

**Garden City  
Natural Resources  
Draft**

# **CHAPTER 8**

## **NATURAL RESOURCES**

Garden City is shaped by the coastal environment that defines much of Chatham County. Tidal rivers, marshlands, wetlands, and low-lying coastal landscapes influence local development patterns, environmental conditions, and community character. These natural systems provide important benefits, including flood protection, water quality protection, wildlife habitat, and recreational opportunities. As regional growth continues, protecting natural resources within Garden City remains essential to public safety, environmental stability, and long-term community resilience.

## **Coastal Resources**

Garden City is influenced by coastal resources that define this portion of Georgia, particularly marshlands, tidal waterways, and nearby barrier island systems. Coastal marshes support fisheries, improve water quality, absorb storm impacts, and reduce flooding during high tides and severe weather events. These systems also contribute to the regional economy by supporting tourism, recreation, and the natural setting that attracts residents and businesses.

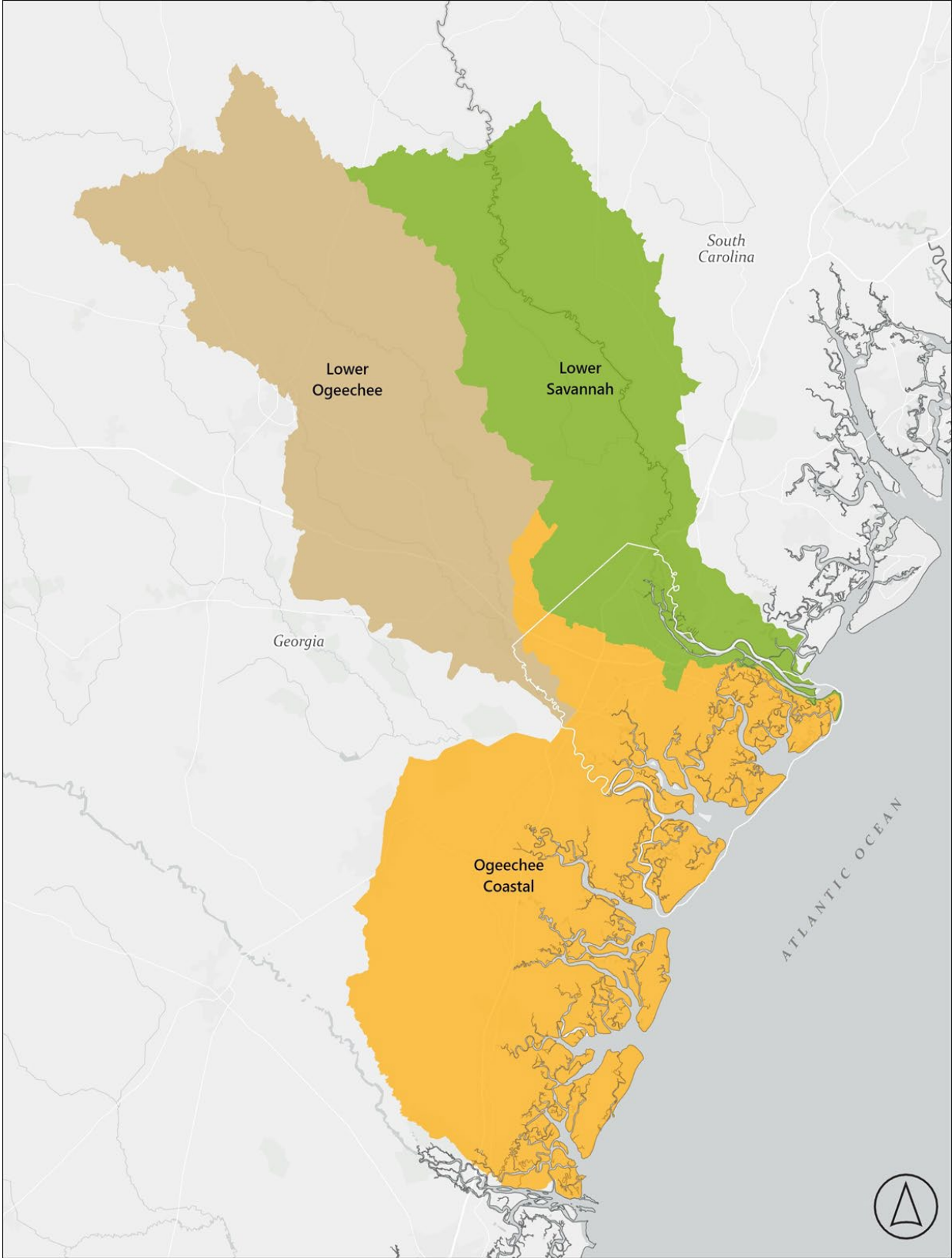
The surrounding coastal landscape includes marsh hammocks, which are small upland areas surrounded by tidal waters and marshes that provide habitat for wildlife and support ecological diversity. Although many of these features are located outside City limits, they affect drainage patterns, habitat connections, and stormwater movement within Garden City. Continued regional growth increases the need for land use policies and conservation strategies that protect coastal systems while guiding future development.

## **Water Resources**

### **Water Supply Watersheds**

Garden City is located within the Atlantic Coastal Flatwoods region and is influenced by watershed systems connected to the Savannah and Ogeechee River Basins. Local water resources are linked to the Lower Savannah, Lower Ogeechee, and Ogeechee Coastal watersheds, which influence drainage, surface water movement, and water quality.

The Ogeechee River Basin begins in central and southeastern Georgia and extends southeast to the Atlantic coast. Covering approximately 5,540 square miles, the basin contributes to regional hydrology and the formation of coastal barrier islands, including Wassaw Island, Ossabaw Island, St. Catherines Island, Blackbeard Island, and Sapelo Island. The Savannah River Basin covers approximately 10,577 square miles and originates in the Blue Ridge region of North Carolina, South Carolina, and Georgia. The Savannah River forms the state boundary before flowing southeast to the Atlantic Ocean near Savannah and remains the region's primary surface water source for municipal, industrial, and ecological needs.



**Exhibit 8.1 – Regional Watersheds**

## **Public Water Supply Sources**

Garden City relies primarily on groundwater drawn from the Floridan Aquifer, one of the most productive aquifer systems in North America and the primary source of drinking water throughout coastal Georgia. The Floridan Aquifer underlies approximately 100,000 square miles across southern Alabama, southeastern Georgia, southern South Carolina, and all of Florida. The depth to the top of the aquifer varies across the region, ranging from less than 150 feet in coastal South Carolina to more than 1,400 feet in parts of coastal Georgia.

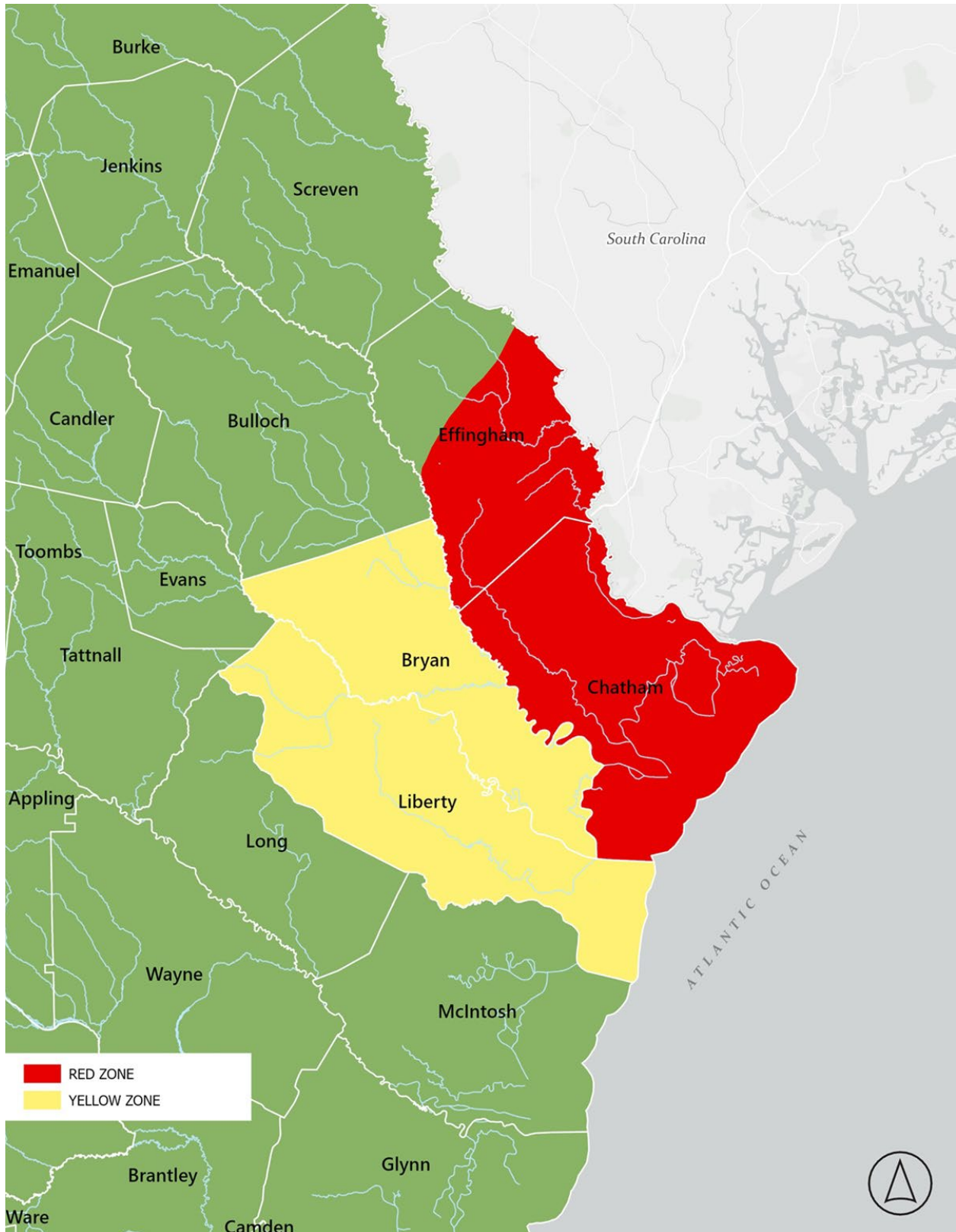
Most households in Garden City are served by centralized municipal water and wastewater systems connected to this groundwater supply. Access to complete indoor plumbing is nearly universal. According to the 2023 American Community Survey 5-Year Estimates, Garden City contains an estimated 4,708 housing units, of which 4,652 units, or approximately 98.8%, have complete plumbing facilities defined as hot and cold running water, a flush toilet, and a bathtub or shower. An estimated 56 housing units lack complete plumbing facilities.

These data indicate that centralized utility service reaches nearly all residential areas within the City. Continued maintenance and modernization of water and sewer infrastructure remain important to protecting public health, maintaining service reliability, and reducing vulnerability associated with flooding, aging facilities, and future demand.

## **Public Water Supply Issues and Long-Range Management**

Groundwater withdrawals across coastal Georgia have altered water levels, affected recharge and discharge patterns, and changed groundwater flow within the Floridan Aquifer. These conditions increase the risk of saltwater intrusion, particularly near the Savannah Hilton Head Metropolitan Area where freshwater and coastal influences intersect.

Because Garden City depends on the Floridan Aquifer for public water supply, long term water management requires continued coordination among local governments, utility providers, the Georgia Environmental Protection Division, and regional stakeholders. Protecting groundwater availability will remain important as residential demand, industrial activity, and economic growth continue across the region.



**Exhibit 8.2 – Regional Pump Zones**

## **Groundwater Recharge Areas & Pollution Susceptibility**

Groundwater recharge areas are locations where water enters the soil and moves downward to replenish underground aquifers. This process occurs more readily in porous materials such as sand, gravel, sandstone, and limestone, while denser materials such as clay, shale, and granite slow infiltration. Although the principal recharge zone for the Floridan Aquifer is located approximately 100 miles northwest of Savannah near the Fall Line, smaller recharge areas also occur within Chatham County in the Miocene and Pliocene Recent unconfined aquifer system.

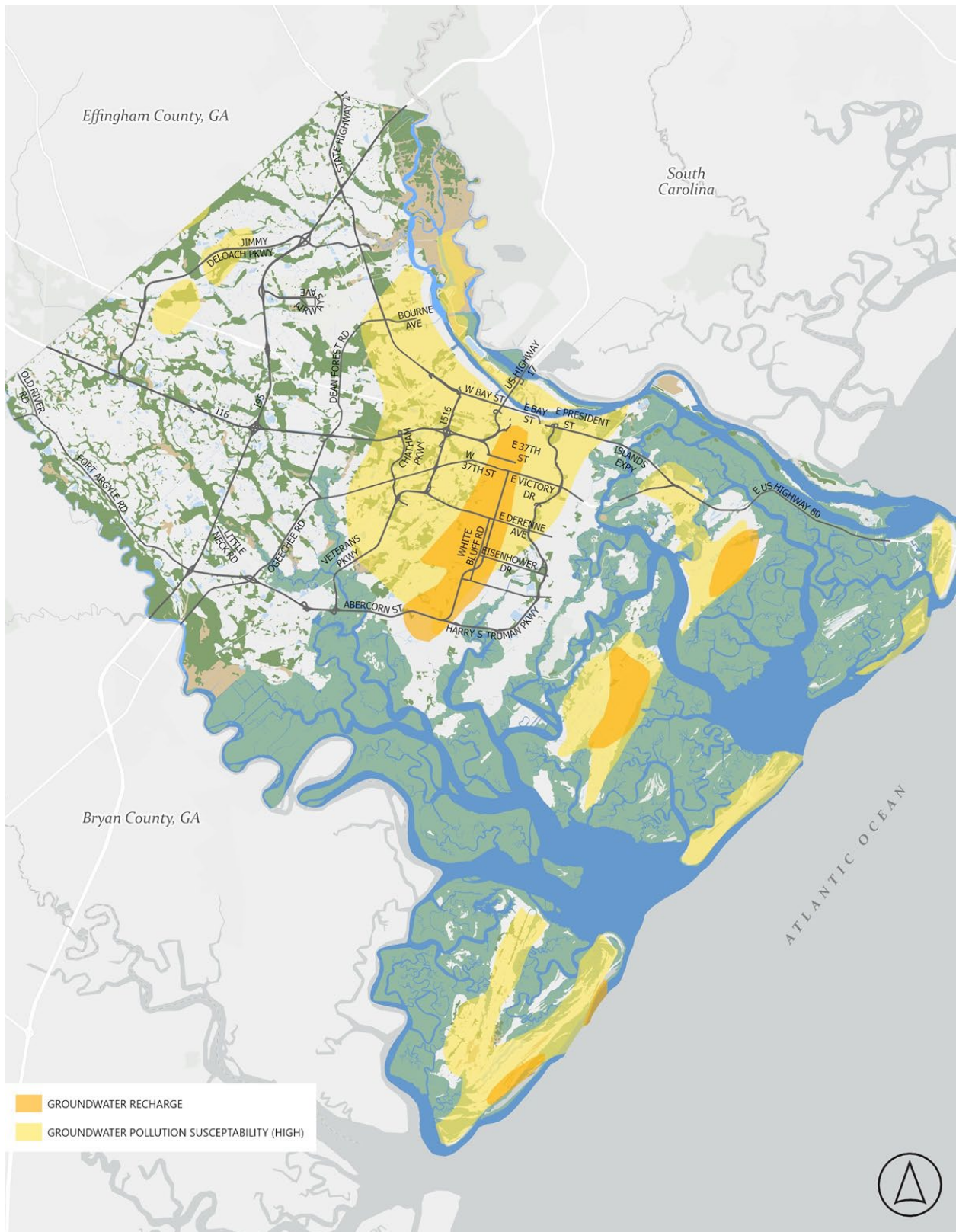
These localized recharge areas are generally concentrated on Wilmington Island, Skidaway Island, and portions of the Abercorn Street corridor in Savannah rather than within Garden City itself. Even so, groundwater quality in Garden City remains directly connected to regional aquifer conditions because the City relies on the Floridan Aquifer for public water supply.

Contamination within recharge areas can introduce hazardous substances into groundwater, creating long term risks for drinking water quality. Once groundwater is contaminated, remediation is difficult and costly. For this reason, wellhead protection measures and stormwater controls remain important throughout the County to reduce the risk of pollutants entering the groundwater system.

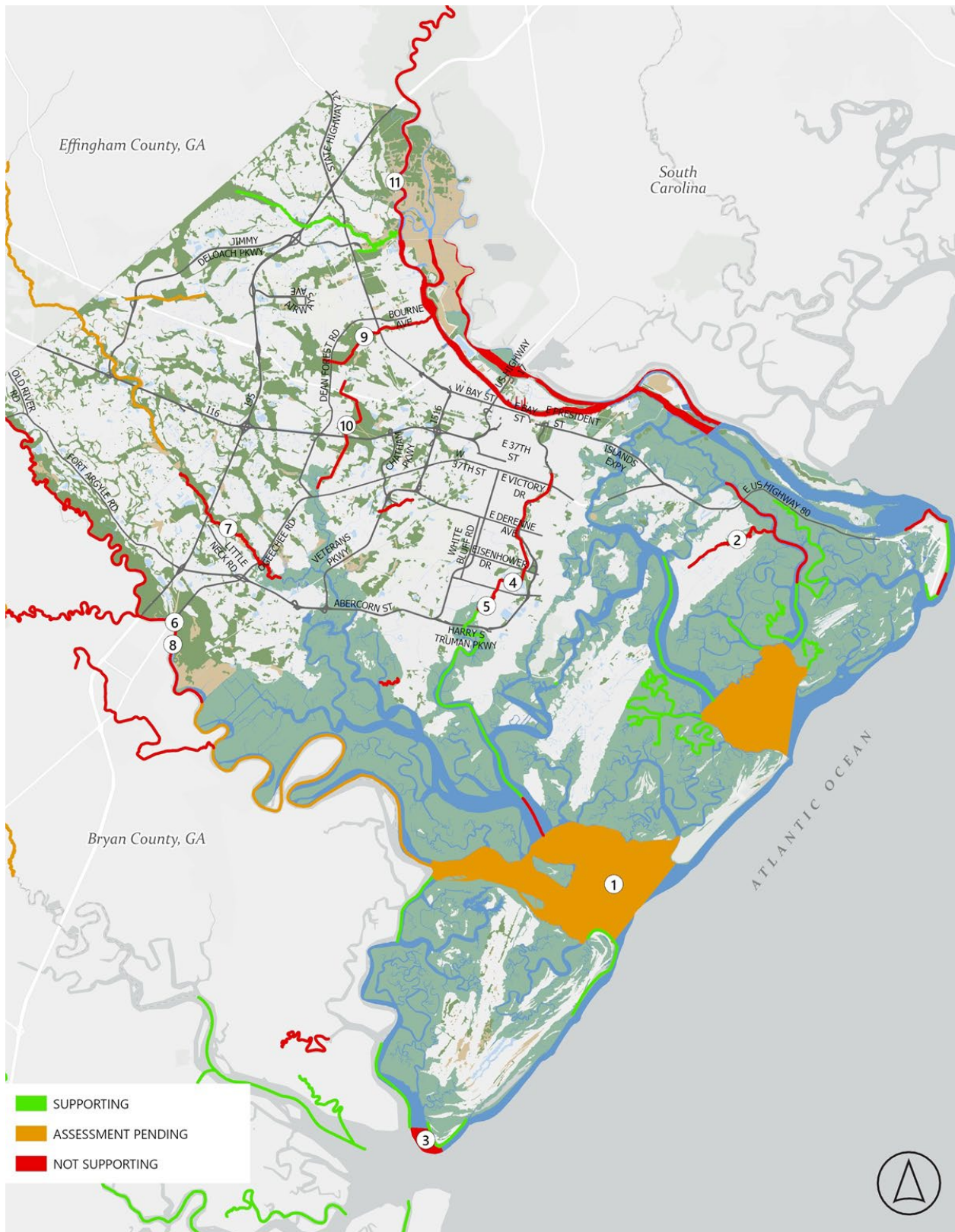
Groundwater protection in Chatham County is supported through land use regulations that limit activities involving hazardous materials in sensitive areas and apply development standards where recharge conditions are present. Before issuing building or demolition permits, local officials evaluate whether a site is located within a groundwater recharge area identified by the Georgia Department of Natural Resources. Areas identified as having elevated pollution susceptibility require additional attention during development review to protect long term groundwater quality.

## **Impaired Waterbodies**

Several waterbodies that influence environmental conditions in Garden City are identified by the Georgia Environmental Protection Division as impaired under Section 303(d) of the Clean Water Act. This federal requirement directs states to identify waters that do not meet established water quality standards and to monitor conditions that may require corrective action.



**Exhibit 8.3 – Chatham County Groundwater Recharge Areas**



**Exhibit 8.4 – Chatham County Impaired Waterbodies**

Within Chatham County, impaired waterways are monitored to address pollutants, habitat conditions, and other factors affecting water quality. Because Garden City is closely connected to regional industrial corridors, Port related activity, and tidal drainage systems, impaired water conditions in nearby waterways have direct implications for stormwater management, ecological health, and long term environmental planning.

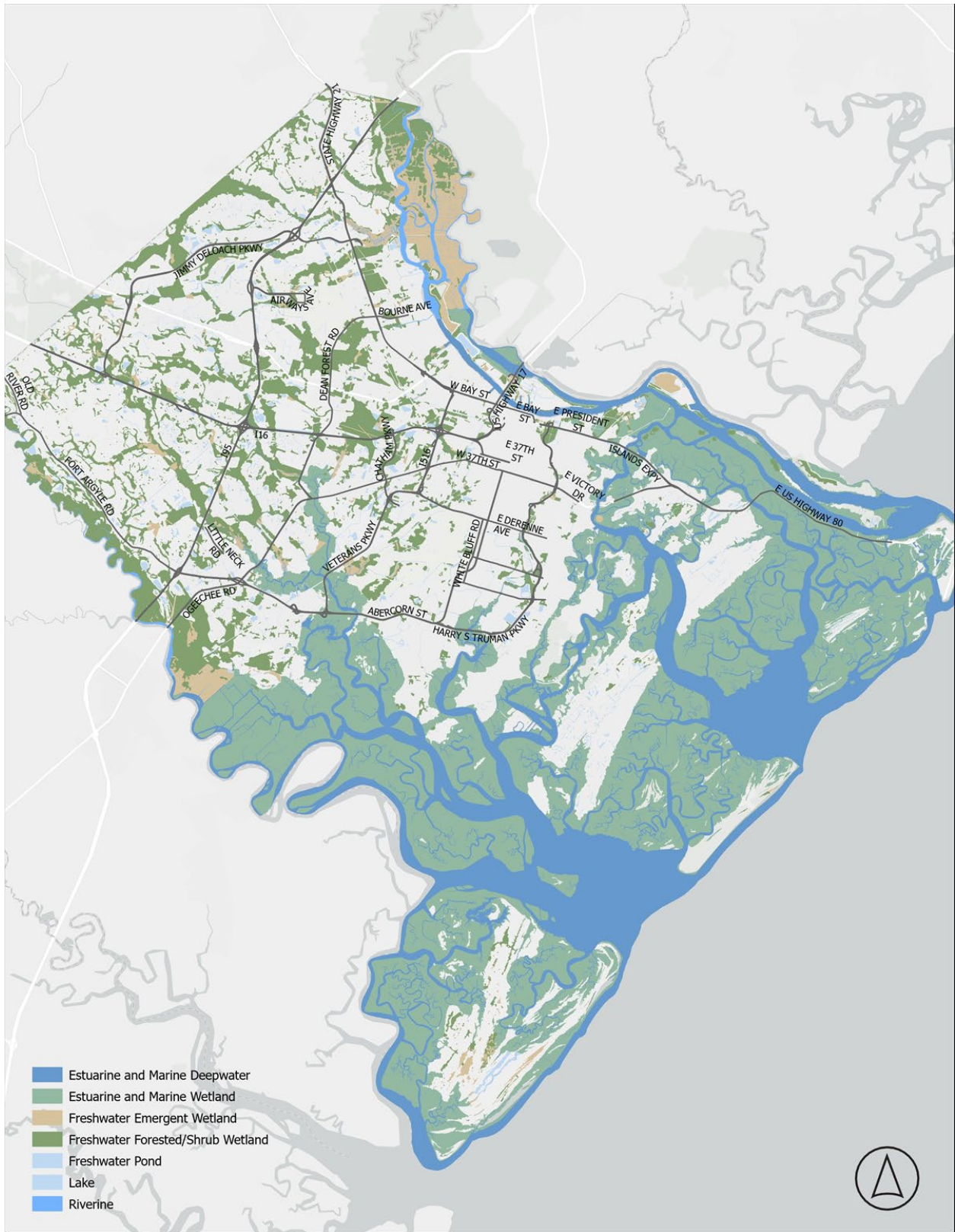
- The 2024 impaired waters list identifies the following nearby waterbodies of significance to Garden City:
- Savannah River / Front River / Harbor
- Salt Creek
- Pipemakers Canal

Continued coordination with state and regional agencies will remain important to improving water quality and reducing impacts associated with stormwater runoff, industrial discharge, and land disturbance. The most current impaired waters data is maintained by the Georgia Environmental Protection Division through its statewide water quality monitoring program.

## **Wetlands**

Over the past several decades, wetlands in Georgia, particularly freshwater wetlands within the Coastal Plain, have been altered by development, infrastructure expansion, and industrial land use. In Garden City, where flat topography, shallow groundwater, and interconnected drainage systems are common, wetland disturbance has reduced natural flood storage capacity and increased vulnerability to rainfall driven flooding. These changes affect more than ecological conditions by contributing to localized flooding, infrastructure stress, and water quality concerns in low lying and industrial areas.

Wetland protection in Garden City is carried out through federal, state, and local development regulations. Projects that contain or adjoin wetlands must identify and delineate wetland boundaries using accepted federal methods prepared by qualified professionals, with review coordinated through the U.S. Army Corps of Engineers and the Georgia Environmental Protection Division. At the local level, floodplain management standards, stormwater requirements, and development review procedures require wetlands and associated buffers to be preserved wherever practical, with disturbance limited to permitted areas.



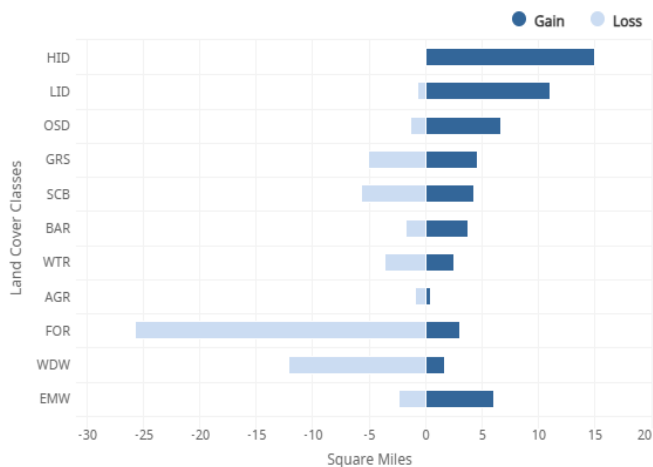
**Exhibit 8.5 – Chatham County Wetlands**

Garden City’s stormwater planning framework also supports wetland protection by requiring development and redevelopment to manage runoff in ways that protect natural drainage systems and reduce downstream impacts. During site review, wetland boundaries, buffer requirements, grading limits, and drainage controls are evaluated together with erosion and sediment measures. Best management practices such as vegetated buffers, bioretention systems, detention facilities, and water treatment features are used to slow runoff, improve water quality, and reduce stress on drainage infrastructure.

Because wetlands function as part of the City’s broader drainage network, preserving existing wetland areas supports flood management, protects water quality, and reduces long term infrastructure demands as industrial activity and redevelopment continue.

NOAA Coastal Change Analysis Program land cover data indicate that Chatham County experienced substantial land cover change between 1996 and 2021, driven largely by continued development and urbanization. Because Garden City is part of this regional growth pattern, these changes provide important context for local land use and environmental planning. During this period, high intensity developed land increased by approximately 15.1 square miles and low intensity developed land increased by about 10.3 square miles, reflecting continued conversion of natural and rural land to residential, commercial, industrial, and infrastructure uses.

Forested and wetland systems also declined during the same period. Forest land decreased by approximately 22.6 square miles, while woody wetlands declined by about 10.4 square miles, reducing natural flood storage capacity, habitat continuity, and ecosystem function. Emergent wetlands increased by approximately 3.6 square miles, likely reflecting hydrologic change, restoration activity, or shifts in coastal conditions rather than a broad gain in wetland resources. These trends reinforce the importance of wetland protection, forest conservation, and coordinated land use decisions as Garden City continues to accommodate redevelopment and industrial activity.



**Figure 8.1 – Distribution of Change by Land Cover**

<b>Distribution of Change (Losses and Gains) By Land Cover</b>						
<b>Land Cover Class</b>	<b>1996 Area (sq. mi.)</b>	<b>Area Lost (sq. mi.)</b>	<b>Area Gained (sq. mi.)</b>	<b>2021 Area (sq. mi.)</b>	<b>Net Change (sq. mi.)</b>	<b>Percent Change</b>
HID (High Intensity Developed)	19.15	0	15.06	34.21	15.06	78.7%
LID (Low Intensity Developed)	38.14	-0.73	11.01	48.42	10.28	26.9%
OSD (Open Space Developed)	22.31	-1.33	6.71	27.68	5.38	24.1%
GRS (Grassland/Herbaceous)	8.36	-5.05	4.57	7.88	-0.48	-5.8%
AGR (Agriculture)	3.54	-0.94	0.49	3.09	-0.45	-12.8%
FOR (Forest)	89.97	-25.7	3.1	67.37	-22.6	-25.1%
SCB (Scrub / Shrub)	8.76	-5.64	4.33	7.45	-1.31	-14.9%
WDW (Woody Wetlands)	78.04	-12.13	1.7	67.6	-10.44	-13.4%
EMW (Emergent Wetlands)	155.91	-2.4	6.05	159.55	3.64	2.3%
BAR (Barren Land)	9.09	-1.68	3.75	11.16	2.07	22.8%
WTR (Open Water)	199.03	-3.64	2.5	197.88	-1.14	-0.6%
<b>Source:</b> NOAA Coastal Change Analysis Program						

**Figure 8.2 - Distribution of Change (Losses and Gains) By Land Cover**

## Protected Rivers and Corridors

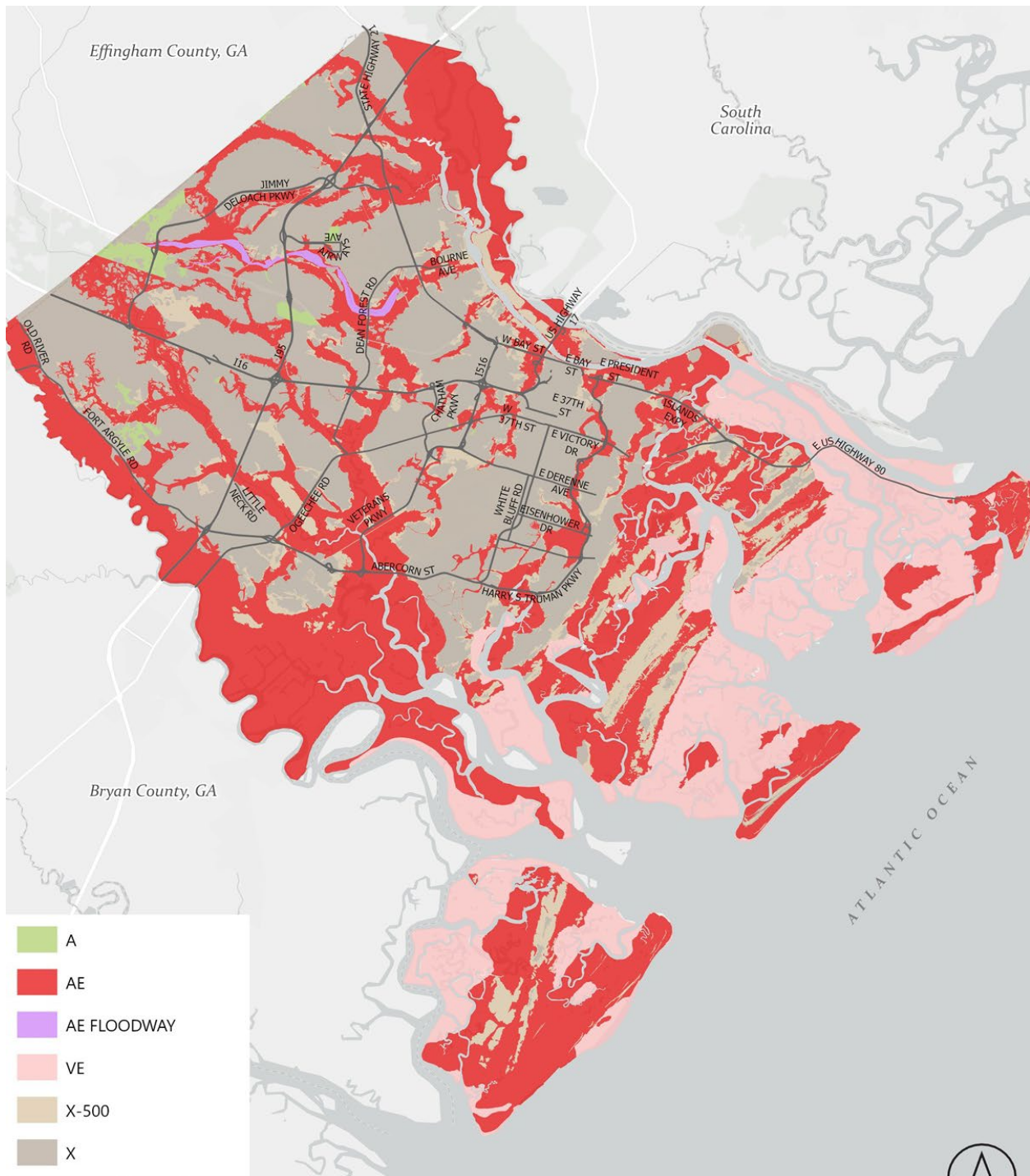
Georgia requires local governments to identify and protect critical natural resources, including major rivers and river corridors. Although the coastal region does not contain protected mountain resources, river systems remain among the most important natural features affecting long term environmental conditions in Garden City.

River corridors support wildlife habitat, provide recreational value, improve water quality, reduce erosion, and help absorb floodwaters during major storm events. In coastal areas, these corridors also allow floodwaters to shift naturally as tidal conditions and sea level patterns change.

Riparian buffers are especially important because they slow stormwater runoff, reduce sediment and pollutant movement, protect stream temperatures, support wildlife habitat, and strengthen the visual character of adjacent developed areas. Maintaining these buffer areas remains an important part of protecting water resources throughout Garden City and the surrounding region.

## Floodplains

Floodplains are low lying areas adjacent to rivers, wetlands, and drainage systems that periodically store floodwaters during major rainfall events and coastal flooding. In Garden City, floodplain function is especially important because flat topography, tidal influence, and developed industrial areas can limit natural drainage capacity.



**Exhibit 8.6 – Chatham County Floodplains**

Preserving floodplain storage helps protect life, property, infrastructure, and water quality. Undeveloped floodplain areas also support wetlands, habitat systems, and other ecological functions that contribute to overall environmental stability.

Regional floodplain regulations adopted by nearby jurisdictions, including Savannah and Chatham County, increasingly recognize sea level rise and the movement of coastal floodwaters. Continued attention to floodplain protection, drainage planning, and development standards will remain important as Garden City addresses future flooding risks associated with changing coastal conditions.

## **Major Park, Recreation and Conservation Areas**

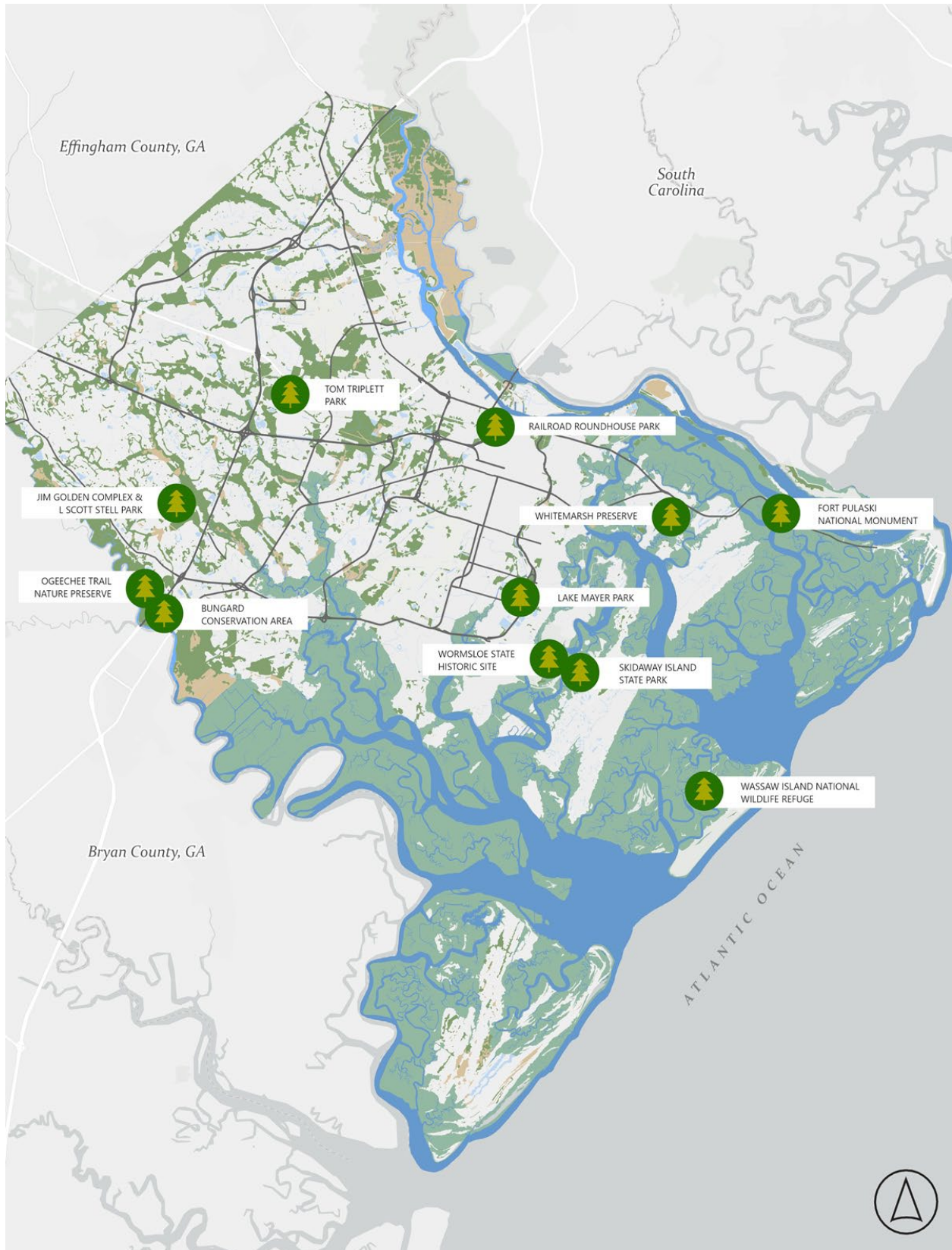
Garden City benefits from access to regional natural and recreational resources throughout Chatham County while also maintaining a local system of neighborhood parks, athletic facilities, and community open spaces. As development continues across the region, preserving open space and maintaining recreational access remain important to supporting community health, neighborhood quality, and long-term land use balance.

In addition to maintaining adequate park acreage and facility types, equitable access remains an important planning consideration. Parks, recreation areas, sidewalks, trails, bicycle routes, and other non-vehicular connections help ensure that residents can reach recreational spaces without depending entirely on personal vehicles.

Open space includes land used for active recreation, passive recreation, natural resource protection, and public benefit. Within Chatham County, conservation and recreation lands are managed through federal, state, local, and nonprofit ownership, providing regional environmental and recreational value. Although many major conservation lands are located outside Garden City, they contribute to the broader open space network available to City residents.

### **Federal**

- Fort Pulaski National Monument
- Savannah Coastal National Wildlife Refuge
- Tybee National Wildlife Refuge
- Atlantic Intracoastal Waterway
- Wassaw Island National Wildlife Refuge



**Exhibit 8.7 – Chatham County: Major Park, Recreation and Conservation Areas**

## **State**

- Little Tybee Island / Cabbage Island
- Skidaway Island State Park
- Ossabaw Island Wildlife Management Area
- University of Georgia Marine Extension and Georgia Sea Grant
- Wormsloe Historic Site

## **Local/Non-Governmental Organizations**

- Bazemore Park
- Salt Creek Boat Ramp Park
- Sharon Park
- Griffin Neighborhood Playground
- Garden City Stadium
- Volunteer Park

Local park facilities in the City are discussed in more detail in **Chapter 9-Quality of Life**.

## **Prime Agricultural and Forest Land**

Although Garden City is highly urbanized and industrial in character, countywide agricultural and forest land trends remain relevant because they affect regional open space, stormwater absorption, air quality, and food system resilience. Across the country, agricultural and forest land continues to be converted to residential, commercial, and industrial uses, increasing impervious surface coverage and reducing natural environmental functions.

In Chatham County, agricultural activity has changed in both scale and structure over the past decade. According to the 2022 Census of Agriculture, the number of farms declined from 67 in 2017 to 41 in 2022, while total farmland increased to 7,742 acres, resulting in an average farm size of 189 acres. This pattern reflects consolidation rather than growth in farm numbers. Small and specialty operations remain significant, with approximately 61% of farms under 50 acres and 17% selling directly to consumers.

Although limited agricultural land remains within Garden City, preservation of forest cover and open land continues to support flood reduction, environmental quality, and land use balance as redevelopment and industrial expansion continue.

## Tree Canopy

The most comprehensive local assessment of tree canopy conditions in Chatham County remains the 2020 canopy analysis prepared by Savannah Tree Foundation, which documented vegetation change between 2014 and 2020 using high resolution aerial imagery.

For Garden City, tree canopy increased from 53% in 2014 to 66% in 2020, representing an estimated gain of approximately 1,207 acres. This was one of the largest percentage increases among municipalities in the County and exceeded the countywide average increase of 7%.

More recent modeled estimates from the United States Forest Service and National Land Cover Database indicate that canopy conditions continue to face pressure from industrial and logistics related development, particularly near transportation corridors and Port influenced areas. Although Garden City’s residential population has remained relatively stable, continued warehouse, freight, and infrastructure expansion has resulted in localized canopy loss where site clearing occurs.

Long term canopy management remains important because mature trees reduce heat exposure, improve stormwater absorption, and help offset the effects of extensive impervious surfaces. Aging canopy also presents a long-term management issue across the region, as many established urban trees approach the end of their typical lifespan and require systematic replacement.

<b>Tree Canopy Change Over Time (2014–2020)</b>				
<b>Municipality</b>	<b>2014 % Vegetation</b>	<b>2020 % Vegetation</b>	<b>% Change</b>	<b>Estimated Acreage Change</b>
Unincorporated Chatham County	25%	32%	7%	14,655
Savannah	39%	49%	10%	7,137
Garden City	53%	66%	13%	1,207
Pooler	62%	63%	1%	204
Bloomington	83%	83%	0%	-5
Tybee Island	7%	15%	8%	168
Thunderbolt	17%	31%	14%	146
Port Wentworth	66%	73%	8%	812
Vernonburg	73%	83%	10%	26
Countywide Average	34%	41%	7%	23,757

Source: Savannah Tree Foundation, 2020 Tree Canopy Assessment

**Figure 8.3 – Chatham County and Garden City: Tree Canopy Change**

## **Geology and Soil Types**

Garden City is located within the Atlantic Coastal Flatwoods region of Georgia, an area defined by nearly level topography and poorly drained soils formed from marine sands, loams, and clays. Elevation across the region is generally low, and drainage occurs slowly through canals, streams, and tidal systems before reaching larger waterways.

Local soils are predominantly classified as Hydrologic Soil Group D, which has a high runoff potential because of shallow water tables and low infiltration capacity. These soils commonly contain clay loam, silty clay loam, sandy clay, or clay and tend to remain saturated when thoroughly wetted. Because infiltration is limited, soil conditions in Garden City directly affect stormwater performance, flood risk, and site development design. The countywide National Commodity Crop Productivity Index average soil rating is 47, reflecting generally low agricultural productivity and reinforcing the importance of drainage management in land development decisions.

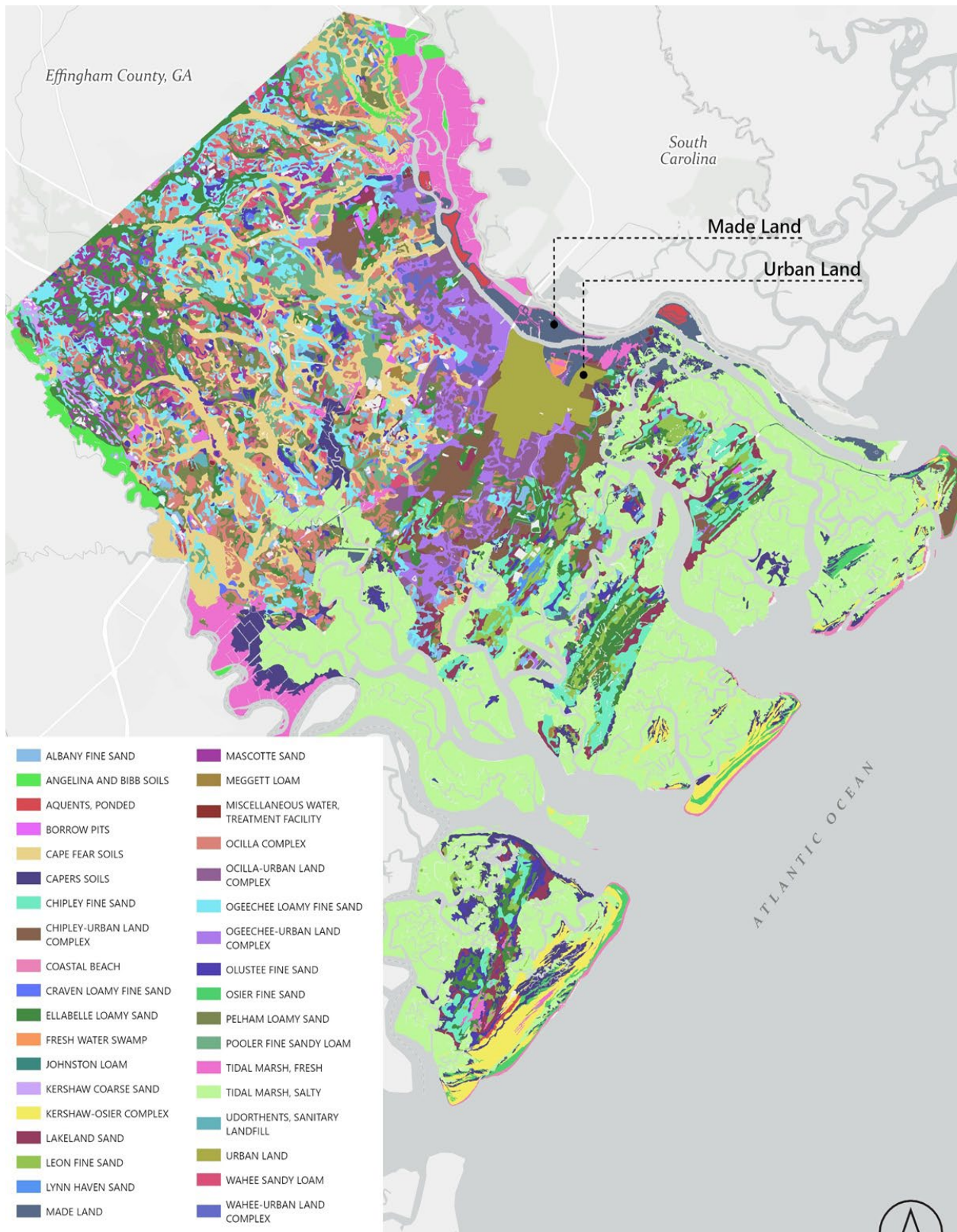
## **Coastal Resource Management**

### **Stormwater Management**

Stormwater runoff in Garden City is generated when rainfall flows across streets, parking areas, rooftops, and other impervious surfaces without infiltrating the ground. As runoff moves through developed areas, it can carry sediment, oils, chemicals, trash, and other pollutants into nearby waterways, affecting local drainage systems and coastal water quality.

Stormwater discharges are regulated through the National Pollutant Discharge Elimination System, which requires municipal separate storm sewer systems to operate under state issued permits. Garden City manages its stormwater system under a Phase I Medium MS4 permit issued by the Georgia Environmental Protection Division under Permit No. GAS000208. The permit requires implementation of a stormwater management program that includes illicit discharge detection, construction runoff controls, post construction standards, municipal maintenance practices, public education, and annual reporting.

Like other jurisdictions in Chatham County, Garden City has adopted the Coastal Stormwater Supplement to the Georgia Stormwater Management Manual, which promotes site design practices that reduce runoff and protect natural drainage systems. Because stormwater crosses jurisdictional boundaries, continued regional coordination remains important, particularly where industrial watersheds and transportation corridors extend across municipal lines. Watersheds with increasing impervious cover require additional attention, since stream quality commonly declines when impervious surfaces exceed 10% and severe degradation often occurs beyond 25%.



**Exhibit 8.8 – Chatham County Soil Classifications**

## **Solid Waste Management**

Solid waste management in Garden City remains closely tied to regional landfill capacity and disposal systems serving Chatham County. As available landfill capacity becomes more limited and disposal costs rise, long term waste handling will increasingly depend on regional transport and external disposal agreements.

Garden City provides residential refuse collection and curbside single stream recycling through a contract with Waste Management. The recycling program has helped divert recyclable materials from landfills, although market instability and fluctuating material values continue to affect program efficiency.

Future waste reduction efforts should continue emphasizing material reuse, household waste reduction, and public education alongside recycling participation.

## **Renewable Energy**

Renewable energy expansion is becoming increasingly important across coastal Georgia as communities work to reduce emissions, improve air quality, and strengthen long term resilience. Regional progress in solar generation, energy efficiency, and cleaner infrastructure is creating new opportunities that affect Garden City through both public investment and nearby industrial development.

Nearby jurisdictions, including Savannah, have adopted formal clean energy goals that support municipal solar deployment, energy efficiency upgrades, and long-term emissions reduction. These regional efforts help establish broader energy trends that influence surrounding municipalities.

## **Solar Energy**

Chatham County expanded solar deployment through a municipal solar program launched in 2023, installing systems at four County facilities through a long-term procurement agreement that required no upfront capital cost. These installations now provide a portion of facility electricity demand while reducing operating costs and emissions. Although Garden City has not yet developed a comparable municipal scale solar program, regional investment in solar infrastructure provides a model for future energy planning at local public facilities.

## **Renewable Energy at Port of Savannah**

The nearby Port of Savannah continues to expand equipment electrification and cleaner operations, directly affecting Garden City because of the City's location adjacent to Port terminals, rail corridors, and freight routes.

Recent investments by the Georgia Ports Authority include replacement of diesel equipment with hybrid electric rubber-tired gantry cranes, reducing emissions and improving operational efficiency. Additional efforts include idle reduction measures, expanded rail use, and equipment modernization, all of which contribute to lower emissions in port adjacent areas. Continued coordination between Garden City, regional partners, and Port operators remains important to address transportation related air quality and environmental conditions.

<b>Renewable Energy Recommendations</b>	
<b>Priority Area</b>	<b>Garden City Focus and Key Actions</b>
<b>Clean Energy Workforce Development and Job Creation</b>	<ul style="list-style-type: none"> <li>• Partner with regional technical colleges, Port related employers, and logistics firms to support workforce training in energy efficiency, electric vehicle maintenance, and industrial electrification</li> <li>• Support apprenticeships and credential programs aligned with clean energy, advanced manufacturing, and Port adjacent industries</li> <li>• Coordinate with regional workforce initiatives to connect residents to infrastructure and clean energy employment.</li> </ul>
<b>Energy Efficiency Programs</b>	<ul style="list-style-type: none"> <li>• Promote energy efficiency upgrades in residential, commercial, and industrial buildings, particularly older housing and warehouse facilities</li> <li>• Encourage weatherization, HVAC replacement, efficient lighting, and equipment upgrades through available federal and state incentives</li> <li>• Expand access to efficiency programs for low- and moderate-income households and small businesses.</li> </ul>
<b>Solar Installations and Community Solar</b>	<ul style="list-style-type: none"> <li>• Encourage rooftop solar on suitable commercial, industrial, and municipal facilities</li> <li>• Explore participation in community solar programs for properties without viable rooftop conditions</li> <li>• Streamline permitting where feasible and expand public outreach to reduce adoption barriers.</li> </ul>
<b>Energy Storage and Grid Resilience Infrastructure</b>	<ul style="list-style-type: none"> <li>• Coordinate with utilities to support substation upgrades, transmission resilience, and smart grid technologies serving industrial and Port adjacent areas</li> <li>• Encourage battery storage at municipal facilities and critical infrastructure</li> <li>• Evaluate solar plus storage and microgrid opportunities at emergency facilities.</li> </ul>
<b>Electric Vehicle Adoption and Fleet Electrification</b>	<ul style="list-style-type: none"> <li>• Support gradual electrification of municipal fleets through scheduled vehicle replacement</li> <li>• Encourage EV charging infrastructure at municipal sites, employment centers, and freight support areas</li> <li>• Coordinate with regional partners to support private fleet electrification, including logistics and Port related operations.</li> </ul>

**Figure 8. 4 – Renewable Energy Resources**

## **Electric Vehicles**

Electric vehicle adoption continues to expand across Georgia through public investment, private charging infrastructure, and federal incentives. These changes support reduced transportation emissions and influence fleet planning throughout the Savannah region.

For Garden City, electric vehicle growth is most relevant through freight movement, municipal fleet transition, and nearby industrial investment tied to vehicle manufacturing

and supply chains. Regional economic activity associated with electric vehicle production is expected to continue shaping employment, freight demand, and infrastructure planning across coastal Georgia.

## **Climate Resiliency and Preparedness**

### **Natural Disasters and Climate Challenges**

#### **Hurricanes**

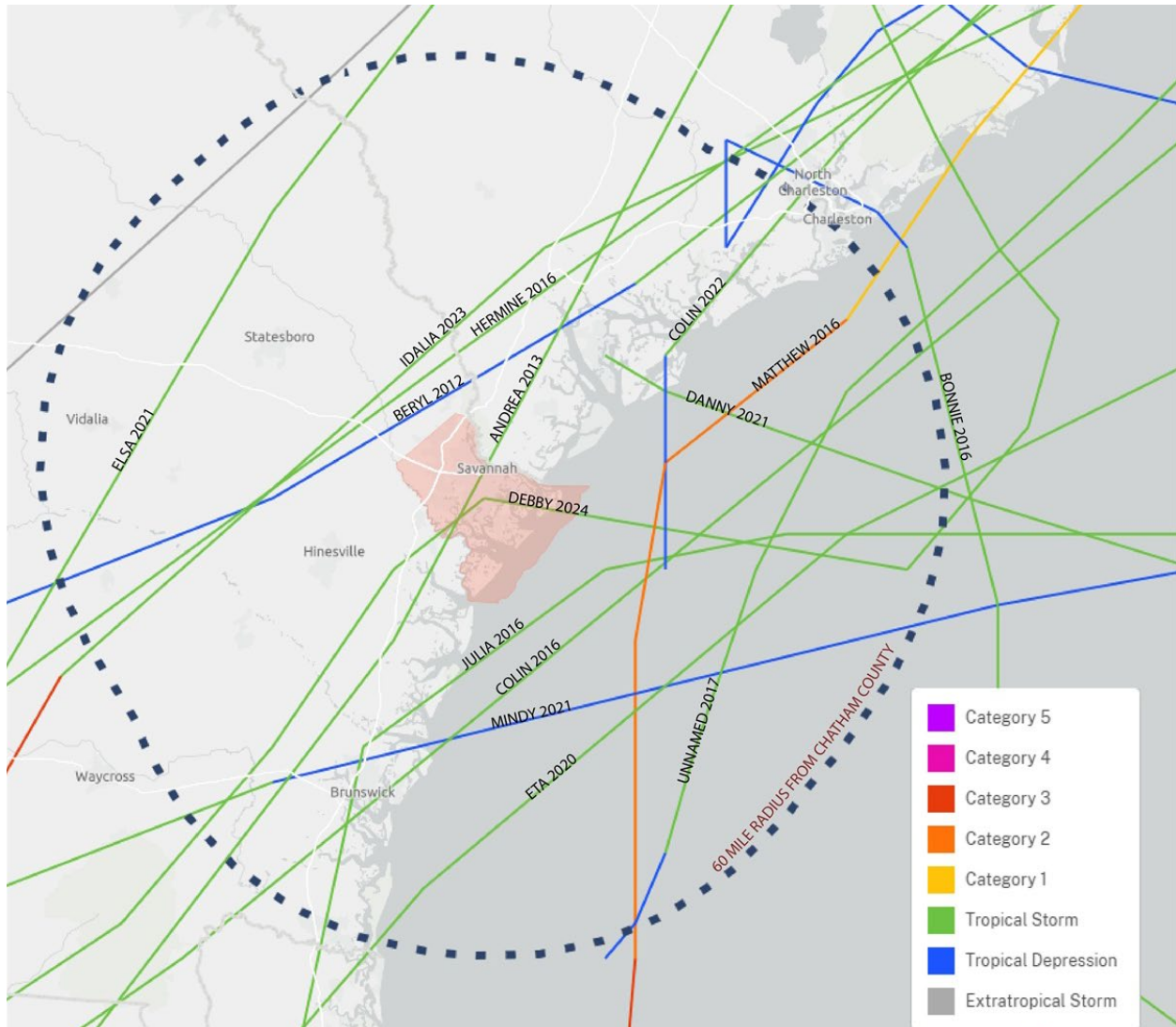
Hurricane season extends from June 1 through November 30, with peak activity typically occurring in early to mid-September. Along the Southeast coast, warmer ocean temperatures, rising sea levels, and changing atmospheric conditions have increased the likelihood of stronger storms, rapid intensification, and more damaging coastal flooding. Recent research indicates that Southeast Atlantic hurricanes have become more frequent and storms may continue to strengthen more quickly under warmer sea surface conditions. Between 2016 and 2024, Garden City experienced impacts from Hurricanes Hermine, Matthew, Irma, Michael, Dorian, Isaias, and Helene. Although some storms remained offshore, local effects included tidal flooding, roadway inundation, wind damage, debris accumulation, and temporary disruptions to transportation and utility systems.

Sea level rise is already affecting coastal Georgia. Long term tide records at Fort Pulaski National Monument show a steady increase in mean sea level, raising baseline tidal elevations and increasing storm surge impacts during coastal events. This trend has increased flood exposure in low lying marsh edges, tidal creek systems, filled estuarine land, and developed waterfront areas.

Because Garden City is influenced by marsh systems, freight corridors, and low elevation drainage networks, storm preparedness remains closely tied to both natural and built infrastructure. The City participates in regional disaster exercises, follows the Federal Emergency Management Agency compliant debris management framework adopted through County coordination, and continues expanding response capacity through measures such as drone-based damage assessment and temporary debris staging.

The six coastal Georgia counties with the highest storm surge evacuation risk are Bryan, Camden, Chatham, Glynn, Liberty, and McIntosh. Population growth and continued development have increased evacuation complexity across the region, particularly where transportation routes serve both residents and freight activity.

Future planning in Garden City should continue incorporating updated sea level projections, storm surge mapping, and flood risk analysis. Protecting floodplains, improving drainage systems, elevating critical facilities, and limiting new vulnerability in the most exposed areas will remain central to long term resilience.



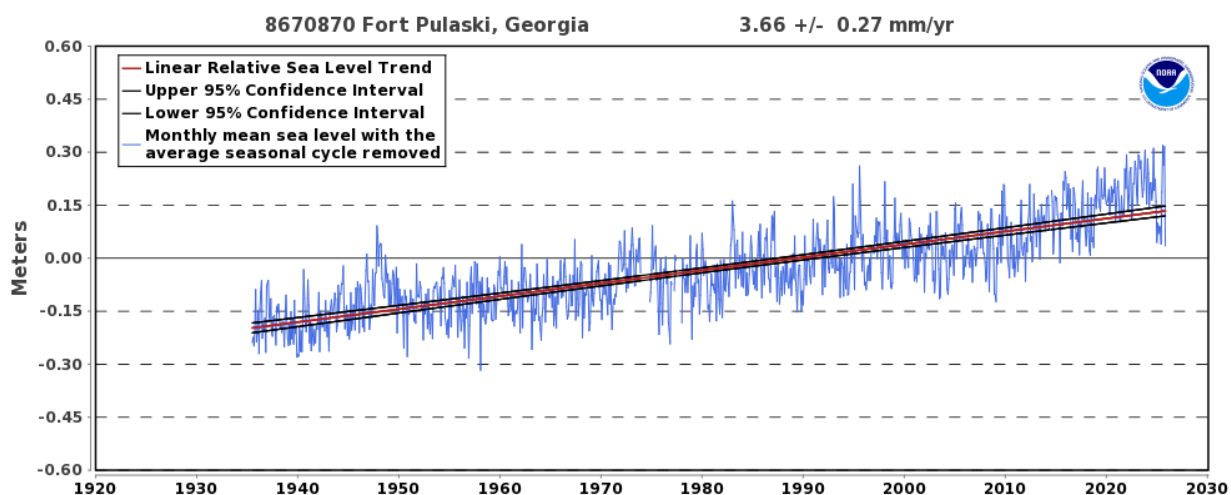
**Exhibit 8.9 – Chatham County: Hurricane History 2010 – Present**

### Sea Level Rise

Sea level rise is an increasing planning concern for Garden City because higher baseline water levels increase flood risk, reduce drainage efficiency, and place public infrastructure at greater long-term risk. Identifying vulnerable areas and evaluating the severity of future impacts remain important to guiding land use decisions, capital investment, and infrastructure design.

Measures that reduce long term exposure include limiting new public investment in highly vulnerable areas, protecting flood prone land, and incorporating sea level rise projections into infrastructure planning. Elevating roads, lift stations, and other critical facilities may reduce future disruption where existing assets cannot be relocated. Because retrofitting developed areas is typically more expensive than avoiding new vulnerability, future capital projects should evaluate sea level rise over their expected service life.

Long term tide records at Fort Pulaski National Monument continue to show a measurable rise in relative sea level, providing the primary regional indicator used in coastal planning.



**Figure 8.5 – Relative Sea Level Trends**

Regional planning efforts completed since 2020, including the Coastal Watershed Management Plan and stormwater vulnerability assessments led by Chatham County and partner jurisdictions, identify growing risks to drainage systems, canals, and tidally influenced outfalls serving Garden City. These studies document existing tidal backwater effects and increasing pressure on gravity-based drainage systems as water levels rise.

Garden City’s ongoing stormwater and floodplain planning reflects this regional framework by prioritizing drainage upgrades, floodplain protection, and resilience considerations in land use and capital planning.

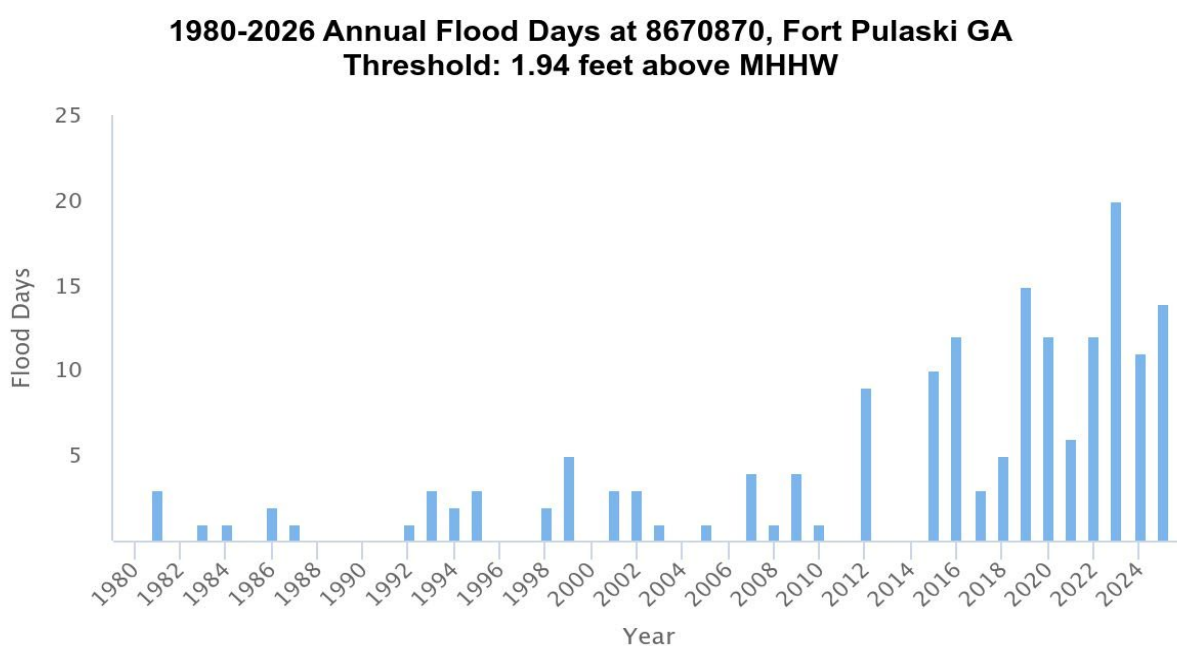
## **Flood Inundation**

### **Tidal Flooding**

Tidal flooding has become more frequent across coastal Georgia as sea level rise raises normal water levels and increases the number of days when high tides exceed drainage thresholds. At Fort Pulaski National Monument, high tide flooding has increased

substantially since the early 2000's, with recent years often recording more than ten flood days annually and some years exceeding twenty.

Seasonal flooding is most common during late summer and fall, when higher astronomical tides and elevated baseline water levels combine to increase tidal impacts. For Garden City, repeated tidal flooding reduces drainage efficiency by creating backflow in canals and stormwater networks, increasing stress on pumps, drainage structures, and low elevation transportation routes. These conditions support continued evaluation of tide control measures, pump improvements, and updated design standards for infrastructure exposed to tidal influence.



NOAA/NOS/Center for Operational Oceanographic Products and Services

**Figure 8.6 – Annual Flood Days at Fort Pulaski**

### Pluvial and Fluvial Floods

In Garden City, flood impacts are also driven by intense rainfall and limited drainage capacity. Flat topography, poorly draining soils, shallow groundwater, and interconnected drainage basins increase the likelihood that heavy rainfall will overwhelm canals, ditches, and stormwater systems, including areas outside mapped floodplains.

Flooding is especially significant where industrial land patterns, transportation corridors, and developed surfaces concentrate runoff and reduce infiltration. Local impacts commonly affect roads, utilities, industrial access, and adjacent neighborhoods.

Garden City addresses these risks through floodplain regulation, stormwater system maintenance, MS4 permit requirements, and drainage planning coordinated with regional flood studies and transportation modeling. Continued capital investment, drainage maintenance, and site level runoff controls remain important as rainfall intensity increases.

## **Climate Change and Vulnerability Index**

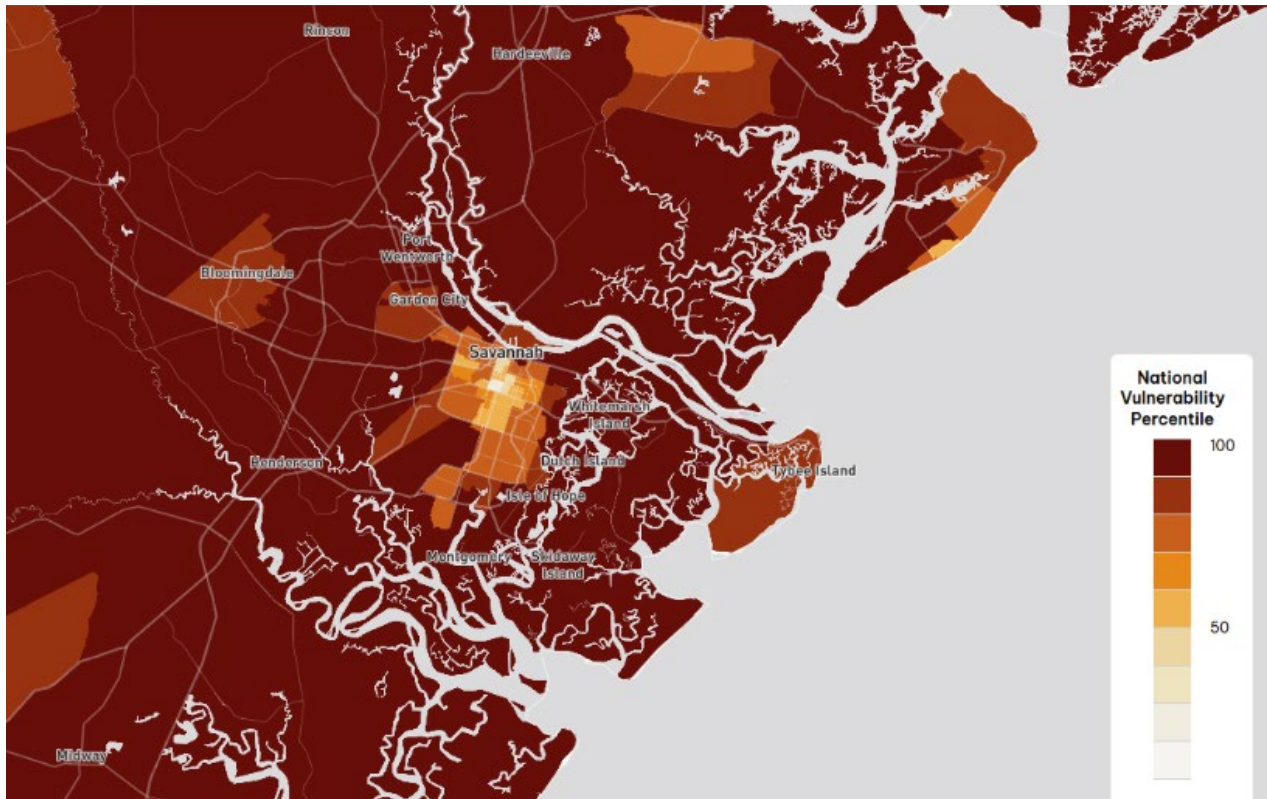
Climate change affects Chatham County through rising temperatures, more frequent extreme heat events, changing rainfall patterns, stronger coastal storms, saltwater intrusion, and increasing flood exposure associated with sea level rise and recurrent tidal flooding. These conditions place growing pressure on infrastructure, natural systems, public safety, and long-term public investment. According to the Georgia Climate Project, as many as 178,787 people statewide could face sea level rise related impacts by 2100, while a three-foot rise in sea level could result in the loss of approximately 36 square miles of salt marsh across Georgia.

Along the coast, these changes are expected to alter ecosystems, shift species distribution, and affect services that support habitat, fisheries, water quality, flood storage, erosion control, and recreation. The resulting economic impacts include higher infrastructure protection costs and increased risk to industries that depend on coastal environmental conditions.

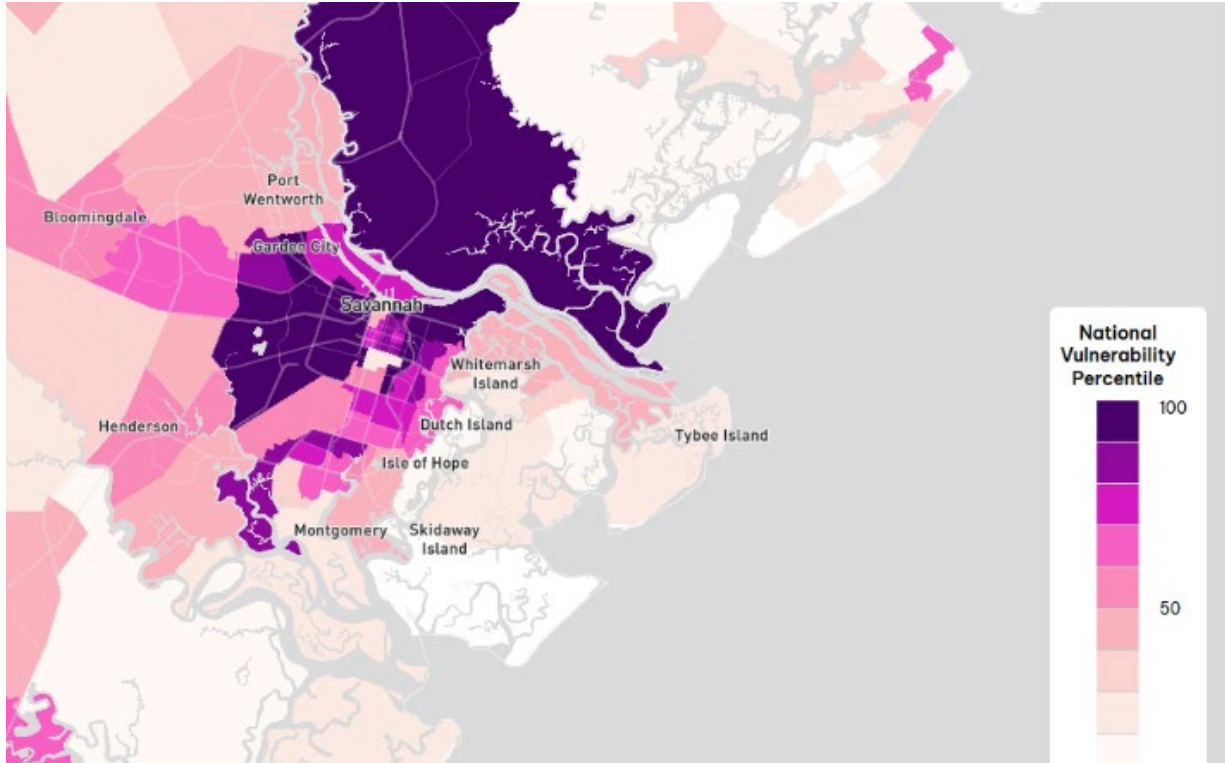
The United States Environmental Protection Agency Climate Vulnerability Index shows that climate risk across Chatham County extends beyond shoreline exposure. Most census tracts rank in upper national percentiles for climate impacts and extreme events, reflecting vulnerability to intense rainfall, flooding, heat, and storm disruption in both inland and coastal areas.

For Garden City, this is especially relevant because flood exposure intersects with industrial land patterns, transportation dependence, and areas of limited drainage capacity. Index indicators also show that climate hazards often overlap with health, social, and economic vulnerability, particularly in Garden City, Port Wentworth, western Savannah, and nearby unincorporated areas.

Lower household income, transportation limitations, housing cost burdens, and concentrations of renters, seniors, and medically vulnerable residents can increase recovery challenges when flooding disrupts housing, roads, utilities, or employment access. These patterns support resilience strategies that prioritize drainage improvements, transportation reliability, green infrastructure, and targeted investment where physical risk and social vulnerability overlap.



**Exhibit 8.10 – Climate Vulnerability Index**



**Exhibit 8.11 – Community Baseline**

## Climate and Resilience Challenges

The most significant climate related challenges affecting Garden City and the surrounding Chatham County involve infrastructure exposure, flood risk, ecosystem change, economic disruption, and unequal community vulnerability. These challenges often overlap, increasing long term pressure on public systems and local decision making:

- **Infrastructure vulnerability and public health risks**  
Roads, drainage systems, utilities, and public facilities face increasing stress from extreme heat, heavier rainfall, flooding, and prolonged storm impacts. Rising temperatures also increase heat related health risks, particularly for children, seniors, outdoor workers, and residents with limited access to cooling resources.
- **Increasing flood risk in coastal and low lying areas**  
Sea level rise, tidal flooding, and more intense rainfall continue to increase flood exposure in developed and low elevation areas. These conditions affect homes, businesses, transportation corridors, and critical infrastructure, particularly where drainage systems already operate near capacity.
- **Transformation and loss of natural ecosystems**  
Wetlands, forests, estuaries, and other natural systems continue to experience stress from changing rainfall patterns, stronger storms, and rising water levels. Reduced ecosystem function weakens flood storage, habitat support, and water quality protection.
- **Economic impacts and workforce vulnerability**  
Regional industries, including logistics, manufacturing, tourism, fishing, and Port related activity, are increasingly affected by flood disruption, extreme heat, and changing coastal conditions that influence operations, labor productivity, and transportation reliability.
- **Equity, health, and community resilience challenges**  
Climate impacts are not distributed evenly. Households with lower incomes, limited transportation access, higher housing cost burdens, or greater medical vulnerability often face greater difficulty preparing for and recovering from disruptions.
- **Water resource and saltwater intrusion risks**  
Changing hydrologic conditions and rising coastal water levels increase long term pressure on freshwater systems, groundwater quality, and water supply reliability.
- **Planning capacity, insurance, and implementation constraints**  
Flood insurance affordability, evolving regulatory requirements, and limited technical and financial capacity continue to challenge long term adaptation and redevelopment decisions.

Because many of these pressures interact, future resilience efforts in Garden City will require coordinated planning, targeted infrastructure investment, and policies that reduce both physical and social vulnerability.

### **Resiliency and Local Preparedness**

All communities face potential disruption from major events such as hurricanes, flooding, public health emergencies, and infrastructure failures. For Garden City, resilience involves strengthening systems that allow residents, businesses, public services, and infrastructure to recover quickly while maintaining critical operations during emergencies.

Resilience planning also addresses recurring conditions such as tidal flooding, drainage limitations, and social vulnerability. Strengthening preparedness requires attention to infrastructure, emergency response coordination, and equitable support for populations with fewer resources to respond to disruption.

### **Coastal Empire Resilience Network**

The Metropolitan Planning Commission began expanding regional resilience planning in 2020 through the creation of the Coastal Empire Resilience Network, developed in partnership with University of Georgia, Georgia Sea Grant, the Georgia Department of Natural Resources Coastal Resources Division, and local jurisdictions.

The network now serves as an active regional collaboration focused on resilience planning, data sharing, education, and coordination across coastal Georgia. Its work supports local governments, including Garden City, by strengthening technical capacity and integrating resilience, equity, and environmental justice into long term planning.

### **Smart Growth and Climate Change**

Smart growth strategies help communities both reduce emissions and improve resilience to changing climate conditions. For Garden City, these strategies are especially relevant because land use decisions influence flood exposure, transportation demand, infrastructure costs, and energy use.

Smart growth can also improve affordability by reducing transportation costs, improving infrastructure efficiency, and protecting environmental resources that support long term resilience.

### **Mitigation**

Development and redevelopment patterns directly affect greenhouse gas emissions. Communities can reduce emissions by:

- Compact building and using energy efficient construction methods
- Reusing existing infrastructure and buildings where practical
- Locating housing, employment, services, and public spaces closer together
- Preserving green space and directing growth toward previously developed areas

These approaches also reduce infrastructure costs, improve mobility options, and help protect natural systems that absorb heat and stormwater.

### **Adaptation**

Climate related impacts are already affecting coastal communities and are expected to intensify over time through stronger storms, heavier rainfall, rising temperatures, sea level rise, and more frequent flooding. In Garden City, adaptation planning should focus on reducing future vulnerability while strengthening infrastructure, land use decisions, and environmental systems that support long term resilience.

Smart growth strategies that support adaptation include:

- Directing growth toward areas that are connected to existing development and less vulnerable to flooding, storm surge, and future climate impacts
- Discouraging new development in areas with higher long term flood exposure
- Preserving large, connected areas of open space that support flood storage and ecosystem function
- Coordinating land use and transportation decisions with climate projections
- Encouraging water efficient and energy efficient buildings
- Upgrading stormwater systems and expanding green infrastructure
- Increasing tree cover, parks, and other cooling elements that reduce heat exposure
- Designing buildings and infrastructure to perform under future climate conditions

Communities that incorporate long term climate adaptation into everyday planning decisions will be better positioned to protect residents, maintain infrastructure performance, and reduce future public costs.

## **Environmental Planning Criteria, Planning Issues, and Opportunities**

Chatham County and its municipalities, including Garden City, apply environmental planning criteria required by state law to protect water resources, wetlands, groundwater recharge areas, and river corridors. These criteria are implemented through zoning, development review, floodplain standards, and stormwater regulations and are increasingly informed by updated flood and climate resilience studies.

### **Water Supply Watersheds and Groundwater Protection**

Water supply watershed standards protect drinking water sources through stream buffers, impervious surface controls, and approved management practices. Groundwater protection is supported through zoning controls, wellhead protection requirements, and restrictions affecting septic systems, hazardous materials, and sensitive recharge areas. In Garden City, these protections are closely linked to floodplain management and drainage conditions because shallow groundwater and saturated soils affect both water quality and infrastructure performance.

### **Wetlands and River Corridor Protection**

Wetlands and river corridors are protected through local ordinances that coordinate federal permitting with development review. These areas function as natural infrastructure by storing floodwaters, reducing erosion, protecting water quality, and supporting habitat systems.

Vegetated buffers remain important along rivers, streams, and drainage corridors to reduce development impacts and maintain floodplain function. Standards governing crossings, hazardous materials, septic systems, and construction activities support long term protection of these areas.

### **Growth Management and Natural Resource Conservation**

Environmental protection remains closely tied to growth patterns and land use decisions. Sensitive coastal and marsh adjacent areas across the County require continued use of buffers, setbacks, and development standards to limit environmental loss.

For Garden City, growth pressures are most closely associated with redevelopment, industrial expansion, and the need to preserve remaining tree canopy, drainage corridors, and open space where practical. Conservation tools may include zoning, easements, targeted acquisition, and site level stormwater controls.

## **Stormwater, Flooding, and Climate Resilience**

Rainfall driven flooding affects both incorporated and unincorporated areas of Chatham County, including locations outside mapped floodplains. Recent flood studies continue to show the importance of integrating stormwater capacity, land use decisions, and transportation planning.

For Garden City, continued use of best management practices, low impact development, drainage upgrades, and coordinated infrastructure standards remains essential to improving system performance. Sea level rise and changing rainfall intensity also require that infrastructure design, building standards, and development decisions account for long term climate conditions.

## **Public Infrastructure, Equity, and Preparedness**

Environmental conditions in Garden City are closely linked to infrastructure resilience and social vulnerability, particularly where aging drainage systems, industrial land patterns, and limited tree canopy overlap. Areas with extensive impervious surface and constrained drainage experience greater flood and heat exposure, increasing pressure on transportation access, utilities, and recovery capacity.

Future investment should prioritize drainage improvements, tree canopy expansion, green infrastructure, and flood mitigation where infrastructure stress and climate vulnerability are greatest. Regional coordination through hazard mitigation and disaster planning remains important to aligning infrastructure investment, emergency response, and long-term resilience planning.

## **Integration with Regional Planning and Ongoing Studies**

Environmental planning criteria continue to be coordinated with regional water planning, flood studies, stormwater programs, and hazard mitigation efforts. As new technical studies become available, these criteria should continue to be reviewed and refined to strengthen alignment between environmental protection, flood mitigation, and future development.

The ongoing Coastal Incentive Grant project provides an important opportunity to incorporate updated flood risk, marsh migration, and resilience analysis into future land use planning and related policy updates.

## Needs and Opportunities

<b>Key Challenges and Opportunities</b>		
<b>Issue Area</b>	<b>Key Conditions and Challenges</b>	<b>Opportunities/Strategic Actions</b>
<b>Flooding Across Multiple Drainage Basins</b>	Rainfall driven flooding affects multiple low lying drainage basins in Garden City, including canals, industrial ditches, and Port adjacent conveyances. Flat topography, shallow groundwater, extensive impervious surface, and aging drainage infrastructure contribute to recurring roadway flooding and ponding.	Advance basin specific capital projects identified in the City stormwater master plan, with priority given to pipe upsizing, outfall improvements, pump upgrades, and maintenance informed by updated drainage modeling.
<b>Sea Level Rise and Drainage System Constraints</b>	Rising water levels in downstream receiving waters reduce gravity drainage efficiency and increase inland flood risk during heavy rainfall, particularly where systems discharge toward tidally influenced waterways connected to the Savannah River.	Incorporate sea level rise and compound flooding assumptions into drainage design, redevelopment review, and long-term capital planning; evaluate backflow prevention and adaptive drainage measures.
<b>Storm Surge and Port Adjacent Infrastructure Risk</b>	Storm surge creates secondary inland risk by affecting transportation corridors, utilities, and industrial systems linked to Port operations. Disruption can limit freight movement and emergency access.	Coordinate with the Georgia Ports Authority and regional partners to align surge planning with transportation, utility, and drainage improvements.
<b>Sedimentation and Reduced Conveyance Capacity</b>	Sediment buildup in canals, ditches, and engineered channels reduces flow capacity, increases localized flooding, and affects water quality. Industrial activity and construction continue to add sediment loads.	Expand inspection, maintenance, and dredging cycles; strengthen erosion control enforcement; restore vegetated buffers where feasible.
<b>Urban Water Quality Impairments</b>	Storm runoff contributes pollutants, nutrient loading, low dissolved oxygen, and legacy contaminants to canals and receiving waters, especially during intense rainfall events.	Expand monitoring, illicit discharge detection, sewer oversight, and stormwater retrofit projects in priority drainage areas.
<b>Groundwater Protection and Saltwater Intrusion</b>	Portions of Garden City remain connected to groundwater systems serving the Floridan Aquifer. Industrial activity, limited septic use, and long-term saltwater intrusion remain concerns.	Protect recharge sensitive areas through land use controls, sewer expansion where practical, and coordination between groundwater and floodplain management standards.
<b>Habitat Fragmentation in Industrial Growth Areas</b>	Industrial and logistics expansion continues to reduce wetlands, tree canopy, and natural drainage corridors that support flood storage and water quality.	Protect priority drainage corridors and remaining natural areas; require low impact development and stronger buffering in redevelopment areas.
<b>Urban Heat and Impervious Surface Expansion</b>	Extensive paved surfaces increase heat exposure and runoff volumes, especially in industrial districts and areas with limited tree cover.	Expand tree planting and green infrastructure where feasible; integrate heat reduction measures into redevelopment and public projects.

<b>Key Challenges and Opportunities</b>		
<b>Issue Area</b>	<b>Key Conditions and Challenges</b>	<b>Opportunities/Strategic Actions</b>
<b>Environmental Justice and Climate Vulnerability</b>	Socially and economically vulnerable populations face greater exposure to flooding, heat, and infrastructure disruption.	Use equity-based prioritization when selecting stormwater, transportation, and resilience projects, with emphasis on access and recovery needs.
<b>Solid Waste, Illegal Dumping, &amp; Drainage Obstruction</b>	Illegal dumping and unmanaged debris obstruct drainage channels, worsen localized flooding, and affect water quality, particularly near industrial corridors.	Strengthen enforcement, expand disposal access, and coordinate outreach with businesses and property owners to protect drainage systems.