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Technical Memorandum

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subject SWIM Plan Update Synthesis Document and GEBF Funding Request

This document provides a synthesis of the recently updated consolidated Surface Water Improvement and Management (SWIM) Plans (Suwannee River and Coastal Rivers) including a summary the findings, conclusions, and recommended projects, programs, and management activities. Updates of these SWIM Plans, and the development of new plans, by the Suwannee River Water Management District (District) essentially ceased due to funding limitations. However, with the passage and implementation of the RESTORE Act in 2012, as well as other legal settlements and resulting funding streams associated with the “2010 Deepwater Horizon” oil spill, there is now an unprecedented opportunity to identify, prioritize and implement restoration projects in Gulf of Mexico coastal watersheds. Taking advantage of this opportunity, the District was awarded a grant from the National Fish & Wildlife Foundation’s (NFWF) Gulf Environmental Benefit Fund (GEBF), through the Florida Fish and Wildlife Conservation Commission (FWC) and the Florida Department of Environmental Protection (FDEP), to update and consolidate the prior six SWIM Plans into two SWIM Plans, as summarized in the table below.

Prior SWIM Plans	Updated/Consolidated SWIM Plans
Suwannee River	Suwannee River Basin
Santa Fe River	
Alligator Lake	
Aucilla River	Coastal Rivers Basin
Coastal Rivers	
Waccasassa River	

The SWIM Plans update the previous SWIM Plans for these water bodies with current status and trends information related to land use, water quantity, water quality, and natural systems. Another important goal of this update is to identify restoration and management priorities and related projects for potential integration into Florida’s GEBF Restoration Strategy based on GEBF funding priorities and parameters.

The primary purpose of this document is to serve as the basis for identifying projects that could be submitted to NFWF for funding consideration under the Florida GEBF. The document will also serve as a coastal master plan for the District that identifies and describes projects, programs, and management activities eligible for funding under the GEBF, as well as a range of other RESTORE Act related funding streams, including:

- RESTORE Act Direct Component (Pot 1) funds;
- RESTORE Act Council Selected Component (Pot 2) funds;
- RESTORE Act Spill Impact Component (Pot 3) funds; and
- Deepwater Horizon Natural Resource Damage (NRD) funds.

With the TransOcean and BP settlements, there is an unprecedented opportunity for the District to collaboratively plan coastal projects and initiatives focused on environmental and economic restoration of the Gulf Coast, and to cooperatively leverage the funding of those projects and initiatives. While the GEBF is a significant funding source, the synthesis document will consider the broader opportunity of leveraging all applicable funding sources to fund priority SWIM Plan projects. A summary of the findings, conclusions, and recommended projects, programs, and management activities are provided below for the Suwannee River and Coastal Rivers Basins.

Suwannee River Basin

The Suwannee River Basin SWIM Plan update includes the following water bodies and their respective watersheds within the State of Florida: Suwannee River, Alapaha River, Withlacoochee River, Santa Fe River, and Ichetucknee River.

Land Use

Managed forests (silviculture) and other forested uplands constitute 46 percent of the Basin, while wetlands (both forested and herbaceous) encompass 17 percent of the Basin. Combined, these two land use classes constitute 64 percent of the Basin area. The more intense agricultural land uses of row crops and rangeland comprise 14 and 10 percent of the Basin, respectively. Urban land development has increased slightly, mostly as growth around existing urbanized areas, but still only constitutes 10 percent of the Basin land area. The greatest amount of urbanization has occurred east of the Suwannee River, in the Santa Fe watershed, due to its proximity to Gainesville and several other incorporated areas.

Due to the rural characteristics of the Suwannee River Basin, habitat fragmentation is relatively minimal compared to other areas in Florida. In addition, the rivers and streams in the Basin remain free flowing (e.g., virtually unimpounded or dammed). However, the expansion of more intense agricultural and urban land uses will likely put greater pressure on water resources and natural systems in the future. Therefore, conservation and management of existing natural systems, including the maintenance of minimum flows and minimum levels (MFLs), and water quality, offer the best means by which to prevent further habitat loss, fragmentation, and/or water resource degradation in the Basin.

Water Quantity

In portions of the Suwannee River Basin the use of traditional, fresh groundwater sources is at or above its sustainable limit. The Lower Santa Fe and Ichetucknee Rivers and associated priority springs are in recovery with estimated flow deficits relative to the MFLs. Recent analyses identified small magnitude changes in long-term

trends for flows or water levels at some locations in the Basin. Declining groundwater levels in portions of the District (including the watersheds addressed in this SWIM Plan) have been designated as Water Supply Planning Regions/Water Resource Caution Areas. Primary threats to the hydrology of the systems with the Suwannee River Basin include jurisdictional boundaries and groundwater withdrawals.

Public supply, agriculture, commercial and industrial entities and other users, both within and outside District boundaries, create multiple demands on the water resources of the District. A majority (57 percent) of the drainage area of the Suwannee River Basin occurs in Georgia, limiting management options that may be directly controlled by the District. Additionally, the area of constrained fresh groundwater availability adjoins the St. Johns River Water Management District (SJRWMD). In this case, joint water supply planning has been initiated and conducted collaboratively with the Florida Department of Environmental Protection (FDEP), the District, and the SJRWMD as part of the North Florida Regional Water Supply Planning (NFRWSP). However, substantial increases in future agricultural water demand in the Suwannee River Basin have been projected (District 2010).

To address these potential threats, the District has identified various management actions and projects/initiatives with the ultimate goal to protect or restore the hydrologic regimes, in terms of frequency, magnitude, duration, and seasonality, in the Suwannee River Basin, ensuring the protection of critical Water Resource Values therein. Specific goals include actions to increase aquifer recharge and decrease excessive runoff and evapotranspiration. Potential projects to meet these goals include agricultural best management practices (BMPs), hydrologic restoration of over-drained lands, water reuse, and water conservation. Because water is an integrated and interconnected resource, many of these management actions, projects or initiatives involve partnerships with other agencies and stakeholders, both within and outside of the District.

Water Quality

A previous comprehensive water quality assessment conducted by Upchurch (2007), and data analyses conducted as part of this SWIM Plan update, have shown that nitrate (NO_3^-) concentrations exhibit increasing trends at several river and spring discharge stations in the western Suwannee River and Santa Fe River watersheds since the late 1980s. Data for more recent years suggest that most locations still have variable, but non-trending concentrations of NO_3^- over time. Many, but not all, of the river and stream sites previously determined to have decreasing NO_3^- concentrations are in the eastern portion of the District, where the Floridan Aquifer is confined, and where stream-aquifer interactions are mostly restricted to the surficial aquifer (Upchurch et al. 2007). Increasing trends in phosphorus concentrations have generally not been observed in the Suwannee River Basin.

The impacts of nutrient enrichment in springs and rivers are manifested through increased abundance of filamentous algae in increased biological oxygen demand, and thus adverse impacts to those natural systems that are dependent on good water quality. In addition to impacts in the springs and rivers themselves, the downstream waters of the Gulf of Mexico that are most strongly influenced by Suwannee River discharges are thought to be nitrogen-limited. Increased nitrogen loads to the Suwannee River estuary have been a topic of concern raised by FDEP in a recent report on trends in seagrass coverage in the Big Bend region. Consequently, actions taken to reduce NO_3^- loads to the springs and rivers of the Suwannee and Santa Fe Rivers are likely to benefit not only the springs and rivers, but also those portions of the nearshore waters of the Gulf of Mexico influenced by their flows.

In the Basin Management Action Plan (BMAP) for the Santa Fe River, FDEP concluded that 48 percent of the NO_3^- load to the Santa Fe River comes from fertilizer applications, with 15, 12, and two percent coming from beef production, dairies, and poultry operations, respectively. However, NO_3^- loads from human sewage were estimated to represent less than 10 percent of the TN load to the Santa Fe River. As such, wastewater upgrades could be locally important in terms of NO_3^- in the Santa Fe River, but anthropogenic sources do not appear to rise to the same level of concern as loads from agricultural practices. These general findings on the relative magnitudes of various nutrient sources are expected to apply to the Suwannee River as well. Therefore, increased compliance with existing agricultural BMPs, and the development of new BMPs, are critical to holding the line on water quality in the Suwannee River Basin.

To address these issues, the District has identified various management actions and projects/initiatives with the ultimate goal to protect or restore the water quality of the Suwannee River Basin. The majority of concerns have focused on the issues of nitrogen enrichment and pathogen abundance. Specific goals include the continuation of efforts to monitor water quality, with regular updates of the status and trends (if any) in water quality across the Basin.

Natural Systems

The natural systems of the Suwannee River Basin comprise valuable ecological, aesthetic, recreational, cultural, and economic resources. Primary threats to natural systems include:

- Land use changes (and corresponding habitat loss and fragmentation);
- Declines in water quality and quantity;
- Introduction of non-native and invasive species; and
- Climate change.

For example, conversion from upland silviculture to higher intensity row crops or animal operations results in loss of forested habitat and connectivity among habitats important to numerous species. Other examples include: disturbance and loss of native submerged aquatic vegetation (SAV) in springs due to excessive recreational use and/or algae proliferation due to increased nutrient concentrations; loss of fish habitat due to reduced flows and exposure of formerly inundated floodplains; loss of marsh habitat due to lowered groundwater levels as a result of water withdrawals; disturbance of habitat by invasive species such as wild hogs and subsequent invasion of nonnative and invasive plant species; and loss of salt marsh habitat due to sea level rise and inundation. Climate change and sea level rise in particular are expected to impact Florida's fish and wildlife across all terrestrial, freshwater, and marine habitats; and combined with other stressors, reduce the long term viability of species and associated ecosystems.

Due to the rural characteristics of the Suwannee River Basin, habitat fragmentation is relatively minimal compared to other areas in Florida. In addition, the rivers and streams in the Basin remain free flowing (e.g., not impounded or dammed). However, the expansion of more intense agricultural and urban land uses will likely put greater pressure on water resources and natural systems in the future. Therefore, conservation and management of existing natural systems, including the maintenance of minimum flows and levels, and water quality, offer the best means by which to prevent further habitat loss, fragmentation, and/or water resource degradation in the Basin.

Equally important is proper management and maintenance of habitats that historically were fire maintained, such as sand pine scrub, sandhills, prairies, and wetlands. Prescribed fire is used to reduce shrub layer vegetation, initiate seeding in some species, and improve and maintain habitats for deer, quail, turkey and many other wildlife species. Some of Florida's rare, fire-adapted plants and animals that inhabit fire maintained communities include the red-cockaded woodpecker, Sherman's fox squirrel, gopher tortoise, eastern indigo snake, and Florida scrub jay.

Finally, continued monitoring, data collection, and research to track native habitats and species and improve our understanding of how they may be impacted by land use changes, water quantity and quality, non-native and invasive species, and climate change, are important to managing natural systems in the Suwannee River Basin.

Coastal Rivers Basin

The Coastal Rivers Basin SWIM Plan update includes the following water bodies and their respective watersheds within the State of Florida: Aucilla River, Wacissa River, Econfinia River, Fenholloway River, Steinhatchee River, and Waccasassa River.

Land Use

Managed forests (silviculture) and other forested uplands constitute 43 percent of the Basin, while wetlands (both forested and herbaceous) encompass 44 percent of the Basin. Combined, these two land use classes constitute 87 percent of the Basin area. Urban land development has increased slightly, mostly as growth around existing urbanized areas, but still only constitutes a little over three percent of the Basin land area. Due to the extensive coverage of forested uplands and wetlands in the Coastal Rivers Basin, habitat fragmentation is relatively minimal compared to other areas in Florida. In addition, the rivers and streams in the Basin remain almost entirely free flowing, with few impoundments or dams. Therefore, conservation and management of existing natural systems, including the maintenance of flows and water quality, offer the best means to prevent further habitat loss, fragmentation, and/or degradation in the Basin.

Water Quantity

Water resources in the Coastal Rivers Basin are generally healthy. There are extensive conservation lands, and the Basin remains mostly rural in nature, with relatively little urban development or intense agriculture. In addition, the rivers and streams in the Basin remain almost entirely free flowing, with few impoundments or dams. Despite the current status, recent analyses identified small magnitude changes in trends for flows or water levels at some locations in the Basin. Primary threats to the hydrology of the systems within the Coastal Rivers Basin include excessive surface-water withdrawals or diversions, groundwater withdrawals, and modifications of natural drainage patterns.

Public supply, agriculture, commercial and industrial entities, and other users, both within and outside District boundaries, create multiple demands on the water resources of the District. The Coastal Rivers Basin is mostly underlain by an unconfined or poorly confined Upper Floridan aquifer. This lack of a distinct confining layer gives rise to the numerous artesian springs in the region and allows for more rapid recharge of groundwater from infiltration; however, the lack of a continuous confining layer also makes the aquifers in this region highly vulnerable to water quality and quantity impacts from activities conducted on the land surface. There have been extensive modifications made to the natural drainage patterns of these watersheds over the years; large areas of

the headwater wetlands have been ditched and drained for timber production, resulting in higher peak flows and quicker response following major rainfall and storm events.

To address these potential threats, the District has identified various management actions and projects/initiatives with the ultimate goal of protecting or restoring natural hydrologic regimes wherever feasible, thus ensuring the protection of critical Water Resource Values therein. Specific goals include actions to increase aquifer recharge and decrease excessive runoff and evapotranspiration. Potential projects to meet these goals include agricultural best management practices (BMPs), hydrologic restoration of over-drained lands, water reuse and water conservation. Because water is an integrated and interconnected resource, many of these management actions, projects or initiatives involve partnerships with other agencies and stakeholders, both within and outside of the District.

Water Quality

Water quality within the Coastal Rivers Basin varies spatially. The Coastal Rivers Basin includes systems that have been used as “reference” locations for regulatory programs, as well as the Fenholloway River, a river with a significant industrial discharge component. The Fenholloway River is undergoing a series of complex and expensive modifications to existing industrial discharges that should allow it to, over the next 5 to 10 years, meet the water quality standards appropriate for its designated use. The extensive conservation lands and the fairly low-impact land use of silviculture are such that most of the rivers themselves are considered healthy, as are the nearshore waters of the Gulf of Mexico into which they discharge (with the exception of the coastal waters near the mouth of the Fenholloway River).

The mostly rural nature of the Coastal Rivers Basin has resulted in the widespread use of septic tank systems as a means of waste disposal. In low enough densities, with adequate separation between the bottom of the drainfield and the wet season water table, septic tank systems can be an entirely appropriate technique for disposing of domestic wastewater. However, various locations have developed over time such that densities and higher water tables might be problematic. Septic tank replacement programs are extremely expensive, but they can also be the most required management action in some locations. Documentation of impacts to pathogen and nutrient loads from septic tank systems should be a near-term focus, to determine those places where conversion to central sewerage would be appropriate. The identification of locations with excessive amounts of pathogens is complicated by the recently shift from the use of fecal coliform bacteria to a combination of fecal coliform bacteria, *Enterococci* bacteria and *E. coli* bacteria.

To address these issues, the District has identified various management actions and projects/initiatives with the ultimate goal to protect or restore the water quality of the Coastal Rivers Basin. Concerns vary, but the majority of concerns have focused on the issues of nutrient (especially nitrogen) enrichment and pathogen abundance. Specific goals include the continuation of efforts to monitor water quality, with regular updates of the status and trends (if any) in water quality across the Basin. In addition, efforts to identify the source(s) of nitrogen to the Wacissa River are called for, as well as the identification of “hot spots” for impacts from septic tank systems. Planned and ongoing efforts to reduce impacts from agricultural land uses are required as well. For the Fenholloway River, stakeholders in the watershed need to continue to implement the projects that have been determined to be required to allow the river to meet Class III freshwater standards.

Natural Systems

The natural systems of the Coastal Rivers Basin comprise valuable ecological, aesthetic, recreational, cultural, and economic resources. Primary threats to natural systems include:

- Land use changes (and corresponding habitat loss and fragmentation);
- Declines in water quality and quantity;
- Introduction of non-native and invasive species; and
- Climate change.

For example, conversion from upland silviculture to higher intensity row crops results in loss of forested habitat and connectivity among habitats important to numerous species. Due to the extensive coverage of forested uplands and wetlands in the Coastal Rivers Basin, habitat fragmentation is relatively minimal compared to other areas in Florida; however, fragmentation is increasing and has become an issue for larger megafauna (e.g., black bear).

Other examples include: disturbance and loss of native SAV in springs due to excessive recreational use and/or algae proliferation due to increased nutrient concentrations; loss of fish habitat due to reduced flows and exposure of formerly inundated floodplains; loss of marsh habitat due to lowered groundwater levels as a result of water withdrawals; disturbance of habitat by invasive species such as wild hogs and subsequent invasion of nonnative and invasive plant species; and loss of salt marsh habitat due to sea level rise and inundation. Climate change and sea level rise in particular are expected to impact Florida's fish and wildlife across all terrestrial, freshwater, and marine habitats; and combined with other stressors, reduce the long term viability of species and associated ecosystems.

Equally important is proper management and maintenance of habitats that historically were fire maintained, such as sand pine scrub, sandhills, prairies, and wetlands. Prescribed fire is used to reduce shrub layer vegetation, initiate seeding in some species, and improve and maintain habitats for deer, quail, turkey and many other wildlife species. Some of Florida's rare, fire-adapted plants and animals that inhabit fire maintained communities include the red-cockaded woodpecker, Sherman's fox squirrel, gopher tortoise, eastern indigo snake, and Florida scrub-jay.

Finally, continued monitoring, data collection, and research to track native habitats and species and improve our understanding of how they may be impacted by land use changes, water quantity and quality, non-native and invasive species, and climate change, are important to managing natural systems in the Coastal Rivers Basin.

Primary Issues and Priority Projects

While the rivers and coastal waters along Florida's Big Bend coastline are often viewed as being in a close to pristine condition, the analysis of status and trends presented herein indicate that there are natural resource management issues that need to be address. The primary issues potentially affecting the surface waters and ecology of the Suwannee River Basin and Coastal Rivers Basin, both now and in the future, include:

- Increase in silviculture and more intense agricultural and urban land uses;

- Alterations to natural hydrology;
- Decreasing river and spring flows in some locations;
- Increasing nitrogen concentrations in river and springs flows in some locations;
- Habitat fragmentation due to land development and road construction;
- Loss of natural oyster bars; and
- Climate change and sea level rise.

The SWIM Plans includes proposed management actions and projects addressing various aspects of the key focus areas of water quantity, water quality, and natural systems, as summarized below.

Water Quantity

- Monitoring, Data Collection, and Research
- Water Supply Planning
- MFLs
- Water Resource Development and Aquifer Recharge
- Conservation

Water Quality

- Monitoring, Data Collection, and Research
- Implementation of Total Maximum Daily Loads (TMDLs) and Basin Management Action Plans (BMAPs)
- Wastewater and Stormwater Infrastructure

Natural Systems

- Habitat Conservation
- Habitat Restoration
- Recreation Management

A total of 74 projects are proposed to address the improvement and management of the Suwannee River and Coastal Rivers Basins. A list of the identified priority projects anticipated to produce benefits that extend beyond jurisdictional boundaries are provided in the table below. These projects have been entered into the FDEP Deepwater Horizon project portal.

**FDEP Portal
Project# Project Title**

1747	Quantifying Groundwater Recharge and Discharge to Improve Tools for Protecting Water Supplies and Natural Systems
123	Lower Aucilla River Hydrographic Survey

FDEP Portal Project#	Project Title
1755	Use of Lidar Bathymetry for Identification of Submerged Freshwater Springs Offshore Jefferson and Taylor County
539	Santa Fe River Basin Aquifer Recharge/Flood Mitigation Project
1031	Upper Suwannee River Watershed Hydrologic Restoration Assessment (USFS - 10)
1743	Hydrologic Restoration on the Lower Suwannee National Wildlife Refuge - Dixie County
1689	Hydrologic Restoration on the Lower Suwannee National Wildlife Refuge - Levy County
1030	Sandlin Bay Restoration (USFS - 9)
1443	Determining an Economic Model for Payments Based on Managing Forests for Increased Regional Water Availability
1745	Deep Coastal Wells for Freshwater-Saltwater Interface Monitoring
540	Santa Fe River Basin Management Action Plan Implementation
1688	Sustainable Suwannee Pilot Program
1605	Suwannee River and Bay Agricultural Water Quality and Conservation Initiative
1653	Suwannee River Watershed Water Quality - Nutrient Reduction Project
156	Cost Share Program for Implementing Best Management Practices for Agriculture
998	Goethe State Forest/2013 Road Restoration Project
1800	Wastewater Septic to Sewer Conversions in the Big Bend
1749	Airborne Lidar Bathymetry for Oyster Reefs
1776	Oyster Restoration and Management to Increase Coastal Resiliency
1797	Culture of bay scallops (<i>Argopecten irradians</i>) for research and population restoration
1533	Lyme Gilchrist Forest
1534	Lyme Gilman Forest
1532	Lyme Lafayette Forest
1515	Wacissa/ Aucilla Rivers Sinks Acquisition
1669	Suwannee River Basin Land Acquisition

FDEP Portal Project#	Project Title
1666	Aucilla Corridor Land Acquisition
1274	Freeman Tract Acquisition
1686	Waccasassa River Basin Land Acquisition
1685	Coastal Rivers/Dixie County Land Acquisition
823	Cedar Key-Waccasassa Bay Acquisition and Restoration Project
1802	Deer Island Acquisition in Lower Suwannee Sound
1518	Lower Suwannee River and Gulf Watershed Conservation Easement
996	Florida Forest Service Gulf Coastal Watershed Reforestation Plan for Florida State Forests
1061	Big Bend Oyster Reef Restoration Project(s)
1275	
1801	
1586	Seagrasses Aquatic Preserve Seagrass Restoration – Phase I
1750	Radar Rainfall
1429	Big Bend Wildlife Management Area Recreation Improvements
1446	Enhancement of Oyster Shell Rakes in Cedar Key, FL to Benefit Wintering and Breeding American Oystercatchers
1809	Integration of Livestock and Agronomic/Vegetable Cropping Systems
1810	Agricultural Water Security and UFA Sustainability: An Integrated Assessment of Economic and Environmental Benefits
1811	Impacts of Crop Diversification and New Crop Rotations and Production Systems on Water Quality
1812	Brooks Sink Phase II
1813	Upper Suwannee River Recharge Project
1814	Lake Sampson Drainage Wells
1815	Prairie Creek Diversion Structure Replacement and Recharge Enhancement
1816	San Pedro Bay and Mallory Swamp Hydrologic Restoration

FDEP Portal Project#	Project Title
1817	Drainage Well Replacement/Rehabilitation
1818	Middle Suwannee River and Springs Restoration and Aquifer Recharge Project
1819	Double Run Creek Water Resource Development Area
1820	Inter-District Water Resource Development Project
1821	City of Perry Wastewater Equalization Storage Tank
1822	Suwannee Valley “Water Schools”
1823	Estuarine Water Quality Assessment Project
1824	Santa Fe River and Springs Environmental Analysis
1825	Developing and Adopting Integrated Pest Management Strategies to Minimize Pesticide Impacts on Water Resources
1826	Advanced Agricultural Technologies for Farmers
1827	Management and Utilization of Animal Manure Resources in Cropping Systems
1828	Economics of BMPs, Alternative Crops, and Farming Systems
1829	Impact of Transitioning to Organic Agriculture on Water Resources
1830	Continued Improvement and Implementation of Agricultural Best Management Practices
1831	Pilgrim’s Pride Wastewater Reuse Feasibility Assessment
1832	Gulf Hammock Acquisition
1833	Caber Coastal Connector Acquisition
1834	St. Joe Timberland Acquisition
1835	Florida Park Service Big Shoals State Park
1836	Florida Park Service Devils Millhopper Geological State Park
1837	Florida Park Service Fanning Springs State Park- SAV mapping
1838	Florida Park Service Ichetucknee Springs State Park- Dampier's Landing Bath house
1839	Florida Park Service Manatee Springs
1840	Florida Park Service O'Leno Springs

FDEP Portal Project#	Project Title
1841	Florida Park Service Stephen Foster Folk Cultural Center State Park
1842	Florida Park Service Troy Spring State Park
1843	Florida Park Service Wes Skiles Peacock Springs State Park
1844	Spring Creek Spring Head Restoration (Folsum Creek Spring)