# MILL BAYOU – WATSON BAYOU SUB-BASIN WORK PLAN

**Beatty Bayou Within Mill Bayou – Watson Bayou Sub-Basin**

**NORTHWEST FLORIDA WATERSHEDS PARTNERSHIP PROGRAM**
**ST. ANDREW BAY WATERSHED**
**JANUARY 2026**

# NORTHWEST FLORIDA WATER MANAGEMENT DISTRICT

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## ACKNOWLEDGEMENTS

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# Executive Summary

The **Northwest Florida Watersheds Partnership Program (Program)** is a collaborative, multi-party initiative to proactively address critical water resource issues within priority sub-basins within the Northwest Florida Water Management District (District). The Program is being implemented in coordination with local and county governments, regional entities, and other interested parties to maximize effectiveness.

The Mill Bayou-Watson Bayou sub-basin was selected as the priority sub-basin within the St. Andrew Bay watershed. This sub-basin encompasses approximately 33,920 acres in Bay County, Florida, including the cities of Panama City, Lynn Haven, and Springfield and portions of Parker and Callaway, as well as unincorporated areas of Bay County. Receiving waters include North Bay to the north and St. Andrew Bay to the south.

The work plan describes the sub-basin's characteristics, critical water resource issues, and strategies and proposed projects that can be implemented to address these issues. Urban development encompasses the majority of the sub-basin, with residential, commercial, and industrial land uses comprising over 59 percent of the area. Upland forest and wetlands each encompass over 12% of the sub-basin. The sub-basin's population was 76,284 according to the 2020 census, with a projected 2045 population of 93,670. This represents a 23 percent increase over the 2020 population.

## *Current Issues and Challenges*

Water quality in the Mill Bayou-Watson Bayou sub-basin is affected by nonpoint source pollution generated by stormwater runoff across the landscape picking up pollutants from diffuse sources. Common pollutants include nutrients, sediments, bacteria, fertilizers, herbicides, insecticides, oils and greases, and effluent from septic systems. The sub-basin includes approximately 6,059 known and likely septic systems, each which may be a source of nutrients and bacteria.

Water quality impairments include:

North Bay (Fecal coliform, dissolved oxygen)
St. Andrew Bay (Fecal coliform, Enterococci)
Beatty Bayou (Fecal coliform)
Robinson Bayou (Fecal coliform)
Massalina Bayou (Fecal coliform)
Pretty Bayou (Fecal coliform, Enterococci)
Mill Bayou (Fecal coliform)

Other challenges affecting the sub-basin include susceptibility to coastal flooding, including storm surge associated with hurricanes and tropical storms, the need to increase the capacity of water supply and wastewater infrastructure, vulnerability of seagrass and salt marsh habitats, and source water protection.

## *Strategies and Solutions*

The Work Plan summarizes management strategies to address the water resource challenges affecting the Mill Bayou-Watson Bayou sub-basin. Each approach identified addresses multiple issue areas and objectives, reflecting the interrelated nature of water resource attributes and conditions. Proposed strategies include stormwater system improvements, central wastewater and onsite septic treatment

system improvements, ecosystem restoration, water supply protection and development, and monitoring and assessment.

As of January 2026, 20 projects have been proposed at an estimated total cost of $50,636,550. The current unmet funding need is $32,295,550. Project types include:

- Water supply and reclaimed water system development and upgrades
- Wastewater infrastructure system improvements and septic to sewer conversions
- Stormwater system upgrades
- Floodplain restoration
- Living shorelines
- Land acquisition
- Estuary program support

*For more information please visit: https://nwfwater.com/water-resources/surface-water-improvement-and-management/*

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# I. Introduction

The **Northwest Florida Watersheds Partnership Program** is a collaborative, multi-party initiative to proactively address critical water resource issues within priority sub-basins within the Northwest Florida Water Management District (District). While shovel-ready projects will be a high priority for implementation, funding is also anticipated to be available for design, feasibility studies, planning, and, where needed, data collection to determine causes of water resource issues or to track improvements. For the first year of the program, efforts will focus on one priority sub-basin within each of the District's seven major watersheds. The program is being implemented in coordination with local and county governments, regional entities, and other interested parties to maximize effectiveness. Partners include the Florida Department of Environmental Protection; Florida Department of Agriculture and Consumer Services; the Florida Fish and Wildlife Conservation Commission; the Choctawhatchee Basin Alliance; and the three Panhandle Estuary Programs: Pensacola and Perdido Bays, Choctawhatchee Bay, and St. Andrew and St. Joseph Bays.

To select priority sub-basins, objective criteria were developed using best-available geographic information system (GIS) datasets and applied to evaluate and rank the 114 sub-basins within the District's seven major watersheds. Evaluation criteria focused on water quality, aquatic habitat restoration, and water supply and considered factors such as water quality impairments, established total maximum daily loads, population growth, and location within a Water Resource Caution Area or Area of Resource Concern. The highest-ranked candidate sub-basins within each watershed were presented at a series of six public workshops held in October 2025. Input received during the workshops and through on-line surveys, together with information regarding proposed projects, was also utilized in the evaluation process to select a single priority sub-basin within each major watershed. Additional details regarding evaluation process can be found in Appendix A.

The Mill Bayou-Watson Bayou sub-basin was selected as the priority sub-basin within the St. Andrew watershed. This sub-basin encompasses approximately 33,920 acres in central Bay County, Florida, and includes Panama City, and portions of Lynn Haven, Parker, and Springfield. This work plan describes the sub-basin's characteristics, critical water resource issues, and strategies and proposed projects that can be implemented to address these issues.

The goal of this work plan is to provide an integrated framework for a multi-year collaborative effort to improve the environmental resources, ecological functions, and public benefits of the Mill-Bayou-Watson Bayou sub-basin.

Specific objectives of the Program and this work plan include:

- Describe critical water resource issues, with a focus on water quality, aquatic habitat, and water supply needs,
- Determine strategies and projects needed to address the most critical issues including project costs and funding needs,
- Provide an integrated and holistic approach framework that recognizes and incentivizes projects with multiple resource benefits,
- Secure and leverage funding and associated resources needed to implement priority strategies and projects,

- Protect and improve the quality of waters directly influenced by the Mill Bayou-Watson Bayou sub-basin area, as well as within the larger St. Andrew Bay watershed,
- Enhance, protect and sustain aquatic and wetland habitats with the Mill Bayou-Watson Bayou sub-basin, together with their economic, recreational, and other societal benefits for the community and for natural systems,
- Enhance the resilience and sustainability of aquatic habitats and water supplies,
- Track project implementation metrics and trends in environmental conditions to monitor and evaluate success and inform an adaptive management approach to enhance strategies and maximize the program's effectiveness.

Accomplishing these objectives will require extensive collaboration and coordination among state and local government agencies, federal agencies, nonprofit organizations, and the private sector to maximize synergy between projects and achieve lower overall restoration costs.

# II. Overview of the St. Andrew Bay Watershed

The focus of this work plan, the Mill Bayou-Watson Bayou sub-basin, is a component drainage basin (sub-basin) of the St. Andrew Bay watershed (Figure 1). A watershed is a geographic area of land that drains to a common waterbody, in this case the St. Andrew Bay estuary. The St. Andrew Bay watershed spans approximately 740,000 acres of the central Florida Panhandle (NWFWMD 2017). The watershed includes the interconnected estuarine system of St. Andrew, West, North, and East bays, and Econfina Creek and the groundwater contribution area for upper Floridan aquifer springs discharging into the creek. The watershed also includes Deer Point Lake Reservoir, Lake Powell, and several other coastal dune lakes and contributing basins and tributaries of all of these waterbodies. St. Joseph Bay and its contributing watershed are also included within the watershed planning area.

Approximately 62 percent of the St. Andrew Bay watershed is within Bay County. Gulf County and Washington County encompass about 20 percent and 10 percent, respectively, of the watershed area. Its northern and western reaches extend into Jackson and Calhoun counties, while Walton County encompasses a portion of the coastal region west of Bay County. Southwestern Jackson County includes the headwaters of Econfina Creek, which discharges into Deer Point Lake Reservoir. Walton County's portion of the watershed drains into the Gulf Intracoastal Waterway (GIWW) and several coastal dune lake drainages. St. Joseph Bay is entirely within Gulf County. Lake Powell and its contributing watershed include portions of southern Walton and Bay counties.

The GIWW acts as a trans-watershed hydrologic connection between the St. Andrew Bay estuary and adjacent estuaries. In the west, the GIWW connects West Bay with the Choctawhatchee Bay system, and in the east it connects East Bay to St. Joseph Bay through the Gulf County Canal and to the lower Apalachicola River and Apalachicola Bay through Lake Wimico.

The northern portion of the St. Andrew Bay watershed includes much of the Sand Hill Lakes region, which is the recharge area for the Floridan aquifer and springs discharging into Econfina Creek. The region includes more than 200 lakes (NWFWMD 2017). The lake basins are internally drained, and lake volumes and levels are largely functions of rainfall, groundwater inflow and leakage (Grubbs 1995; Richards 1997). Econfina Creek receives inflow from upper Floridan aquifer springs along the creek, the largest of these being first magnitude (more than 100 cubic feet per second [cfs] discharge) Gainer Spring Group. Barrios and Chelette (2004) identified 11 springs or spring groups with more than 36 individual vents within the middle reach of Econfina Creek. During low-to-moderate flow conditions, groundwater makes up the majority of stream flow (NWFWMD 2017).

Deer Point Lake Reservoir, a 5,000-acre impoundment north of the Panama City and Lynn Haven, is the major source of potable water for Bay County. The reservoir was created in 1961 through construction of a dam across North Bay at Deer Point. The reservoir receives inflow from Econfina, Bear, and Cedar creeks, and Bayou George, and it discharges water to North Bay.

The overall watershed is described in detail by the St. Andrew Bay Watershed Surface Water Improvement and Management (SWIM) Plan (NWFWMD 2017) and the Comprehensive Conservation and Management Plan (CCMP) of the St. Andrew and St. Joseph Bays Estuary Program (St. Andrew and St. Joseph Bays Estuary Program 2024). The SWIM plan describes characteristics of the overall watershed, and details watershed issues, responsive strategies, and recommended project approaches. The St. Andrew and St. Joseph Bays Estuary Program was established in 2021 and works to preserve the natural integrity and function of the estuary and provide effective cross-jurisdictional collaboration.

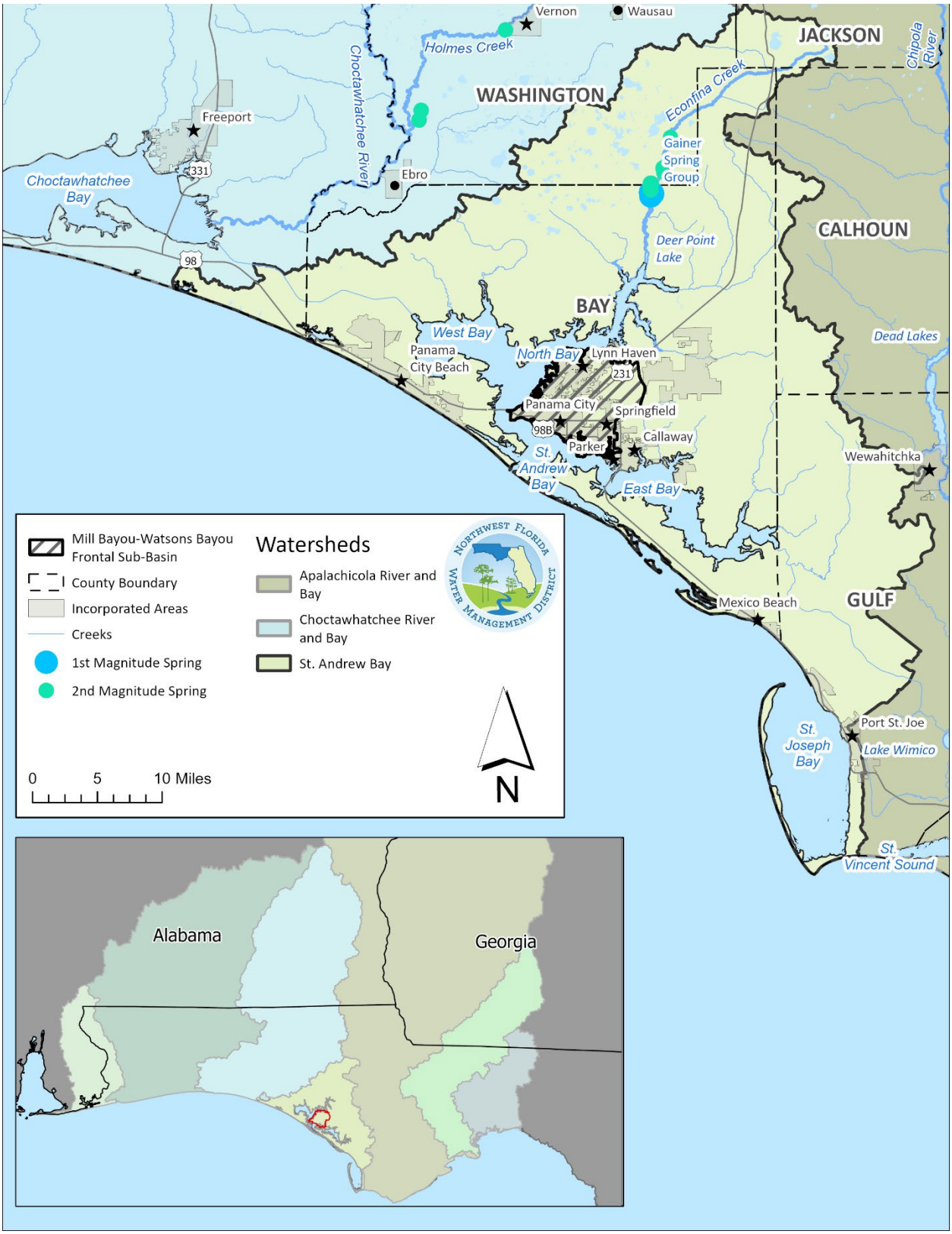


*Figure 1. St. Andrew Bay Watershed*

# III. Mill Bayou – Watson Bayou Sub-Basin Characteristics

The Mill Bayou-Watson Bayou sub-basin (Figure 2) encompasses approximately 33,920 acres in Bay County. It includes the cities of Panama City, Lynn Haven, and Springfield and portions of Parker and Callaway, as well as unincorporated areas of Bay County. Receiving waters include North Bay to the north and St. Andrew Bay to the south. Multiple estuarine bayous within the sub-basin drain predominantly urbanized land uses. Within the southeastern portion of the sub-basin, Lake Martin is a freshwater impounded bayou receiving runoff from the cities of Springfield, Parker, and Callaway.

St. Andrew Bay and the Mill Bayou-Watson Bayou sub-basin are within the Gulf Coastal Lowlands subregion of the Gulf Coastal Plain physiographic region. Terraces, coastal barriers, dunes, and other topographical features of the region were formed through sea-level fluctuations during the Pleistocene Epoch (NWFWMD 2017). The geography of the sub-basin is depicted by Figure 3. Land elevations range from sea level to approximately 88 feet (NAV88).

Within their respective jurisdictions, Bay County and the cities of Panama City, Lynn Haven, Springfield, Parker, and Callaway are responsible for land use and land development regulations within a broad array of other local government responsibilities. The Florida Department of Environmental Protection (FDEP) regulates water quality, wastewater, and septic systems, and it owns and manages state parks and coordinates other environmental programs at the state level. The Northwest Florida Water Management District (NWFWMD, or District) is responsible for environmental resource permitting and regulation of wells and consumptive uses of water, as well as land management and nonregulatory water resource programs. Within the upper reaches of the watershed, the District owns and manages more than 41,000 acres within the Econfina Creek recharge area, protecting water quantity and quality within the Deer Point Lake Reservoir and the St. Andew Bay estuary. The planning area is also within the region served by the Emerald Coast Regional Council, which provides technical assistance and coordinates transportation planning, economic development, emergency and environmental planning, housing, and other services cooperatively with local governments across a seven-county area of northwest Florida.

The Florida Fish and Wildlife Conservation Commission (FWC) is responsible for freshwater and marine resource management. The FWC Florida Fish and Wildlife Research Institute conducts seagrass monitoring and management, tracking of coastal harmful algal blooms (red tides), and the Oyster Integrated Mapping and Monitoring Program. The Florida Department of Agriculture and Consumer Services, Division of Aquaculture, monitors and evaluates and classifies shellfish harvesting areas and is responsible for developing and enforcing regulations governing commercial aquaculture. Among nonprofit organizations, St. Andrew Baywatch conducts long-term water quality monitoring, living shorelines establishment and restoration, and the Grasses in Classes program in area schools.

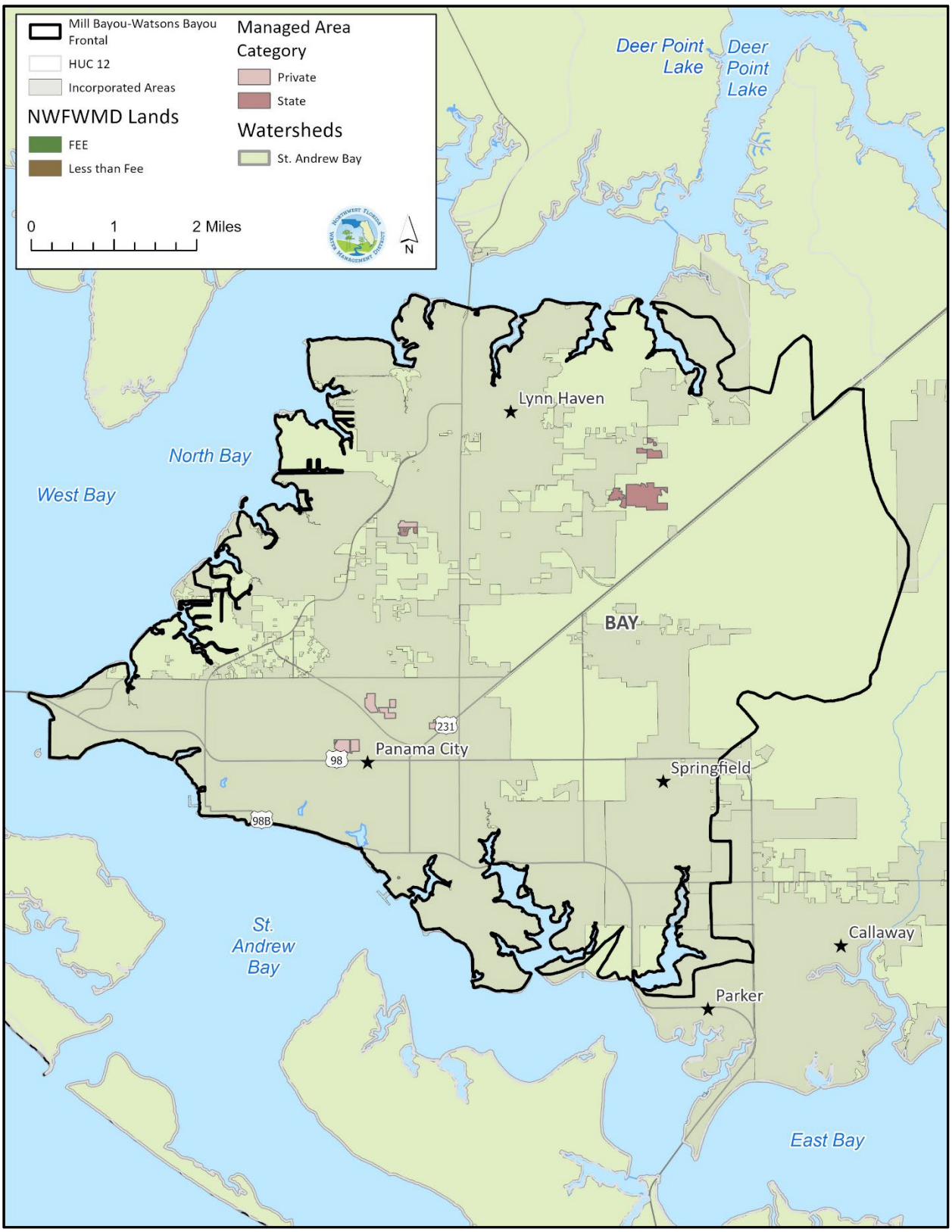


*Figure 2. Mill Bayou-Watson Bayou Sub-basin*

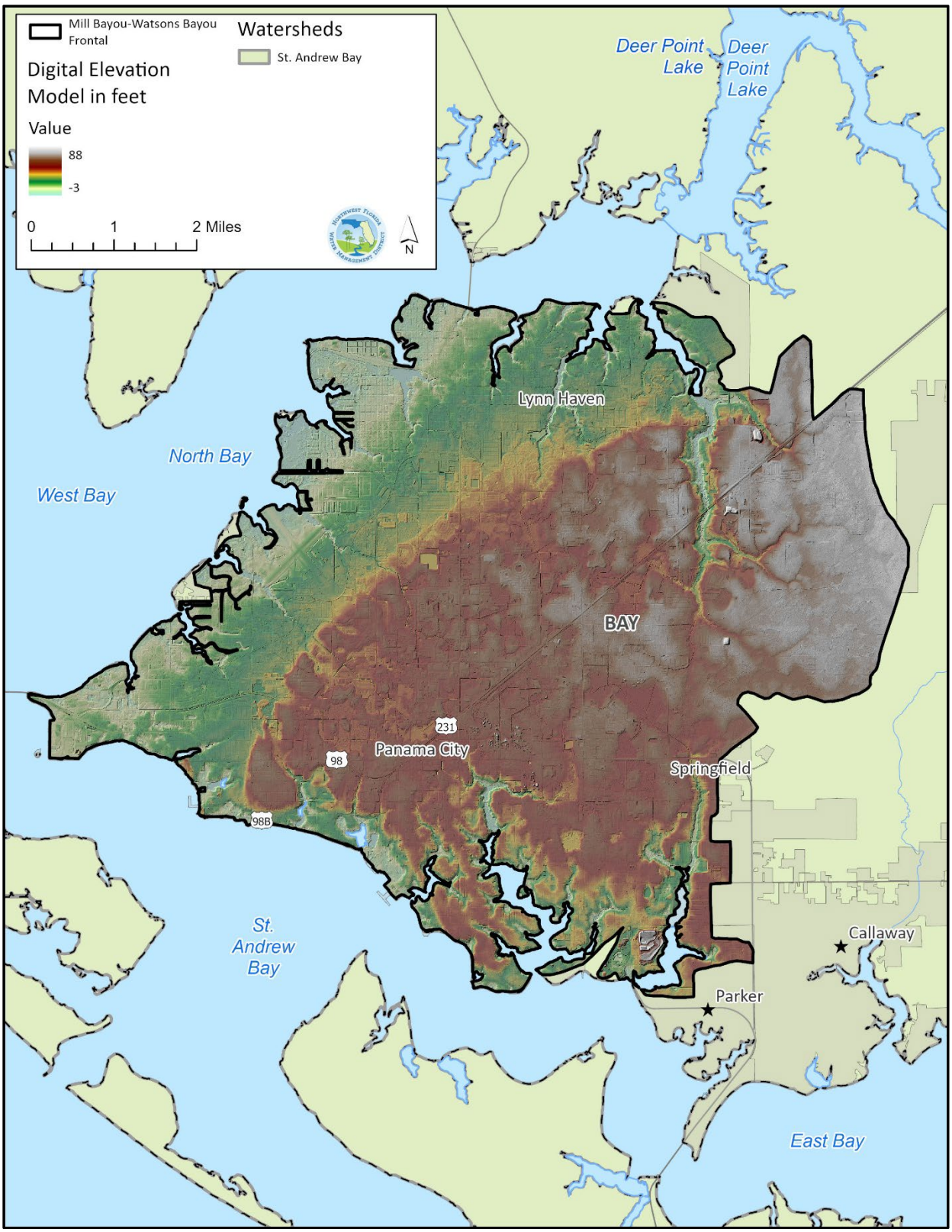


*Figure 3. Topography in the Mill Bayou-Watson Bayou Sub-basin*

## 3.1 Sub-basin Functions and Benefits

Water resource values and associated ecosystem services provided by the Mill Bayou-Watson Bayou sub-basin and St. Andrew Bay are essential to the character and quality of the human environment, as well as to regionally significant natural systems. These include fish and wildlife resources, diverse recreational opportunities, noteworthy aesthetic characteristics, surface and groundwater storage, water supply, floodwater storage, and the considerable economic benefits of all of these. Wetlands and floodplains protect water quality, provide important habitats, and provide essential flood protection for the community.

## 3.2 Hydrology

St. Andrew Bay is unique among northwest Florida estuaries in that it has no major riverine inflow. Bay waters consequentially are comparatively deep, clear, and of relatively high and consistent salinity (NWFWMD 2017). The major source of freshwater inflow to the St. Andrew Bay estuary is Econfina Creek, which has an average annual discharge of 535 cubic feet per second (cfs) at the USGS gauge near Bennett, Florida (NWFWMD 2023a). Other tributaries of the reservoir include Bear Creek, Bayou George Creek, and Cedar Creek. Crowe *et al*. (2008) estimated an average of approximately 800 cfs is discharged from the reservoir into North Bay. Other tributaries of the estuary include Burnt Mill Creek and Crooked Creek, which together discharge approximately 60 cfs into West Bay, and Sandy and Wetappo creeks, which together discharge about 232 cfs into East Bay (Crowe *et al*. 2008).

The Mill Bayou-Watson Bayou sub-basin is characterized by highly urbanized drainages, with diminished and fragmented wetlands drained by ditches and remnant stream segments. These discharge into a series of estuarine bayous along North Bay to the north and St. Andrew Bay to the south. Notable bayous in the sub-basin include Mill, Beatty, Anderson, Lynn Haven, Goose, Upper Goose, Robinson, Posten, and Pretty bayous along North Bay, and Johnson, Massalina, and Watson bayous along St. Andrew Bay. Within the southeastern portion of the sub-basin, Lake Martin is a freshwater impounded bayou receiving drainage from the cities of Springfield and Parker.

## 3.3 Aquatic and Terrestrial Habitats

Estuarine waters within the Mill Bayou-Watson Bayou sub-basin include extensive seagrass beds and limited salt marshes and oyster reefs. These resources, described below, provide habitat for economically important species of fish and shellfish and enhance public uses and benefits.

### *Seagrasses*

Seagrass beds are exceptionally important for the health and productivity of St. Andrew Bay (SASJBEP 2024b; Yarbro and Carlson 2018). They provide habitat and food for fish, shellfish, manatees, sea turtles, and waterfowl. Many economically significant species of fish and shellfish depend on seagrasses during critical life stages. Additionally, seagrasses help stabilize sediments and thereby protect water quality (Orth *et al*. 2020).

Continuous and patchy seagrass beds are found across most of the sub-basin's estuarine shoreline along both North Bay and St. Andrew Bay (Figure 3). Yarbro and Carlson (2018) indicate turtlegrass (*Thalassia testudinum*) and shoalgrass (*Halodule wrightii*) are the most commonly found species, with manateegrasss (*Syringodium filiforme*) occurring at lower densities. Stargrass (*Halophila engelmannii*) and widgeongrass (*Ruppia maritima*) are less common within the estuary.

### *Salt Marshes*

Salt-marsh area within the Mill Bayou-Watson Bayou sub-basin is limited, with the most substantial marsh being along North Bay between Goose and Upper Goose bayous. Smaller marshes are within and adjacent to several bayous opening to North Bay and St. Andrew Bay. Estuarine marshes exist as an intertidal ecotone between terrestrial and marine environments, providing nursery habitat and refuge for a variety of invertebrates and fish, as well as habitat for migratory and other bird species, reptiles, mammals, and other wildlife. Additionally, salt marshes are important for nutrient cycling, water quality protection, floodwater storage, and shoreline stability, thereby enhancing coastal resilience.

Salt marshes in northwest Florida are typically characterized by relatively homogenous expanses of black needlerush (*Juncus roemerianus*), with smooth cordgrass (*Spartina alterniflora*) frequently at deeper elevations along the water's edge. Saltmeadow cordgrass (*Spartina patens*) populates higher elevations with less frequent tidal inundation with salt grass (*Distichlis spicata*) and other herbaceous and woody species.

### *Oysters*

The only reef-building oyster in the St. Andrew Bay estuary is the Eastern oyster (*Crassostrea virginica*). In addition to being valuable as a commercially harvested food source, oysters provide a range of ecosystem services critical to the health and productivity of northwest Florida's estuaries (Radabaugh *et al*. 2019). They improve water quality and clarity through the filter feeding process, improve coastal resiliency by reducing erosion, and provide important habitat and food for fish, invertebrates, and birds.

Oysters have historically been harvested within St. Andrew Bay, particularly in North, West and East bays (SASJBEP 2024b), although yields are currently considered low (Radabaugh *et al*. 2019). Much of North Bay is classified as Conditionally Approved for oyster harvesting (FDACS 2015), with interior bayou waters classified Prohibited. Estuarine areas within the Mill Bayou-Watson Bayou sub-basin are not approved for shellfish harvesting. Two oyster beds are mapped by FWC (2025) north of Upper Goose and Anderson bayous. Crowe *et al*. (2008) indicated additional oyster beds were historically present in North Bay, north of Beatty Bayou.

Radabaugh *et al*. (2019) described factors essential to the sustainability of oyster populations, including with respect to salinity conditions, runoff and sedimentation, and the rate of shell deposition from new growth relative to the rate of shell loss (the "shell budget").

### *Listed Species*

Aquatic habitats, estuarine and freshwater wetlands, and limited terrestrial habitats within the planning area are important for sustaining biological diversity within the region, including a number of potentially occurring species federally listed under the Endangered Species Act (Table 1).

*Table 1. Listed Species Potentially Occurring in the Mill Bayou-Watson Bayou Sub-basin*

| Common Name | Scientific Name | Federal Status |
|---|---|---|
| Panama City crayfish | *Procambarus econfinae* | Threatened |
| Godfrey's butterwort | *Pinguicula ionantha* | Threatened |
| Reticulated Flatwoods Salamander | *Ambystoma bishop* | Threatened |
| Loggerhead Sea Turtle | *Caretta caretta* | Threatened |
| Green Sea Turtle | *Chelonia mydas* | Endangered |
| Leatherback Sea Turtle | *Dermochelys coriacea* | Endangered |
| Kemp's Ridley Sea Turtle | *Lepidochelys kempii* | Endangered |
| Hawksbill Sea Turtle | *Eretmochelys imbricata* | Endangered |
| Alligator Snapping Turtle | *Macrochelys temminckii* | Proposed Threatened |
| Florida Pine Snake | *Pituophis melanoleucas mugitus* | Proposed Threatened |
| Eastern Indigo Snake | *Drymarchon couperi* | Threatened |
| Piping Plover | *Charadrius melodus* | Threatened |
| Red-cockaded Woodpecker | *Dryobates borealis* | Threatened |
| Wood Stork | *Mycteria americana* | Threatened |
| Red knot | *Calidris canutus rufa* | Threatened |
| West Indian Manatee | *Trichechus manatus* | Threatened |
| Gulf Sturgeon | *Acipenser oxyrinchus desotoi* | Threatened |
| Source: NWFWMD (2017) | | |

The Panama City crayfish is found only within south central Bay County. Historically, the species inhabited shallow freshwater areas within open pine flatwoods and wet prairies. As most of these have been lost to development, the crayfish currently inhabits grassy ditches and swales, pine plantations, utility rights-of-way, and remnant wetlands (USFWS 2021). The primary threat to the Panama City crayfish is habitat loss (FWC n.d.). Other potential threats include soil disturbance, ditch maintenance, wetland fill, off-road vehicles, bait collection, and use of pesticides and herbicides (FWC n.d.).

## 3.4 Land Use and Land Cover

Land use and land cover are listed in Table 2 and depicted in Figure 4. The Urban and Built-Up category, including residential, commercial, and industrial land uses, comprises over 59 percent of the sub-basin. Upland forest and wetlands each encompass over 12 percent, and Transportation, Communication, and Utilities account for nearly 6 percent of the sub-basin.

*Table 2. Land Use and Land Cover in the Mill Bayou-Watson Bayou Sub-basin*

| Land Use/Cover | Area (acres) | Percent |
|---|---|---|
| Urban and Built-Up | 20,190 | 59.52 |
| Upland Forest | 4,289 | 12.64 |
| Wetlands | 4,159 | 12.26 |
| Transportation, Communication, Utilities | 2,000 | 5.90 |
| Agriculture | 148 | 0.44 |
| Barren Land | 477 | 1.41 |
| Hurricane Impacted | 666 | 1.96 |
| Water | 1,542 | 4.55 |
| Rangeland | 449 | 1.32 |
| Total | 33,920 | 100.00 |

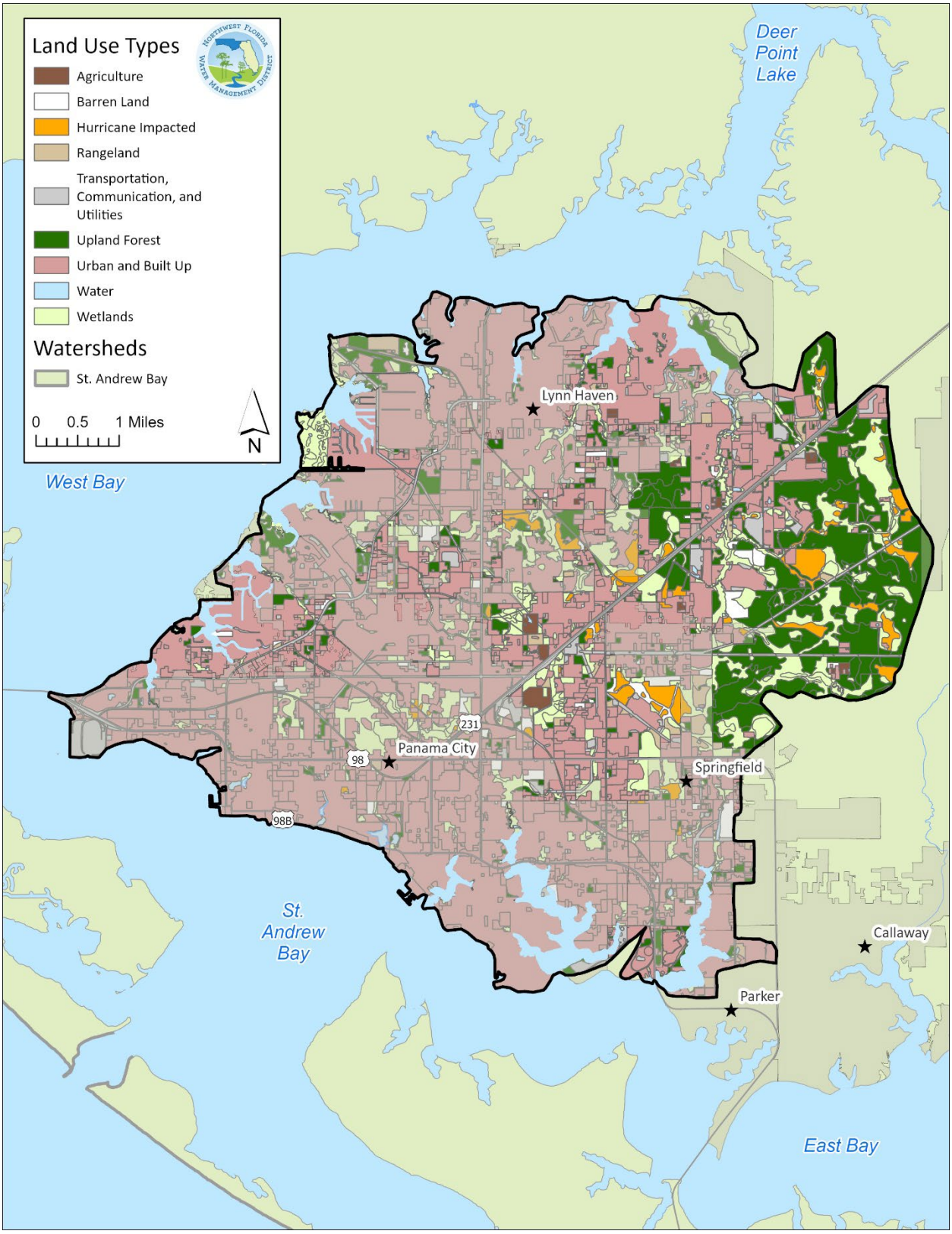


*Figure 4. Land Use and Land Cover in the Mill Bayou-Watson Bayou Sub-basin*

## 3.5 Population and Growth

The University of Florida Bureau of Economic and Business Research (BEBR) (2024) estimated the 2024 population of Bay County at 199,718. By 2024, population numbers within the county have recovered from impacts attributed to 2018's Hurricane Michael (BEBR 2024). The population growth rate for the county from 2020 to 2024 was estimated at approximately 14 percent. Analysis of U.S. Census point data indicates the Mill Bayou-Watson Bayou sub-basin had a population of 76,284 in 2020, with a projected 2045 population of 93,670. This represents a 23 percent increase over the 2020 population.

## 3.6 Water Supply

Surface water from Deer Point Lake Reservoir is the primary water source for Bay County, including this sub-basin. Public supply is the largest water use sector. Public supply utilities include Bay County Utility Services, Panama City, and the city of Lynn Haven. Panama City solely relies on surface water from Bay County to supply its community. Residents within Springfield and Parker and unincorporated areas also rely on surface water provided by Bay County. Lynn Haven purchases a small amount of surface water from Bay County and is the only utility in the planning area to rely primarily on groundwater for potable water supply.

The District (NWFWMD 2023) projects water demands in this sub-basin to increase by nearly 20 percent between 2020 and 2045. Deer Point Lake Reservoir has sufficient supplies to meet future surface water demands. The flow of Econfina Creek, the reservoir's major tributary, is relatively stable, even during drought periods due to substantial spring flow and groundwater inflow. The largest concerns for the reservoir have historically been the risk of storm surge associated with major hurricanes and water quality impacts from adjacent land uses. A Regional Water Supply Plan (RWSP) was in place for Bay County between 2008 and 2018 due to this concern (NWFWMD 2014). The RWSP was discontinued following the construction of an alternate intake location in southern Econfina Creek, which increased the resilience of the potable water supply.

The major hydrostratigraphic units that comprise the groundwater flow system are the surficial aquifer, the intermediate system, and the underlying Upper Floridan aquifer. Lynn Haven's production wells utilize the upper Floridan aquifer. The Floridan aquifer system is comprised of carbonate and dolomitic rocks that generally range in thickness from 450 feet to 850 feet across most of Bay County (NWFWMD 2023). The upper Floridan aquifer is also the water source for self-supplied commercial and industrial uses and some domestic wells within the sub-basin. Where well yields are sufficient, the intermediate system may also be utilized for minor uses such as domestic wells and landscape irrigation.

# IV. Current Issues and Challenges

Critical challenges affecting Mill Bayou-Watson Bayou sub-basin include water quality impairments, degradation and loss of aquatic and wetland habitats, and flooding and coastal resilience. These issue areas and responsive management strategies are closely interrelated. Water quality, for example, directly influences habitat quality and sustainability. Similarly, healthy aquatic, wetland, and upland ecosystems directly support water quality. Functional floodplains and wetland systems each provide flood protection for surrounding communities, provide fish and wildlife habitat, and protect and improve water quality.

## 4.1 Monitoring and Trends

The St. Andrew Bay Watch program monitors 70 stations throughout St. Andrew Bay. Field parameters include turbidity, temperature, pH, dissolved oxygen, salinity, tide, and precipitation. Samples are analyzed by Florida LAKEWATCH for total nitrogen, total phosphorus, and chlorophyll-a.

Florida's Seagrass Integrated Mapping and Monitoring (SIMM) Program conducts periodic mapping updates and assessments of seagrasses in Florida's estuarine waters, including St. Andrew Bay (Yarbro and Carlson 2018). Water quality data are collected as part of the assessments, including salinity, temperature, depth, Secchi depth, pH, and dissolved oxygen concentration, together with optical water quality parameters — light attenuation, chlorophyll-a concentration, turbidity, total suspended solids, and color.

The Florida Healthy Beaches Program of the Florida Department of Health monitors two sites within the planning area: Carl Gray Park on North Bay and Beach Drive on St. Andrew Bay. Samples at public beaches are analyzed for *Enterococcus*, as an indicator fecal contamination. Advisories are issued when data exceed established criteria. Sites are sampled weekly to biweekly (FDOH 2025). The Florida Department of Agriculture and Consumer Services, Division of Aquaculture monitors shellfish harvesting areas for the presence of fecal coliform bacteria as an indicator of the possible presence of other pathogens.

## 4.2 Water Quality

The Mill Bayou-Watson Bayou sub-basin and receiving waters have been impacted by threats to water quality common to Florida waters, including stormwater runoff and nonpoint source pollution, and, potentially, issues associated with wastewater management and treatment. Nonpoint source pollution is generated by stormwater runoff across the landscape carrying pollutants from diffuse sources to receiving waters. Common nonpoint source pollutants include nutrients, sediments, bacteria, pet and wildlife waste, fertilizers, herbicides, insecticides, oils and greases, effluent from onsite sewage treatment and disposal systems (OSTDS), and litter. Sources may include residential yards, commercial and industrial sites, streets and parking lots, agricultural areas, construction sites, atmospheric deposition, and erosion sites. The highest rates of pollutant loading, including for nutrients, suspended solids, and biochemical oxygen demand, are typically associated with residential, commercial, industrial, and agricultural land uses (Harper 1999).

Impairments listed by the state of Florida within the Mill Bayou-Watson Bayou sub-basin include fecal coliform, where shellfish harvesting waters are not fully approved, and dissolved oxygen in North Bay, as well as bacterial parameters in St. Andrew Bay adjacent to the sub-basin. Waterbodies listed as not attaining standards at the time of this writing are listed in Table 3.

*Table 3. Waters Not Attaining Standards in the Mill Bayou-Watson Bayou Sub-basin*

| Waterbody | WBID* | Parameters Not Attaining Standards |
|---|---|---|
| North Bay Segment 1 | 1061G | Fecal coliform (Shellfish harvesting area classified Conditionally Approved)<br>Dissolved oxygen (percent saturation) |
| North Bay Segment 2 | 1061H | Fecal coliform (Shellfish harvesting area classified Conditionally Approved) |
| St. Andrew Bay North Segment | 1061B | Fecal coliform (Shellfish harvesting area classified Prohibited) |
| St. Andrew Bay Middle Segment | 1061C | Enterococci |
| Beatty Bayou | 1088 | Fecal coliform (Shellfish harvesting area classified Prohibited)<br>Fecal coliform |
| Robinson Bayou | 1123 | Fecal coliform |
| Massalina Bayou | 1144 | Fecal coliform |
| Pretty Bayou | 1128 | Fecal coliform (Shellfish harvesting area classified Prohibited)<br>Fecal coliform<br>Enterococci |
| Mill Bayou | 1086 | Fecal coliform (Shellfish harvesting area classified Prohibited)<br>Fecal coliform |

* Waterbody Identification Number

Sources:

DEP, Division of Environmental Assessment and Restoration – Impaired Waters, TMDLs, and Basin Management Action Plans Interactive Map
https://floridadep.gov/dear/water-quality-restoration/content/impaired-waters-tmdls-and-basin-management-action-plans

FDACS, Division of Aquaculture – Shellfish Harvesting Area Classification Map #10
https://www.fdacs.gov/Agriculture-Industry/Aquaculture/Shellfish-Harvesting-Area-Classification/Shellfish-Harvesting-Area-Information

There are no Florida TMDLs established within the Mill Bayou-Watson Bayou sub-basin. The U.S. EPA has established TMDLs for several bayous within the sub-basin (DEP 2025):

- Beatty Bayou – Nutrients
- Robinson Bayou – Total phosphorus
- Pretty Bayou – Biochemical oxygen demand
- Johnson – Total nitrogen
- Massalina Bayou – Total nitrogen

Within the Mill Bayou-Watson Bayou sub-basin, bacterial parameters are the major identified water quality impairments. Sources of bacteria and other pathogens may include seepage of groundwater affected by leaking sanitary sewer lines and septic tanks, animal wastes, sanitary sewer overflows and leaks, and urban stormwater runoff. The sub-basin includes 6,059 known and likely OSTDS (Figure 5).

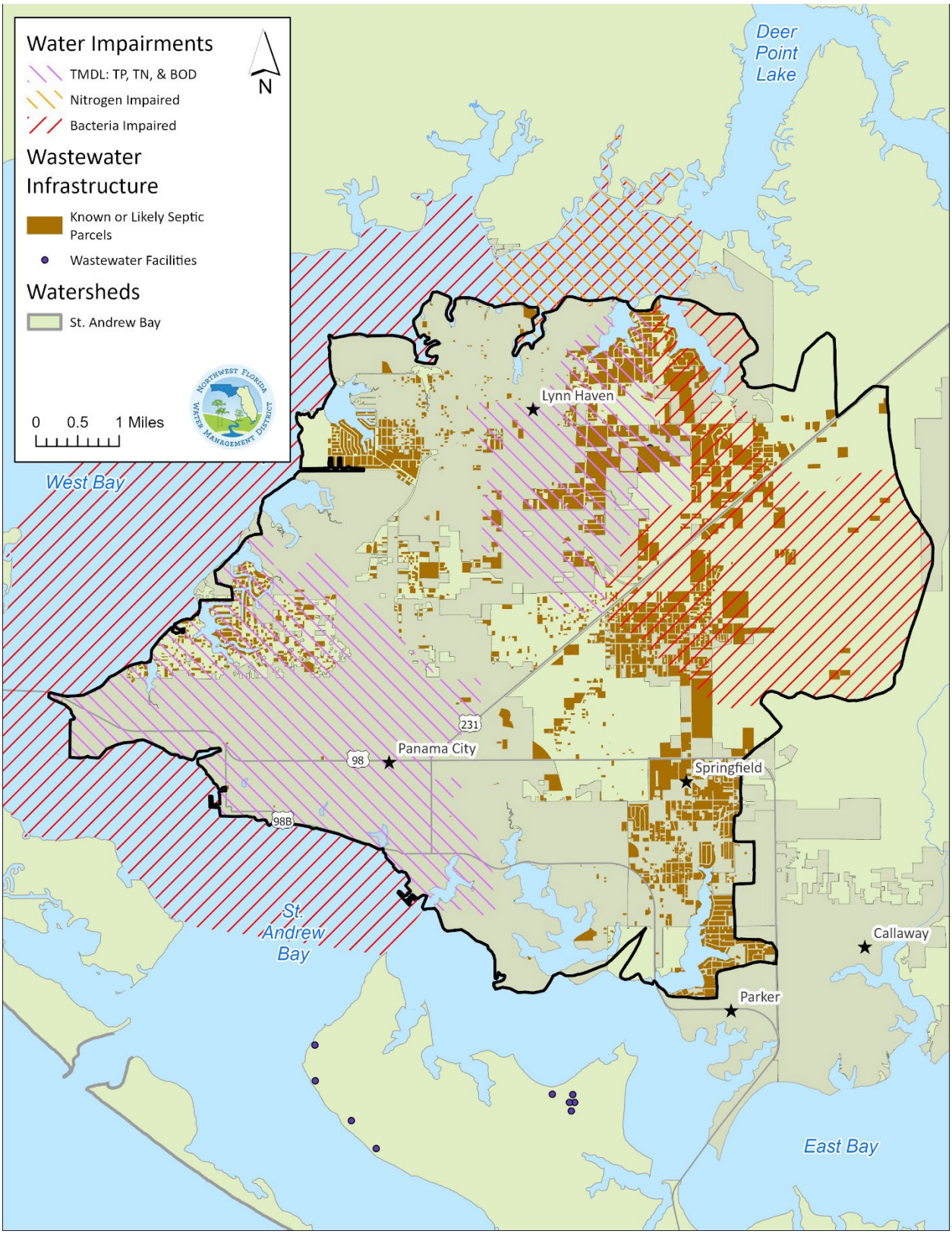


*Figure 5. Septic System Distribution in the Mill Bayou-Watson Bayou Sub-basin*

Three domestic wastewater treatment facilities are within the sub-basin. These are the Millville and St. Andrews advanced wastewater treatment facilities in Panama City and the Lynn Haven Advanced Wastewater Treatment Plant.

## 4.3 Aquatic and Wetland Habitats

### *Seagrasses*

Yarbro and Carlson (2018; 2020) indicated seagrass coverage remained generally stable from 2010 to 2015, while noting that some beds in North Bay and St. Andrew Bay exhibited increasing patchiness. North Bay and central St. Andrew Bay lost 33 acres and 17 acres respectively of seagrass beds between 2015 and 2017 (Yarbro and Carlson 2020). Stressors described include stormwater runoff and impacts from hurricanes and tropical storms. Additionally, propeller scarring is estimated to affect approximately 32 percent of the seagrass beds across the estuary. Seagrasses are vulnerable to water quality impairments, changing climatic conditions, and physical impacts. Orth *et al*. (2006) describes a number of stressors, including nutrient enrichment, sediment runoff, invasive species, hydrological alterations, coastal armoring, and sea level rise. Climatological risks include increases in sea level, sea surface temperature, frequency and intensity of storms, and associated water quality effects. Shoreline armoring can prevent shoreward migration of seagrasses in response to sea level rise, leading to losses of habitat at the deeper edges of the grass beds.

### *Oysters*

Radabaugh *et al*. (2019) noted oyster populations have suffered major declines statewide in recent decades and that harvests are limited in the St. Andrew Bay estuary, having peaked in 1993. St. Andrew Bay has been described as a challenging habitat for oysters due to higher-than-optimal average salinity, as well as effects of large pulses of fresh water occurring with runoff from major storm systems (Radabaugh *et al*. 2019; Crowe et al. 2008). Principle contributors to losses statewide and continuing threats include:

- Sedimentation, burying oysters and impacting filter feeding and respiration.
- Coastal development and shoreline armoring, increasing sedimentation and runoff, diminishing water quality, reducing available habitat area, and constraining the ability of oysters to migrate shoreward in response to sea level rise.
- Predation and disease, particularly at higher salinity levels.
- Stormwater runoff and tropical storm events causing unsuitable salinity conditions, both in pulses and in long-term trends.
- Effects of changing climate conditions, including sea level rise, warming, low oxygen levels, and acidification.

### *Salt Marshes*

Salt marshes are vulnerable to sea-level rise where coastal construction and armoring prevents migration of marshes inland along an elevation gradient. The Mill Bayou-Watson Bayou sub-basin is substantially developed along its coastal fringe, limiting the ability of marshes to adapt to rising sea levels and coastal erosion.

## 4.4 Flooding and Coastal Resilience

The entire planning area is highly susceptible to coastal flooding, including storm surge associated with hurricanes and tropical storms (Bay County 2025). Recent hurricanes directly impacting the planning area include hurricanes Michael (2018) and Sally (2020) and Tropical Storm Fred (2021). Category Five Hurricane Michael brought 160 mph winds and a 14-foot storm surge, causing intensive destruction throughout most of the county, including the Mill Bayou-Watson Bayou sub-basin.

Over 31 percent of the planning area is within the Special Flood Hazard Area (one percent annual chance of flooding). A limited area of the sub-basin is within the VE zone, with impacts from waves and high velocity waters during hurricanes and tropical storms (Figure 6).

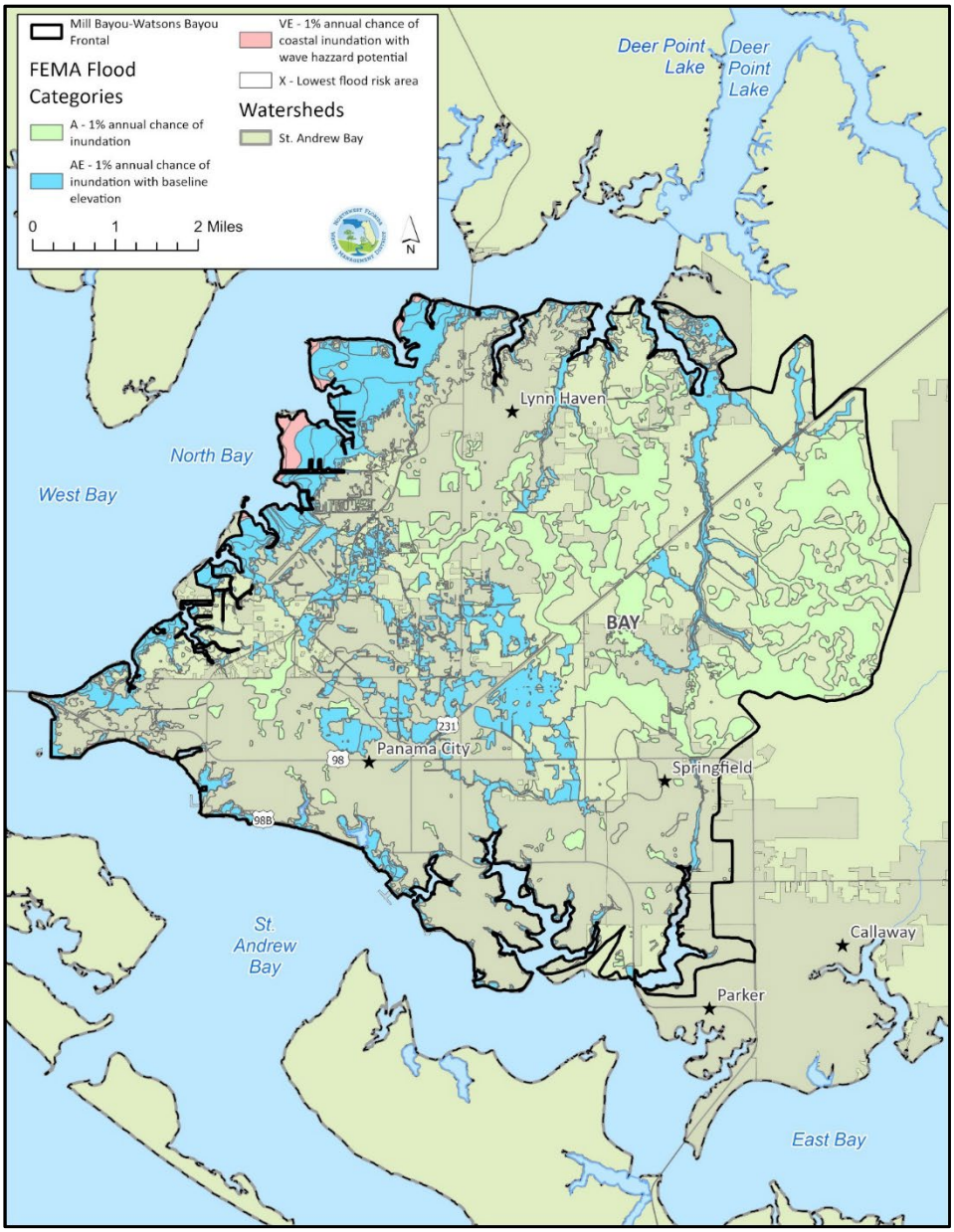


*Figure 6. Flood Zones in the Mill Bayou-Watson Bayou Sub-basin*

## 4.5 Water Supply

Most of Bay County, including this sub-basin, has been designed as an Area of Resource Concern due to high groundwater use, low groundwater availability, and historical declines in the potentiometric surface of the upper Floridan aquifer. Within the sub-basin, the potentiometric surface of the upper Floridan aquifer ranges from a high of about 25 feet (NAVD88) in the northern portion of the sub-basin to 15 feet below sea level to the south. Where the potentiometric surface is below sea level, there is a risk of saltwater intrusion due to the lateral movement of brackish water from West Bay and St. Andrew Bay, and the upconing of poor-quality water from deeper zones within the upper Floridan aquifer. Some wells within central Bay County have exhibited increasing trends in saline parameters, but trends appear to be localized (NWFWMD 2023). The District has initiated work to evaluate the need to establish minimum aquifer levels in Bay County to protect groundwater resources from potential future saltwater intrusion.

Water supply challenges in the sub-basin include:

- Groundwater Quantity and Quality – Well yields are low to moderate and groundwater resources are limited within this sub-basin. Some wells exhibit increasing trends in saline parameters.
- Upper Floridan aquifer sustainability – Wells located near West Bay and St. Andrew Bay may be susceptible to coastal flooding and storm surge and are subject to the potential long-term risks of saltwater intrusion. Potential mechanisms for saltwater intrusion include lateral movement, and vertical upconing of lower quality water.
- Source Water Protection – Deer Point Lake Reservoir, the primary source of water in this sub-basin, was historically vulnerable to impacts from storm surge and land use activities. Bay County constructed an alternate surface water intake location in 2015, which significantly reduced the potential for storm surge impacts. The reservoir and major tributaries are classified as Class I waters, which have the state's most stringent water quality criteria (NWFWMD 2014). Bay County established protective measures in the land development code for the Deer Point Reservoir Protection Zone and the Sand Hills Rural Community Special Treatment Zone (NWFWMD 2014). The function of the protection zone is to protect water quality by limiting allowable land uses, limiting density and impervious surfaces within the designated protection zone, requiring a 75-foot development setback with natural vegetation, increasing the setback distance for septic systems, and requiring silviculture best management practices. The District's purchase and ongoing protection of land within the Econfina Water Management Area contributes greatly to the sustainability and quality of the Deer Point Lake Reservoir water supply.
- Reuse and Conservation – There are additional opportunities for water conservation to reduce future water demands. Measures could include plumbing retrofits, appliance rebates, and measures that enhance the efficiency of landscape irrigation use. There are also opportunities for additional water reclamation and reuse, although Bay County is currently pursuing the use of deep injection wells for the disposal of treated wastewater.
- Infrastructure Retrofit and Maintenance – Per discussions with Bay County, the surface water intake on Deer Point Lake Reservoir may need some modifications. Additionally, aging water system pipes are subject to leakage and infiltration, necessitating repair or replacement. Population growth and new development may also require increased pipe diameters or water line extensions. Associated improvements may include booster pumps, modernized metering

and data systems, and looping and sectionalization of water distribution systems to improve reliability.

- Changes in Regulated Contaminants – Water utilities must track and plan for potential changes in drinking water regulations. An area of ongoing concern for most utilities is changes in regulations regarding per- and polyfluoroalkyl substances (PFAS). PFAS is a category of human-made chemicals that have been widely used in a variety of products and industries, such as firefighting foams, protective coatings, and surfactant applications among many other uses and products (National Groundwater Association 2024).

## 4.6 Data and Knowledge Gaps

- Water Quality – Water quality can be highly variable, depending on precipitation, freshwater inflow, and seasonal conditions. Sampling frequency may be inadequate for capturing effects of individual events or evaluating trends over a period of months or years. Substantially increasing the temporal and spatial density of water quality monitoring, at least for one-to-two years, would provide an improved assessment of water quality in the sub-basin.
- Sediment Quality – Sediment data are indicative of the quality of benthic habitats, as well as potential effects from sedimentation, nutrient enrichment, or contaminants. Sediments integrate processes over time and can therefore be useful in assessing long-term impacts. Legacy sediment quality data published by the Florida Department of Environmental Protection (FDEP) (Seal *et al*. 1994) indicates a number of stations in the planning area; however, the data might not be representative of current conditions.
- Biological Data – Periodic updates to evaluations and maps of seagrass and oyster reef distributions and conditions help identify trends and risks for water quality, habitat quality, and coastal resilience.

## 4.7 Risks and Vulnerabilities

Future risks and ongoing vulnerabilities affecting the planning area and the St. Andrew Bay estuary as a whole are centered on effects related to land use and sea-level rise. These are summarized as follows:

- Water Quality – Continued population growth and development bring with them additional stormwater and wastewater management challenges. It is important to effectively prevent pollutant loading from point and nonpoint sources within a changing landscape. Coastal waters are otherwise vulnerable to eutrophication and harmful algal blooms.
- Seagrasses – The health and extent of the bay's important seagrass communities can be impacted by poor water quality conditions and physical impacts. Seagrass bed area at the deeper edges may be lost due to sea level rise.
- Oysters – Oysters are similarly susceptible to being impacted by pollutant loading and sedimentation. Additionally, oysters can be vulnerable to changing climatic conditions, including warming, low oxygen levels, and acidification.
- Salt Marshes – Salt marshes and littoral habitats are likely to continue to be lost due to sea level rise (due to both submergence and erosion). Salt marshes are also vulnerable to loss where coastal development and shoreline armoring precludes shoreward migration as sea levels rise.

- Habitat loss and Fragmentation – Loss or fragmentation of wetland and other aquatic habitats within the sub-basin will diminish beneficial functions, including floodwater storage, water quality improvement, and fish and wildlife habitat.
- Coastal Resilience – The planning area is highly susceptible to coastal flooding, including storm surge associated with hurricanes and tropical storms.

# V. Management Strategies and Projects

Table 4 summarizes management strategies recommended to address the water resource challenges described above. Each approach addresses multiple issue areas and objectives, reflecting the interrelated nature of water resource attributes and conditions and the fact that most projects can be designed to achieve multiple complementary outcomes.

Consistent with the SWIM plan (2017) and CCMP (2024), the management strategies and projects incorporated within this work plan are based on a watershed approach to protecting and restoring water resources. A watershed approach is predicated on recognition that the character and quality of a waterbody are defined by conditions across the contributing drainage basin.

*Table 4. Recommended Management Strategies for the Mill Bayou-Watson Bayou Sub-basin*

| Management Strategy | Issue Areas Addressed | Objectives | Description |
|---|---|---|---|
| Stormwater Retrofits | • Water Quality<br>• Aquatic and Wetland Habitats<br>• Flooding and Coastal Resilience | Improved water quality<br>Improved flood protection and resilience<br>Sustained aquatic and wetland ecosystems | Retrofit stormwater systems to incorporate BMPs to improve flood protection and downstream water quality.<br>Identify specific BMPs effective for treating bacteria, suspended solids, and nutrients. |
| Septic Tank Abatement | • Water Quality<br>• Aquatic and Wetland Habitats | Improved water quality<br>Sustained aquatic and wetland ecosystems | Connect structures served by OSTDS to central sewer systems. Alternatively, modern nutrient reducing septic systems can be installed. Either approach would require funding to incentivize connections or conversions. |
| Sanitary Sewer System Improvements | • Water Quality<br>• Aquatic and Wetland Habitats | Improved water quality<br>Sustained aquatic and wetland ecosystems | Design, permitting, and construction of retrofits to existing sanitary sewer systems to reduce inflow and infiltration of stormwater. |

| Management Strategy | Issue Areas Addressed | Objectives | Description |
|---|---|---|---|
| Green Infrastructure | • Water Quality<br>• Aquatic and Wetland Habitats<br>• Flooding and Coastal Resilience | Improved water quality<br>Improved flood protection and resilience<br>Sustained aquatic and wetland ecosystems<br>Improved public access | Apply "nature-based," green infrastructure methods for multipurpose projects.<br>Projects frequently involve integrating stormwater BMPs, buffer zones, greenways, and living shorelines into public parks and transportation systems. |
| Reuse of Reclaimed Water | • Water Quality<br>• Water Supply Sustainability | Improved coastal water quality<br>Enhanced sustainability of water resources | Construct reclaimed water treatment, storage, transmission, and distribution systems to reduce potable water demand and to reduce wastewater discharges. |
| Monitoring and Assessment | • Water quality<br>• Aquatic and Wetland Habitats<br>• Flooding and Coastal Resilience | Improved understanding of current conditions and trends | Intensive water quality monitoring over the course of one-two years will provide a reliable assessment of current conditions and trends.<br>Periodic updates to assessments and maps of seagrasses and oysters will identify trends and risks for water quality, habitat quality, and coastal resilience. |
| Ecosystem(s) Restoration | • Aquatic and Wetland Habitats | Sustained aquatic and wetland ecosystems | Oyster ecosystem restoration<br>Living shorelines restoration<br>Seagrass restoration<br>Wetland restoration |

Preliminary project recommendations known at the time of this writing are listed in Table 5. Projects listed, details, and cost estimates will be updated in cooperation with local governments and other cooperators within the planning area.

*Table 5. Proposed Projects and Funding Needs Identified in the Mill Bayou-Watson Bayou Sub-basin*

| Project Name | Lead and Project Partners | Water Resource Benefits | Description | Estimated Total Cost | Funding Need |
|---|---|---|---|---|---|
| Lynn Haven Sports Park Reuse Booster Plant | City of Lynn Haven | • Increase reclaimed water storage to 2.5 million gallons<br>• Reduce non-beneficial surface water discharge<br>• Support public irrigation use | The proposal for this project will increase the city's reclaimed water storage to 2.5 million gallons. Currently the city has to have someone hired on staff to relocate the water to select areas of the city for certain allotted amounts of time. This increase in storage will allow the city to store reclaimed water for the public's irrigation use. During the winter months the city has to discharge certain amounts of reclaimed water into our bay system due to not having enough storage to hold the unused water. During the summer months the city is not able to store enough water for the city to freely use the water for irrigation purposes. This project will consist of two sites in the same place. These proposed plans withhold the addition of a 1.5-million-gallon storage tank along with the redesign of site one's pipe manifold. | $12,636,550 | $6,101,550 |
| Mill Bayou Reuse Booster Plant | City of Lynn Haven | • Add 1 million gallons of reclaimed water storage<br>• Reduce surface water discharge into St. Andrews Bay | The Mill Bayou Reuse Booster Plant will add an additional 1 million gallons of reclaimed water storage to the Mill Bayou Neighborhood. With the additional 1 million gallons of storage capacity the city will be able to store water throughout all times of the year and can reduce the surface water discharge into St. Andrews Bay. The state of Florida introduced a new statute 403.064(17) that states that all non-beneficial surface water discharge is to be eliminated by January 1st, 2032. With the implementation of this additional storage facility the city will be making the correct steps to prepare for the complete elimination of surface water discharge into St. Andrews Bay. | $1,000,000 | $1,000,000 |

| Project Name | Lead and Project Partners | Water Resource Benefits | Description | Estimated Total Cost | Funding Need |
|---|---|---|---|---|---|
| Lynn Haven Wastewater Feasibility Rate Study | City of Lynn Haven | • Eliminate vulnerable wastewater plant (due to sea level rise, hurricanes, flooding)<br>• Convey sewer to regional treatment plant | Perform a study that would determine the feasibility of eliminating the City of Lynn Haven's AWTF Permit # FL0169978 on the bay and construct a master sewer pump station that would convey the city's sewer to Bay County's North Bay Plant for treatment. This would eliminate a wastewater plant that is vulnerable to sea level rise, hurricanes, and flooding due to storm surge. | $8,000,000 | $4,000,000 |
| Bay County Water Treatment Plant Planning and Design | Bay County | • Enhance resilience with redundant water supply<br>• Support population growth and sustainability | Having a second water treatment plant in Bay County will enhance resilience by ensuring a reliable and redundant water supply system. With the existing plant reaching its capacity, this additional facility will reduce the risk of widespread disruptions by providing an alternative source of treated water if the primary plant is compromised. The additional plant will also help support population growth and will foster long-term sustainability for residents and businesses. | $9,000,000 | $5,000,000 |
| Bay County West Bay Wastewater Capacity Enhancement Planning and Design | Bay County | • Increase capacity for population growth<br>• Prevent septic tank use near Outstanding Florida Waters (OFW) | The funds provided will offset the cost of design, engineering, and programming. The goal is to plan out the most cost efficient way to ensure Bay County has the capacity to withstand continued population growth and provides an environmental value because the sewer plant will prevent septic tanks from being used especially so close to West Bay and its tributaries, which is an Outstanding Florida Waters (OFW). | $3,000,000 | $3,000,000 |

| Project Name | Lead and Project Partners | Water Resource Benefits | Description | Estimated Total Cost | Funding Need |
|---|---|---|---|---|---|
| Panama City Pretty Bayou Water & Wastewater Improvements - Phase III | City of Panama City | • Eliminate leaking septic tanks<br>• Improve groundwater quality in coastal area | The neighborhood of Pretty Bayou currently has aged utilities that include well and septic tanks that have the possibility of infiltrating the groundwater system and nearby state water bodies. This neighborhood is a coastal area that has direct access to St. Andrews Bay. With the elimination of the leaking septic tanks and new water main, we believe this project will greatly benefit the residents of this neighborhood as well as support the states' initiative to improve groundwater quality. | $7,000,000 | $3,750,000 |
| Lynn Haven Bayou Preserve Living Shoreline | City of Lynn Haven | | Living shoreline project. | TBD | TBD |
| Carl Gray Park | City of Panama City | | Living shoreline project. | TBD | TBD |
| Lynn Haven Refuse Pond Living Shoreline | City of Lynn Haven | | Living Shoreline to protect Lynn Haven WWTP Refuse Pond. | TBD | TBD |
| Beach Drive Living Shoreline | City of Panama City | | Living Shoreline Project along Beach Drive. | TBD | TBD |
| McKitchen's Bayou | City of Lynn Haven | • Protect seagrass and wetland/marsh areas• Provide filtration for major drainage basin | Removal of sediment that has closed McKitchen's Bayou to the Bay will result in seagrass loss. This removal combined with the living shoreline will protect the seagrass and wetland/marsh area and provide filtration for one of the major drainage basins in Robinson Bayou. | $1,500,000 | $1,500,000 |
| Springfield Floodplain Restoration | City of Springfield | | Floodplain restoration. | $8,000,000 | $7,474,000 |

| Project Name | Lead and Project Partners | Water Resource Benefits | Description | Estimated Total Cost | Funding Need |
|---|---|---|---|---|---|
| Cincinnati and Lake Streets Stormwater Wetland | City of Panama City | | Wetland enhancement project that will create a stormwater wetland in an area that has repetitive flooding issues. The City has been working through Voluntary Home Buyout programs and has designed the project. It would need construction. | TBD | TBD |
| Sweet Bay Stormwater Wetland Park | City of Panama City | | Stormwater wetland park to include restoring wetlands and channel and possibly provide habitat for listed Panama City crayfish and benefiting Posten Bayou that is listed as impaired by DEP for nutrients and bacteria. | TBD | TBD |
| 17th Street Stormwater Wetland Park | City of Lynn Haven | | Stormwater wetland park to include restoring wetlands that drain into Beatty Bayou that is listed as impaired for nutrients. | TBD | TBD |
| Issac Byrd Park Living Shoreline | Bay County/SASJBEP | | A greenspace park right on the Bay experiencing erosion since Michael that has potential for stormwater detention, rain garden landscaping. | TBD | TBD |
| St. Andrew and St. Joseph Bays Estuary Program | SASJBEP | • Support project identification, implementation, and management | Support for Estuary Program operations to continue project identification, implementation, and management meeting watershed partnership objectives and future project planning. | $500,000 | $470,000 |
| Truesdell Park Stormwater Facility | City of Panama City | • Provide stormwater treatment and water quality improvements | Project will create a dry retention stormwater facility at a public area that will allow for stormwater treatment and water quality improvements for a parking lot at a city owned park property. | TBD | TBD |
| 11th street Stormwater Retention and Park | City of Springfield | | Construction of 20-acre wetland and stormwater park with nature trail. | TBD | TBD |
| Panama City Crayfish protection | Bay County | | Numerous parcels have been identified to acquire and restore for Panama City Crayfish. | TBD | TBD |
| **Total** | | | | **$50,636,550** | **$32,295,550** |

# VI. Monitoring, Metrics, and Next Steps

Setting clear resource protection and restoration goals with associated metrics and monitoring to evaluate progress are essential for achieving the stated objectives. Metrics will be developed cooperatively with local governments and other cooperators to track completion and quantify the benefits of funded projects and monitor trends in environmental indicators. This sub-basin work plan will be updated periodically using adaptive management principles to ensure continued effectiveness.

Examples of metrics for the Mill Bayou – Watson Bayou sub-basin may include:

- Sub-basin-level:
  - Water quality data and trends
  - Aquatic habitat area and trends:
    - Seagrass beds
    - Oyster harvest areas
    - Salt marshes
- Project level:
  - Project status (percent complete)
  - Quantifiable project benefits achieved (e.g., acres of habitat enhanced)
  - Project targets/objectives met
- Funding and expenditures:
  - Percent of current budget allocated
  - Percent of budget remaining
  - Total estimated project funding cost
  - Total estimated remaining project funding needs

Maintaining a publicly-accessible website for the program will facilitate effective monitoring of work plan implementation, project status and metrics, funding needs, and water quality and habitat trends. Additionally, the website will enhance public awareness regarding water resources within the Mill Bayou-Watson Bayou sub-basin. The website will include information regarding:

- Project status
- Funding and expenditures
- Water quality trends

During 2026, the District, local governments, and state and regional agencies will work collaboratively to refine and prioritize critical water resource issues, as well as the strategies and projects to address the identified issues within the Mill Bayou- Watson Bay sub-basin. This work plan is anticipated to be finalized by the summer of 2026. As program funding is obtained, the District and project partners will implement the prioritized projects approved by the District's Governing Board.

Work plans will be updated periodically to reflect progress achieved, new information, or additional proposed projects and remaining funding needs. A program website will be created to track project progress, metrics, and expenditures and to share information regarding trends in water quality and aquatic habitat and water supply improvements achieved by program implementation.

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# Appendix A. Sub-basin Prioritization Process

**Overview of Prioritization Process**

The District's 114 HUC-10 sub-basins were analyzed for water quality, water supply, and natural areas criteria using multiple different GIS layers. From this initial analysis, the top-ranked basins from each watershed were selected based on a natural break in scores within each watershed. In total, 34 HUC-10 candidate basins were selected from the seven watersheds. The District then hosted public workshops for each watershed to discuss the candidate sub-basins with the public. Online surveys were also created to expand the opportunity for public input on the sub-basins. The District also reviewed planned projects within the 34 candidate sub-basins based on available information from local governments and utilities. The public feedback from the workshops, online surveys, and project information were then scored and added to each sub-basin's GIS analysis scores to create the final overall scores. The top-ranked candidate sub-basin per watershed was then recommended for the development of a sub-basin workplan. The recommended priority sub-basins were presented to and approved by the District Governing Board on December 10, 2025. Additional details regarding the prioritization process are provided below.

**Public Input**

During October 2025, the District hosted public workshops for each of the seven watersheds to share information about the program and obtain input regarding the prioritization of sub-basins for work plan development. In addition to the public meetings, the District solicited public input regarding the selection of priority sub-basins within each watershed including water resource areas of concern via online surveys. This public input was a major component in the prioritization process. Scoring was based on survey priority rank responses where basins receiving the highest priority votes for their watershed were awarded the highest points.

**Consideration of Proposed Projects**

The availability of proposed projects within sub-basins was also considered in the prioritization process. The District requested and reviewed information on current and future projects related to water quality improvement, habitat restoration, and water supply from the public, local governments, and utility companies. Scoring was based on project status where basins including shovel-ready projects received the highest points.

**Water Quality Criteria**

**GIS Layers Assessed:** FDEP Statewide Basin Management Action Plan (BMAP) General Areas, FDEP Waters Not Attaining Standards (WNAS), FDEP Alternative Restoration Plans, FDEP Total Maximum Daily Load (TMDL), EPA Established Total Maximum Daily Load (TMDL), NWFWMD Drinking Water Facilities, NWFWD Locally Provided Water Infrastructure, NWFWMD Treatment and Pump Stations, FDEM Storm Surge Zones Tiled, FEMA Flood Special Hazard Area

**Analysis Process:**

GIS layers depicting the features BMAP area, WNAS, Alternative Restoration Plans, FL TMDL, EPA TMDL, and Storm Surge Zones were overlayed on the District HUC-10 layer and inspected to verify what basins contain each target feature. All basins containing the targeted feature were then awarded points for that parameter.

The FEMA Flood Special Hazard layer was queried to isolate areas susceptible to a 1% chance of annual flooding. The new layer was then spatially isolated to the District HUC-10 basin layer. The sub-basins

were then evaluated for total acreage and percent of the sub-basin represented by floodplain and scored using a four-quartile system.

The NWFWMD Drinking Water Facilities, Locally Provided Water Infrastructure, and Treatment and Pump Stations (critical assets) were spatially isolated to the FEMA Flood Special Hazard layer then spatially joined to the District HUC 10 layer. The count of each identified critical asset in the FEMA Flood Special Hazard Layer was then summed per sub-basin and scored using a using a four-quartile system.
Scores for all water quality fields were then summed to create the sub-basins overall water quality score.

**Water Supply Criteria**

**GIS Layers Assessed:** NWFWMD Planning Region 2, NWFWMD Water Resource Caution Areas, NWFWMD Areas of Resource Concern, FGS Potentiometric Surface Map, Census Bureau 2010 and 2020 Census Block Points

**Analysis Process:**

GIS layers depicting the features NWFWMD Planning Region 2, Water Resource Caution Areas, Areas of Resource Concern, and FGS Potentiometric Surface Map were overlayed on the District HUC-10 layer and inspected to verify what basins contain the target feature. The FGS Potentiometric Surface Map was analyzed by identifying all sub-basins intersecting and located south of the zero-contour line. All basins containing the targeted feature were then awarded points for that parameter.

The 2010 and 2020 Census Block points were both joined to the District HUC-10 layer and exported to excel. The difference in population and the percent change from 2010 to 2020 was then calculated and sorted from largest to smallest. Each sub-basin was then scored individually for both parameters where 1 equals the smallest amount of population or percent of population change. The two scores were then averaged together and re-scored using a 1-to-10-point scale where 1 represents the lowest 10% of the averaged population score. Additionally, an estimated future population change was also conducted by analyzing BEBR data. The 2020 Census Block Points were joined with the District counties layer and exported. All exported points were then sorted by county and summed. The percent of the county population was calculated for each point's unique ID number. The determined percentage was then multiplied by the estimated 2045 BEBR County Population Estimate to give each point its estimated 2045 estimated population. Using the points' unique ID number, each point was matched to its sub-basin using the previous join to the District HUC-10 layer. The populations for each sub-basin were then summed. The future estimated population was then assessed using the same process as the one described above for the other population analyses. The sum of both scores was then averaged.
Scores for all water supply fields were then summed to create the sub-basins overall water supply score.

**Natural Areas Criteria**

**GIS Layers Assessed:** NWFWMD 2010 Land Use, NWFWMD 2022 Land Use

**Analysis Process:**

All 6000 level Florida Land Cover Classification System (FLUCCS) codes were isolated for the 2010 and 2022 layers. Both revised layers were then isolated to the District HUC-10 basins. The natural areas exported were then summed by sub-basin. The total acreage difference and percent acreage change was then calculated for each sub-basin and scored on a 1 to point 10 scale where 1 represents the least amount of natural area change. The two scores for each sub-basin were then added together.

Table A.1 GIS Layers Assessed Reference Table

| Layer Name | Year Data Updated | Location |
|---|---|---|
| FDEP Statewide Basin Management Action Plan (BMAP) General Areas | 2025 | Statewide Basin Management Action Plan (BMAP) General Areas \| Florida Department of Environmental Protection Geospatial Open Data |
| FDEP Waters Not Attaining Standards (WNAS) | 2025 | Waters Not Attaining Standards (WNAS) \| Florida Department of Environmental Protection Geospatial Open Data |
| FDEP Alternative Restoration Plans | 2025 | Alternative Restoration Plans \| Florida Department of Environmental Protection Geospatial Open Data |
| FDEP Total Maximum Daily Load (TMDL) | 2025 | Florida Total Maximum Daily Load (TMDL) \| Florida Department of Environmental Protection Geospatial Open Data |
| EPA Established Total Maximum Daily Load (TMDL) | 2025 | EPA Established Total Maximum Daily Loads (TMDLs) \| Florida Department of Environmental Protection Geospatial Open Data |
| NWFWMD Drinking Water Facilities (Isolated from parent data set by District) | 2024 | Critical Infrastructure \| Florida Department of Environmental Protection Geospatial Open Data |
| NWFWD Locally Provided Water Infrastructure (Isolated from parent data set by District)) | 2024 | Critical Infrastructure \| Florida Department of Environmental Protection Geospatial Open Data |
| NWFWMD Treatment and Pump Stations (Isolated from parent data set by District) | 2024 | Critical Infrastructure \| Florida Department of Environmental Protection Geospatial Open Data |
| FDEM Storm Surge Zones Tiled | 2022 | Storm Surge Zones \| Florida State Emergency Response Team |
| FEMA Flood Special Hazard Area | 2024 | FEMA Flood Zones \| Florida Department of Environmental Protection - MapDirect |
| NWFWMD Planning Regions | 2023 | Water Supply Planning Regions \| NWFWMD - Open Data |
| NWFWMD Water Resource Caution Areas | 2023 | Water Resource Caution Area \| NWFWMD - Open Data |

| | | |
|---|---|---|
| NWFWMD Areas of Resource Concern | 2023 | Resource Concern Area \| NWFWMD - Open Data |
| FGS Potentiometric Surface Map (Isolated from parent data set by District) | 2025 | Upper Floridan Aquifer Potentiometric Surface \| Florida Department of Environmental Protection Geospatial Open Data |
| US Census Bureau 2010 Block Points | 2025 | USA Census BlockGroup Points - Overview |
| US Census Bureau 2022 Block Points | 2025 | USA Census Block Points - Overview |
| NWFWMD 2010 Land Use | 2024 | District Land Use 2010 \| NWFWMD - Open Data |
| NWFWMD 2022 Land Use | 2024 | NWFWMD 2022 Land Use \| Florida Department of Environmental Protection Geospatial Open Data |