 SQ. FT

3 BEDROOMS

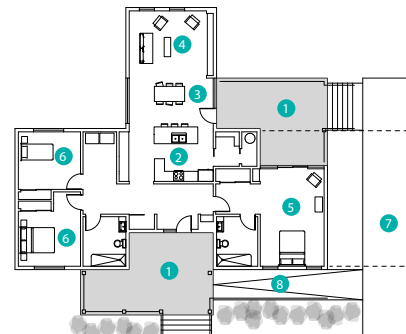
2 BATHROOMS

FRONT + SIDE PORCH



## CROATAN: TYPE 1

The Croatan plan is well-suited for family living. It has three bedrooms and contains generous living areas and storage space. The recessed entry provides a shaded outdoor space. The master bedroom and dining room have access to the back porch. This house is designed to be built with or without accessibility features, such as wheelchair ramps, depending on the needs of the residents.



- 1 Porch
- 2 Kitchen
- 3 Dining
- 4 Living
- 5 Master bedroom
- 6 Bedroom
- 7 Carport
- 8 Ramp

### DETAILS

1800 SQ. FT

3 BEDROOMS

2 BATHROOMS

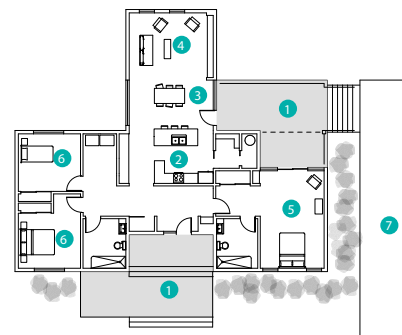
FRONT + BACK PORCH





## CROATAN: TYPE 2

The Croatan plan is well suited for family living. It has three bedrooms and contains generous living areas and storage space. The recessed entry provides a shaded outdoor space. The master bedroom and dining room have access to the back porch on the side of the house. This house is designed to be built with or without accessibility features, such as wheelchair ramps, depending on the needs of the residents.



- 1 Porch
- 2 Kitchen
- 3 Dining
- 4 Living
- 5 Master bedroom
- 6 Bedroom
- 7 Driveway

### DETAILS

1800 SQ. FT

3 BEDROOMS

2 BATHROOMS

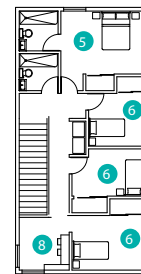
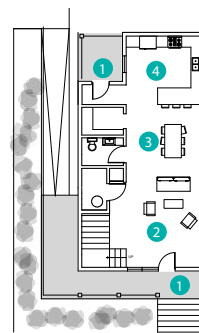
FRONT + BACK PORCH





## CURRITUCK: TYPE 1

The Currituck is a two-story plan that fits four bedrooms into an upstairs space. The lower floor provides living spaces and a generous walk-in pantry for storage. Upstairs there is an open workspace with room for a desk and shelves. A large front porch extends across the front of the house.



- 1 Porch
- 2 Living
- 3 Dining
- 4 Kitchen
- 5 Master bedroom
- 6 Bedroom
- 7 Driveway
- 8 Study

### DETAILS

2000 SQ. FT

4 BEDROOMS

3 BATHROOMS

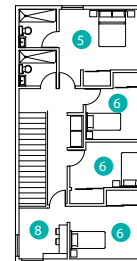
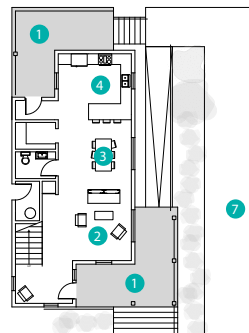
FRONT + BACK PORCH





## CURRITUCK: TYPE 2

The Currituck is a two-story plan that fits four bedrooms into an upstairs space. The lower floor provides living spaces and a generous walk-in pantry for storage. Upstairs there is an open workspace with room for a desk and shelves. Porches in the front and back of the house provide covered outdoor spaces.



- 1 Porch
- 2 Living
- 3 Dining
- 4 Kitchen
- 5 Master bedroom
- 6 Bedroom
- 7 Driveway
- 8 Study

### DETAILS

2000 SQ. FT

4 BEDROOMS

3 BATHROOMS

FRONT + BACK PORCH

# I WANT TO ELEVATE

## ELEVATION OPTIONS



PIERS



SITWORK



FOUNDATION

## ELEVATED HOUSING TYPES



BOGUE



CROATAN



PAMLICO

## What can I afford?

The cost of elevating a house depends on many factors, including location, size, quality of materials and construction, complexity of details, site constraints, utility requirements, systems requirements, development and permitting fees, and general market and economic conditions. The following pages will help you consider your options.

## What are my elevation options?

The first step in elevating a house is to consult all relevant codes and regulations. There are three basic strategies for constructing an elevated house: lifting on piers, mounding sitework, and building a tall foundation. All three strategies are explained in this section.

When considering sitework—to include elevating structures on fill material—it is imperative that the work is carried out in compliance with the Local Flood Damage Prevention Ordinance. This might require, for example, obtaining a “no-rise certification” before work may begin.

## What will my house look like?

The three elevated house types in the guide are designed to fit comfortably into existing neighborhoods in Windsor. The styles, forms, materials, and details are contemporary, but they reference historical precedents from eastern North Carolina.

# **DEMO/** **REBUILD**

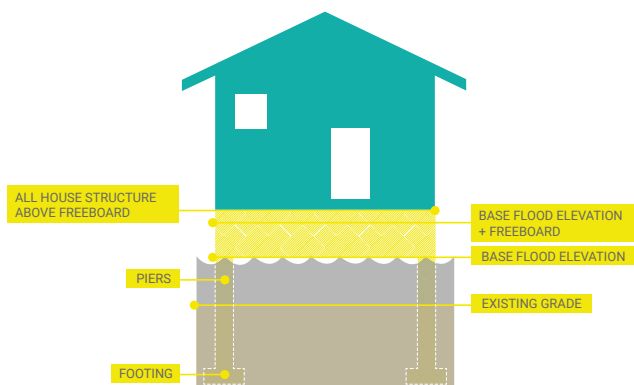
After flooding, homeowners who want to remain on their property are faced with a major decision: Should I repair my existing house or rebuild entirely? The answer to this question is largely one of cost, in terms of both money and safety. Flooded houses often suffer damage to the structure, air conditioning systems, electrical and plumbing systems, insulation, exterior cladding, and interior finishes. Mold is a common problem in flooded houses and requires abatement. Repairing damage can be difficult, time-consuming, and expensive. Owners should consider several factors in determining the best course of action:

- 01 \_ the extent of damage to the house as determined by a certified house inspector and engineer, if required;**
- 02 \_ the expense of repairs compared to the expense of demolitions and an entire rebuild; and**
- 03 \_ the degree to which either option will provide necessary safety assurances.**

Additionally, homeowners should consider governmental, non-profit, or other assistance programs that will offset expenses associated with either approach.

# ELEVATING OPTIONS

The first step in elevating a house is to consult all the codes and regulations that govern a jurisdiction to determine freeboard requirements. A homeowner might determine that an even greater freeboard will add peace of mind.



It is important to understand that houses in floodplains could be susceptible to future damage, and that they might not be eligible for flood insurance. In all cases, it is important to elevate a house to the proper freeboard level to ensure safety.

## WHAT IS FREEBOARD?

The National Flood Insurance Program (NFIP) communicates flood risk through maps that show Base Flood Elevation (BFE). BFE is the height that floodwaters are expected to reach during a 100-year flood, or a flood that, based on historical rainfall and river level data, has a 1% chance of occurring in any given year.

Freeboard refers to the distance above BFE that a house is elevated; FEMA recommends a freeboard of at least two feet, though it can be larger. The higher the freeboard, the higher the up-front building costs. But a higher freeboard also provides greater safety, and it can lead to significant long-term savings in repair costs and flood insurance premiums. Refer to the Resources section of this document for more information.

Remodeling might seem less expensive because of lower up-front costs. But if a house is not elevated, it will not be protected during floods. Whether repairing or building new, elevating the house to proper freeboard level is the most sound approach, and it saves the most money in the long run.

# ELEVATING OPTIONS



## PIERS

When houses must be elevated more than a few feet, piers or piles offer the most common and cost-effective solution. Raising a house on piers not only provides safety; it creates useful space underneath for parking, storage rooms, or even screened porches. Piers can be integrated into typical wood-frame construction systems. One challenge to elevating a house on piers is the need for more stairs. Accessibility is also difficult to achieve without an elevator or lift.



## SITWORK

A site can be graded, or “mounded,” in order to lift the building pad to a level above the required freeboard. This method can be costly, especially when several additional feet of elevation are required. As such, this method is employed only when a few feet of additional elevation are required.



## FOUNDATION

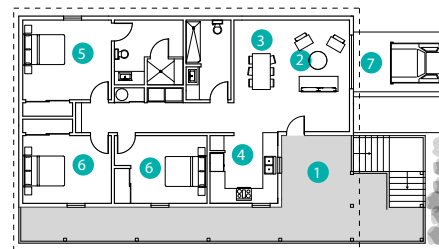
In some cases, a foundation wall can be built high enough to attain freeboard. While foundation materials such as concrete are resilient to moisture damage, wooden floor joists are not. Houses must be elevated so that the underside of joists is above the BFE while not exceeding the height stipulated in the Local Flood Damage Prevention Ordinance. An appropriate height—along with well-placed hydrostatic openings—will protect a foundation from external water pressure.





## BOGUE: ELEVATED

This version of the Bogue plan includes three bedrooms and two baths. Its spaces are generously proportioned in order to accommodate family living. The bedroom zone is separated from the open living spaces to provide privacy. Covered parking and storage areas are available as a result of elevating the house one story.



- 1 Porch
- 2 Living
- 3 Dining
- 4 Kitchen
- 5 Master bedroom
- 6 Bedroom
- 7 Covered parking

### DETAILS

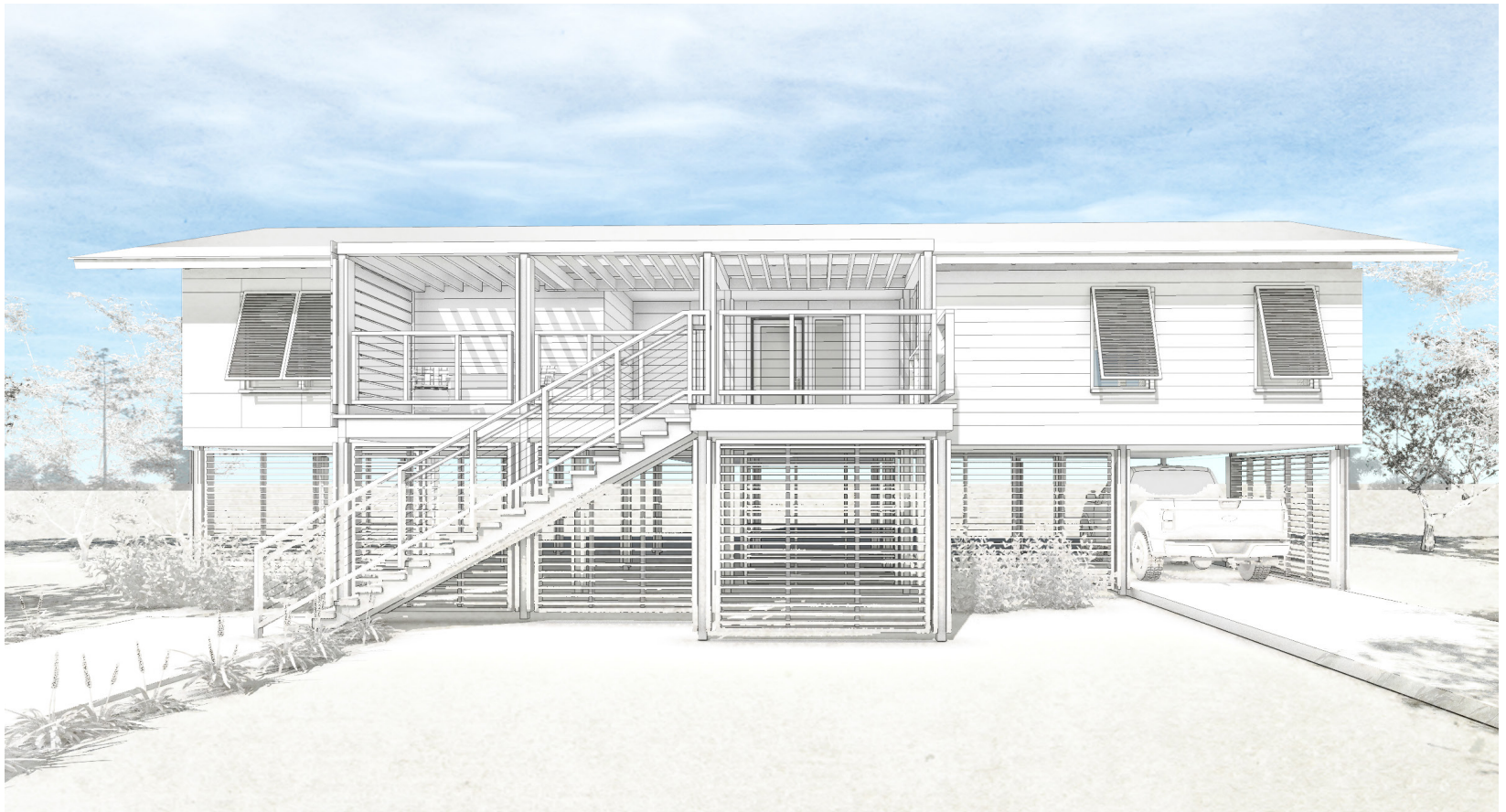
1420 SQ. FT

3 BEDROOMS

2 BATHROOMS

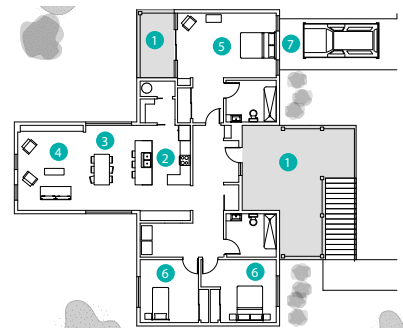
PORCH





## CROATAN: ELEVATED

The Croatan plan is well suited for family living. It has three bedrooms and contains generous living areas and storage space. The recessed entry provides a shaded outdoor space. The master bedroom has access to the back porch on the side of the house. Covered parking and storage areas are available as a result of elevating the house one story.



- 1 Porch
- 2 Kitchen
- 3 Dining
- 4 Living
- 5 Master bedroom
- 6 Bedroom
- 7 Covered parking

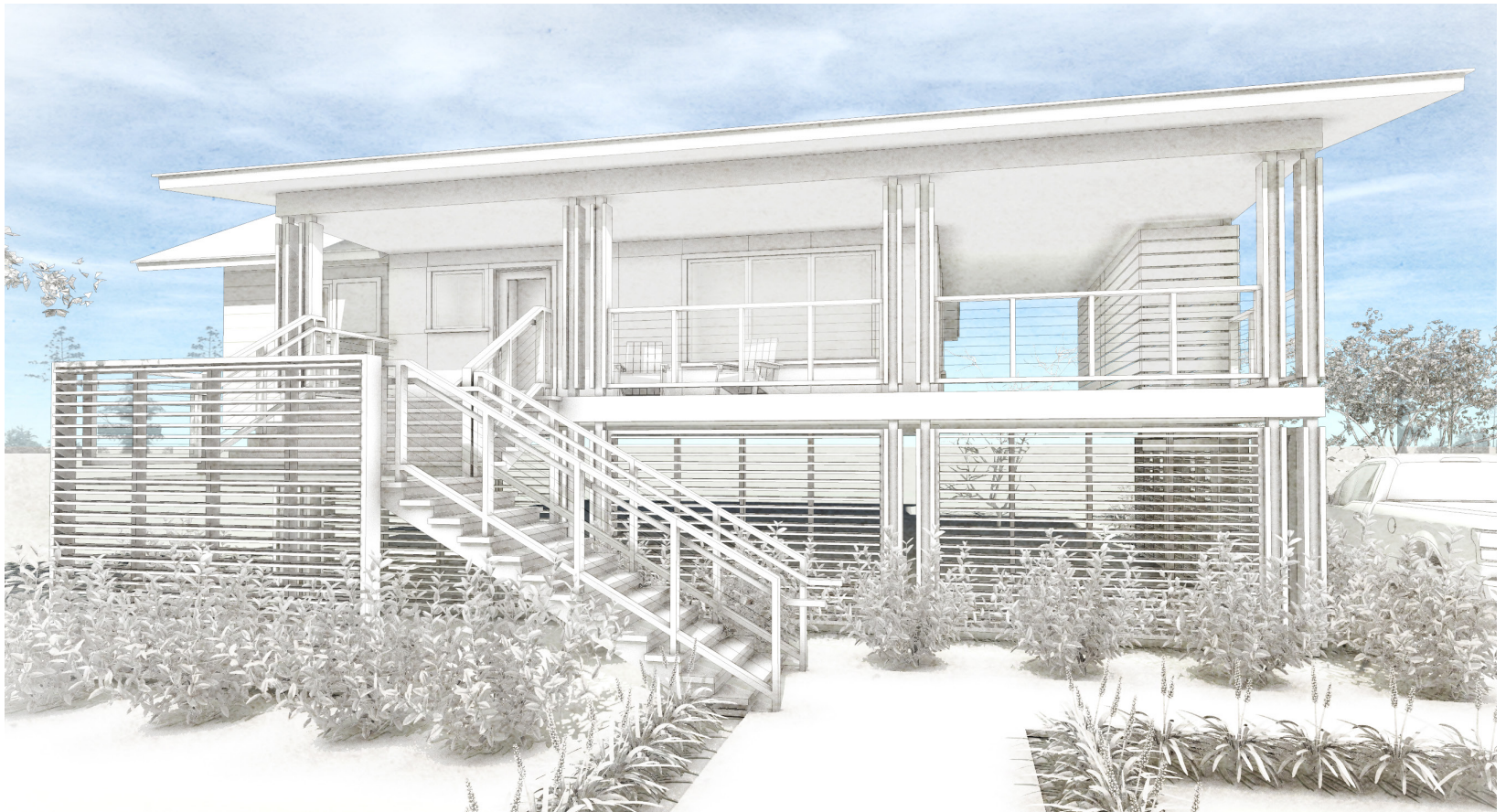
### DETAILS

1800 SQ. FT

3 BEDROOMS

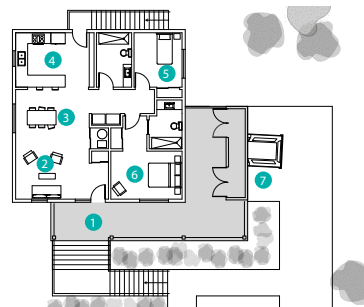
2 BATHROOMS

FRONT + BACK PORCH



## PAMLICO: ELEVATED

The Pamlico is a two-bedroom, two-bathroom house. One side of the house contains an open kitchen, dining, and living space. The other side contains bedrooms, bathrooms, and a full laundry closet. A generous front porch wraps the corner of the house. Elevating the house above flood levels allows for covered parking and increased yard size.



- 1 Porch
- 2 Living
- 3 Dining
- 4 Kitchen
- 5 Bedroom
- 6 Master bedroom
- 7 Covered parking

### DETAILS

1300 SQ. FT

2 BEDROOMS

2 BATHROOMS

PORCH



# CREATING MORE RESILIENT NEIGHBORHOODS

Design can enable **resilience** at the yard and street scale to protect entire neighborhoods from flooding. This section introduces yard and street design strategies to address environmental issues, while growing local neighborhood patterns capable of building social cohesion and sustaining neighborhood life over time.

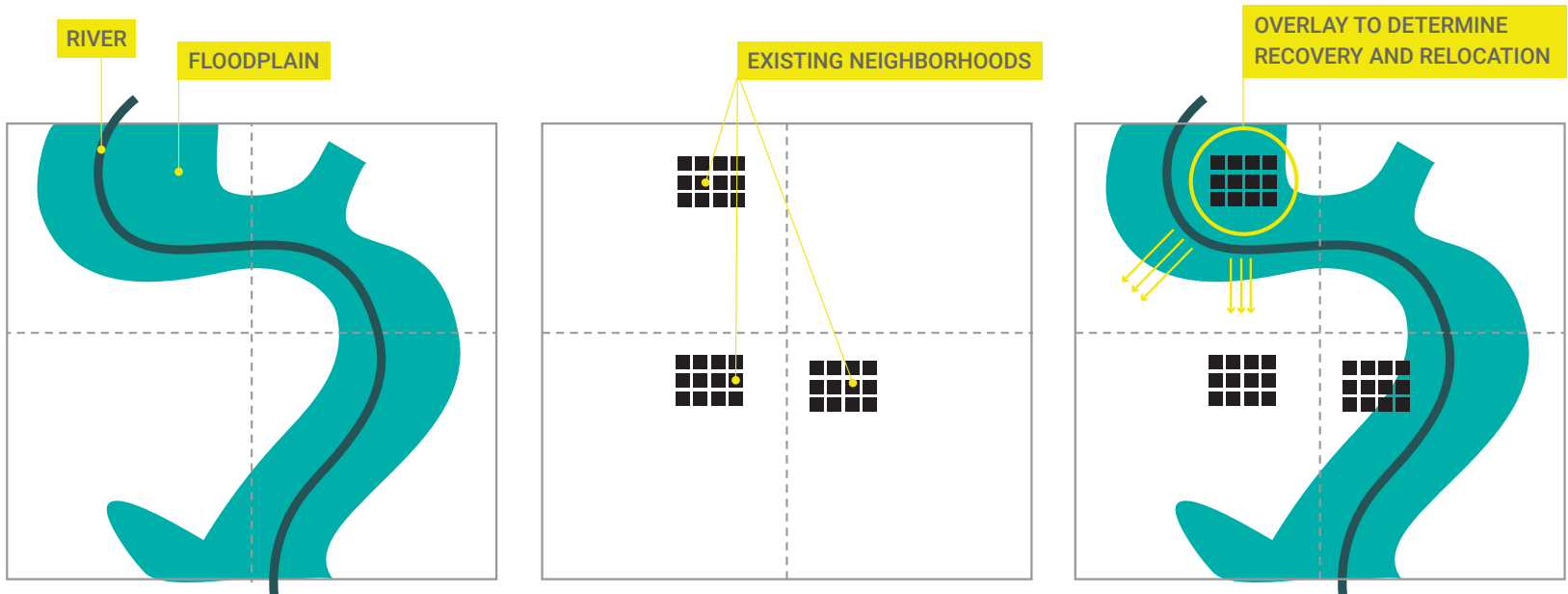
# LANDSCAPE ANALYSIS

The landscape is influenced by many different forces. Maps can help identify these forces.

## THE USE OF MAPS

One set of forces is environmental and associated with floodplains, the places that face highest flood risk. Another set of forces is social and associated with neighborhoods, and with the landscape patterns that define the homeplaces of residents. These include streets, yards, porches, stoops, and other elements of landscape that support community life.

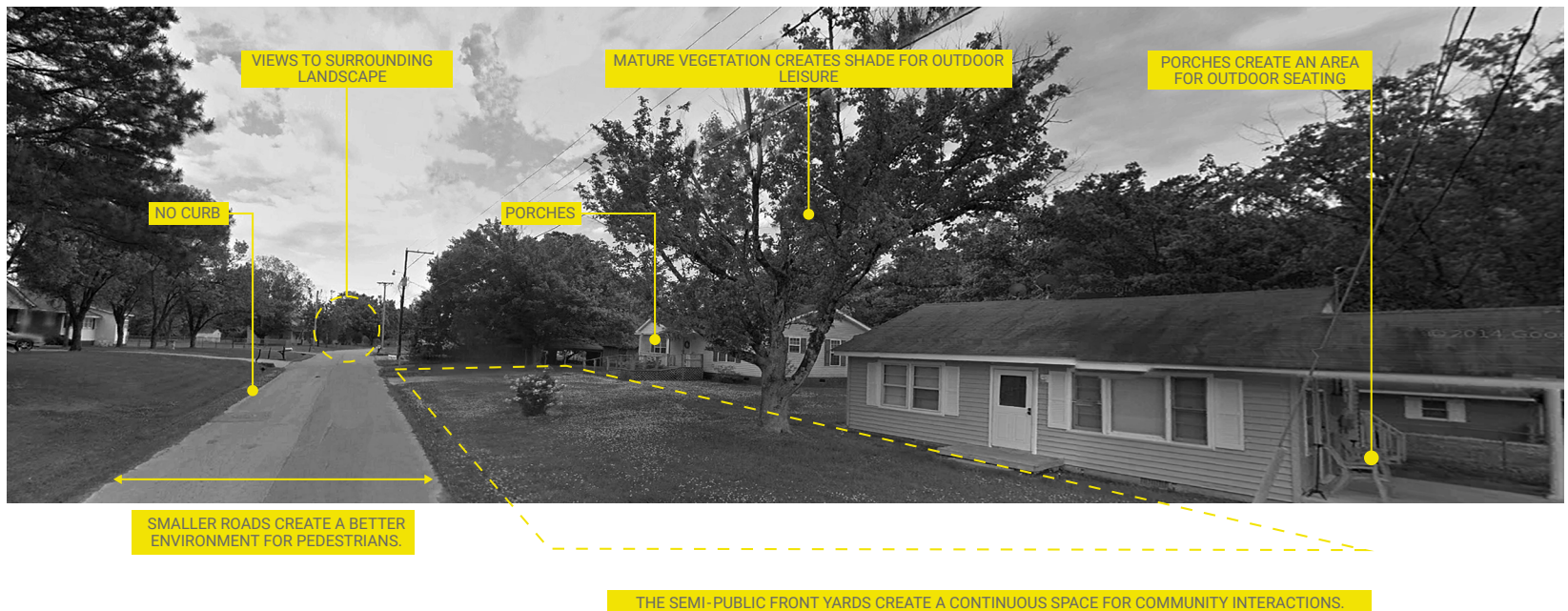
Mapping and overlaying these forces can provide a window into the qualities of the landscape that helped people lead their lives in floodplain areas. It is important to consider these patterns—combined with the findings of the HMDRRI Land Suitability Analysis—when regenerating floodplain areas for those who choose to stay and to reinvest in place. Mapping can also identify the landscape qualities of neighborhoods outside the floodplain, to consider and respond to when relocating and building new homes in existing neighborhoods.



# SAMPLE STREETS

Focusing the analysis of neighborhood patterns on sample streets offers lessons on how houses relate to one another and the surrounding landscape.

To implement the strategies in this guide, it is useful to consider sample streets from two areas: the neighborhoods that were flooded, where some homes will remain, and the neighborhoods that were not flooded, where people may choose to relocate. In both areas, sample streets reflect a range of individual homeowner responses to their context. Whether the solution is to stay in place or to relocate, the design response should respect and build upon the qualities of existing sample streets. The sample streets selected are descriptive and not prescriptive; they are tools for promoting neighborhood discussion about values, character, and identity.



# WINDSOR

# CHARACTER



The town of Windsor has characteristics that are common to many towns in eastern North Carolina. Today, Windsor is in a unique position to engage in resilient long-term planning that responds to and builds upon the physical, economic, and social character of the community.

## AT THE HOME SCALE

The town of Windsor has a mix of lot sizes and yard setbacks. Yards are primarily lawn with informal landscape framing driveways and entries. There is a range of landscape maintenance, but informal landscapes are most common. Humid and hot weather causes people to gather underneath mature shade trees. Mature tree cover on private property and in the surrounding landscape shades streets and houses.

## AT THE NEIGHBORHOOD SCALE

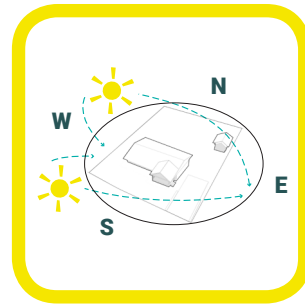
Mature trees are primarily in backyards. There are large lawns, and mature trees are preserved in backyards. There are narrow two-lane streets, some with sidewalks on one side. There are curbs and drains. The curbs define the streets. Recent sidewalk improvements offer a potential model for integrating sidewalks into other community streets.

Photos courtesy of Realtor.com



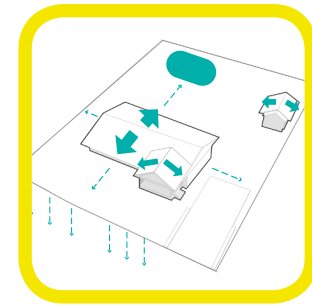
# BIOPHYSICAL FACTORS

Making the right choices about the orientation of your house and about the drainage and planting patterns of your yard can make a big difference over time. When your house and yard are designed to suit their environment, they will perform better, cost less, and provide greater comfort and beauty for you and your family.



## SOLAR ORIENTATION

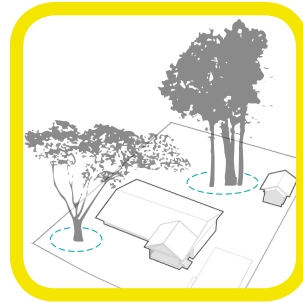
The placement of houses and landscapes on a lot can have dramatic impacts on quality of life. Houses that are aligned on an east-west axis—with shaded southern and southwestern exposure, and with more windows on their northern sides—can increase natural daylight and reduce reliance on artificial lighting, heating, and cooling. This reduces short- and long-term energy costs.



## SLOPE AND DRAINAGE

Landscapes that direct rainfall away from rooftops and impervious surfaces, detain it, and allow it to infiltrate on the site help to reduce flooding. When many home landscapes capture their rainfall on site, it has a dramatic community-wide impact. Landscapes can be graded and materials can be used to promote best management practices. Proper drainage also protects foundations.

# **BIOPHYSICAL FACTORS**



## **PRESERVING MATURE TREES**

Landscapes that work with existing vegetation can provide immediate benefits. Mature trees provide shade, which can cool houses and outdoor spaces. The roots of mature trees can absorb stormwater and reduce runoff. To reap these benefits, it is important to protect the root zones of valuable vegetation. Critical root zones extend roughly as far as the reach of the tree's branches overhead. Avoid building anything within this zone, and protect it from construction traffic. Avoid building too close to trees that could damage a structure during or after storms.

# SOCIAL FACTORS

At the scale of the house and lot, simple design decisions can have an outsized impact in determining how neighbors relate to each other and to the neighborhood at large.



## **YARDS + SETBACKS**

Proper house placement on lots can promote social networks, sense of place, and accessibility. House placement is controlled by setbacks—policies that determine how close houses are to one another and to the street. In areas closer to town centers, lots are narrower, and houses are closer to each other and to the street, with sidewalk access. In areas further from town centers, houses are further apart, lots are wider with driveways, and houses are further from streets.



## **INFORMAL LANDSCAPE**

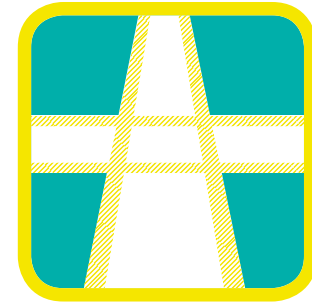
Yards provide outdoor settings for everyday activities, communicate a sense of place, and encourage homeowners to make their lots unique. Although fences and walls make clear boundaries, many yards in the region have a sense of enclosure through planting. Planting creates outdoor rooms used for seating, gathering, and other leisure activities. Planters, sculptures, flagpoles, and other elements accumulate and represent the long-term investment made by homeowners into their properties. Many yards also have carports and other ancillary structures that provide sheltered settings for everyday activities.

# SOCIAL FACTORS



## **PORCHES + STOOPS**

Porches and stoops are important places where people can participate in the life of the community, connecting with neighbors and promoting safety through visible outdoor activity. Porches and stoops with visibility from the street are essential to strong street character. When homes are elevated, maintaining street orientation through stairs, ramps, balconies, and use of the space underneath elevated structures is essential.



## **NARROW STREETS + DRIVEWAYS**

Narrow streets are important for controlling car speed, creating an intimate environment, and communicating community character. Narrow streets with slow traffic speeds are good for walkers and cyclists. Streets with curbs and gutters can help manage stormwater runoff. Mature trees that are close to the streets can provide shade and frame views. Driveways can provide off-street parking and be settings for outdoor activities.

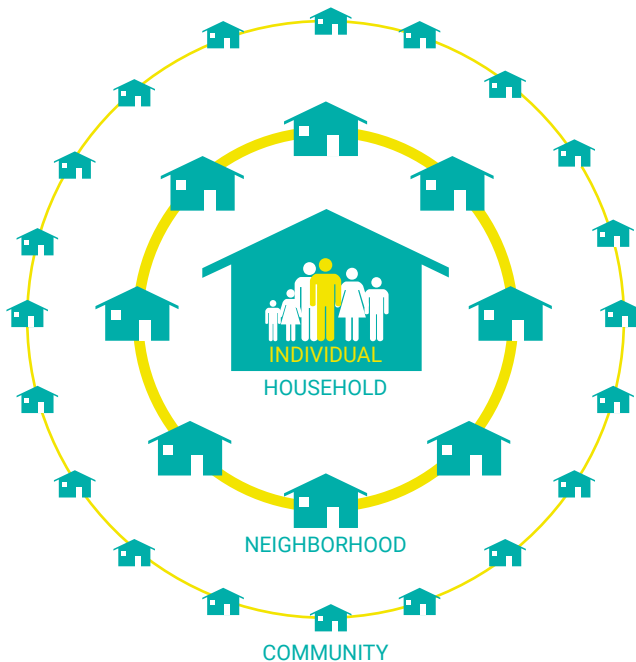
# SOCIAL FACTORS



## **STREET CHARACTER**

The way that homes relate to the street affects their ability to encourage neighborly interaction and to build social cohesion and sense of place. Homes facing the street with well-maintained front yards can contribute positively to the overall quality of the street. Trees, planting, lighting, paving, and other landscape elements can convey a sense of community pride and investment.

# NEIGHBORHOOD SCALE

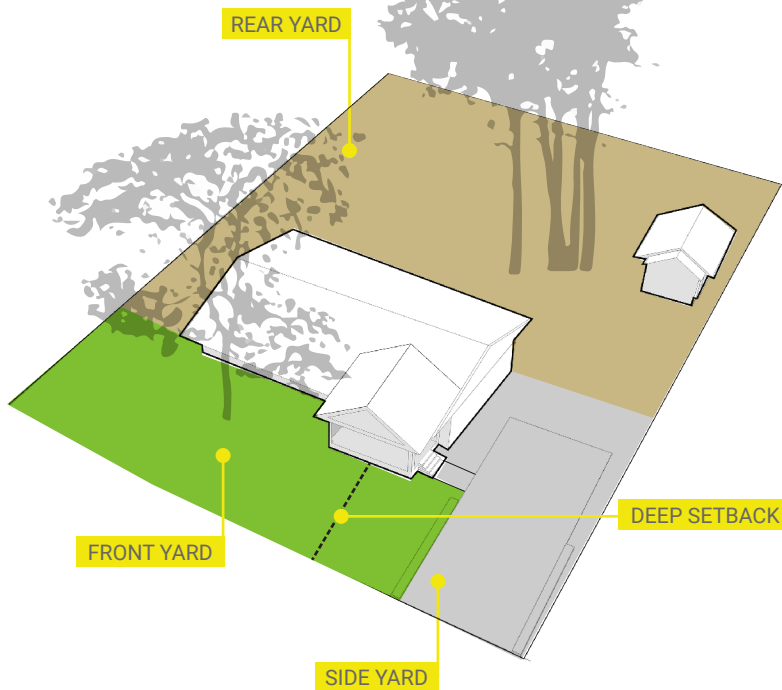


## VILLAGE MODEL

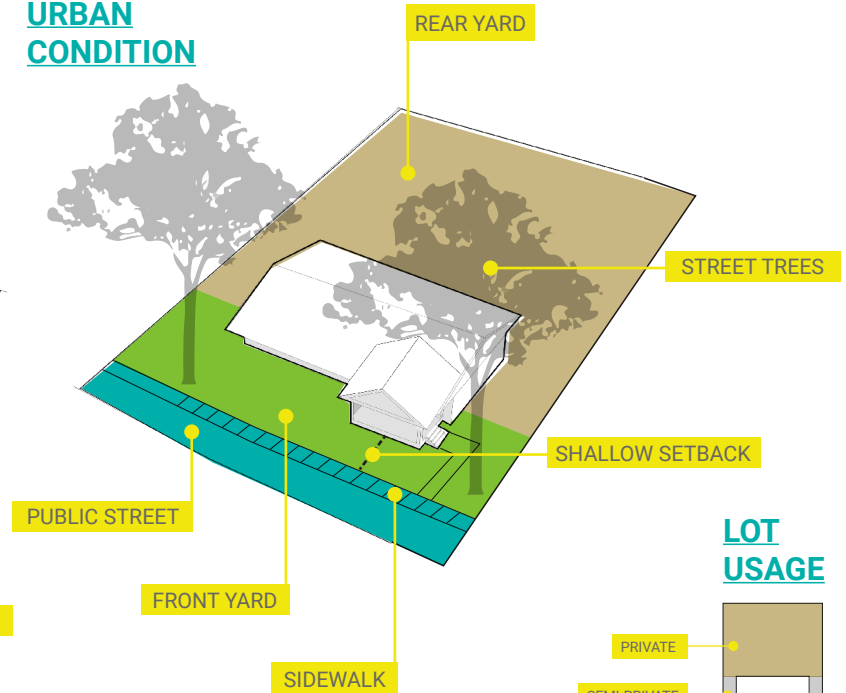
Strong neighborhoods provide a sense of belonging to their residents and encompass more than houses. Strong neighborhoods contain—or are close to—a wider range of uses needed to sustain community life. These include places to shop, play, work, learn, and worship. A village model of a strong neighborhood suggests that residents can access all of their daily needs within a 20-minute walk, or they have access to transportation that can take them to their daily needs. In some affected areas that have struggled with declining investment, the lack of amenities that can meet the needs of a village can exacerbate the challenges posed by lost or damaged housing. This is especially true for vulnerable populations.

Decisions made that affect whether someone remains and invests in a floodplain area, or relocates out of a floodplain area, can be considered in the context of a village model. It is important to ask: Does the place where I live provide me with access to my daily needs? Does the place where I want to relocate? If not, ask yourself how a place can change to provide access.

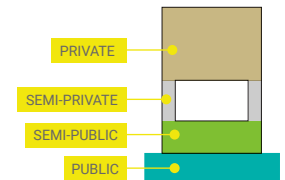
## SUBURBAN CONDITION



## URBAN CONDITION



## LOT USAGE



## YARDS AND SETBACKS

Yards are the most direct ways that houses connect to their streets and neighborhoods. Setbacks—the policies that control how close together houses can be to one another and the street—define yards. The overall pattern of yards contributes to the image and quality of a neighborhood. Yards are often the settings of informal activities that connect people to their neighbors. To promote social cohesion

and strong communities, noting and responding to local patterns of yards and setbacks should be an area of design and planning focus.





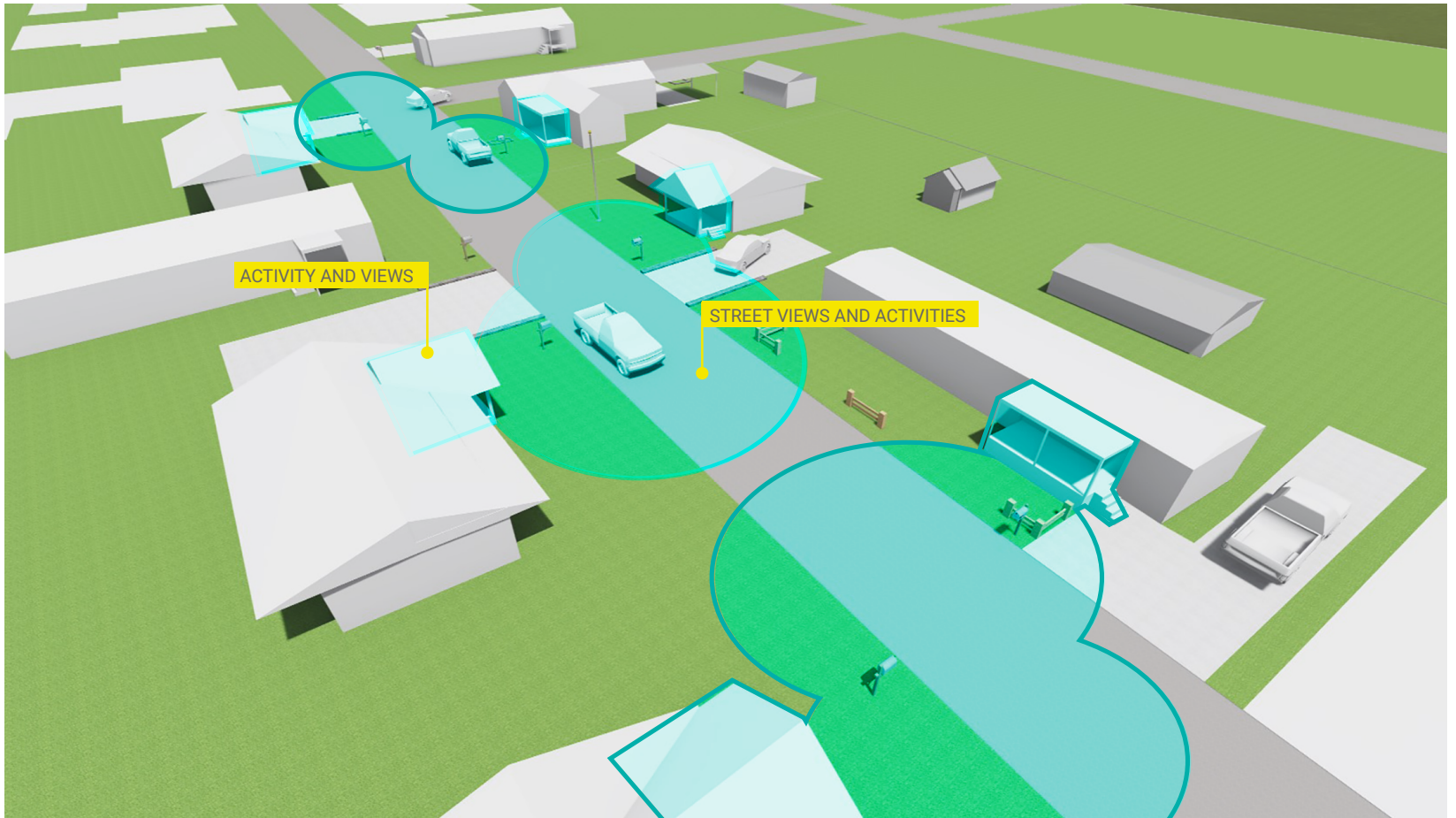


## PORCHES AND STOOPS—CONNECTING NEIGHBORS

Porches and stoops historically have played a significant role in connecting houses to their streets and neighborhoods. Before air conditioning, they served as outdoor rooms where residents could get relief from the heat and also engage with their neighbors.

Today, porches and stoops continue to offer a vital bridge between the private life of the home and the public life of the street. They prevent isolation, fostering regular interaction with neighbors and building a sense of community.



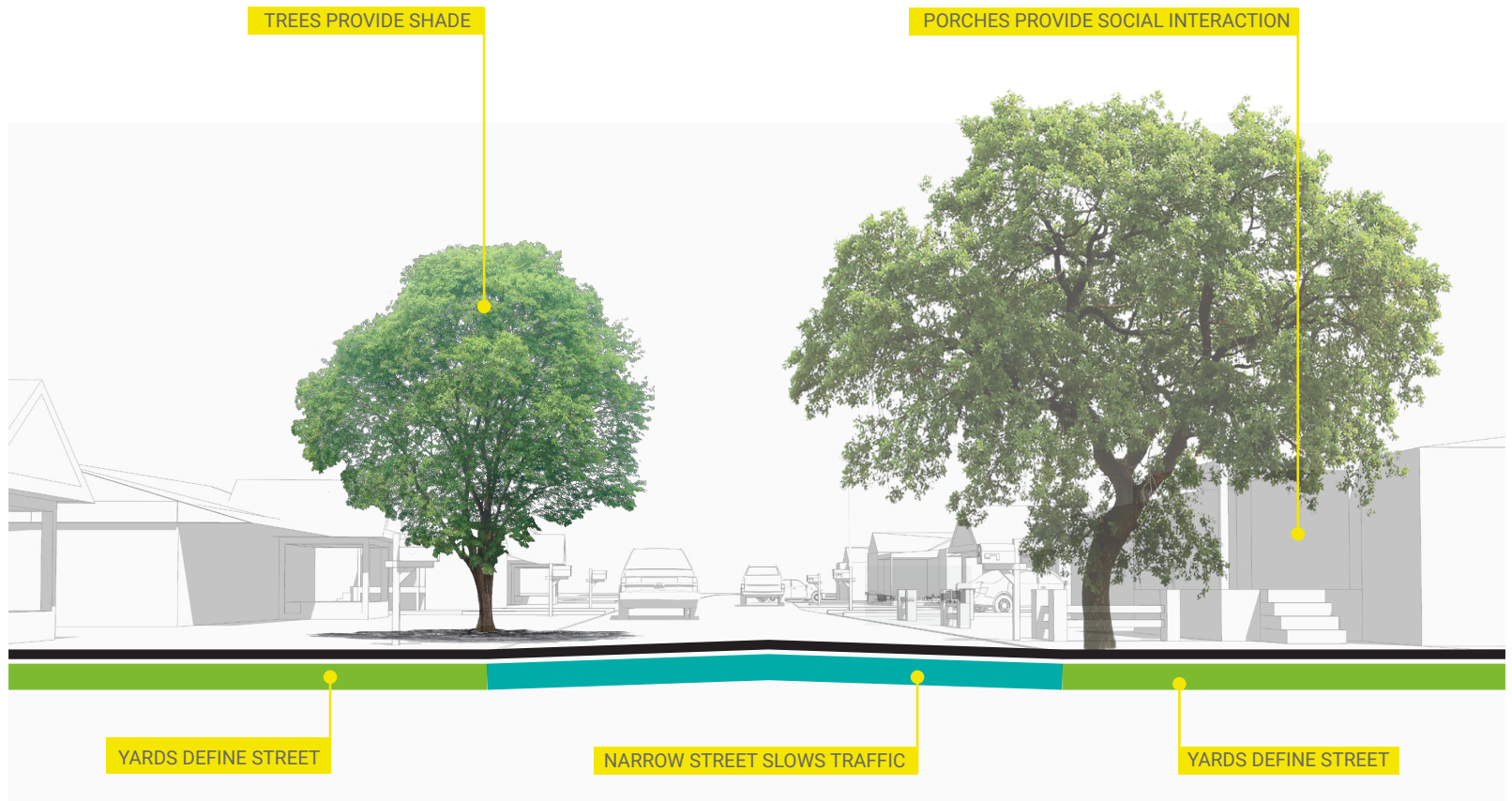


## PORCHES AND STOOPS—PROMOTING SAFETY

Porches and stoops also promote safety in neighborhoods by encouraging activities that put “eyes on the street” and informally monitor neighborhood activities. Although some homes built after World War II included air conditioning and lack these structures, porches and stoops are important settings for community interaction.



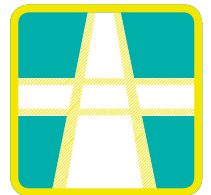


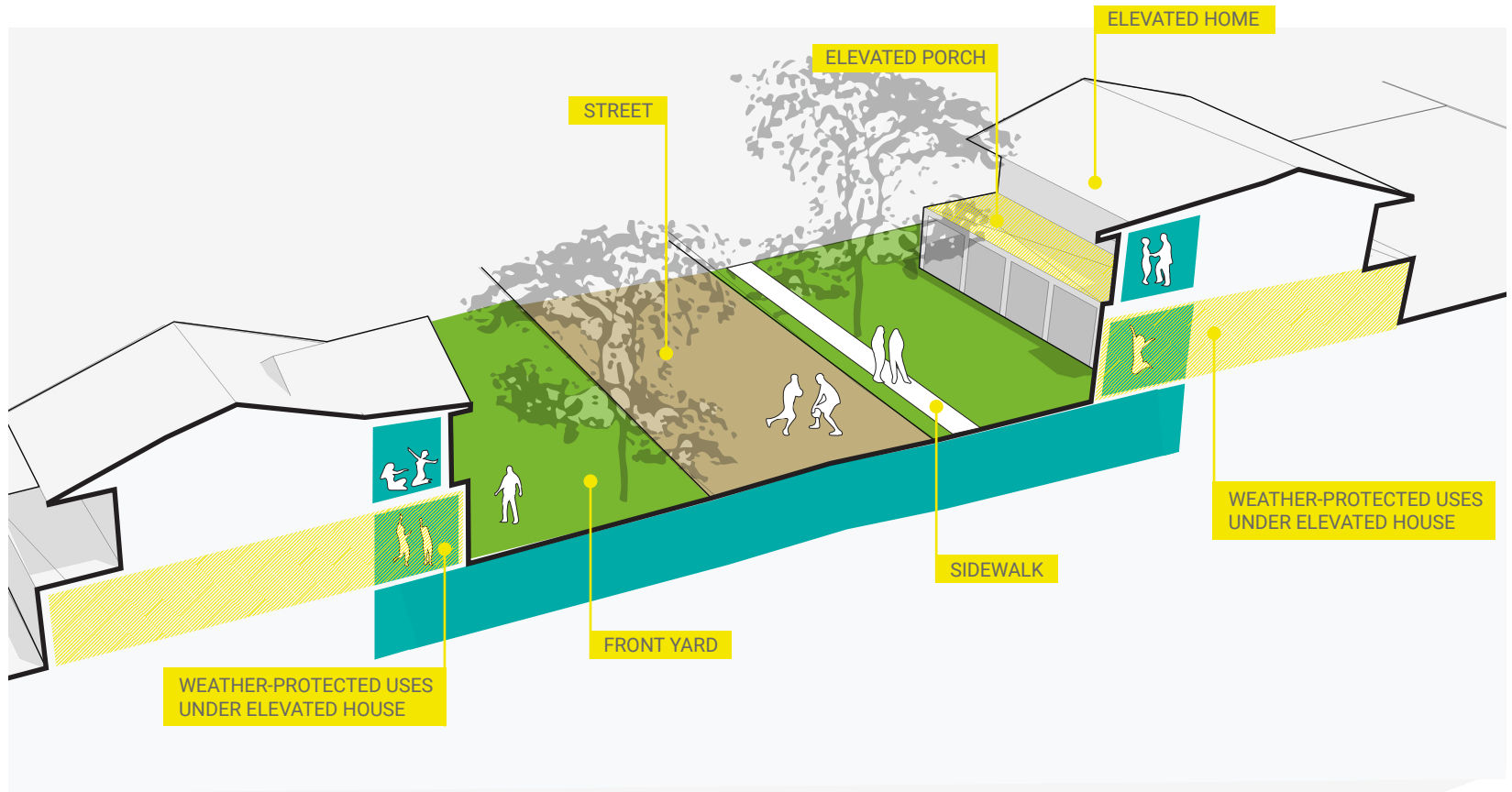


## WALKABLE STREETS

Many streets in areas affected by flooding are two lanes and narrow by contemporary standards. However, research suggests that narrow streets have many benefits to neighborhoods—including promoting slower automobile travel speeds, encouraging walking, and promoting stronger neighborhood character.

Pre-World War II street design favored connected networks with walkable block sizes and shapes. Traffic volumes in many affected areas are relatively low and still favor walking, especially if measures are taken to improve pedestrian safety and comfort. These might include improved wayfinding and signage, crosswalks, maintenance of streets and sidewalks for pedestrian safety, and the preservation or planting of shade trees for protection from the sun.





## ACTIVATING PUBLIC SPACE

If residents choose to stay in areas affected by flooding, they choose to either elevate their existing home or build a new elevated home. Most previous neighborhood patterns in floodplain areas did not include elevated structures, and the qualities of the landscape that historically enabled social interaction were at the ground level. These included the streets, the yards, the porches and stoops, and other elements that promoted “eyes on the street.” There is an

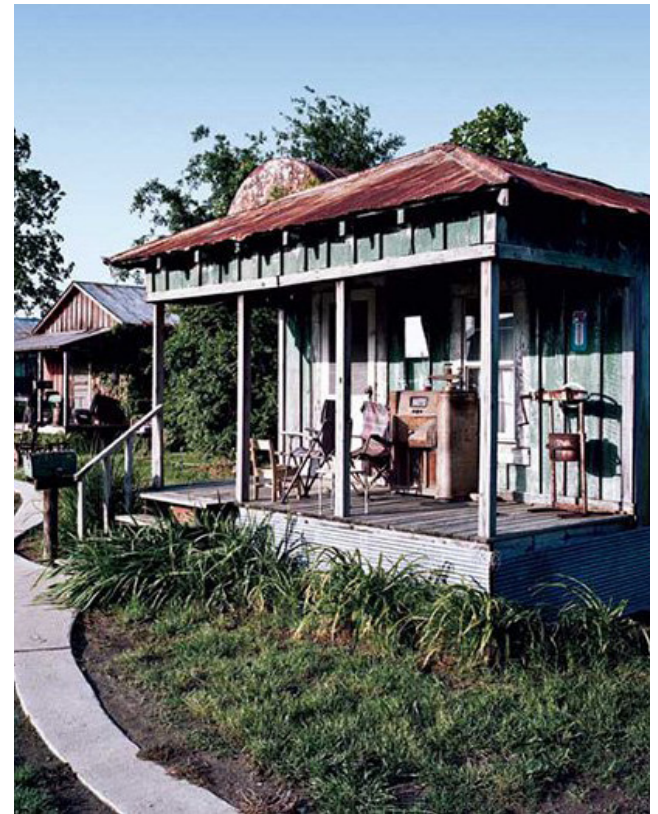
opportunity to address the potential impact of elevation on social life in the neighborhood. Activating space beneath the structure allows for weather-protected uses such as shaded seating, children’s play, outdoor eating, and other activities that can simulate the life that was once on a porch or stoop. Keeping elevated structures close enough to the street to allow people to engage neighbors from porches and balconies can also support neighborhood life.







Foster's Market, Durham, NC



Cabins at the Shack Up Inn, Mississippi Delta Blues Highway (photo courtesy of gardenandgun.com)

## COMMUNITY CHARACTER

Residents might be willing to relocate out of the floodplain but want to retain their previous home. Losing one's homeplace is a major contributor to trauma and long-term challenges caused by relocation after disaster. Although living in a floodplain continues to put residents at flood risk, adaptively reusing their homes in the floodplain for other uses might be a way to offset the pain associated with loss. There are many examples—such as the two shown

above—of houses becoming community meeting places, galleries, performance venues, nature centers, tourism offices, and other non-residential uses that can maintain ties to a particular place while removing the risk of housing loss.







## BRINGING IT ALL TOGETHER

Although there are many different elements that make up community character, communities are the result of incremental decisions made by people committed to making their neighborhood a better place. This guide outlines different aspects of the landscape and broad decision-making tools that can affect community form. But observing the community reveals the cumulative decisions made

over time that make the values of homeowners present in the environment. There need to be places where planting, outdoor seating, carports, and other components can be put together in the unique styles of each homeowner. When people take pride in their homes and invest in them to suit their preferences and community values, it indicates the success of a resilience strategy.

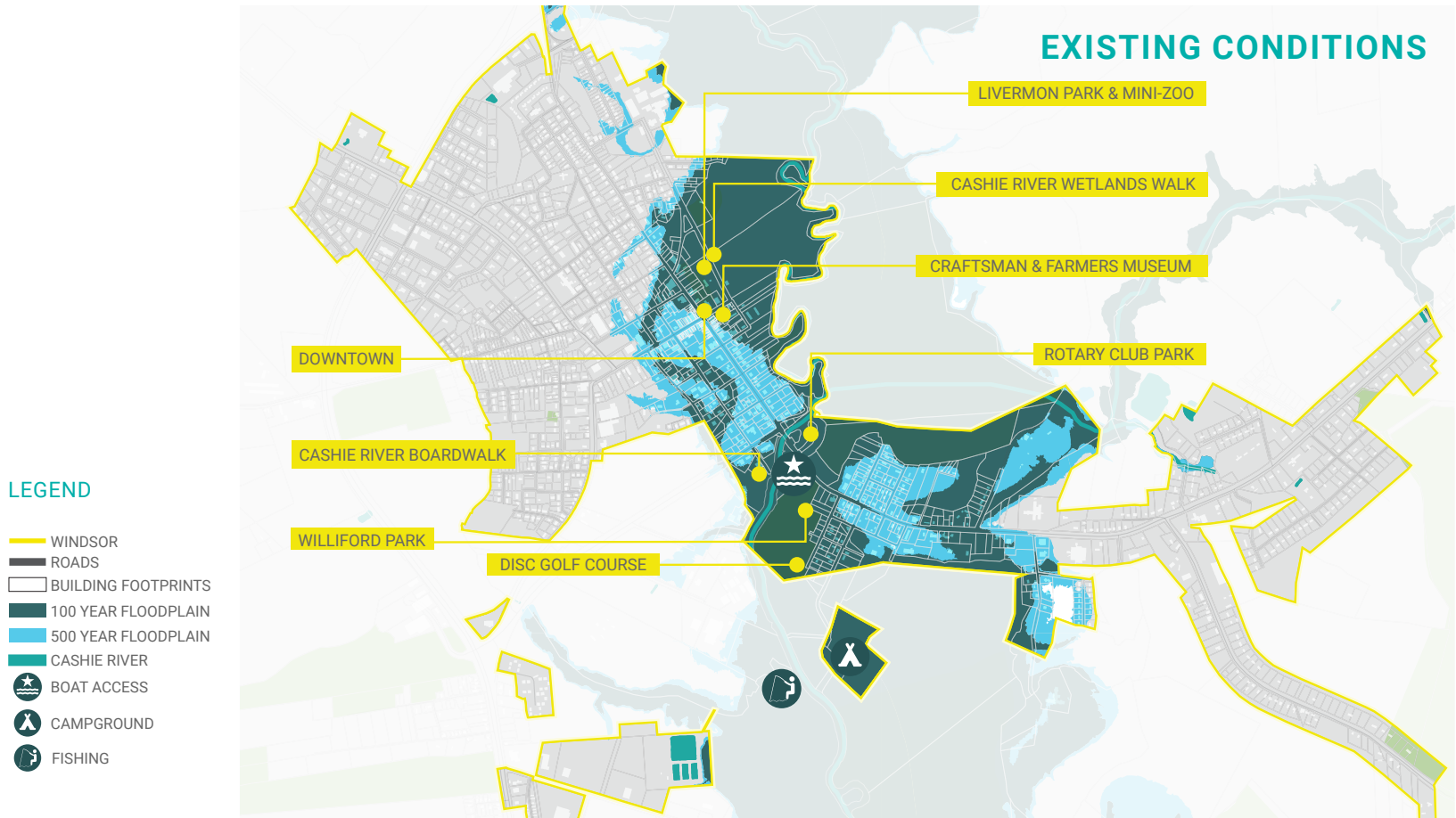


# GROWING MORE RESILIENT COMMUNITIES

Design can enable **resilience** at the town and regional scale to protect whole communities from flooding. This section introduces design and planning concepts that allow previously flooded communities to regroup, to form partnerships, and to emerge physically, environmentally, socially, and economically stronger.

# WINDSOR GREENSPACE

The conceptual greenspace framework for Windsor is intended to connect a number of existing greenspace elements to establish a synergistic whole. This framework is based on an expansion of the successful Cashie River greenway system, elements of which include the Cashie River Wetlands Walk, Williford Park, Livermon Park and Mini-Zoo, Rotary Park, Windsor Craftsman and Farmers Museum, Cashie River Campground, and local fishing piers and boat launches.



# WINDSOR

# GREENSPACE

# CONCEPT

Windsor offers platform camping and treehouse rentals along the Cashie River, which serve to enhance blueway tourism. By connecting all of these greenspace elements, Windsor could become a popular eco-tourism destination along the Inner Banks of eastern North Carolina.

Additional greenspace elements might include a network of neighborhood sidewalks, bike paths, and trails that connect parts of the community, along with an expansion of the Cashie River Greenway with additional festival and event space.

Another possibility for Windsor is to create a new outdoor event space close to its downtown, building on its efforts to build the Cashie River Disc Golf Course on post-Floyd buyout properties. The further removal of repetitive flood-loss properties could generate a multi-acre tract of land within walking distance of the town center. This landscape could be designed as flex space, offering the opportunity to be transformed as needed to host a variety of outdoor events, from concerts to ball games.

# WINDSOR ECONOMIC DEVELOP- MENT

Setting aside land in the floodplain for greenways and greenspace has helped communities across the country to protect themselves from flooding. It also provides a shared local amenity, and it has been shown consistently to boost local economies. Greenspace development is a proven economic-development strategy.

The Trust for Public Land and the Rails-to-Trails Conservancy have found that greenways have a positive impact on surrounding property values: Homes next to greenways consistently sell faster and for more money than similar homes that are not next to greenways. Parks, trails, and greenways also generate local revenue. In southwest Virginia, the community of Damascus—with a 2015 population of 759 people—is known as Trail Town, USA, because it is located at the intersection of five major trails that connect to public lands and recreation areas. A 2004 assessment of just one of those trails estimated an annual economic impact of \$1.6 million, generated by the trail's approximately 130,000 users, who traveled an average of 154 miles to reach the trail. The story of high economic value is common to greenway and greenspace developments across the country.

# WINDSOR ECONOMIC DEVELOP- MENT

## OPPORTUNITY

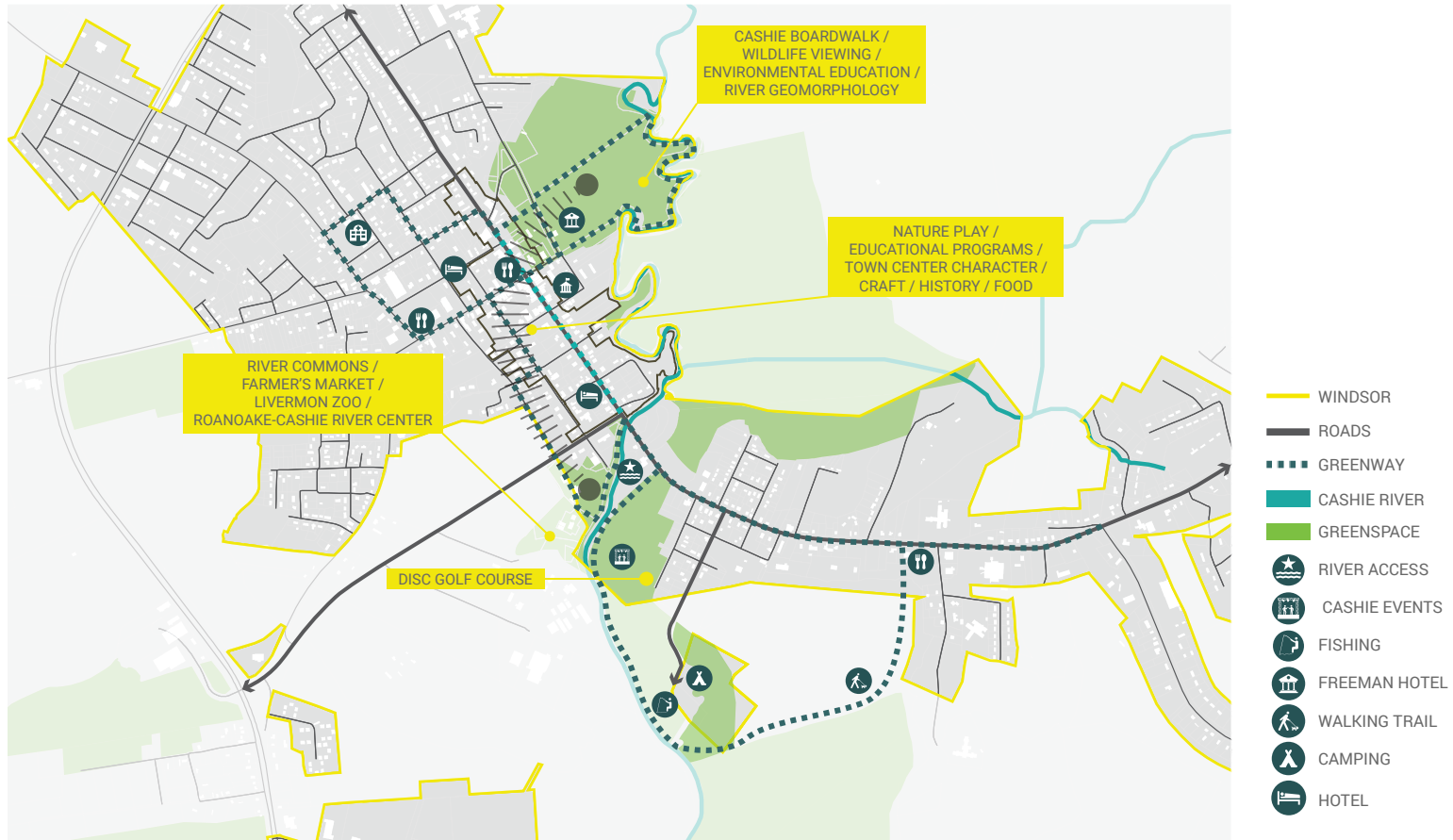
Windsor has a vibrant and thriving downtown, with a diversity of businesses and merchants. It has the potential to draw travelers on their way to the Outer Banks. Building an interconnected greenway system could provide more efficient connections for residents and tourists alike. These efforts can enhance the town’s business district, which currently includes:

- Bunn’s Barbecue
- U.S. Post Office
- Wells Fargo Bank
- Edward Jones Financial
- Windsor Police Department
- N.C. License Plate Agency
- Inn at Gray’s Landing

Windsor is within a day’s bicycle ride of Kinston, making it possible to include it in regional tourism efforts. More importantly, numerous destinations on the Albemarle and Pamlico Sounds—as well as many rivers that feed into them—are also within a day’s ride. Several of these are close enough for out-and-back day trips from Windsor, making it a possible base for exploring the region.

## ACTION STEPS

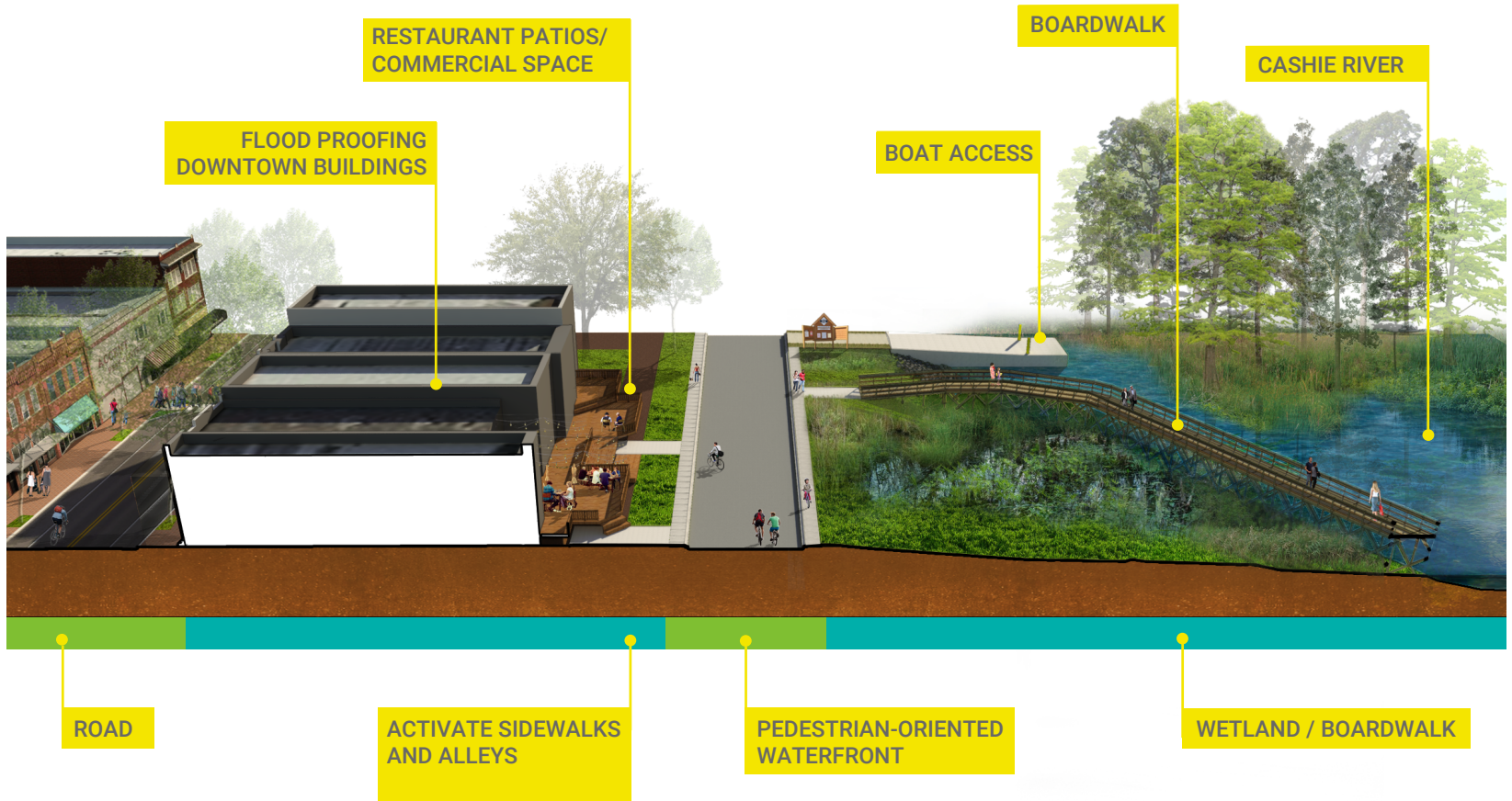
Windsor should continue to grow its greenspace holdings strategically. The town should update its existing greenspace and greenway master plan to incorporate recommendations provided within this report. The first major implementation might include the establishment of the downtown outdoor event space.



## GREENSPACE CONCEPT

Windsor has a well-developed trail and park network. The conceptual greenspace plan builds on this success and expands a network of neighborhood trails, sidewalks, and bikeway facilities throughout the community. This trails network would be linked with the blueway offerings on the Cashie River to make Windsor one of the most desirable outdoor destinations in North Carolina’s Inner Banks.





## BOARDWALK CONCEPT

Windsor's boardwalk trail is an essential link between the downtown, the community greenway network, and the Cashie River blueway trail. This conceptual image shows how careful siting and simple design measures can create places and streetscapes that are pleasant and easy to navigate, allowing for resident- and tourist-friendly connections to multiple community features and destinations.

# WINDSOR

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# SUMMARY

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The culture and character of Windsor is rich and distinct. The information presented throughout this guide has attempted to address the unique qualities of Windsor across different scales, including the house, yard, street, neighborhood, and community. The diverse range of housing and landscape elements are intended to prompt discussion among residents and local decision makers related to various ways Windsor can rebuild to respect and honor its history, respond to future flooding threats, and address known and anticipated community needs.

As a flood-prone community, a critical step in Windsor's recovery and rebuilding process is providing safe, comfortable, and respectful housing to displaced residents. Therefore, the primary focus of this guide has centered on single-family residential housing. Upon returning, survivors of Hurricane Matthew can begin the healing process and once again contribute to the vitality of Windsor.

The landscape, neighborhood, and community design elements also carefully consider flood and recovery issues facing Windsor, from watershed to individual home site. These design strategies, concepts, and best practices promote long-term community culture, function, health, resilience, and vibrancy. In doing so, these community-centered approaches respond to broader public infrastructures, development patterns, and population trends.

In total, this document is a result of community visits and collaboration among designers, planners, policy experts, hazard mitigation and recovery specialists, and local stakeholders. This undertaking represents the beginning of a much longer conversation that is required to engage complex socioenvironmental issues and frame new design directions for Windsor in the aftermath of Hurricane Matthew. Working together to refine these strategies, ongoing efforts will seek to identify additional community issues and needs so appropriate resources can be directed to Windsor to support health, safety, and well-being for all.

# FLOOD RECOVERY & MITIGATION RESOURCES

HUD—Community Development Block Grant-Disaster Recovery Toolkits

<https://www.hudexchange.info/programs/cdbg-dr/toolkits/>

FEMA—Hazard Mitigation Grant Program Acquisition And Relocation Guide

[https://www.fema.gov/media-library-data/20130726-1516-20490-5325/relocation\\_sow.pdf](https://www.fema.gov/media-library-data/20130726-1516-20490-5325/relocation_sow.pdf)

FEMA—Homeowner’s Guide to the Hazard Mitigation Grant Program

[https://www.fema.gov/media-library-data/1478272128411-2eca27a89d418bb73e817edfb-702cc15/HMA\\_HO\\_Brochure\\_508.pdf](https://www.fema.gov/media-library-data/1478272128411-2eca27a89d418bb73e817edfb-702cc15/HMA_HO_Brochure_508.pdf)

FEMA—Hazard Mitigation Assistance Guidance

[https://www.fema.gov/media-library-data/1424983165449-38f5dfc69c0b-d4ea8a161e8bb7b79553/HMA\\_Guidance\\_022715\\_508.pdf](https://www.fema.gov/media-library-data/1424983165449-38f5dfc69c0b-d4ea8a161e8bb7b79553/HMA_Guidance_022715_508.pdf)

FEMA—How the National Flood Insurance Program Works

[https://www.fema.gov/media-library-data/20130726-1620-20490-0019/f025\\_hownfip-works\\_0210.pdf](https://www.fema.gov/media-library-data/20130726-1620-20490-0019/f025_hownfip-works_0210.pdf)

FEMA—National Disaster Recovery Framework

<https://www.fema.gov/national-disaster-recovery-framework>

FEMA—Public Assistance Grant Program for Government Organizations and Non-Profits

<https://www.fema.gov/public-assistance-local-state-tribal-and-non-profit>

FEMA—Pre-Disaster Mitigation Grant Program

<https://www.fema.gov/pre-disaster-mitigation-grant-program>

FEMA—Flood Mitigation Assistance Grant Program

<https://www.fema.gov/flood-mitigation-assistance-grant-program>

FEMA—Case Studies from Communities Making Use of Various Grant Programs

<https://www.hsdl.org/?view&did=787128>

NOAA—Kinston Case Study: Relocation Strategies to Reduce Flood Risk

<https://coast.noaa.gov/digitalcoast/training/kinston-flood-risk.html>

FEMA—Explanation of Freeboard and Its Purpose

[https://www.fema.gov/media-library-data/1438356606317-d1d037d75640588f45e2168e-b9a190ce/FPM\\_1-pager\\_Freeboard\\_Final\\_06-19-14.pdf](https://www.fema.gov/media-library-data/1438356606317-d1d037d75640588f45e2168e-b9a190ce/FPM_1-pager_Freeboard_Final_06-19-14.pdf)

# HOUSING

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# RESOURCES

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FEMA—Natural Hazards and Sustainability for Residential Buildings  
[https://www.fema.gov/media-library-data/20130726-1743-25045-4520/fema\\_p\\_798.pdf](https://www.fema.gov/media-library-data/20130726-1743-25045-4520/fema_p_798.pdf)

FEMA—Homeowner’s Guide to Retrofitting: Six Ways to Protect Your Home From Flooding  
[https://www.fema.gov/media-library-data/1404148604102-f210b5e43aba0fb393443fe7ae-9cd953/FEMA\\_P-312.pdf](https://www.fema.gov/media-library-data/1404148604102-f210b5e43aba0fb393443fe7ae-9cd953/FEMA_P-312.pdf)

FEMA—Engineering Principles and Practices for Retrofitting Flood-Prone Residential Structures  
[https://www.fema.gov/media-library-data/20130726-1506-20490-2593/fema259\\_complete\\_rev.pdf](https://www.fema.gov/media-library-data/20130726-1506-20490-2593/fema259_complete_rev.pdf)

FEMA—Protecting Building Utility Systems From Flood Damage  
[https://www.fema.gov/media-library-data/1489005878535-dcc4b360f5c7eb7285ac-b2e206792312/FEMA\\_P-348\\_508.pdf](https://www.fema.gov/media-library-data/1489005878535-dcc4b360f5c7eb7285ac-b2e206792312/FEMA_P-348_508.pdf)

FEMA—Flood Damage-Resistant Materials Requirements  
[https://www.fema.gov/media-library-data/20130726-1502-20490-4764/fema\\_tb\\_2\\_rev1.pdf](https://www.fema.gov/media-library-data/20130726-1502-20490-4764/fema_tb_2_rev1.pdf)

FEMA—Free-of-Obstruction Requirements for Buildings Located in Coastal High Hazard Areas in Accordance with the National Flood Insurance Program  
[https://www.fema.gov/media-library-data/20130726-1511-20490-9526/fema\\_tb\\_5.pdf](https://www.fema.gov/media-library-data/20130726-1511-20490-9526/fema_tb_5.pdf)

FEMA—Catalog of FEMA Building Science Branch: Publications and Training Courses  
[https://www.fema.gov/media-library-data/1476460097383-a315a523c-d7a30a1c737b7dd6388400d/FEMA\\_P787\\_2016-508.pdf](https://www.fema.gov/media-library-data/1476460097383-a315a523c-d7a30a1c737b7dd6388400d/FEMA_P787_2016-508.pdf)

FEMA—Elevating Your House  
<https://www.fema.gov/pdf/rebuild/mat/sec5.pdf>

NC State—The Principles of Universal Design  
[https://www.ncsu.edu/ncsu/design/cud/about\\_ud/udprinciplestext.htm](https://www.ncsu.edu/ncsu/design/cud/about_ud/udprinciplestext.htm)

NC State—Residential Rehabilitation, Remodeling, and Universal Design  
[http://www.ncsu.edu/www/ncsu/design/sod5/cud/pubs\\_p/docs/residential\\_remodelinl.pdf](http://www.ncsu.edu/www/ncsu/design/sod5/cud/pubs_p/docs/residential_remodelinl.pdf)

NC State—Affordable and Universal Homes: A Plan Book  
[https://www.ncsu.edu/ncsu/design/cud/pubs\\_p/docs/AffordableUHomes.pdf](https://www.ncsu.edu/ncsu/design/cud/pubs_p/docs/AffordableUHomes.pdf)

# GREENSPACE AND TOWN PLANNING RESOURCES

Alta Planning + Design—Small Town and Rural Design Guide  
<http://ruraldesignguide.com>

Greater Grand Forks—Greenway Master Plan  
<http://www.greenwayggf.com/greenway-plans.html>

Cedar Rapids, Iowa—Parks and Greenway Plan  
[http://www.cedar-rapids.org/document\\_center/ParksRec/Concept%20Plan.pdf](http://www.cedar-rapids.org/document_center/ParksRec/Concept%20Plan.pdf)

Napa River Flood Control Channel Design: Obstacles and Successes  
[http://www.sfei.org/sites/default/files/biblio\\_files/NapaRiverCaseStudy\\_Final20161207.pdf](http://www.sfei.org/sites/default/files/biblio_files/NapaRiverCaseStudy_Final20161207.pdf)

North Carolina Mountains-to-Sea Trail  
<https://mountaintoseatrail.org>

Federal Highway Administration—Small Town and Rural Multimodal Networks  
[http://www.fhwa.dot.gov/environment/bicycle\\_pedestrian/publications/small\\_towns/fhwa-hep17024\\_lg.pdf](http://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/small_towns/fhwa-hep17024_lg.pdf)

# GLOSSARY

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**100-YEAR FLOODPLAIN**—The land beyond the floodway that, based on historical data about rainfall and river levels, has a 1% chance of being inundated by floodwaters in any given year.

**500-YEAR FLOODPLAIN**—The land beyond the 100-year floodplain that, based on historical data about rainfall and river levels, has a 0.2% chance of being inundated by floodwaters in any given year.

**ACCESSIBLE**—A dwelling that meets prescribed requirements for accessible housing. Accessible features in dwellings include wide doors, sufficient clear floor space for wheelchairs, lower countertop segments, lever and loop handles on hardware, seats at bathing fixtures, grab bars in bathrooms, knee spaces under sinks and counters, audible and visual signals, switches and controls in easily reached locations, and entrances free of steps and stairs.

**BASE FLOOD**—A flood having a 1% chance of being equaled or exceeded in any given year.

**BASE FLOOD ELEVATION (BFE)**—The elevation of surface water resulting from a flood that has a 1% chance of equaling or exceeding that level in any given year. The BFE is shown on the Flood Insurance Rate Map (FIRM).

**BLUEWAY**—Marked routes for recreational use on navigable waterways, such as rivers, lakes, canals, and coastlines. Also called water trails.

**COMPLETE STREETS**—Streets designed and operated to enable safe access for all users, including pedestrians, bicyclists, motorists, and transit riders of all ages and abilities.

**ELEVATED BUILDING**—A building with no basement and with its lowest elevated floor raised above ground level by foundation walls, shear walls, posts, piers, pilings, or columns.

**FAIR MARKET VALUE**—The price that the seller is willing to accept and the buyer is willing to pay on the open market and in an arm's-length transaction.

**FINISHED FLOOR ELEVATION**—Elevation above grade level of a building's finished floor.

**FLOOD**—A general and temporary condition of partial or complete inundation of two or more acres of normally dry land area or of two or more properties, resulting from overflow of inland or tidal waters, unusual and rapid accumulation of surface waters, or mudflow.

**FLOOD INSURANCE RATE MAP (FIRM)**—Official map of a community on which FEMA has delineated the Special Flood Hazard Areas (SFHAs), the Base Flood Elevations (BFEs), and the risk premium zones applicable to the community.

**FLOODPLAIN**—Any land area susceptible to being inundated by floodwaters from any source.



# GLOSSARY

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**FLOOD FRINGE**—Lands outside the floodway that are at or below the BFE that store, but do not effectively convey, floodwaters. Lands that compose the flood fringe will be inundated during a 1% chance flood event but, due to physical characteristics of the floodplain, do not effectively convey floodwaters.

**FLOODPROOFING**—Any combination of structural and nonstructural additions, changes, or adjustments to structures that reduce or eliminate risk of flood damage to real estate or improved real property, water and sanitation facilities, or structures with their contents.

**FLOODWAY**—The channel of a river or other watercourse plus the land to either side that must remain undeveloped to accommodate typical fluctuations in water level and to prevent water from rising above a designated height.

**FREEBOARD**—An additional amount of height above the Base Flood Elevation used as a factor of safety (e.g., 2 feet above the Base Flood) in determining the level at which a structure's lowest floor must be elevated or floodproofed to be in accordance with state or community floodplain management regulations.

**GREENSPACE**—Protected areas of undeveloped landscape open to the public, often with public amenities like parks, greenways, community gardens, or wildlife areas.

**GREENWAY**—A corridor of land used for recreation and pedestrian and bicycle traffic that is linked to a larger network of corridors often flanked by vegetation, roads, or riparian areas.

**IMPERVIOUS SURFACE**—A hard surface that does not allow water to soak into the ground or that greatly reduces the amount of water that soaks into the ground. Examples include rooftops and roads, sidewalks, driveways, and parking lots that are covered by materials such as asphalt, concrete, brick, and stone. Soils compacted by development are also impervious.

**MIXED-USE BUILDING**—A building that has both residential and non-residential uses.

**REPLACEMENT COST VALUE (RCV)**—The cost to replace property with the same kind of material and construction, without deduction for depreciation.

**SUBSTANTIALLY DAMAGED BUILDING**—A building that has incurred damage of any origin whereby the cost of restoring the building to its before-damage condition would equal or exceed 50% of the market value of the building before the damage occurred.

**UNIVERSAL DESIGN**—The design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design

**WATERSHED**—The area of land where all the water that falls in it and drains off of it goes to a common outlet.