

# NORTHEAST FLORIDA REGIONAL RESILIENCY ACTION PLAN

## TABLE OF CONTENTS

I.	<a href="#">Introduction</a>	Page 2
II.	<a href="#">Definitions</a>	Page 3
III.	<a href="#">What is resilience?</a>	Page 5
	a. Definition of resilience	
	b. Why is resilience important?	
IV.	<a href="#">What is a Regional Resiliency Action Plan?</a>	Page 6
	a. Definition of an RRAP	
	b. Scope of this RRAP	
	c. Intended audience for this RRAP	
V.	<a href="#">Why is a Regional Resiliency Action Plan needed?</a>	Page 7
	a. <a href="#">Background on Northeast Florida</a>	
	b. <a href="#">Drivers of Vulnerability</a>	
	c. <a href="#">Justification for a regional approach</a>	
VI.	<a href="#">Overview of the Northeast Florida Regional Resiliency Action Plan</a>	Page 15
	a. Resilient First Coast Collaborative	
	b. Guiding principles of the RRAP	
	c. Structure of the RRAP	
VII.	<a href="#">Goals and objectives</a>	Page 17
VIII.	<a href="#">Best Practices</a>	Page 22

## INTRODUCTION

In 2021, the Resilient Florida Program was created by the Florida Legislature to address numerous challenges, advising the state of Florida to assist communities in adapting critical and regionally significant assets to the effects of flooding and sea level rise. The Resilient Florida program administers grant funding through the Florida Department of Environmental Protection, which oversees many resiliency-related projects in the state. The Florida Department of Environmental Protection awarded the Northeast Florida Regional Council funds to create an “action plan” to address the growing concerns of the region about the effects of flooding and sea level rise on their communities. Additional funds were provided by the Economic Development Administration via a grant-funded position for disaster recovery and by other organizations via in-kind contributions to address additional, broader concerns from climate change.

This document is an effort taken on by the Northeast Florida Regional Council (NEFRC) and the Resilient First Coast (RFC) Collaborative in 2023 to create a Regional Resiliency Action Plan (the “action plan”) to assist in protecting local and regional assets from the current or expected impacts of climate change like weather extremes and hazards, sea-level rise, extreme heat, biodiversity loss, or food and water insecurity. Four (4) subcommittees were created from the RFC collaborative that covered topics such as Quality of Life, Environment, Infrastructure, and Economic Resilience; these committees consisted of various professionals from around Northeast Florida who worked diligently with NEFRC staff to draft the action plan. Once the action plan was created, it was then presented to the full RFC Collaborative and additional stakeholders for further input and review. This action plan will provide the tools to the region to further those efforts and create a more adaptive regional community.

In addition to developing the policies needed to guide adaptation, this plan will encourage governments to look at large-scale measures, such as strengthening or relocating infrastructure from coastal areas affected by sea-level rise, building infrastructure able to withstand more extreme weather conditions, transforming surface infrastructure to mitigate extreme heat and stormwater flooding, enhancing early warning systems and access to disaster information, developing insurance mechanisms specific to climate-related threats, and creating new protections for wildlife and natural ecosystems.

## DEFINITIONS

**Adaptation:** The process of adjusting to new climate conditions to reduce risks to valued assets, increase communities' beauty and livability as conditions change, and to safeguard the public health and welfare.

**Anthropogenic:** Environmental change caused or influenced by people, either directly or indirectly.

**Built Environment:** Human-made structures, features, and facilities viewed collectively as an environment in which people live and work.

**Climate Change:** A change in global or regional climate patterns, in particular a change apparent from the mid to late 20th century onwards and attributed largely to the increased levels of atmospheric carbon dioxide produced by the burning of fossil fuels.

**Compound Flooding:** Compound flooding refers to a situation where multiple types of flooding occur simultaneously or sequentially, compounding the overall impact and complexity of the flooding event.

**Density:** Density is the number of dwelling units per gross acre within a given land area.

**Drivers of Vulnerability:** Specific environmental, social, economic, and infrastructure characteristics of a community that make an area more vulnerable to climatic risks by increasing either the exposure or sensitivity of the system to the risks.

**Economic Inequity:** A disparity between the resources of different groups of individuals to prepare for and/or recover from an extreme climatic event.

**Evacuation Zones:** Evacuation zones are the areas that officials may order evacuated during a hurricane. These zones are mapped by the National Hurricane Center and indicate areas that will be affected by storm surge - storm-driven waves that can inundate a community and threaten lives. For example, if you are in an evacuation zone, typically Zone A is the most vulnerable and the most likely to evacuate first. Zone E is most likely to evacuate last.

**Evapotranspiration:** Evapotranspiration is the sum of all processes by which water moves from the land surface to the atmosphere via evaporation and transpiration.

**Exposure:** The nature and degree to which a set of assets is exposed to significant climate variations, such as extreme heat or precipitation, flooding, and sea level rise.

**Extreme Weather Event:** Occurrences of unusually severe or unexpected weather or climate conditions that can cause devastating impacts on communities and agricultural and natural ecosystems.

**Green Infrastructure:** Trees and other vegetation that are implemented for their numerous practical benefits, including increased shade, reduced ambient air temperatures, improvements to water quality, reductions in stormwater (and other) flooding, habitat creation, and creation of recreational areas. Green infrastructure includes nature-based projects like green neighborhood stormwater parks or living shorelines.

**Infrastructure:** The basic physical and organizational structures and facilities (e.g. buildings, roads, power supplies, internet) needed to operate a community.

**Living Shorelines:** A [green infrastructure](#) technique using native vegetation alone or in combination with low sills to stabilize the shoreline. Living shorelines provide a natural alternative to ‘hard’ [shoreline stabilization](#) methods like rip rap or bulkheads, and provide numerous benefits including [nutrient pollution](#) remediation, essential fish habitat structure, and buffering of shorelines from waves and storms.

**Mitigation:** The action of reducing the severity, seriousness, or effects of an action or event.

**Nature-Based Solutions:** Sustainable planning, design, environmental management, and engineering practices that weave natural features or processes into the built environment to promote adaptation and resilience. For example, planting trees that thrive in coastal areas – known as mangroves -- reduces the impact of storms on human lives and economic assets, and provides a habitat for fish, birds and other plants supporting biodiversity.

**Redlining:** The mid-20th-century practice by banks and insurers to concentrate black and other minority homeowners within certain neighborhoods. This practice of lending was banned under the Fair Housing Act of 1968.

**Resilience:** The capacity of communities or the natural environment to prevent, withstand, respond to, and recover from a climatic disturbance.

**Resilient Communities:** Communities able to minimize the impacts of environmental shocks and stresses, making the return to normal life as effortless as possible.

**Sensitivity:** The degree to which people and the things they value could be harmed by exposure to a hazard.

**Shocks:** Sudden, extreme events that damage the sustainability of a community, such as a hurricane, a flood, a bad storm, or even extended dry spells.

**Silviculture:** The art and science of managing forests and woodlands for various purposes and values.

**Smart Surfaces:** Surface infrastructure technologies that effectively reduce extreme heat and stormwater flooding, often through increases to surface reflectivity, presence of vegetation, or increased permeability.

**Stressors:** A long-term condition, event, or trend that can weaken a community over time.

**Supply Chain:** A network of individuals and companies who are involved in creating a product and delivering it to the consumer. Links on the chain begin with the producers of the raw materials and end when the van delivers the finished product to the end user.

## WHAT IS RESILIENCE?

### Definition of Resilience

Most of Florida’s coastal cities, and those inland areas adjacent to rivers and tributaries, have experienced flooding on one or many more occasions within the last decade. Northeastern Florida also faces increases in extreme heat events – as referenced in the Resilient Jacksonville Action Plan, days with heat index above 90 degrees F are projected to go from an historical average of less than 100 to nearly 140 by mid-century and days with heat index above 100 degrees are projected to go from less than 20 to more than 60 by mid-century. With the onslaught of extreme climatic events over the last few decades, both inland and coastal communities within Florida have experienced damage and/or devastation to major assets, and serious impacts to human health and well-being. Resilience is the ability to effectively manage both immediate shocks and long-term stressors related to climate change and weather extremes. Prepared and responsive communities are the fundamental components of resilience. While immediate response is required in the event of a catastrophe or natural disaster, ongoing adaptation through long-range planning and the strengthening of regional assets and operations can provide a more resilient future. Creating resilience within the state requires numerous measures focused on creating more durable infrastructure and creating more environmentally sound policies at the local level to ensure the preservation of our quality of life.

### Why is Resilience important to the region?

Resilience in Northeast Florida is imperative to prepare for the inevitable impacts of climate change, with federal and state government efforts focusing on creating more resilient communities now more than ever. There are several themes that the region has identified as important for the immediate and future allocation of time and resources. Without adequate attention given to the following thematic areas, regional resilience will not be achieved.

- **Durable Built Environment:** The region has determined that our built environment (existing human-made structures, features, and facilities) is critical for the safety of the community and should be protected from rising sea levels and climate change. Manifesting a durable built environment protects critical assets, such as infrastructure, transportation, and technology, and reduces the time, expense, and disruption of needing to replace critical assets that would otherwise be destroyed during extreme weather events.

- **Thriving Regional Economy:** A thriving regional economy can sustain communities during unforeseen disruptions, reduce repair and maintenance expenses, and create a solid foundation for sustainable economic growth. Furthermore, protection of these assets that create revenue and tourism for communities fosters a more sustainable community, which offsets the impacts from climate shocks and stressors.
- **Vibrant Quality of Life:** A vibrant quality of life may be achieved by not only providing access to the most basic needs of the community but also by increasing the viability and effectiveness of communities to recover quickly and more efficiently from disruptions.
- **Healthy Natural Environment:** Existing natural resources that buffer and protect specific areas need to be maintained and preserved to offset the impacts from climate shocks and stressors, serve as habitat for biodiversity, and provide other ecosystem services. A healthy natural environment can enhance all the other themes above.

## WHAT IS A REGIONAL RESILIENCY ACTION PLAN?

### Definition of a RRAP

A Regional Resiliency Action Plan (RRAP) provides a set of strategies for a region to collaboratively mitigate and adapt to a changing climate. The RRAP is a voluntary tool for the region and local governments that includes a broad set of best practices to guide building resilience that each jurisdiction may choose to implement. The RRAP is a framework for cohesive regional actions rather than a specific set of directives aimed at any one specific program focused on the local government level. This plan provides a set of guidelines for local governments, educational facilities, business owners, and other various stakeholders. One guideline may not apply to every area. Each local government will need to devise their own adaptation plan based on their specific needs; however, they can rely on this action plan for general direction and guidance.

### Scope of this RRAP

This RRAP is a living document that is designed to guide action over the next five (5) years for the Northeast Florida region. This comprehensive document includes four (4) high level goals, a multitude of objectives, a well-vetted set of best practices, and actions and metrics for local implementation and regional collaboration. It is designed to focus on effective and equitable solutions to mitigate and adapt to climate stressors. The recommendations provided within this RRAP can be implemented on both the local government level and on a regional scale.

Phase II of this document will entail NEFRC staff constructively working on Vulnerability Assessments with several local communities throughout the northeast region. Forthgoing efforts will be focused on completing these assessments so that local communities involved can move forward with utilizing funds provided by the Department of Environmental Protection for adaptation strategies.

### Intended audience for this RRAP

The Northeast Florida region, local governments, educational facilities, business owners, and other stakeholders within the community can utilize the RRAP to guide their communities into a more sustainable future. Coordination among these entities fosters an environment where best practices are shared and utilized throughout the region.

## WHY IS A REGIONAL RESILIENCY ACTION PLAN NEEDED?

### Background on Northeast Florida

Welcome to the Northeast Florida region, otherwise known as the “First Coast”. Northeast Florida is a diverse landscape consisting of coastal, urban, suburban, and rural communities that host a multitude of people from all socioeconomic backgrounds. The Northeast region consists of seven (7) counties, three (3) of which are inland, and four (4) of which are coastal. The region consists of Baker, Clay, Duval, Flagler, Nassau, Putnam, and St. Johns Counties and their 25 municipalities.

The region covers 4,428 square miles and has a population of approximately 1.8 million and growing. Predominant industries in the region include agriculture, manufacturing, transportation and warehousing, administrative support, waste management, remediation services, healthcare and social assistance, federal government and military, retail, and various hospitality industries (i.e. hotels, restaurants). The region maintains 140 miles of coastline and five barrier islands encouraging economic development along the coastal areas which lures a high influx of tourism throughout the warmer seasons.

While 43% of the region is dedicated to agriculture among the inland area of the region, those areas further east near the coast are developed with downtown centers, ports, airports, industrial complexes, major retail development, and hotels/restaurants. For example, Jacksonville boasts a population of approximately one million and is also home to the Everbank Stadium, where a national football league team is located. Further down the coast is the historic downtown Saint Augustine district, the earliest European colonized city in the U.S., where some homes date as far back as the 1700’s. The downtown area of Saint Augustine abuts the Matanzas River where many retail, restaurant/bar, and hotels are located. This area is prone to flooding during tidal and storm events, often rendering the downtown area not navigable.

Coastal communities consist of areas such as Jacksonville Beach, St. Augustine Beach, Fernandina Beach, Ponte Vedra Beach, and Flagler Beach, which host a seasonal influx of tourism in the warmer months. These communities are often characterized by transient-oriented uses (i.e. hotels, vacation rentals, bed and breakfast), restaurants, retail, and residential uses. Many are walkable areas with mixed residential and nonresidential uses near the Atlantic Ocean.

Further west are more rural/agricultural and silvicultural lands. These areas typify as low-density development and an abundance of cropland and grazing areas for cattle. They also provide abundant opportunities for ecotourism, consisting of hiking trails, biking trails, and maritime activities along the rivers and lakes. Some less populated cities along the St. Johns River consist of both agricultural/silviculture

areas, manufacturing, and low-intensity urban areas. One of those rural cities is the City of Palatka. Due to the historical importance of Palatka as a southeastern interior port, much of the urban development is oriented toward the riverfront. The eastern sections of the city, which include downtown and the historic districts, are characterized by a gridded street system. The western outlying suburban areas are primarily characterized by an amorphous road pattern.

Population: According to the University of Florida’s Bureau of Business and Economic Research (BEER), the population within the Northeast Florida region in 2022 was 1,878,146. The table below breaks down the population within the seven counties of the Region. The Northeast Florida Region saw extraordinary growth over the last decade with a 2% growth in the Region’s population from 2021 to 2022. However, this population growth is not equal throughout the Region. For example, St. Johns County experienced a 3.8% population growth from 2021 through 2022. In Baker County, however, the population experienced a decrease of 2.8% from 2021 through 2022.

**Table 1: Northeast Florida 2022 Population by County<sup>1</sup>**

<b>County</b>	<b>2021 Population</b>
Baker County	27,881
Clay County	225,553
Duval County	1,033,533
Flagler County	124,202
Nassau County	95,809
Putnam County	74,249
St. Johns County	296,919
Northeast Florida Total	1,878,146

*FEMA Evacuation Zones Explained: A FEMA evacuation zone is an area designated by the Federal Emergency Management Agency (FEMA) to identify regions at risk of severe impact from natural disasters, such as hurricanes, floods, or wildfires. These zones help local officials determine which areas should be evacuated in the event of an emergency.*

*The zones are often categorized by levels or letters to indicate the severity of risk, with different zones having different evacuation orders based on the nature and intensity of the threat. For example, in a hurricane scenario, a Zone A might be the most vulnerable and evacuated first, while Zones B and C could follow based on the storm’s projected path and strength. These zones are referenced several times in the County descriptions below.*

---

<sup>1</sup> [Florida Projections of Population in 2023, UF BEBR](#)



**Baker County****Population:** 27,881 / **Land Area** (sq. miles): 585

Baker County is an inland area bordering Georgia with a population of about 28,000. It is home to the Osceola Wildlife Management Area, the Osceola National Forest, and the John M. Bethea State Forest. Baker is home to the City of Macclenny and the Town of Glen Saint Mary, and four notable rivers: Saint Marys River, Cross Branch, North Prong Saint Marys River, and New River. The area is roughly 125 feet above sea level, leaving it less vulnerable than other counties in the Northeast Florida region.

Baker County does not have designated evacuation zones. The county may still issue evacuation orders, but the orders will not refer to designated evacuation zones. Instead, they will refer to geographic boundaries or landmarks. The St. Mary's River passes through Baker and numerous other counties. Baker County is very rural in nature and boasts 220,000 acres taken up by the Osceola National Forest.

**Clay County****Population:** 225,553 / **Land Area** (sq. miles): 601

Clay County is an inland area **that** borders the St. Johns River on its east side. Clay has a population of about 225,000 and is roughly 151 feet above sea level. Clay has multiple evacuation zones all along the St. Johns River. Most of the zones, however, are ranked level D. Clay is home to Green Cove Springs, Keystone Heights, Orange Park, and Penney Farms. Clay County boasts several historical areas, state parks, and outside recreation. Furthermore, Clay County has an old Florida vibe, where much of the area provides for trails, horseback riding, and agriculture.

**Duval County****Population:** 1,033,533 / **Land Area** (sq. miles): 774

Duval County is a highly populated county with over 1,000,000 people. The county sits on average 26 feet above sea level. The county is massive in terms of land area. While elevation levels in the county fluctuate over such a large landmass, many of the county's residents are vulnerable to coastal hazards, with many flood evacuation zones having a C rating or higher. The presence of the St. Johns River also leaves the region highly vulnerable to fluvial and pluvial flooding. Municipalities within Duval County include Jacksonville, Jacksonville Beach, Atlantic Beach, Neptune Beach, and the Town of Baldwin.

Duval County is the home of the Jacksonville Jaguars NFL Football team and has a diversified downtown area of retail and nightlife. Many parts of Duval County and the city of Jacksonville surround the St. Johns River which has developed a maritime characteristic that caters to food retail, nightlife, passive recreation, and industrial uses along the river.

**Flagler County****Population:** 124,202 / **Land Area** (sq. miles): 485

Flagler County is a coastal county of over 124,202 people that sits on average 20 feet above sea level. This low elevation and proximity to the coast leaves many of the county's residents vulnerable to coastal hazards. Many residents near the coast and Crescent Lake have flood evacuation zones with a C rating or higher. Other municipalities within Flagler County include the City of Palm Coast, the City of Flagler Beach, the Town of Beverly Beach, the City of Bunnell, and the Town of Marineland.

Flagler County has coastlines along the Atlantic Ocean making it a premier destination for beachgoers. Areas such as Flagler Beach boast retail shops and restaurants within feet of the shoreline. There are also many dolphin encounter programs at Marineland Dolphin Adventure and the Sea Turtle Hospital at Whitney Laboratory.

**Nassau County**

**Population:** 95,809 / **Land Area** (sq. miles): 652

Nassau County is the most northeastern county in Florida, with a population of approximately 95,809 and an average Evacuation Zone designation of D. The county in its entirety has mobilized on mitigating the prospect of sea level rise and flooding in numerous ways. Other municipalities located within Nassau County are the Town of Fernandina Beach, the Town of Callahan, and the Town of Hilliard.

Nassau County boasts a diverse economy that encompasses various sectors, ranging from agricultural activities, predominantly in the form of tree farms situated in the western and central regions, to a range of endeavors closer to Amelia Island. A significant portion of the tree farming land is under the ownership of a notable local employer and proprietor of a substantial pulp mill located in Fernandina Beach. In the central county region is an exclusive property named White Oak Conservation featuring exotic animals such as giraffes and large albino felines.

**Putnam County**

**Population:** 74,249 / **Land Area** (sq. miles): 722

Putnam County is home to Palatka, Crescent City, Interlachen, Pomona Park, and Welaka, amounting to about 74,000 residents in total. Putnam lies about 62 feet above sea level. While elevation levels in the county vary, many of the county's residents are vulnerable to coastal hazards, with many flood evacuation zones having been designated a C rating or higher.

Downtown Palatka is the County seat of Putnam, which hosts local festivals and events including the Florida Azalea Festival, Blue Crab Festival, and Mug Race. Numerous other public gatherings occur throughout the year. Furthermore, Palatka is the center point of the Lake Butler to St. Augustine Rails-to-Trails project which is nearly complete and serves as the backbone for an elaborate Trail System. The Palatka-to-St. Augustine State Trail currently runs through the communities of Armstrong, Elkton, and Vermont Heights in northeastern Florida.

**St. Johns County**

**Population:** 296,919 / **Land Area** (sq. miles): 609

St. Johns County is a coastal county that has a population estimated to be about 296,919 and an average elevation of 30 feet above sea level. Therefore, coastal threats such as flooding are a major concern, given that a significant portion of the county lies within "A" and "F" grade Evacuation Zones. Municipalities located within St. Johns County are the City of Saint Augustine and the City of St. Augustine Beach. Saint Augustine is the oldest continuously colonized city in the United States. Saint Augustine hosts several historical features, including Fort Mose, which is one of the first legally sanctioned free African settlements of the U.S.

## DRIVERS OF VULNERABILITY

The Northeast Florida region faces multiple drivers of vulnerability that will be exacerbated by climate change. Northeast Florida is at risk of wildfires, hurricanes, storm surge, sea level rise, flooding, extreme heat, concurrent events that combine the worst of multiples of these, and other shocks and stresses. Climate change can impact the lives of residents, damage property, disrupt businesses, increase crop damage, and degrade natural systems. Such impacts result in disruptions to local economies, lost revenues for the private and public sectors, loss of employment opportunities over time, and extreme demand for governmental resources to combat and recover from those events. The drivers of vulnerability for the region are outlined in three categories: water/environment, infrastructure, and policy/social.

### **WATER/ENVIRONMENT:**

**Geographic proximity to water:** Those structures and vegetation along rivers, tributaries, and/or the ocean are more likely to experience erosion of shoreline natural systems that buffer the effects of extreme weather events. Furthermore, sea level rise also affects the mean high water line along the rivers and tributaries that it may flow into. This threat alone increases the likelihood of flooding in upland areas that were once not prone to these stressors, affecting critical infrastructure located along waterways or within these upland areas prone to flooding.

**Anthropogenic pollution and runoff:** Increased rainfall from a climate event can lead to more runoff of sediments, nutrients, pathogens, and other substances into water bodies. Increases in nutrient runoff, along with warming water temperatures, can also lead to harmful algal blooms. These algal blooms can kill fish, shellfish, and other animals. They can also make drinking and recreational water sources unsafe for people and pets.

**Topography:** Florida has a very flat topography with very little mountainous or hilly areas. In Northeast Florida, most of the land area is at or below sea level, increasing the risk of flooding and causing damage to critical assets and existing infrastructure. Furthermore, hills and mountains buffer structures and areas from high winds.

**Soil saturation capacity:** Florida exhibits eight (8) different soil types across the region. With many of those soils being clay, water tends to take longer to permeate back into the groundwater table, exacerbating puddling and flooding of stormwater and runoff. These types of soils intensify flooding events during periods of excessive rainfall and sea level rise, which may also increase the flooding areas where critical infrastructure is located.

**Saltwater intrusion into surface water and groundwater:** Rising sea level and increased drought can enable saline water to advance farther upstream and inland in estuaries, wetlands, and aquifers. Higher salinity can contaminate freshwater supplies and harm aquatic plants and animals. It can also push saltwater into areas of high-water aquifer recharge. These are sandy soils that allow water to permeate at a

much higher rate. When these areas intake saltwater during a flooding event, they permeate into the aquifers and can potentially destabilize an area's water supply.

**Loss of wetlands:** Loss of wetlands impacts the coastal carbon cycle, reducing the potential for removal of carbon dioxide from the atmosphere during photosynthesis, thereby exasperating climate change. Loss of wetlands also reduces the ability of stormwater retention and the buffering of storm surge. Without the additional buffering of storm surge, there is also an increase in the rate of sediment erosion on tidal lands.

**Loss Of Biodiversity:** Some agricultural and building practices lead to a loss of biodiversity. The destruction of ecosystems threatens food systems, air quality, and water quality, and undermines nature's ability to regulate greenhouse gas (GHG) emissions and protect against extreme weather.

**Urban Heat Island:** Urban areas with high concentrations of heat-absorbing buildings, roads, and other dark and impervious infrastructure and with limited trees and other greenery consistently experience higher temperatures than areas with more natural landscapes.

**Change in Rainfall Patterns:** As a result of climate change, storm-affected areas are likely to experience increases in precipitation and increased risk of flooding, while areas located far away from storm tracks are likely to experience less precipitation and increased risk of drought. Storm-affected areas are more prone to flooding and risk damage to critical assets and infrastructure.

## **INFRASTRUCTURE:**

**Aged stormwater management systems:** As climate change is projected to increase the frequency and intensity of rainfall, these aged systems (such as dams, canals, ditches, stormwater infrastructure) will not be able to maintain their current level of service. These changes in the rainfall patterns along with the condition of the aged systems may reduce the capability of the systems to control flooding and prevent potential damage during extreme weather events

**Condition of infrastructure:** The location and condition of public infrastructure such as roadways, public facilities, and internet/cable determine how quickly a community shall recover from an extreme weather event. Furthermore, there are public facilities in the region that were constructed prior to current building codes and located within floodplains and would be prone to flooding and potential damage during an extreme weather event.

**Concentration of septic tanks:** Approximately 30% of the state of Florida is on septic systems. When water tables rise due to heavy, prolonged rains, coastal storms, or sea level rise, septic tanks are unable to function properly, causing sewage to seep into drinking water or onto the surface. In many coastal areas, rising seas and extreme weather are pushing water tables higher. That could allow the liquid waste to reach groundwater before it's properly filtered.

**Transportation and logistics chains:** As climate change makes extreme weather more frequent and/or severe, it increases the annual probability of events that are more intense than manufacturing and transportation assets (such as roadways, cargo ships, aviation, etc.) are constructed to withstand, increasing the likelihood of supply-chain disruptions.

**Sensitivity of historical assets:** Many structures within the Northeast Florida region are historical structures built prior to the efforts of the Florida Building Code and are within flood zones that render these structures prone to flooding. Furthermore, other historical assets (i.e. cemeteries, monuments, forts) are vulnerable to the effects of climate change. Many historically significant sites rely on tourism for preservation and maintenance funding. Climate change impacts such as extreme weather events and sea level rise can disrupt tourism patterns, reducing revenue and affecting local economies.

**Power and communication networks:** Climate change poses significant challenges to both power and communication networks. Extreme weather events can damage power lines, substations, and telecommunication infrastructure, leading to widespread outages and disruptions. Furthermore, an extreme weather event can affect supply chains for equipment and materials needed for the maintenance and repair of power and communication networks, delaying recovery efforts after disasters.

**Information communication practices:** The ability to communicate the risks and hazards facing an area is inhibited during extreme weather events.

**Proliferation of Impervious Surfaces:** Much of the built environment throughout Northeast Florida consists of dark colored and impervious roads, parking areas, driveways, and other features of the built environment that increase extreme heat impacts and do not allow stormwater to readily infiltrate into soils.

## **POLICY/SOCIAL**

**Population growth:** The region has seen extraordinary growth over the last decade with a 2% growth in the region's population from 2021 to 2022. Population growth, along with increasing consumption, tends to increase emissions of climate-changing greenhouse gases. Rapid population growth worsens the impacts of climate change by straining resources. It also exposes more people to climate-related risks.

**Economic Inequity:** Economic inequity is when there are groups of individuals that may or may not have the means to recover as well as another group of individuals during a climatic event. Throughout extreme weather events, some businesses shut down due to flooding, access obstructed by debris in the roadways, and unavailability of local resources (gas, water, electricity, and debris removal). Not having the means to recover from an event may lead to other stressors such as economic downturn, supply chain issues, and loss of income/resources. These same individuals tend to be less likely to have the resources necessary to prepare for a disaster and to lack the savings needed after disasters strike; as a result, they take longer to recover. In the past, banks and insurance companies redistributed money away from low-income neighborhoods. Politicians then targeted low-income areas as cheap land for new industries, highways, warehouses and public housing, built with heat-absorbing asphalt and little cooling vegetation. Therefore,

their access to those basic needs such as transportation, housing, healthcare, and access to food were severely hindered, as further outlined below:

- **Housing inequity:** Areas of low-income housing are often those most vulnerable to the impacts of natural hazards, including those related to climate change and flooding. Often, older homes within the area were constructed prior to Building Codes and may be located within flood zones or in wetland areas that may be more prone to flooding. Furthermore, during flooding events, lower standard utilities in place in impoverished neighborhoods take more time to repair, as they are often inadequate or antiquated infrastructure. Furthermore, the benefits of recent economic growth have not been felt by all Floridians. Economic inequality has been exacerbated by a lack of affordable housing, with rising housing costs eclipsing the growth in wages. A majority of affordable housing in the Northeast region of Florida has been developed prior to Building Code regulations governing development within floodplains or wetland areas, thus placing many of these homes and relative critical assets within vulnerable areas of the region.
- **Transportation inaccessibility:** Areas of low-income communities seldom have modes of transportation other than public transportation. Access to shelters and other assets is inhibited during extreme weather events and flooding.
- **Food inaccessibility:** A significant percentage of residents rely on Supplemental Nutrition Assistance Program (SNAP) retailers, and must be able to access these providers before, during, and after extreme weather events.
- **Heat vulnerability:** Historically underinvested low-income neighborhoods regularly experience higher temperatures due to a lack of trees and other green infrastructure, as well as a greater presence of dark and impervious surface infrastructure. Those same vulnerable residents often do not have the financial resources to properly maintain air conditioning or the ability to afford utility bills for air conditioning during extreme heat events. Compounding health issues among low-income communities exacerbate the above to disproportionately impact the health of residents.

**Workforce:** Climate change impacts can be felt across numerous industries, including agriculture, fishing, insurance, and tourism. In the event of a severe flood, numerous unequipped industries tend to shut down for intermittent periods of time, crippling their ability to reinstate their operations. In addition, increasing frequency/severity of extreme heat events may discourage tourism to the region.

**Transient populations:** Climate change contributes to more frequent and severe natural disasters, such as hurricanes, floods, heat waves, and droughts. These events can force transient populations to move abruptly from their temporary settlements, disrupting their livelihoods and increasing their vulnerability. Transient populations often face challenges in accessing basic services such as healthcare, education, and sanitation. Extreme weather events can exacerbate these already existing conditions.

**Lack of flood insurance:** After Hurricane Matthew and Hurricane Irma in 2016 and 2017 respectively, there was a mass exodus of homeowners insurance companies leaving the state of Florida, resulting in the loss of 15 major insurers. Insurance payouts from flood insurance policies are crucial for recovery efforts. Without this financial support, residents may struggle to recover and rebuild their homes or businesses in a timely manner, prolonging the economic and emotional strain caused by the disaster.

## JUSTIFICATION FOR A REGIONAL APPROACH

The RRAP focuses on the regional scale because disasters often happen at a regional scale, and a coordinated process across multiple jurisdictions can result in safer communities. In addition, extreme heat mitigation measures provide cooling benefits for downwind neighbors, so regional coordination can reduce costs and greatly increase the impact of interventions. The action plan is set up to allow multiple jurisdictions and levels of government to work together for regional-scale actions. It is also designed for non-governmental partners and community groups to engage in a more inclusive and holistic process so that resilience actions are guided by core community values. Many jurisdictions have created adaptation plans specifically related to their communities. However, a regional approach is needed to maximize the resilience of our regionally significant assets, our regionally common assets, and our networks that cross jurisdictional boundaries.

## OVERVIEW OF THE REGIONAL RESILIENCY ACTION PLAN

### **Resilient First Coast Collaborative**

The RRAP was developed by the Resilient First Coast Collaborative (the “Collaborative”), which works across multiple jurisdictions and with non-governmental partners. Resilient First Coast (RFC) is the regional resiliency collaborative for Northeast Florida, which includes Baker, Clay, Duval, Flagler, Nassau, Putnam, and St. Johns counties.

It is a formal partnership to work together to improve the resilience of the region. It is comprised of local governments, businesses, non-profit organizations, academia, and federal/ state agencies. A network of resiliency collaboratives exists in Florida and throughout the nation.

The purpose of the Collaborative is to bring together people from diverse backgrounds to tackle regional challenges involving resiliency to the effects of climate change, including sea level rise, flooding, extreme heat, and other hazards. This Collaborative is made up of many partners from multiple sectors, including local government, business, non-profit organizations, academic institutions, state and local agencies, utilities, and the military. The Collaborative was formed in 2022 based on 4 pillars: Environment, Infrastructure, Quality of Life, and Economic Resilience. The Collaborative has over 20 member organizations, a Steering Committee led by a chair and co-chair, 4 subcommittees (each dedicated to 1 of the pillars of the Collaborative), and additional working groups focused on specific projects or outcomes.

Each committee was instrumental in developing the goals, objectives, and actions for the RRAP. Additional information about the Collaborative may be found at <https://resilientfirstcoast.com>.

### **Guiding principles of the Regional Resiliency Action Plan**

The RRAP is based on sound science and well-vetted methodologies. Goals, objectives, and actions set forth in the RRAP will be tracked using appropriate metrics to evaluate their success. The RRAP will take into account the results of existing and ongoing vulnerability assessments, as well as additional data for social and economic vulnerabilities and populations. It will utilize a regional-scale risk assessment for climate sensitivities and future conditions. The RRAP considers grey, green, and blue types of strategies and leverages multi-purposed projects/strategies into planning efforts. The RRAP will complement other similar efforts underway for the region, such as the Comprehensive Climate Action Plan, which will include a greenhouse gas inventory and mitigation measures. Input for the RRAP came from the RFC Committees and the Collaborative as a whole. Working with the Collaborative helped to ensure that the community was kept involved and informed. The RRAP encourages cooperation with a variety of entities and identifies regional opportunities for collaboration.

### **Structure of the RRAP**

Phase I of the RRAP provides information about Northeast Florida, creation of the Resilient First Coast Collaborative, guiding principles, the drivers of vulnerability, best practices, and goals and objectives.

Phase II of the RRAP will create action items to implement the goals and objectives and will be largely based upon the key findings of relevant studies and vulnerability assessments that were completed during the previous year. Upon review of these studies, additional goals and objectives may be created. Other components of Phase II include providing for the metrics of the action items, a system for tracking the metrics, funding of resilient projects, and an executive summary. The goals, objectives, and best practices of the RRAP are organized around the 4 themes describing the importance of resilience to the region (Economic, Infrastructure, Quality of Life, and Environment).

In Phase II, the actions within the RRAP will be organized under 3 layers of applicability, based on the types of assets (whether natural, built, or human) under consideration. Each action will be tied to more than one goal and/or objective, thus necessitating a more holistic organizational structure. Those 3 layers of applicability are as follows:

1. **Regionally Significant Assets:** These areas represent those regional assets that are extraordinary to the region and are either historically significant, regionally important, and/or are significant to a vibrant economy within some parts of the Northeast Region.
2. **Assets Available Throughout the Region:** This tier represents those resources that are available in every county. Some examples of those assets are healthcare, jobs, and transportation.
3. **Networks Throughout the Region:** This tier focuses on regional resources that traverse jurisdictional boundaries and that are significant resources to the region. Some examples may be regionally significant roadways, waterways, and trail systems.



# GOALS AND OBJECTIVES

## **Goal 1: Create a durable built environment.**

Objective 1: Encourage policies that utilize resilient development practices.

- With many structures located within wetlands and floodplains, the probability of these assets being affected from climate change such as extreme weather events, extreme heat, and flooding are very high. Building with smart surfaces – reflective, nature-based, permeable and low-carbon resilient infrastructure – will need to become the urban design norm for counties and municipalities to ensure resilient communities, for both private and public development of lands.

Objective 2: Promote diverse modes of transportation by improving vulnerable infrastructure and community mobility.

- Many roadways are constructed at or below sea level and are prone to flooding and exacerbate disruptions to post-storm recovery. Furthermore, single modes of transportation severely limit transportation options and may not be accessible to those lower income and other individuals that rely on public transportation and/or bicycle and foot travel.

Objective 3: Enhance utility and technology networks to be resilient during extreme weather events for an efficient post-event recovery.

- A more efficient post-storm recovery is heavily dependent on the ongoing operations of infrastructure utilities, such as wastewater, potable water, and communication facilities. While it is important for a community to understand their energy needs post-storm recovery, often there are limited resources to secure those assurances. Therefore, resilient utility and technology networks are imperative for more efficient recovery.

## **Goal 2: Develop a thriving regional economy.**

Objective 1: Ensure housing stability in the face of environmental and economic challenges by promoting the incorporation of more diverse types of resilient housing.

- Housing stability, affordability, and accessibility are issues compounded by the impacts from climate change. Right now, 28.8% of the households in the region are cost-burdened, meaning that households spend at least 30% of their annual income on housing expenses. Compounding effects from climate change such as extreme weather events, extreme heat, and flooding pose risks to all housing, especially for economically vulnerable groups of people. Residents in Northeast Florida will benefit from housing solutions that match the environmental and economic conditions of Northeast Florida. Resiliently designed housing

reduces insurance risk and costs, the risk of loss of property or life, and ensures that homeowners can more quickly recover after extreme weather events.

Objective 2: Cultivate economic resilience by prioritizing smart growth practices.

- Smart growth is defined as a combination of development and conservation strategies that enable communities to be “more attractive, economically stronger, socially diverse, and resilient to climate change.” In 1996, the Environmental Protection Agency, among other governmental and nonprofit organizations, established the Smart Growth Network to create development strategies that prioritize human and environmental health.

Objective 3: Foster a diverse and resilient labor force through comprehensive workforce development initiatives.

An equipped, diverse workforce can increase Northeast Florida’s ability to adapt and bounce back from climate and economic shocks and stressors. Climate change impacts can be felt across numerous industries, including agriculture, fishing, insurance, and tourism. In the event of severe flooding, numerous unequipped industries tend to shut down for intermittent periods of time, crippling their ability to reinstate their operations. Training a modern workforce to support construction of more resilient infrastructure will result in a more prepared region and provide tremendous economic development and upward mobility opportunities.

- To approach workforce development from a climate change perspective, local and regional actions must account for dynamic economic conditions. Workforce development and jobs must be centered in a regionally focused economy that diversifies current industries for economic resilience, utilizes unique local & regional resources, and develops a green, climate resilience-based workforce.

Objective 4: Foster resilient historic preservation and tourism by implementing adaptive measures to protect culturally significant community economic assets from disasters and climate-related risks.

- Northeast Florida is known as Florida’s First Coast with its rich history, cultural heritage, and bustling tourism economy from the region’s environmental assets such as the beaches, rivers, and forests. These resources help protect the character and history of the region while creating jobs and economic activity. Historical resources and environmental assets are particularly susceptible to climate change impacts such as flooding, high rainfall, and strong winds. Oftentimes, these resources are shared across municipal or county boundaries, so the region needs to focus on protecting these cultural, historical, and environmental assets that make Northeast Florida unique.

### **Goal 3: Ensure a vibrant quality of life.**

Objective 1: Prioritize developments that reduce driving and promote walkability.

- Unsustainable land use practices continue to contribute to excessive building-related energy consumption and increased vehicle miles traveled per capita. Furthermore, low density development creates higher greenhouse gas emissions due to increased driving and less efficient building stock. This objective would seek to prioritize development in neighborhoods that permanently reduce total driving and consume less energy. Increasing walkability also increases public health and reduces costs to the healthcare system, and is shown to promote greater economic outcomes. Walkability is contingent on effective use of trees and other vegetation to reduce ambient temperatures and provide shade.

Objective 2: Increase engagement of the general public and other various stakeholders in quality-of-life issues, resiliency initiatives, and protections from natural hazards.

- Through increased communication to communities through diversifying methods of information exchange, more people become informed about resilience efforts. So, by engaging stakeholders and residents on the effects of natural hazards and resiliency efforts, these groups become more aware of the effects of flooding on critical assets and can potentially recover from a post storm event.

Objective 3: Ensure equitable distribution of funding and resources to all citizens for resiliency needs.

Economic recovery for Florida will require state and local leaders to confront historic health, economic, and environmental disparities that heighten residents' vulnerability to more extreme weather, sea level rise, and other public health threats. This is especially true for the low-income areas in Florida that experience increased post storm recovery times due to lack of resources. These impoverished areas are more prone to flooding that may affect antiquated infrastructure and other assets of the community. Through historical disinvestment or under-investment, many low-income communities do not have the same levels of urban forests, green infrastructure, and other heat and flood resilient characteristics. To adjust for this historical reality, counties and municipalities should more equitably invest in trees, green infrastructure and cool surfaces in historically underinvested communities.

Objective 4: Encourage a more resilient and diverse energy supply that may increase post-event recovery time.

- In anticipation of the emerging challenges of climate change, several types of actions have the potential to increase the resilience of energy supply. For instance, modifying existing equipment and/or making sound choices in selecting new facility sites and equipment purchases can help

build resilience. Any action that results in reduced energy demand, such as smart surfaces and solar battery storage can help relieve stresses on the overall energy system.

Objective 5: Foster expanded public health initiatives and food security within vulnerable and underserved areas.

- Climate change threatens to augment and intensify the risks to food insecurity for the most vulnerable populations. Climate change will have broader impacts for vulnerable communities through effects on trade flow, food markets, and price stability. These impacts could introduce new risks for human health.

#### **Goal 4: Promote a healthy natural environment.**

Objective 1: Create equitable and innovative solutions to reduce heat stress and improve air quality.

- As the world warms due to climate change, heat-related issues will become more pervasive and more dangerous. Mapping heat islands and implementing strategies to reduce the burden on those most affected is crucial to reducing extreme heat and ensuring heat resilience throughout the region. Ensuring the reduction in air pollutants will also bolster a healthy population and increase the overall well-being of the region. Preserving and increasing the tree canopy in the region aids in the reduction of heat and provides cleaner air. Where increased tree canopy coverage may not be feasible, other vegetation and green roofs should be encouraged. The expansion and protection of green space should be targeted in areas with the most need. The implementation of other smart surfaces, like cool roofs and cool pavement coatings, will also play a pivotal role in reducing the prevalence of extreme heat events, while also lowering heat burdens for the health of the region's communities.

Objective 2: Increase awareness of nature-based solutions to improve community resilience and quality of life

- Traditional grey infrastructure has long been used to engineer solutions to extreme weather hazards and stormwater management. Nature-Based Solutions (NBS) offer more comprehensive solutions to hazard management that have multiplicative benefits (stormwater and urban heat island reductions, human health improvements, increase in biodiversity, etc.), and should be considered for standalone projects or in combination with grey infrastructure solutions. Many policy makers, regulators, and other officials involved in local and regional planning should be educated on the overall benefits of using nature-based solutions. NBS allows more harmony with the environment by utilizing methods that bridge the natural environment and modern hardscape while, in many cases, affording greater flood and extreme heat protection than traditional grey infrastructure.

Objective 3: Prioritize restoration and protection of our natural systems to increase ecological services to improve water quality.

- Development must be done in a sustainable and resilient manner, which will require an understanding and appreciation for natural ecosystems. Ensuring that natural resources are prioritized and protected is of the utmost importance. Wetland areas are especially important to protect for the myriad benefits they provide for human health and recreation, carbon sequestration, resilience, including improving water quality, recharge, drainage, and the natural flow of water. In addition, wetlands provide habitat for native plants and animals. Investments in restoring natural ecosystems, including wetlands, will not only enhance the environment but will also improve regional resilience and quality of life.

Objective 4: Proliferate the use of nature-based solutions (NBS) and other green infrastructure practices, where appropriate.

- To maximize resilience benefits, it is important to protect natural ecosystems and to utilize NBS, where appropriate. Traditional grey infrastructure has long been used to engineer solutions to extreme weather hazards, coastal erosion, and stormwater management. However, with proper design NBS (or green infrastructure) can offer similar benefits as grey infrastructure with respect to resilience, and NBS also provide many other co-benefits for communities and the environment. The conversion of natural landscapes to impervious surface alters watershed hydrology, resulting in increased peak flows and greater volumes of stormwater runoff. The implementation of NBS reduces the volume of flooding to those critical assets that may be located closer to waterways prone to flooding. An important step towards implementation of NBS is increasing awareness of their many applications and highlighting the socioeconomic, environmental, and other benefits.

# BEST PRACTICES

## Goal 1: Create a durable built environment.

### 1. Conduct Vulnerability Assessments pursuant to State Statute requirements (Section 380.093, F. S.)

- Several coastal communities have conducted Vulnerability Assessments to understand the potential impacts that sea level rise may have on critical assets (fire stations, police stations, infrastructure, community centers, storm shelters, and utilities). With the knowledge of how critical assets may be affected during a severe storm event or other flooding conditions, communities are able to determine which assets are at most risk and mitigate potential damages. For example, Applied Sciences is working with Port Tampa Bay and Hillsborough County to complete a vulnerability assessment for the largest port in Florida and a major employer. Applied Sciences is studying flooding impacts from tidal inundation, storm surge, precipitation, and sea level rise. Analyses include examining flooding impacts to Port and Community lifelines, stormwater infrastructure, transportation systems, tenant assets and functions, and critical facilities. This project is being performed with funding from the Resilient Florida Program managed through FDEP. Vulnerability Assessments for inland communities in Florida are currently underway; therefore, very little data has been created yet for a set of best practices for these, but examples are forthcoming.

### 2. Use vulnerability assessments to prioritize and obtain funding for regional resilience priorities.

- Miami has conducted extensive vulnerability assessments to address the city's susceptibility to sea-level rise, flooding, hurricanes, extreme heat, and other climate-related hazards. These assessments have informed initiatives such as the Miami Forever Bond, a \$400 million general obligation bond program approved by voters in 2017 to fund resilience projects including flood mitigation, infrastructure upgrades, and affordable housing.

### 3. Develop best practices language for comprehensive plans, Land Development Regulations, and process applications to reduce flood impacts across the region.

- Miami Beach has been proactive in addressing flooding and sea level rise by integrating resilience measures into its planning and development regulations. Some of the initiatives undertaken by Miami Beach include:
  - a. Comprehensive Plan: Miami Beach has updated its comprehensive plan to include policies and strategies aimed at reducing flood impacts and increasing resilience. This includes provisions for land use planning, infrastructure improvements, and flood risk reduction measures.

- b. Land Development Regulations (LDR): Miami Beach has revised its LDR to incorporate requirements for new development and redevelopment projects to mitigate flood risks. This may include elevation requirements, stormwater management regulations, and restrictions on development in flood-prone areas.

Through these efforts, Miami Beach aims to reduce flood impacts, enhance community resilience, and adapt to the challenges of sea level rise and climate change. The city's approach serves as a model for other municipalities in Florida and beyond, demonstrating how comprehensive planning and regulatory measures can help address flood risks and promote sustainable development in coastal areas.

4. Plan, fund, design, and construct climate-resilient critical infrastructure.
  - St. Petersburg has implemented a range of climate-resilient critical infrastructure projects to address sea level rise, flooding, and other climate-related hazards. This includes the construction of stormwater management facilities, such as retention basins and green roofs, to reduce runoff and prevent urban flooding. St. Petersburg has also invested in the retrofitting and elevation of existing infrastructure, such as wastewater treatment plants and utility systems, to increase resilience to extreme weather events.
5. Encourage the development of Adaptation Action Areas and Smart Growth policies, as applicable.
  - Fort Lauderdale has adopted Smart Growth policies to manage growth, protect natural resources, and promote resilience to climate change. The city has encouraged infill development, redevelopment of underutilized sites, and revitalization of urban neighborhoods to promote compact, connected, and vibrant communities. Fort Lauderdale has also designated Adaptation Action Areas to focus resources and investments on climate adaptation and resilience measures in areas vulnerable to sea-level rise, flooding, and storm surges.
6. Provide guidance on a seawall (or similar) ordinance that accounts for future sea level rise and storm surge conditions. Set consistent standards for all regional jurisdictions.
  - Tampa has provided guidance on seawall ordinances that address future sea level rise and storm surge impacts. The city has adopted regulations for seawall construction, repair, and maintenance to mitigate flooding and erosion risks along the waterfront and protect coastal infrastructure and properties. Furthermore, living shoreline projects in Florida are a crucial part of coastal management and environmental conservation. They aim to protect and restore natural coastal ecosystems, such as mangroves, salt marshes, and seagrasses, which provide important benefits like erosion control, habitat for wildlife, and improved water quality. Tampa also created the Tampa Bay Estuary Program where they worked on several living shoreline projects including the restoration of mangrove forests and seagrass beds to enhance shoreline stability and support biodiversity.

7. Retrofit/adjust existing facilities/buildings to make them “climate resilient”, providing for storm protection, water storage, water and energy efficiency, shade, and urban heat mitigation.

- Several cities in Florida are taking proactive measures to retrofit existing buildings and facilities to increase their resilience to climate change impacts, protect against extreme weather events, and enhance sustainability. By incorporating features such as storm protection, water storage, efficiency, cool and green roofs and cool walls, and shade into retrofitting projects, these cities are working to create more resilient and sustainable communities for the future.

The City of Tampa has retrofitted existing facilities and buildings to improve their resilience to climate change by the installation of storm shutters, impact-resistant windows, and reinforced roofing to protect against hurricanes and high winds. Tampa has also implemented measures to increase water storage capacity, such as the installation of rainwater harvesting systems and retention ponds, as well as the use of landscaping features such as shade trees and green roofs to reduce heat island effects and improve thermal comfort.

8. Harden or relocate critical infrastructure, as appropriate, and implement green infrastructure and other nature-based solutions to reduce flood damage and remain operable during storms, making them “climate resilient”.

- Several cities in Florida have taken proactive steps to harden or relocate critical infrastructure to reduce flood damage and ensure operability during storms, thus making them more climate resilient. For example, the city of St. Petersburg has undertaken efforts to harden and relocate critical infrastructure to mitigate flood damage and enhance resilience to storms. This includes elevating fire stations and emergency shelters to protect against inundation, as well as relocating water and wastewater infrastructure away from flood-prone areas. St. Petersburg has also invested in the construction of stormwater retention ponds and green infrastructure projects to reduce flood risks and improve drainage during extreme weather events.

## **Goal 2: Develop a thriving regional economy.**

1. Codify tiny home developments, multi-family housing, accessory dwelling units, and other medium density housing solutions into Comprehensive Plan Future Land Use Elements and Land Development Codes.

**Description:** Tiny homes are often more affordable than traditional housing, making them accessible to a wider range of people. This can help address housing affordability issues exacerbated by climate change impacts such as displacement and economic disruption. Furthermore, tiny homes often use less energy for heating, cooling, and lighting, thereby reducing their carbon footprint over the long term.



- Nassau County, Florida codified tiny home development in the Comprehensive Plan’s Future Land Use Element, Land Development Code, and mobility/impact fees. Nassau County’s Tiny Home Development Program contains two components: Redevelopment Tiny Home Developments and Government Tiny Home Developments. A Redevelopment Tiny Home Development includes a tiny home development on previous land utilized for a mobile home park, travel trailer park, or recreational vehicle (RV) park. The government Tiny Home Development portion states that tiny home developments may be developed on land owned or managed by local government entities, and the impact fees may be waived.
2. Utilize incentive zoning, land development regulations, and development agreements to integrate resiliency building measures in communities such as utilizing hurricane-resistant materials in new homes, requiring LEED certifications, or advanced flood and heat mitigation techniques.
    - In La Plata County, Colorado, wildfires are a top natural hazard concern. There is an existing sporting event space that entered a development agreement with the County to require the developer to adhere to several provisions that would make the site more prepared and resilient to wildfires by requiring a Wildfire Mitigation and Evacuation Plan. This agreement also requires each new cabin at this site to maintain vegetation consistent with the plan as well as use fire-resistant building materials.
    - Miami Beach incorporates sustainability and resiliency as a chapter in their Land Development Regulations. Article I in this chapter explains that any new construction over 7,000 square feet or a ground floor addition over 10,000 square feet, with exceptions, must “attain at a minimum LEED Gold certification” or a similar recognition to curb the impacts of climate change. If a new development fails to attain this certification, they will pay a sustainability fee to the city. Articles II and III discuss sea level rise and resiliency standards for the city.
  3. Develop inter- or intra-city train and bus systems within Northeast Florida to diversify transportation options and reduce greenhouse gas emissions.
    - The Brightline train connects transportation corridors such as Miami, Fort Lauderdale, and West Palm Beach, so passengers can commute or travel at a fast speed while simultaneously reducing personal vehicle travel. Brightline boasts that passengers riding the Brightline train reduce their CO<sub>2</sub> emissions by 75% per mile traveled compared to a personal vehicle. The upcoming Brightline West project will connect Las Vegas, NV to Los Angeles, CA through a fully electric-powered train. This will reduce carbon emissions and plans to be 100% emission free by 2045.
  4. Implement complete and green street design that supports multi-modal transportation opportunities, traffic safety, greater access to businesses, and climate resilience.

**Description:** A diversified transportation system that includes multiple modes provides resilience against climate change impacts such as extreme weather events and disruptions to infrastructure. For example, during emergencies or natural disasters, multimodal networks can offer alternative transportation options when certain modes are affected.

- Complete and green streets promote an appealing street design for walkability, slower traffic, stormwater management, and ambient temperature reduction, which leads to higher employment levels, new businesses, higher property values along these streets, and a safer pedestrian experience. Rosemary Avenue in City Place, West Palm Beach, brings together multiple complete street elements such as wide pedestrian and cycling paths, narrow vehicle lanes, crosswalks, landscaping, as well as access to businesses. Rosemary Avenue supports multiple modes of transportation yet encourages non-motorized travel options through amenities such as wide pedestrian and bike paths, street lighting, and shade from trees and awnings.
5. Partner with colleges, non-profit organizations, governments, and career-development organizations, such as CareerSource, to develop green, equitable workforce development programs.
    - The New York State Energy Research and Development Authority sustains a Clean Energy Workforce Development program to prepare the workforce for clean energy job opportunities. The State of New York committed \$170 million for on-the-job training for new clean energy workers, internships for students, curricula adaptations to meet the needs of clean energy employers, and talent pipelines to match employers to employees, among other initiatives. This collaboration between New York, private organizations, colleges and universities, students, and jobseekers integrates all stakeholders in developing the rapidly growing green workforce.
  6. Inventory, designate, analyze, and adapt historical and cultural resources for climate change impacts.
    - Annapolis, Maryland created a resiliency process called “Weather it Together” for adapting historical and cultural resources using a four-step approach: 1) Assess risks; 2) Develop a mitigation plan; 3) Implement the plan and monitor progress; 4) Organize resources. This plan aids in climate change planning for historical and cultural properties across the City. By following these steps, Annapolis developed implementation project ideas to adapt historical and cultural resources as well as apply for funding for these projects. Implementation projects for this plan include stormwater and flood mitigation design as well as a survey of the risks of over 145 culturally significant properties. Paired with adaptation and mitigation measures, Annapolis utilizes the National Historic Landmarks Program as well as three historic districts to designate and prioritize significant cultural areas. These designations can help facilitate funding for preservation efforts as well as increase tourism in the area.
  7. Partner with Chambers of Commerce and economic development organizations, such as JaxUSA, to diversify local economies.

**Description:** Economies that are diversified across multiple sectors are less vulnerable to the shocks and disruptions caused by climate change impacts such as extreme weather events, natural disasters, and shifts in agricultural productivity. When one sector is affected, others can provide resilience and stability.

- In rural Arkansas, agriculture and manufacturing-based economies have been turning to ecotourism to diversify the economy and highlight natural resources. For example, Northwest Arkansas over the past twenty years has become a renowned mountain biking destination as various partnerships have constructed over 250 miles of mountain biking trails. The University of Arkansas determined that in 2023, the biking business has generated over \$100 million in revenue and 743 jobs. This initiative has helped diversify the economy, draw in visitors to Northwest Arkansas, and put this area on the map for a unique resource.

### **Goal 3: Ensure a vibrant quality of life.**

#### 1. Encourage the design and development of green spaces

- Parks, street trees and trees on private lands, urban nature preserves, and other urban green spaces are of great importance for habitability and quality of life in cities. Urban green spaces are increasingly considered essential “green infrastructure” because they provide numerous ecosystem services and generate diverse socioeconomic and environmental benefits, from improving health inequalities to reducing urban heat islands. Urban green spaces are also a growing strategy for promoting climate change resilience, where resilience refers to a socio-ecological system’s ability to persist, transition or transform to maintain functioning and well-being in response to disturbance. For example, parks are a top option for lowering urban heat island effects as they are found to have lower air temperatures than the surrounding, built landscape, often creating a spillover cooling effect. Furthermore, additional green spaces enhance infiltration of stormwater runoff to slow down the flow of water into drainage systems and natural waterways, reducing the peak discharge of stormwater, reducing impacts from flooding, and filtering out pollutants.

For example, in Fort Lauderdale employees worked with local developers, public agencies at the county and state level, private businesses, and neighbors to build vegetated spaces. They’ve created greenways, parks and neighborhood green spaces, urban farms and community gardens, and parklets to further their efforts of resiliency. These green spaces mitigate urban heat islands, remove air toxins, provide wildlife habitat, reduce soil erosion, ameliorate stormwater runoff, absorb flooding, and can support biodiversity if planned carefully.

#### 2. Foster community engagement through community events and partnerships promoting health, fitness and education.

**Description:** Engaged communities tend to have stronger social networks and better community cohesion. This cohesion is crucial during climate-related crises, as it facilitates effective responses and supports vulnerable community members. Furthermore, community engagement can influence local planning decisions, leading to more resilient infrastructure designs. For example, communities engaged in climate resilience planning may prioritize green spaces, renewable energy projects, and sustainable urban development practices, all of which contribute to climate change mitigation and adaptation efforts.

- Several cities in Florida have fostered community engagement through community events and partnerships promoting health, fitness, and education. For example, the city of Gainesville emphasizes community engagement through events like the Active Streets Gainesville initiative, which temporarily closes streets to vehicular traffic, allowing residents to walk, bike, and engage in various fitness activities. The city also partners with local schools and organizations to provide educational workshops on health-related topics.
3. Ensure equitable distribution of resources, funding and needs of all citizens.
    - Several cities worldwide have been taking steps to ensure equitable distribution of resources, funding, and addressing the needs of all citizens in the context of climate change. For example, Portland Oregon has a reputation for prioritizing equity in its climate action plans. The city's Climate Action Plan includes strategies to address environmental justice issues, such as reducing air pollution in low-income neighborhoods and expanding access to renewable energy and energy efficiency programs for all residents. Extreme heat and stormwater flooding are frequently concentrated in low-income, disadvantaged neighborhoods due to the disproportionate presence of dark, impervious surface infrastructure. Implementation of Smart Surfaces can help deliver justice for these communities.
  4. Diversify the energy grid through local utility providers.
    - Several cities worldwide have been working to diversify their energy grids through partnerships with local utility providers as part of their efforts to address climate change and transition to renewable energy sources. For example, Burlington Electric Department (BED) has helped Burlington, Vermont to become the first city in the United States to source 100% of its electricity from renewable generation. BED has partnered with local renewable energy developers to increase the city's reliance on wind, solar, and biomass energy, demonstrating the potential for local utility providers to drive renewable energy adoption.
  5. Highlight and promote the region's public assets, such as parks, historic landmarks, cultural institutions, and waterfront areas.

**Description:** Promoting a region’s public assets can enhance climate change resilience through numerous strategic approaches. Investing in and promoting public assets like parks, green spaces, and urban forests can mitigate climate impacts by absorbing carbon dioxide, reducing urban heat island effects, improving air quality, and providing habitat for biodiversity. Furthermore, preservation of historic landmarks, cultural institutions, and waterfront areas preserves a community’s identity and sense of place, strengthening social cohesion, which is crucial during times of extreme climate events.

- Several U.S. cities have successfully promoted their public assets, including parks, historic landmarks, cultural institutions, and waterfront areas, employing various strategies to attract visitors and enhance quality of life for residents. For example, NYC has promoted its public assets through extensive marketing campaigns, iconic events, and strategic partnerships. Central Park, Times Square, the Statue of Liberty, and Broadway are among the well-known attractions highlighted in tourism campaigns. The city also hosts events like the Macy’s Thanksgiving Day Parade and New York Fashion Week to showcase its cultural vibrancy.

6. Develop initiatives to protect and preserve Northeast Florida's unique natural assets.

- Many U.S. cities have developed initiatives to protect and preserve their region's unique natural assets, recognizing the importance of conservation for environmental sustainability, biodiversity, and quality of life. Orlando is known for its "Green Works Orlando" initiative, which aims to make the city more sustainable through energy efficiency, green building practices, and conservation efforts. The city has also invested in protecting its wetlands and waterways, which are crucial to its local ecosystem.

7. Establish cultural exchange programs with neighboring communities to showcase Northeast Florida's diverse heritage, traditions, and local talents, fostering regional pride and cross-cultural understanding.

**Description:** Cultural exchange programs promote interaction and collaboration among diverse communities. Building strong social networks and fostering regional pride enhances community cohesion, which is crucial during times of crisis caused by climate change impacts. Strong community bonds facilitate effective communication, mutual support, and collective action in response to climate-related challenges.

- The city of Miami, Florida is known for its multicultural population and vibrant arts scene, influenced by Latin American, Caribbean, and European traditions. The city hosts events like Art Basel Miami Beach and Calle Ocho Festival, which celebrate its diverse heritage and showcase local artists and performers. Miami also collaborates with neighboring cities like Little Havana and Little Haiti to promote cultural exchange and preserve their unique identities.

8. Support efforts to preserve and rehabilitate historic buildings, neighborhoods, and landmarks in Northeast Florida, recognizing their significance in telling the region's story and maintaining its character.
  - Several cities in Northeast Florida have made efforts to preserve and rehabilitate historic buildings, neighborhoods, and landmarks, recognizing their significance in telling the region's story and maintaining its character. For example, the city of St. Augustine, Florida has made efforts to preserve and rehabilitate historic buildings and neighborhoods throughout the city. The St. Augustine Historic District, which includes sites like the Castillo de San Marcos and the Lightner Museum, is a testament to these preservation efforts. Additionally, organizations like the St. Augustine Historical Society work to promote awareness of the city's history and advocate for the preservation of its historic assets.

**Goal 4: Promote a healthy natural environment.**

1. Use urban heat mapping and modeling campaigns.
  - Urban heat mapping has been demonstrated by many cities, including the city of Richmond Virginia, where spatial analysis tools in Geographic Information Systems (GIS) were utilized to map equity indicators and create an interactive dashboard visualizing heat island hot spots. This initiative highlights the urban heat island effect, where cities experience significantly higher temperatures than surrounding rural areas, mainly due to dark and impermeable surfaces like asphalt roads and dark roofs that absorb and retain heat. The mapping effort in Richmond aimed to reveal the disproportionate impact of heat islands on low-income neighborhoods and communities of color, highlighting areas where green spaces and cooling infrastructure are limited due to historic underinvestment.

The City of Jacksonville has recently concluded their ongoing heat mapping survey mapping the hottest parts of their city. Researchers drove over 400 miles measuring the temperature on 30 different routes throughout Duval County on a hot day in June. The results concluded that there are some neighborhoods within Jacksonville where there was as much as a 12-degree difference than in other greener parts of the County. The maps indicate that some of the hottest areas in the county are in underserved communities without the financial means to mitigate against climate change. A lot of these underserved areas are located within commercial or industrialized areas that foster dark and impermeable surfaces, such as asphalt roads and dark roofs that absorb and retain heat. These new heat maps provide the City with the tools to allocate budget dollars for projects that would mitigate extreme heat and deliver health benefits to vulnerable communities.

In 2023, the City of Jacksonville also signed on to the Cities for Smart Surfaces initiative, a pro-bono technical assistance program provided by Smart Surfaces Coalition, National League of Cities, American Public Health Association, and others to accelerate the adoption of Smart

Surfaces in the Jacksonville metropolitan area. Included in this technical assistance program is analysis from Altostratus, Inc., which offers detailed micrometeorological modeling of air temperature across the metropolitan area (see below), and simulations of temperature reductions from the implementation of reflective surfaces and vegetation. This modeling can be useful identifying regions with the greatest potential for cooling, and quantifying that potential in degrees Fahrenheit. This modeling will be paired with two policy and planning tools that support decision making processes with geospatial data analysis and complementary benefit-cost analysis. The first of these tools, the “Decision Support Tool” mirrors the efforts in Richmond, VA, enabling the user to cross reference heat distribution data with land use land cover, health, and socioeconomic data.

## 2. Tree Planting and Restoration

- Urban heat mapping campaigns can be coupled with initiatives like the MillionTreesNYC program, a large-scale urban forest project launched as part of PlaNYC, with a mission to plant and care for one million new trees across New York City's five boroughs. This initiative was a collaborative effort between the City of New York's Department of Parks & Recreation (NYC Parks) and the New York Restoration Project (NYRP), a not-for-profit organization. The initiative aimed to significantly expand the city's green infrastructure, enhancing the urban environment by increasing the urban forest by 20%. The goal for tree planting was completed in the fall of 2015. These efforts significantly contribute to the reduction of urban heat through shade and evapotranspiration, in addition to improving the health and quality of life for residents.

## 3. Educate on nature-based solutions.

- The International Union for Conservation of Nature (IUCN) provides education to policymakers on nature-based solutions through its various initiatives and programs. The IUCN works globally to demonstrate how nature-based solutions can address societal challenges such as climate change, biodiversity loss, and sustainable development. Through its work, the IUCN engages with policymakers by providing scientific research, policy guidance, and practical examples of how integrating nature into policy and planning can yield significant environmental, social, and economic benefits. This includes initiatives like restoring ecosystems to protect communities from natural disasters, implementing sustainable land management practices to enhance biodiversity, and promoting the conservation of natural habitats to mitigate climate change. The IUCN's efforts in educating policymakers aim to influence policy decisions and promote the widespread adoption of nature-based solutions for a sustainable future.

## 4. Use nature-based solutions such as a living shoreline.

**Description:** [Living shorelines](#) offer a great alternative to armored shorelines by providing natural materials that buffer wave action, absorb storm impacts, filter pollutants, and provide food and shelter for fish, shellfish, and wading birds.

- The city of St. Petersburg, Florida, has implemented several initiatives to promote and implement living shorelines as a coastal management strategy. The multifaceted initiatives include a shoreline restoration project in which they removed hardened structures and replaced with natural materials; oyster reef restoration was implemented along certain shorelines to act as natural breakwaters, reducing wave energy and erosion; and mangroves were planted in some areas to stabilize shorelines by trapping sediment and protecting against storm surges.

5. Implement wetland restoration projects which improve water flow, quality and biodiversity.

- The Bolsa Chica Wetland Restoration Project, one of Southern California's largest wetland restoration efforts, aimed to rejuvenate and preserve a significant portion of marine and wetland habitats in Orange County, California. This extensive project, completed in 2006, restored or rehabilitated nearly 600 acres of these vital ecosystems, historically part of a vast estuarine ecosystem. Significant achievements included the creation of a new full tidal basin connected to the ocean, which has significantly increased the habitat availability for various southern California fishery resources. Juvenile and adult fish, including commercially important species like the California halibut and white seabass, have been commonly found in the basin, indicating its success as a nursery habitat. The restoration has also led to the thriving of eelgrass meadows, providing essential support for resident fish species and breeding grounds for others.

The restoration's biological benefits primarily stem from the reintroduction of daily tidal influence from the ocean. Therefore, maintaining this connectivity is critical, requiring regular inlet maintenance to prevent sand accumulation from closing off the basin, which would lead to water quality degradation and harm to the biota and plant communities. The project underscores the importance of ongoing maintenance and adaptive management to ensure longevity.

5. Enhance resiliency and sustainability through installations of green stormwater infrastructure.

- Several cities in Florida have been enhancing resiliency and sustainability through the use of green stormwater infrastructure, which involves using natural systems to manage water, reduce urban heat island effects, improve air quality, and promote biodiversity. For example, the city of Tampa, Florida has been incorporating green infrastructure into its urban planning efforts to address flooding and promote sustainability. The city has installed rain gardens, permeable pavement, and green roofs to capture and filter stormwater runoff. Tampa is also working to preserve and restore natural habitats, such as wetlands and mangroves, to enhance resilience to sea-level rise and coastal erosion.