



# FLORIDA DEPARTMENT OF Environmental Protection

Marjory Stoneman Douglas Building  
3900 Commonwealth Boulevard  
Tallahassee, FL 32399

**Ron DeSantis**  
Governor

**Jeanette Nuñez**  
Lt. Governor

**Alexis A. Lambert**  
Secretary

January 3, 2025

The Honorable Ron DeSantis  
Governor of Florida  
Plaza Level 01, The Capitol  
400 South Monroe Street  
Tallahassee, Florida 32399

The Honorable Ben Albritton  
President, Florida Senate  
Room 409, The Capitol  
404 South Monroe Street  
Tallahassee, Florida 32399-1100

The Honorable Daniel Perez  
Speaker, Florida House of Representatives  
Room 420, The Capitol  
402 South Monroe Street  
Tallahassee, Florida 32399-1300

Dear Governor DeSantis, President Albritton and Speaker Perez:

The enclosed report, *2024 Five-Year Review of the Lake Okeechobee Basin Management Action Plan*, prepared in fulfillment of paragraph 373.4595(3)(b), Florida Statutes (F.S.), details the status of reducing phosphorus pollution in the Lake Okeechobee Watershed (LOW). The review was coordinated by the Florida Department of Environmental Protection (department) with participation from the Lake Okeechobee watershed stakeholders.

I am pleased to report that, with your unprecedented support and the commitment of local stakeholders to the LOW, significant progress has been made. An estimated 42% of the necessary phosphorus reductions have been achieved with implemented projects and strategies. The Lake Okeechobee Basin Management Action Plan (BMAP) was first adopted in December 2014 to implement water quality restoration goals (known as total maximum daily loads, or TMDLs) for total phosphorus in the watershed. The BMAP was updated and adopted in January 2020, following Executive Order 19-12, and refined the BMAP boundary to include the three basins South of the lake, revised allocations and estimated reductions based on model updates, as well as implemented a targeted restoration area evaluation that assists stakeholders in prioritizing resources for restoration projects. The BMAP is designed to be implemented in a phased approach to

Jan. 3, 2025

Page 2 of 2

allow for adaptive management. At the end of each 5-year phase, a formal review is completed. This second 5-Year Review provides updates on implementation status and recommendations for the future BMAP phases.

Each 5-Year Review establishes an implementation schedule and evaluates progress toward the next 5-year milestone. The milestones are established in 5-year increments with the goal of achieving the TMDL in 20 years, as outlined in paragraph 373.4595(3)(d), F.S. The 5-Year Review also provides recommendations regarding the need for continued restoration efforts, including actions and projects identified by local governments in their wastewater facility treatment plans and onsite sewage treatment and disposal system remediation plans, as well as regional projects that are an important component in achieving the TMDL. As appropriate, revisions will be made to the BMAP that will be adopted by Secretarial Order.

The restoration of Lake Okeechobee is vital to the environment, economy and communities of south Florida. The department looks forward to continued collaboration and partnership with our committed stakeholders to achieve additional water quality improvements in the region. If you have questions regarding the report, please feel free to contact me or Adam Blalock, Deputy Secretary for Ecosystem Restoration, at (850) 245-2031.

Sincerely,



Adam Blalock  
Deputy Secretary for Ecosystems Restoration

Enclosures

cc: Drew Bartlett, Executive Director, South Florida Water Management District  
West Gregory, Director, Office of Agricultural Water Policy, Florida Department  
of Agriculture and Consumer Services  
Brett Tubbs, Director, Office of Legislative Affairs, DEP



**2024 Five-Year Review of the Lake Okeechobee Basin  
Management Action Plan  
Fiscal Year 2024-2025**

**Division of Environmental Assessment and Restoration  
Water Quality Restoration Program  
Florida Department of Environmental Protection  
December 2024**

## Acknowledgments

The *Lake Okeechobee Basin Management Action Plan*, originally adopted in December 2014 and updated in January 2020, was prepared as part of a statewide watershed management approach to restore and protect Florida's water quality. This *2024 Five-Year Review of the Lake Okeechobee Basin Management Action Plan* was prepared by the Florida Department of Environmental Protection pursuant to section 373.4595(4)(b), Florida Statutes, with participation from the Lake Okeechobee stakeholders identified below.

Type of Governmental or Private Entity	Participant
<b>Counties</b>	Glades Hendry Highlands Martin Okeechobee Orange Osceola Palm Beach Polk
<b>Municipalities</b>	City of Avon Park City of Clewiston City of Edgewood City of Kissimmee City of Moore Haven City of Okeechobee City of Orlando City of Sebring Town of Lake Placid Town of Windermere
<b>Special Districts and Other Interested Parties</b>	Avon Park Air Force Range Central Florida Tourism Oversight District Istokpoga Marsh Watershed Improvement District Okeechobee Utility Authority Spring Lake Improvement District Valencia Water Control District
<b>Agencies</b>	Florida Department of Agriculture and Consumer Services Florida Department of Environmental Protection South Florida Water Management District Florida Department of Transportation District 1 Florida Department of Transportation District 4 Florida Department of Transportation District 5 Florida Department of Transportation Turnpike Enterprise



# 2024 Five-Year Review of the Lake Okeechobee Basin Management Action Plan

## TABLE OF CONTENTS

List of Acronyms and Abbreviations.	6
Executive Summary.	7
Chapter 1: Background Information.	9
Chapter 2: Assessing Progress.	14
Chapter 3: Recommendations.	40
References.	44
Appendices.	46

## **List of Figures**

---

Figure 1. Lake Okeechobee Watershed .....	11
Figure 2. Lake Okeechobee sub-watersheds.....	13
Figure 3. Current SFWMD-led projects in the Lake Okeechobee Watershed .....	27
Figure 4. Results of Seasonal Kendall test for TP by basin in northern LOW .....	35
Figure 5. Results of Seasonal Kendall test for TP by basin in the southern LOW.....	36
Figure 6. TP TRA results .....	38
Figure 7. TN TRA results .....	39
Figure 8. Estimated progress towards the Lake Okeechobee BMAP TP milestones .....	42

## **List of Tables**

---

Table 1. Designated use attainment categories for Florida surface waters.....	9
Table 2. Projects to achieve the TMDL .....	14
Table 3. Reductions towards the TMDL.....	15
Table 4. Current SFWMD-led projects in the Lake Okeechobee Watershed.....	21
Table 5. Results of the Seasonal Kendall test for TP by basin .....	32
Table A-1. POR for Stations TP concentration data series.....	49
Table B-1. TRA Results.....	56

## List of Acronyms and Abbreviations

---

ASR	Aquifer Storage and Recovery
CERP	Comprehensive Everglades Restoration Plan
BMAP	Basin Management Action Plan
BMP	Best Management Practice
DACS	Florida Department of Agriculture and Consumer Services
DEP	Florida Department of Environmental Protection
DOT	Florida Department of Transportation
EIS	Environmental Impact Statement
F.S.	Florida Statutes
FSAID10	Florida Statewide Agricultural Irrigation Demand (Version 10)
HSPF	Hydrological Simulation Program-FORTRAN
IMWID	Istokpoga Marsh Watershed Improvement District
lbs/yr	Pounds Per Year
LOCAR	Lake Okeechobee Component A Storage Reservoir
LOW	Lake Okeechobee Watershed
LOWCP	Lake Okeechobee Watershed Construction Project
LOWPP	Lake Okeechobee Watershed Protection Plan
LOWRP	Lake Okeechobee Watershed Restoration Project
MS4	Municipal Separate Storm Sewer System
mt/yr	Metric Tons Per Year
NEEPP	Northern Everglades and Estuaries Protection Program
O&M	Operations and Maintenance
OSTDS	Onsite Sewage Treatment and Disposal Systems
POR	Period of Record
SFER	South Florida Environmental Report
SFWMD	South Florida Water Management District
STA	Stormwater Treatment Area
STAR	Statewide Annual Report
TMDL	Total Maximum Daily Load
TN	Total Nitrogen
TP	Total Phosphorus
TRA	Targeted Restoration Area
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey
WAM	Watershed Assessment Model
WBID	Waterbody Identification (Number)
WIN	Watershed Information Network
WWTF	Wastewater Treatment Facility
WY	Water Year



## Executive Summary

---

### **Background**

The Lake Okeechobee Watershed (LOW) is located in south Florida in Glades, Hendry, Highlands, Martin, Okeechobee, Orange, Osceola, Palm Beach and Polk counties. Lake Okeechobee is a driver of water quality and quantity in south Florida, and the watershed is an economically important area.

Lake Okeechobee and its associated watershed have been subjected to hydrologic, land use, and other anthropogenic modifications over the past century that have degraded its water quality. To help address the nutrient impairment, the Florida Department of Environmental Protection (DEP) adopted a total maximum daily load (TMDL) for total phosphorus (TP) in the LOW as a target for restoration of the lake. The Lake Okeechobee Basin Management Action Plan (BMAP) represents the joint efforts of multiple stakeholders to identify where TP, as well as total nitrogen (TN), can be reduced through regulatory and non-regulatory programs, incentive-based programs and implementation of projects that will ultimately achieve the TMDL for the lake.

### **Summary of Load Reductions**

DEP asked the stakeholders to provide information on management actions, including projects, programs and activities, that would reduce nutrient loads from the LOW. Management actions were required by the original BMAP (2014) and 2020 update to address nutrient loads to the lake and had to meet several criteria to be considered eligible for nutrient reduction credit. Through December 31, 2023, 292 projects were completed, and an additional 60 underway or planned projects were added to the BMAP. Based on the load estimation tool developed from the Watershed Assessment Model (WAM), the completed activities in the LOW are estimated to achieve total reductions of 243,895 pounds per year (lbs/yr) of TP, which is 42 percent of the reductions needed to meet the TMDL.

### **Recommendations for Future Implementation**

The BMAP implements phased TP reductions, according to subparagraph 403.067(7)(a)1., Florida Statutes (F.S.), for the portion of loading generated in the LOW. The purpose of this 2024 Five-Year Review is to evaluate implementation activities that have taken place during the second 5-year phase and make recommendations for future implementation activities that may be incorporated into a revised BMAP.

The first and second BMAP phases included significant restoration efforts by stakeholders, and the implementation will continue to help achieve the TMDL. This 2024 Five-Year Review recommends including additional water quality analyses to continue to better target the placement of restoration projects, including regional projects that will be an important component in achieving the TMDL. Small modifications to the water quality monitoring network are also recommended to fill in gaps and enable complete analyses. Finally, the next BMAP update will include actions and projects from the wastewater facility plans and onsite sewage

treatment and disposal system (OSTDS) remediation plans prepared by local governments. The update will be completed no later than July 1, 2025, in accordance with the Clean Waterways Act, Chapter 2020-150, Laws of Florida. In addition, an effort will be initiated in late 2025 to develop a new model of the LOW to support identification of future project needs.

## Chapter 1: Background Information

### 1.1. Water Quality Standards and Total Maximum Daily Loads (TMDLs)

Florida's water quality standards are designed to ensure that surface waters fully support their designated uses, such as drinking water, aquatic life, recreation and agriculture. Lake Okeechobee is designated as a Class I water, with uses including public water supply, fish consumption, recreation and propagation and maintenance of a healthy, well-balanced population of fish and wildlife. Most surface waters in Florida, including those in the Lake Okeechobee Watershed (LOW), which ultimately reach Lake Okeechobee, are categorized as Class III waters. **Table 1** lists all designated use classifications for Florida surface waters.

**Table 1. Designated use attainment categories for Florida surface waters**

<sup>1</sup> Class I, I-Treated, and II waters additionally include all Class III uses.

\* Class I-Treated waters designation has not yet been approved by the U.S. Environmental Protection Agency.

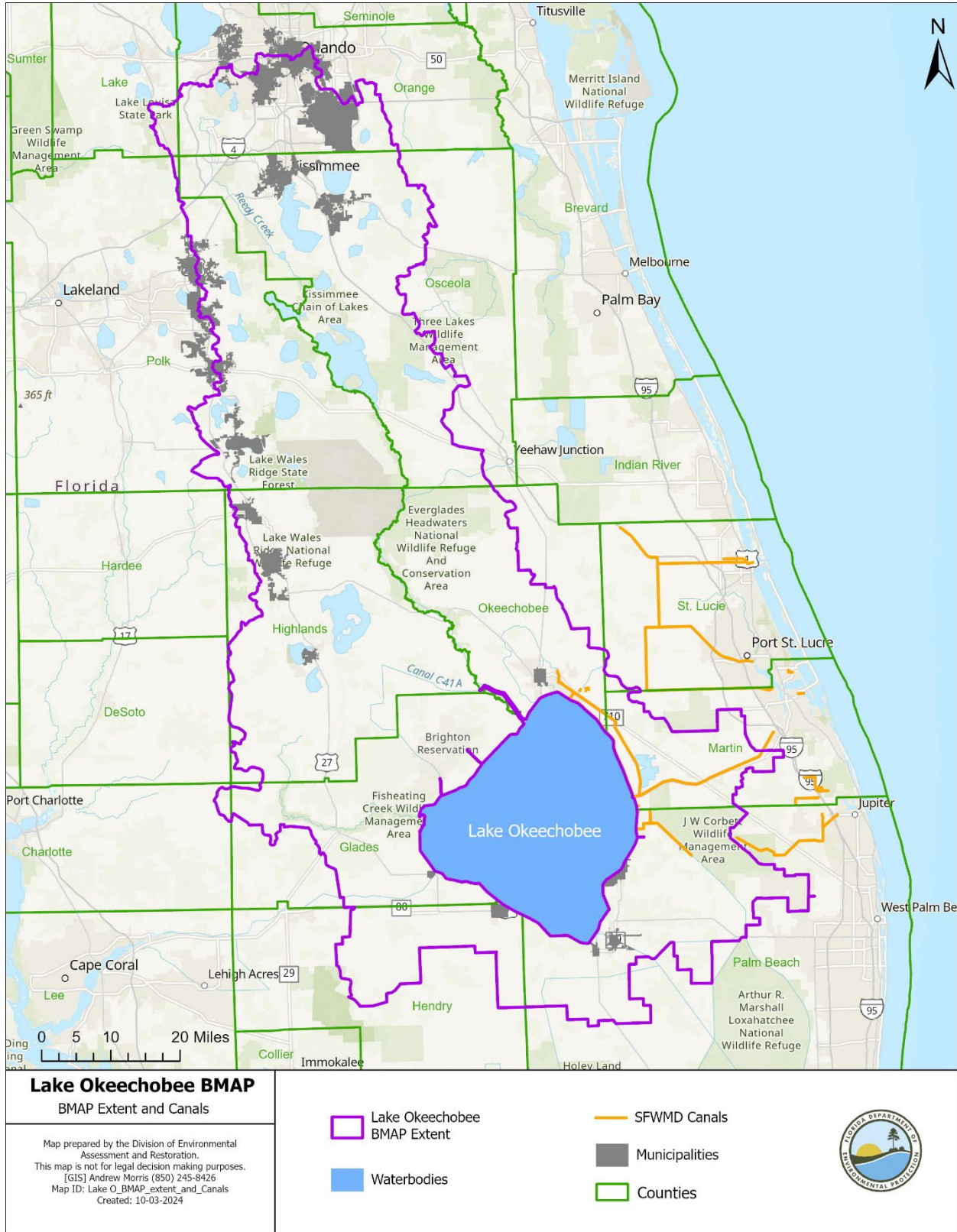
Classification	Description
Class I <sup>1</sup>	Potable water supplies
Class I-Treated <sup>1*</sup>	Treated potable water supplies
Class II <sup>1</sup>	Shellfish propagation or harvesting
Class III	<b>Fish consumption; recreation, propagation and maintenance of a healthy, well-balanced population of fish and wildlife</b>
Class III-Limited	Fish consumption, recreation or limited recreation, and/or propagation and maintenance of a limited population of fish and wildlife
Class IV	Agricultural water supplies
Class V	Navigation, utility, and industrial use ( <i>no current Class V designations</i> )

Section 303(d) of the federal Clean Water Act requires that each state identify its impaired waters every two years, including estuaries, lakes, rivers and streams, that do not meet their designated uses. The Florida Department of Environmental Protection (DEP), Division of Environmental Assessment and Restoration is responsible for assessing Florida's waters for inclusion on the Verified List of Impaired Waters (when a causative pollutant for the impairment has been identified) and Study List (when a causative pollutant for the impairment has not been identified and additional study is needed). These lists are then provided to the U.S. Environmental Protection Agency as an update to the state's 303(d) list. In 1998, DEP identified Lake Okeechobee as impaired for total phosphorus (TP).

#### 1.1.1. Lake Okeechobee TMDL

DEP develops and adopts TMDLs for waterbody segments it identifies as impaired. A TMDL is the maximum amount of a specific pollutant that a waterbody can assimilate while maintaining its designated uses. In August 2001, DEP adopted the Lake Okeechobee TMDL for TP. The TMDL includes nine segments with waterbody identification (WBID) numbers 3212A, 3212B, 3212C, 3212D, 3212E, 3212F, 3212G, 3212H and 3212I.

The TMDL is an annual TP load to Lake Okeechobee of 140 metric tons per year (mt/yr), of which 35 mt/yr are estimated to fall directly on the lake through atmospheric deposition. The remaining 105 mt/yr of TP are allocated to the entire LOW, which consists of nine sub-watersheds. TMDL attainment will be calculated on a 5-year rolling average using the monthly loads calculated from measured flow and concentration values. **Figure 1** shows the LOW.



**Figure 1. Lake Okeechobee Watershed**

## **1.2. Lake Okeechobee Basin Management Action Plan (BMAP)**

DEP implements TMDLs through permits and BMAPs or other restoration efforts. BMAPs include strategies to reduce and prevent pollutant discharges through various cost-effective means. During the watershed restoration process, DEP and the affected stakeholders jointly develop BMAPs or other implementation approaches, such as nutrient reduction plans. Stakeholder involvement is critical to the success of the watershed restoration program and varies with each phase of implementation to achieve different purposes. The BMAP development process is structured to achieve cooperation and consensus among a broad range of interested parties, including the South Florida Water Management District (SFWMD), Florida Department of Agriculture and Consumer Services (DACS), and stakeholders representing other agencies, governments and interested parties.

The Florida Watershed Restoration Act, section 403.067, Florida Statutes (F.S.) establishes an adaptive management process for BMAPs that continues until the TMDLs are met. This approach allows for incrementally reducing loadings through the implementation of projects and programs, while simultaneously monitoring and conducting studies to better understand water quality dynamics (sources and response variables) in each impaired waterbody. The original Lake Okeechobee BMAP was adopted in December 2014, and the first Five-Year Review was completed in January 2020. Section 373.4595, F.S., calls for a review of the BMAP to be completed and submitted to the Legislature and Governor every five years.

In January 2019, Executive Order 19-12, section 1, C, required updates to all restoration plans, within one year, for waterbodies impacting south Florida communities, including the Lake Okeechobee BMAP. The 2020 BMAP update fulfilled those requirements and implemented many recommendations from the first Five-Year Review. The BMAP update revised sub-watershed allocations and estimated nutrient reductions based on model updates, incorporated both the targeted restoration area (TRA) evaluation and basinwide sources approach, and set limitations on nutrient discharges from wastewater treatment facilities (WWTFs), among other policy decisions. The BMAP boundary and the basins within the BMAP are shown in **Figure 2**.

### **1.2.1. BMAP Pollutant Reduction and Discharge Allocations**

In the 2020 Lake Okeechobee BMAP update, detailed allocations were not assigned to the stakeholders but rather to each sub-watershed. During BMAP development, DEP requested that the stakeholders provide information on activities and projects that would reduce nutrient loading. The outputs from the Watershed Assessment Model (WAM) were used to develop a load estimation tool for the calculation of existing loads and nutrient reduction benefits associated with stakeholder projects.

There are various sources of pollution in the LOW. Nonpoint (i.e., diffuse) sources in the watershed contribute to the majority of TP and total nitrogen (TN) loads, which include agricultural and urban stormwater runoff. The BMAP included an assessment of basinwide

sources that also considers nutrient input from onsite sewage treatment and disposal systems (OSTDS) and WWTFs.

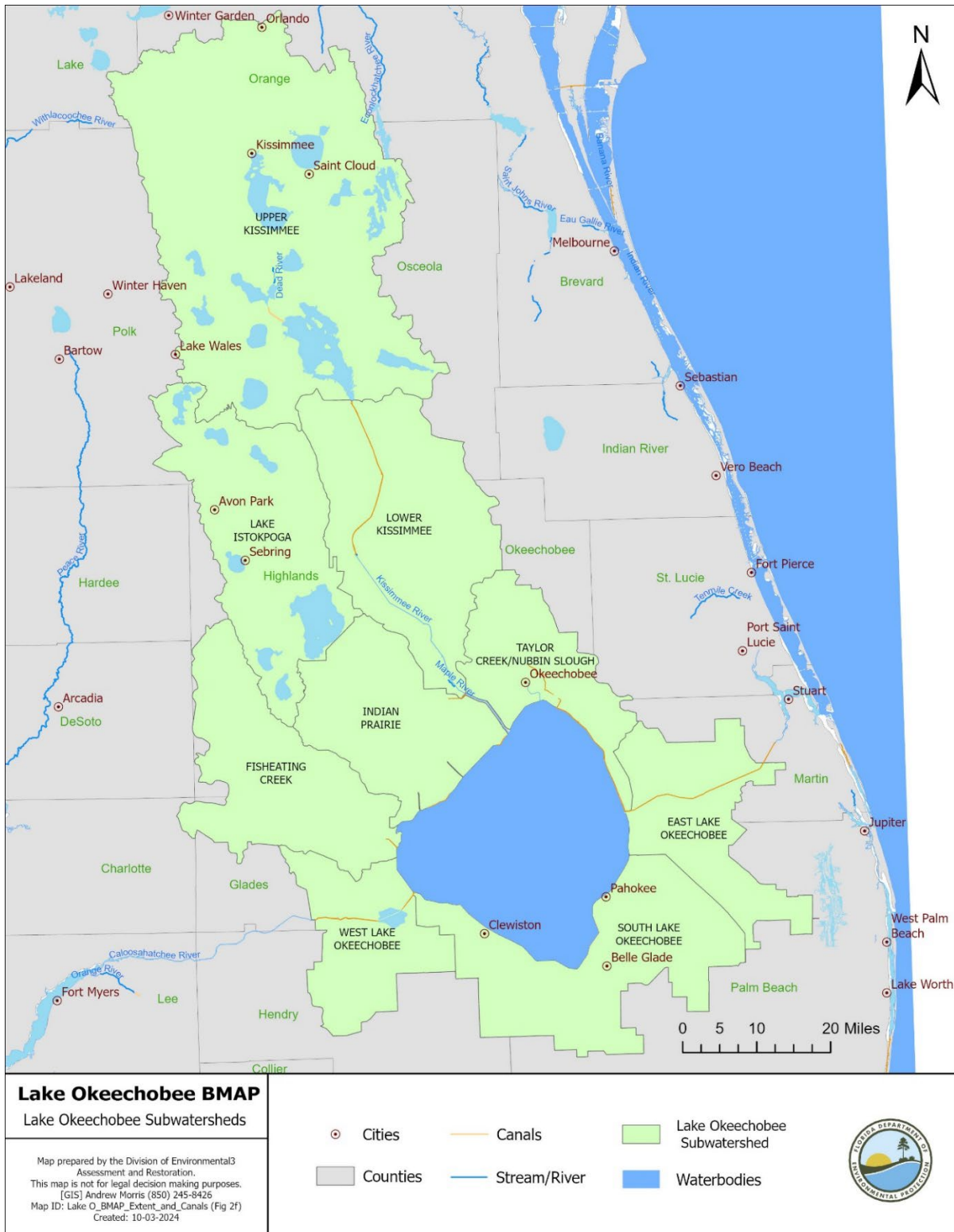


Figure 2. Lake Okeechobee sub-watersheds

## Chapter 2: Assessing Progress

### 2.1. Projects to Achieve the TMDLs

As required by section 403.0675, F.S., DEP annually reviews each entity's progress towards completing projects listed in the BMAP to achieve the TMDL. Detailed project information can be found in the Statewide Annual Report (STAR), published online (DEP 2024).

#### 2.1.1. Nutrient Removal Projects

**Table 2** outlines the number of projects that each entity has committed to in the BMAP process, along with the status of those projects as of Dec. 31, 2023.

**Table 2. Projects to achieve the TMDL**

Entity	Completed	Ongoing	Planned	Underway	Total
Avon Park Air Force Range	1	0	0	0	1
City of Avon Park	2	1	0	0	3
City of Clewiston	2	3	0	0	5
City of Edgewood	0	3	0	0	3
City of Kissimmee	5	2	2	0	9
City of Moore Haven	1	0	1	0	2
City of Okeechobee	3	3	0	2	8
City of Orlando	7	10	1	1	19
City of Sebring	1	1	0	0	2
Central Florida Tourism Oversight District	0	3	0	0	3
Coordinating Agency	12	0	12	3	27
DACS/Agriculture	7	18	0	0	25
Florida Department of Transportation (DOT) District 1	2	6	1	1	10
DOT District 4	1	5	0	0	6
DOT District 5	35	2	0	0	37
DOT Turnpike Enterprise	0	1	0	0	1
Glades County	3	2	0	3	8
Hendry County	0	0	3	1	4
Highlands County	3	4	0	0	7
Istokpoga Marsh Watershed Improvement District (IMWID)	1	0	0	1	2
Martin County	0	0	0	1	1
Okeechobee County	8	0	0	0	8
Okeechobee Utility Authority	0	0	1	2	3
Orange County	63	8	2	20	93
Osceola County	30	3	0	0	33
Polk County	1	3	0	0	4



Entity	Completed	Ongoing	Planned	Underway	Total
SFWMD	22	0	1	0	23
Spring Lake Improvement District	1	0	0	0	1
Town of Lake Placid	0	0	0	1	1
Town of Windermere	1	0	0	0	1
Valencia Water Control District	1	1	0	0	2
<b>Total</b>	<b>213</b>	<b>79</b>	<b>24</b>	<b>36</b>	<b>352</b>

**Table 3** summarizes the reductions achieved in each sub-watershed as of December 31, 2023.

**Table 3. Reductions towards the TMDL**

\* Reductions to date include TP reductions associated with projects completed as of the end of the reporting period (December 31, 2023).

Sub-watershed	TP Reduction to Date* (pounds per year [lbs/yr])
East Lake Okeechobee	5,171
Fisheating Creek	33,847
Indian Prairie	50,004
Lake Istokpoga	5,991
Lower Kissimmee	29,772
South Lake Okeechobee	6,655
Taylor Creek/Nubbin Slough	71,195
Upper Kissimmee	40,036
West Lake Okeechobee	1,245
<b>Total</b>	<b>243,866</b>
<b>Total Required Reductions</b>	<b>578,052</b>
<b>Total Reductions Achieved (%)</b>	<b>42%</b>

## 2.2. Coordinating Agency Projects and Initiatives

### 2.2.1. Interagency Agreement

The Coordinating Agencies (DEP, DACS and SFWMD) continue to work to identify restoration needs throughout the LOW. Interagency workgroups regularly meet to evaluate and discuss water quality monitoring data in localized areas to determine potential needs for management strategies or projects. The Coordinating Agencies have also committed to an annual public workshop to discuss progress and take stakeholder feedback in determining priorities and future updates.

During the first and second phases of the BMAP, restoration work in the LOW moved forward. In addition to site-specific projects, the Coordinating Agencies (DEP, DACS and SFWMD) continued work on other initiatives to achieve nutrient reductions in the LOW, such as the DACS initiative to update the best management practice (BMP) manuals with DEP review. In addition,

the process for identifying projects and participants for the cooperative agricultural regional water quality improvement elements to be incorporated into the BMAP update is underway.

### **2.2.2. Lake Okeechobee Watershed Restoration Project (LOWRP)**

In 2019–20, the Florida legislature appropriated funding for the design, engineering and construction of specific LOWRP components designed to reduce harmful discharges to the Caloosahatchee and St. Lucie River estuaries. LOWRP is being implemented in partnership between the U.S Army Corps of Engineers (USACE) and SFWMD. The current recommended plan proposes approximately 5,900 acres of wetland restoration along the Kissimmee River, including 4,700 acres in Paradise Run and 1,200 acres in Paradise River Center, and up to 55 aquifer storage and recovery (ASR) wells located in clusters across the Northern Everglades watersheds. The plan identifies the need for storage north of Lake Okeechobee as key to reducing harmful discharges to the Caloosahatchee and St. Lucie River estuaries.

The ASR Well Program has a number of uncertainties and risks that are being evaluated through a stepwise scientific approach. The first public and peer reviewed ASR Science Plan was published by SFWMD and USACE in June 2021 (SFWMD and USACE 2021). The second plan was drafted and posted for public review in October 2022 (SFWMD and USACE 2022) and will be finalized after input from the ASR peer review panel workshop held in July 2024. The next version of the Draft ASR Science Plan will be released for a 30-day public review in fall 2024. Looking ahead, the plan will be updated as the program progresses. To begin addressing the uncertainties associated with ASR in the Comprehensive Everglades Restoration Plan (CERP), SFWMD began advancing ASR exploration in the northern watersheds in 2019 with evaluations completed at several test well cluster locations. SFWMD work on the continuous core and data collection began in 2020 and will be completed in 2024. The first set of test wells at two ASR cluster locations were initiated in 2021 and were completed in summer 2023. The next set of test wells are currently being constructed at the L63N location. Test wells, pump tests, demonstration treatment facilities and cycle testing are important next steps to evaluating the scope and scale of the ASR program. Further details on regional LOWRP progress can be found in the draft [2025 SFER – Volume I, Chapter 8B](#) and at <https://www.sfwmd.gov/our-work/cerp-project-planning/lowrp>.

### **2.2.3. North of Lake Okeechobee Storage Reservoir Section 203 Study**

As a priority in Executive Order 23-06, SFWMD is directed to make every effort to advance Everglades restoration projects to ensure meaningful progress over the next four years, including all CERP storage components within the LOW. As the non-federal sponsor for CERP, SFWMD conducted the North of Lake Okeechobee Component A Storage Reservoir (LOCAR) Section 203 Feasibility Study under the federal Water Resources Development Act of 1986, as amended. SFWMD also contracted with USACE to work on its behalf to provide technical assistance and conduct federal activities to meet these requirements. Under LOCAR, USACE has the lead in coordinating the National Environmental Policy Act portion of the Feasibility Study and Environmental Impact Statement (EIS).

The Feasibility Study and EIS explored opportunities for aboveground water storage north of Lake Okeechobee, with an estimated water storage capacity of 200,000 acre-feet. The study area covers a large portion of the LOW north of Lake Okeechobee and will provide ecological benefits to the lake and the Caloosahatchee and St. Lucie River estuaries. Project scoping was completed in spring 2023, and the identification of alternatives/recommended plan was completed in summer 2023. On February 28, 2024, the final Feasibility Study and EIS was submitted to the Assistant Secretary of the Army for Civil Works for consideration by the United States Congress in the 2024 Water Resources Development Act. Further details on regional LOCAR progress can be found in the draft [2025 SFER – Volume I, Chapter 8B](#) and at <https://www.sfwmd.gov/our-work/lake-okeechobee-component-reservoir-locar>.

#### **2.2.4. Agriculture/DACS' Office of Agricultural Water Policy Activities**

All agricultural nonpoint sources in the Lake Okeechobee BMAP area are statutorily required either to implement DACS-adopted BMPs or conduct water quality monitoring prescribed by DEP or the applicable water management district. Paragraph 403.067(7)(c), F.S., provides a presumption of compliance with water quality standards for the pollutants addressed by the BMP to producers that implement DACS-adopted, DEP-verified BMPs, in accordance with DACS rules.

DACS used the Florida Statewide Agricultural Irrigation Demand (Version 10) (FSAID10) data set to identify the agricultural lands. As of December 31, 2023, 1,524,843 agricultural acres are enrolled in the BMP program, which is 83 percent of the total 1,825,200 agricultural acres within the Lake Okeechobee BMAP. The types of agriculture enrolled include citrus, cow/calf, dairy, equine, fruit/nut, nursery, poultry, row/field crop and sod. The acreages for conservation plans are counted in the enrolled acres.

Beyond enrolling producers in the BMP program, DACS is working with DEP to improve the data used to estimate agricultural lands. DACS performs an "unenrolled agricultural lands" characterization analysis, which provides an indication of areas that are more likely to have enrollable agricultural activities occurring on them. Of the remaining 300,357 acres categorized as agricultural land in FSAID10, 174,010 acres are unlikely enrollable based on an analysis of the existing land use at the parcel level, which indicates a low probability that they contain agricultural activity, or agricultural activity that is enrollable within the purview of DACS (e.g., no agricultural tax exemption, within state-owned lands and/or water restoration project boundaries). Using this adjusted agricultural acreage, 92 percent of agricultural acres within the Lake Okeechobee BMAP have been enrolled. DACS will continue to characterize the land uses with agricultural production that are consistent with DACS' BMP Program and provide this information to DEP. As appropriate, DEP will incorporate the information into the next BMAP update.

DACS continued its efforts to successfully implement the requirements of section 403.067, F.S., by enrolling new agricultural producers and performing Implementation Verification site visits to verify the proper implementation of applicable agricultural BMPs for producers enrolled in the

BMP Program. DACS is required to perform Implementation Verification site visits to enrolled operations at least every two years and to retain records related to application of phosphorus and nitrogen fertilizers (subparagraph 403.067(7)(d)3., F.S.).

DACS also works with producers to identify and implement a suite of agricultural projects and research agricultural technologies on properties where they are deemed technically feasible and where funding can be made available. The implementation of these projects requires funding as well as more detailed design based on site-specific information, such as applicable acreages and willing landowners. Since June 2019, DACS has provided \$20,197,546 in cost-share assistance to enrolled producers in the Lake Okeechobee BMAP. A total of 517 projects were completed that assist producers with nutrient and irrigation management and protecting water resources.

Further details on these updates and BMP implementation and verification can be found in the DACS report Status of Implementation of Agricultural Nonpoint Source Best Management Practices (DACS 2024), which is available on the DACS Office of Agricultural Water Policy's webpage.

#### **2.2.5. SFWMD Activities**

The Coordinating Agencies are working together to identify restoration measures for the LOW to meet the intent of the Northern Everglades and Estuaries Protection Program (NEEPP). In accordance with Paragraph 373.4595(3)(a), F.S., the Coordinating Agencies, led by SFWMD, originally developed the Lake Okeechobee Watershed Protection Plan (LOWPP) (SFWMD et al. 2007), which includes the Lake Okeechobee Research and Water Quality Monitoring Plan and the Lake Okeechobee Watershed Construction Project (LOWCP). The plan contains an integrated management strategy based on watershed and in-lake remediation activities.

The purpose of the LOWCP is to provide an overall strategy to protect and restore surface water resources by improving hydrology and water quality for the Northern Everglades ecosystem to support the BMAP in achieving the TP TMDL for Lake Okeechobee. To date, the LOWCP has evolved through two phases. As outlined in the 2007 LOWPP, Phase I was intended to bring immediate TP load reductions to the lake with a subset of specific projects. Phase II, known as the Phase II Technical Plan (SFWMD et al., 2008), identified regional construction projects and onsite measures, practices, and regulations intended to prevent or reduce pollution at the source and to increase storage north of the lake to attenuate and reduce flows to Lake Okeechobee.

In 2019, SFWMD worked closely with the Coordinating Agencies to develop the planned initiatives and projects (known as management measures) in the LOWCP and establish the recommended modifications and updates to the LOWCP. In accordance with Subparagraph 373.4595(3)(a)(1)c, F.S. in support of the 2020 BMAP Update, SFWMD provided the final LOWCP 2020 Update to DEP on March 1, 2020, which was published by SFWMD in the final LOWPP 2020 Update in the [2020 SFER – Volume I, Appendix 8A-1](#) (Betts et al. 2020). In support of this 2024 BMAP Five-Year Review, SFWMD is currently preparing the draft LOWPP 2025 Update, which will be published in the draft [2025 SFER – Volume I, Chapter 8B](#) (Welch et al. 2024) in November 2024.

Over the past five years, state-appropriated funds coupled with SFWMD resources were used to advance numerous restoration activities in the LOW during the BMAP reporting period. Local and regional projects with both water storage and water quality benefits progressed, as spotlighted below. Key highlights of SFWMD-led projects in the LOW through December 31, 2023, are summarized in **Table 4** and shown in **Figure 3**.

- In the LOW, conceptual design efforts are underway for the Grassy Island and Brady Ranch flow equalization basins (FEBs). Importantly, these two large-scale projects—2,400-acre Grassy Island adjacent to Taylor Creek Stormwater Treatment Area (STA) and 1,800-acre Brady Ranch adjacent to Lakeside Ranch STA—will provide regional storage and assist with STA operations. In March 2024, a design charette was completed for each project, with full design expected in 2026 for the Grassy Island FEB and in 2027 for the Brady Ranch FEB, each followed by approximately two years of construction.
- As a major milestone of regional restoration efforts in the LOW, construction of the Kissimmee River Restoration Project was completed in summer 2021 in partnership with USACE, physically restoring one-third of the Kissimmee River and its floodplain for the first time since it was channelized in the 1960s. Hydrologic restoration will begin to occur over the next several years as new operational criteria are adopted for the Headwater Lakes (Lakes Kissimmee, Cypress and Hatchineha), bringing more natural patterns of flow and seasonality to the physically restored portions of the river.

As a key priority, the new regulation schedule for the S-65 structure—known as the Kissimmee River Headwaters Revitalization Schedule (a component of the regional Kissimmee River Restoration Project)—is being implemented in phases over the next several years (through 2026); subsequently, the final phase of restoration (post-restoration monitoring) is then planned (2027–2031). As part of this phased approach, the first regulation schedule increase toward the Headwaters Revitalization Schedule (Headwaters Revitalization Schedule Increment 1 deviation) was approved and implemented in August 2024 by USACE in coordination with SFWMD.

- As a priority project in the LOW, construction for the El Maximo Ranch Dispersed Water Management public-private partnership project is being completed in fall 2024. This large-scale, active treatment and flow attenuation project will store water on 7,030 acres of privately-owned land. Once fully operational, the project will provide an average water storage benefit of 2,500 acre-feet per year (3.1 million cubic meters) and a water quality benefit of 2.4 metric tons per year (mt/yr) of TP retention and 7.0 mt/yr of TN retention to help reduce overall nutrient loading to Lake Okeechobee.
- In support of the LOWPP, agreements for four existing public-private partnership projects—Buck Island Ranch, XL Ranch, Dixie Ranch and Eagle Haven Ranch—were also renewed for 10 years of additional operation as part of the SFWMD’s Northern Everglades Watersheds Water Retention and Nutrient Load Reduction solicitation.
- For the Lower Kissimmee Basin Stormwater Treatment Area project, the Design Documentation Report for Basis of Design was completed in February 2023 (EIP 2023).

This project in the Taylor Creek/Nubbin Slough Subwatershed will use constructed wetlands to improve regional water quality. In summer 2024, the contract was modified to expand the project area by 1,400 acres to increase treatment capacity. Based on this modification, preliminary design has been reinitiated, with final design expected in 2026; construction is slated through 2029. Further information on this project can be found at [sfwmd.gov/LKBSTA](https://sfwmd.gov/LKBSTA).

- In collaboration with the Coordinating Agencies, the Basinger Dairy Legacy Phosphorus project kicked off in summer 2023. The project will allow access to and use of 950 acres on the 1,300-acre, recently closed dairy farm in the S-65D NEEPP Priority Basin, about 2 miles upstream of the Kissimmee River. This opportunity is intended to support the Lake Okeechobee BMAP by removing a long-standing source of legacy phosphorus in the Lower Kissimmee Subwatershed and provide an in-situ location to conduct a series of innovative treatment technology studies and nutrient remediation at the property. For the phytoremediation phase of the project, preliminary design was completed in summer 2024. As the next step, an alternatives analysis will be conducted to help inform the final design, which is planned to be completed by September 2025.

**Table 4. Current SFWMD-led projects in the Lake Okeechobee Watershed**

Project Name	BMAP Project Number	Program Type	Project Type	Project Benefits	Project Area (acres)	Description	Subwatershed	Project Status	Construction Completion Date
Taylor Creek STA	SFWMD-01	District Lands	STA	Water Quality Treatment	118	Taylor Creek STA is a two-celled STA.	Taylor Creek/Nubbin Slough	Operations and maintenance (O&M)	2009
Nubbin Slough STA	SFWMD-02	District Lands	STA	Water Quality Treatment	773	Nubbin Slough STA is the larger of the two pilot STAs constructed north of the lake; 2-celled enclosure.	Taylor Creek/Nubbin Slough	O&M	2015
Lakeside Ranch STA - Phase I	SFWMD-03	District Lands	STA	Water Quality Treatment	1,707	Phase I includes a northern STA and inflow pump station (S-650), which began operating in 2012.	Taylor Creek/Nubbin Slough	O&M	2012
Otter Slough Restoration	SFWMD-04	District Lands	Hydrologic Restoration	Water Storage and Treatment	500	Completed project included 5 ditch plugs and removal of 2 berms to help attenuate regional stormwater runoff, as well as provide nutrient reductions due to plant uptake from overland flows.	Lower Kissimmee	O&M	2009
Kissimmee River Restoration	SFWMD-05	District Lands	Hydrologic Restoration	Restoration	25,000	Restore ecological integrity by restoring 40 miles of meandering river and more than 12,000 acres of wetlands through the design and construction of physical project features coupled with application of optimized hydrologic conditions.	Lower Kissimmee	O&M	2021
Rolling Meadows - Phase I	SFWMD-06	District Lands	Wetland Restoration	Water Storage and Treatment	1,900	Restore historic Lake Hatchineha floodplain wetlands and habitat within the Rolling Meadows property, which was purchased jointly with DEP.	Upper Kissimmee	O&M	2017

Project Name	BMAP Project Number	Program Type	Project Type	Project Benefits	Project Area (acres)	Description	Subwatershed	Project Status	Construction Completion Date
Gardner-Cobb Marsh Restoration	SFWMD-07	District Lands	Hydrologic Restoration	Water Storage and Treatment	2,500	Project includes various activities (ditch plugs, berm removal, exotic veg. treatment, and culvert replacement) to help attenuate regional stormwater runoff. May provide ancillary water quality benefits due to nutrient plant uptake from overland flows in marsh.	Upper Kissimmee	O&M	2021
Rough Island	SFWMD-08	District Lands	Hydrologic Restoration	Restoration	1,000	Completed project included various activities (e.g., ditch plugs, ditch filling, exotic removal) to help attenuate regional stormwater runoff and provide incidental nutrient reductions due to plant uptake from overland flows.	Upper Kissimmee	O&M	2009
Oasis Marsh Restoration	SFWMD-09	District Lands	Wetland Restoration	Restoration	77	Completed project included filling 4 ditches, totaling 2.4 acres in size, with 3,144 cubic yards of sediments from an adjacent levee to restore floodplain function of 77 acres of wetlands and reconnect them to the littoral zone of Lake Kissimmee.	Upper Kissimmee	O&M	2010
West Waterhole	SFWMD-10	Public-Private Partnership (PPP)	Dispersed Water Management (DWM)	Water Storage and Treatment	2,370	Project pumps excess water from the C-40 Canal for phosphorus removal via uptake in wetlands and associated marshes before discharge towards Lake Okeechobee.	Indian Prairie	O&M	2009
Rafter T Ranch	SFWMD-11	Public-Private Partnership (PPP)	Dispersed Water Management (DWM)	Water Storage	2,602	A 2,602-acre project area with storage through above ground impoundment and pasture; estimated annual storage is 1,298 ac-ft.	Lake Istokpoga	O&M	2014

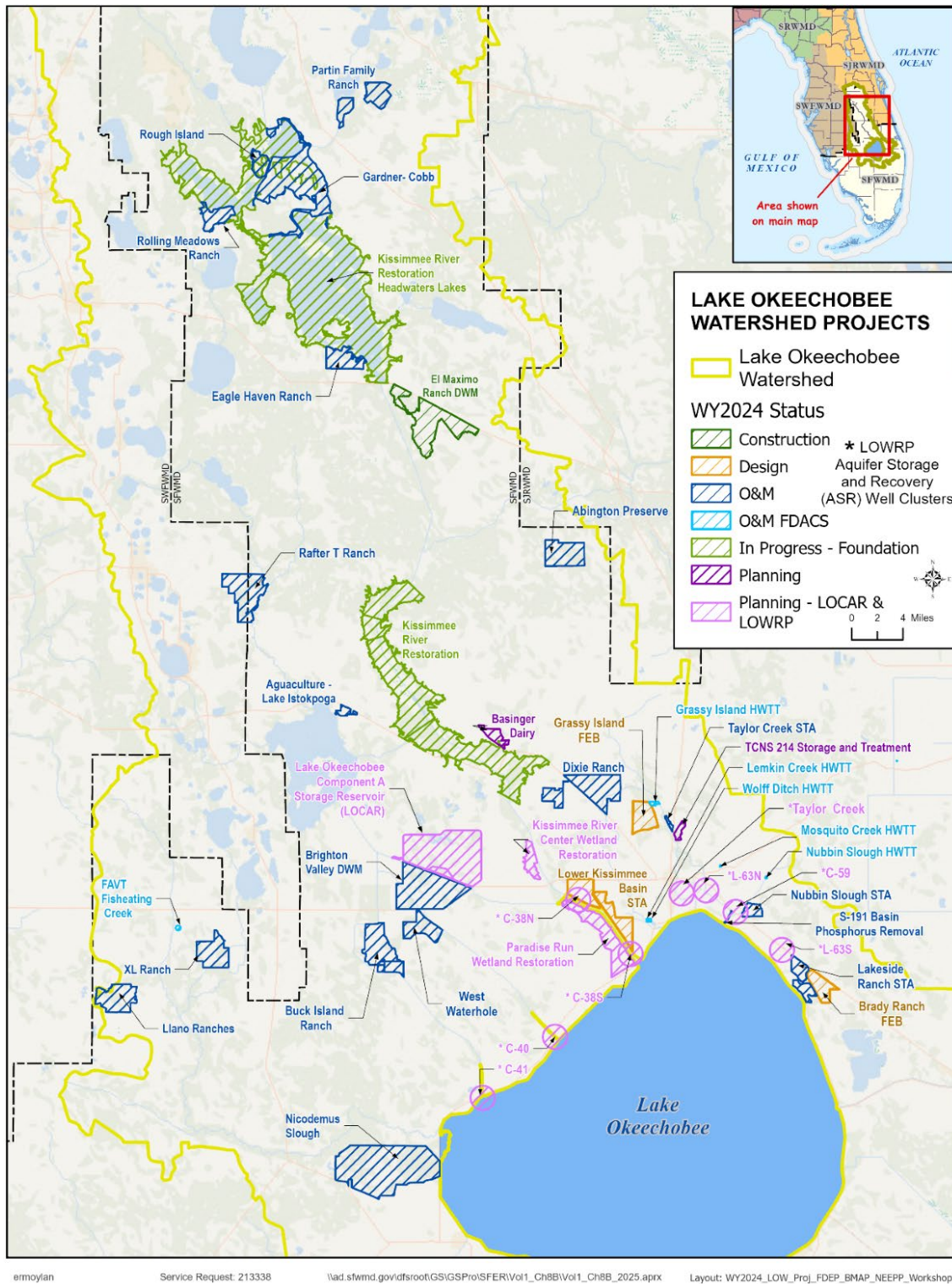


Project Name	BMAP Project Number	Program Type	Project Type	Project Benefits	Project Area (acres)	Description	Subwatershed	Project Status	Construction Completion Date
Buck Island Ranch	SFWMD-12	Public-Private Partnership (PPP)	Dispersed Water Management (DWM)	Water Storage	4,7962	Project comprises Buck Island Ranch, WMA Component 1, and WMA Component 2; estimated annual storage is 6,736 ac-ft through pasture.	Indian Prairie	O&M	2015
Dixie West	SFWMD-13	Public-Private Partnership (PPP)	Dispersed Water Management (DWM)	Water Storage	See SFWMD-14	See SFWMD-14.	Lower Kissimmee	O&M	2012
Dixie Ranch	SFWMD-14	Public-Private Partnership (PPP)	Dispersed Water Management (DWM)	Water Storage	3,063	A 3,063-acre project area through pasture comprised of Dixie West and Dixie Ranch; named Dixie Ranch under one contract. The estimated annual ac-ft of storage is 1,171 ac-ft.	Lower Kissimmee	O&M	2012
Dixie Ranch	SFWMD-15	Public-Private Partnership (PPP)	Dispersed Water Management (DWM)	Water Storage	See SFWMD-14	See SFWMD-14.	Taylor Creek/Nubbin Slough	O&M	2012
Eagle Haven Ranch (formerly Lost Oak Ranch)	SFWMD-16	Public-Private Partnership (PPP)	Dispersed Water Management (DWM)	Water Storage	730	A 730-acre project area with water storage through pasture; estimated annual storage is 374 ac-ft.	Upper Kissimmee	O&M	2013
Willaway Cattle and Sod	SFWMD-17	Public-Private Partnership (PPP)	Dispersed Water Management (DWM)	Water Storage	69	A 69-acre project through an above ground impoundment; estimated annual storage is 229 ac-ft.	Lower Kissimmee	Closed3	2009
XL Ranch	SFWMD-18	Public-Private Partnership (PPP)	Dispersed Water Management (DWM)	Water Storage	765	A 765-acre water storage area through above ground impoundment and pasture; estimated annual storage is 1,642 ac-ft.	Fisheating Creek	O&M	2012
Abington Preserve (formerly Triple A Ranch)	SFWMD-19	Public-Private Partnership (PPP)	Dispersed Water Management (DWM)	Water Storage	106	A 106-acre project area with water storage through an above ground impoundment; estimated annual storage is 397 ac-ft.	Lower Kissimmee	O&M	2015

Project Name	BMAP Project Number	Program Type	Project Type	Project Benefits	Project Area (acres)	Description	Subwatershed	Project Status	Construction Completion Date
Llano Ranches (formerly La Hamaca)	SFWMD-20	Public-Private Partnership (PPP)	Dispersed Water Management (DWM)	Water Storage	3,507	A 3,507-acre project area of water storage through pasture; estimated annual storage is 2,681 ac-ft.	Fisheating Creek	O&M	2017
Nicodemus Slough	SFWMD-21	District Lands	Dispersed Water Management (DWM)	Water Storage	15,858	Public-private partnership project that pumps water from Lake Okeechobee and provides an estimated 24,600 ac-ft of storage in above ground impoundments and pasture.	West Lake Okeechobee	O&M	2015
Kissimmee River Headwaters Revitalization	SFWMD-22	District Lands	Hydrologic Restoration	Restoration	7,200	Increase stages and change operating schedule of three headwaters lakes to provide appropriate flow patterns to the restored Kissimmee River and floodplain. This is also expected to improve the quantity and quality of littoral habitat in headwater lakes.	Multi-Basin	Underway	2027
Buck Island Ranch WMA (NE-PES-2)	SFWMD-23	Public-Private Partnership (PPP)	Dispersed Water Management (DWM)	Water Storage	See SFWMD-12	See SFWMD-12.	Indian Prairie	O&M	2015
Brighton Valley DWM	CA-01	Public-Private Partnership (PPP)	Dispersed Water Management (DWM)	Water Storage	8,142	This NE-PPP project pumps water from the C-41A Canal and treats an estimated 11,552 ac-ft of water per year via a flow-through system.	Indian Prairie	O&M	2020
Lakeside Ranch STA - Phase II	CA-04	District Lands	Stormwater Treatment Area (STA)	Water Quality Treatment	See SFWMD-03	Phase II Includes southern STA and pump station (S-191A), also known as Phase III in 2018 Ops Plan, to manage rim canal levels during high flow and potentially recirculate lake water back to STA for further TP removal.	Taylor Creek/Nubbin Slough	O&M	2021

Project Name	BMAP Project Number	Program Type	Project Type	Project Benefits	Project Area (acres)	Description	Subwatershed	Project Status	Construction Completion Date
El Maximo Ranch DWM	CA-05	Public-Private Partnership (PPP)	Dispersed Water Management (DWM)	Water Storage	7,030	This NE-PPP project will detain water from the Kissimmee River and Blanket Bay Slough before discharging to the Kissimmee River downstream of S-65.	Lower Kissimmee	Construction	2024
Rolling Meadows Wetland Restoration - Phase II	CA-13	District Lands	Wetland Restoration	Restoration	580	Land has been acquired and a conceptual plan has been recommended. Implementation of Phase II is contingent upon the success of Phase I and future legislative funding.	Upper Kissimmee	Planned	TBD
Sumica DWM	CA-16	District Lands	Dispersed Water Management (DWM)	Water Storage	N/A4	Construction of earthen weir at the inlet of a box culvert under SR 60 to increase water storage within the 700-acre Sumica Preserve.	Upper Kissimmee	O&M	2014
Brady Ranch FEB and ASR	CA-21	District Lands	Hydrologic Restoration	Water Storage and Treatment	1,800	Planned FEB and ASR to detain excess stormwater, reduce nutrient loading to Lake Okeechobee, and provide operational flexibility to the Lakeside Ranch STA.	Multi-Basin	Planned	2027
Grassy Island FEB and ASR	CA-22	District Lands	Hydrologic Restoration	Water Storage and Treatment	2,400	Planned FEB and ASR to detain excess stormwater, reduce nutrient loading to Lake Okeechobee, and provide operational flexibility to the adjacent Taylor Creek STA.	Multi-Basin	Planned	2026
Lower Kissimmee Basin STA	CA-24	Public-Private Partnership (PPP)	Stormwater Treatment Area (STA)	Water Quality Treatment	4,800	The planned STA is intended to remove phosphorus from the S-154C and S-154 Basins in the Taylor Creek/Nubbin Slough watershed, Indian Prairie C-41A Canal, and Lower Kissimmee River Basin/C-38 Canal.	Taylor Creek/Nubbin Slough	Planned	2029

Project Name	BMAP Project Number	Program Type	Project Type	Project Benefits	Project Area (acres)	Description	Subwatershed	Project Status	Construction Completion Date
Lake Okeechobee S-191 Basin Surface Runoff Phosphorus Removal Using Innovative Technologies	CA-25	District Lands	Study	Water Quality Treatment	N/A4	This project will use an innovative technology that will remove phosphorus from the C-59 Canal water column.	Taylor Creek/Nubbin Slough	O&M	2024
Aquaculture – Lake Istokpoga	CA-26	Public-Private Partnership (PPP)	Aquatic Vegetation Harvesting	Water Quality Treatment	N/A4	Project includes mechanical harvesting of unconsolidated muck from Lake Istokpoga to be applied as a nutrient and retained on privately owned land.	Lake Istokpoga	O&M	2024
Partin Family Ranch	CA-27	Public-Private Partnership (PPP)	Dispersed Water Management (DWM)	Water Storage and Treatment	3,050	As a public-private partnership, this 3,050-acre project area near Lake Gentry retains direct rainfall and stormwater runoff within two large detention areas to reduce excess discharges to Lake Okeechobee.	Upper Kissimmee	O&M	2024
TCNS 214 Storage and Treatment	CA-28	District Lands	Dispersed Water Management (DWM)	Water Storage and Treatment	410	Project will pump excess stormwater from Williamson Ditch into a shallow water storage and treatment feature before discharging to Taylor Creek.	Taylor Creek/Nubbin Slough	Planned	2026
Basinger Dairy Legacy Phosphorus Removal	CA-29	Public-Private Partnership (PPP)	Study	Water Quality Treatment	950	As a public-private partnership, this 5-year research project targets legacy phosphorus on a 950-acre former dairy farm.	Lower Kissimmee	Underway	2026



**Figure 3. Current SFWMD-led projects in the Lake Okeechobee Watershed**

### **2.2.6. DEP Activities**

As part of the 2020 BMAP update, DEP implemented a basinwide source assessment approach. To support this approach, DEP has taken several actions to address the basinwide sources since the BMAP update was adopted.

The Clean Waterways Act, Chapter 2020-150, Laws of Florida, requires local governments to develop WWTF plans and/or OSTDS remediation plans to address loads from wastewater, including WWTFs and existing and new OSTDS. These plans are also required by the BMAPs. DEP collected these plans from the local governments in August 2024, which will be incorporated into the next BMAP update in 2025 (see Section 3.3 for additional details).

The 2020 BMAP update also includes WWTF TP and TN effluent limits, based on the facility size and effluent discharge method. As the WWTF permits in the LOW come up for renewal, DEP evaluates the current effluent concentrations to the BMAP requirements. DEP is modifying the WWTF permits, as needed, during renewal to revise effluent limits to meet BMAP requirements.

To address stormwater sources, the Clean Waterways Act required updates to the stormwater design and operation regulations for environmental resource permitting. On June 28, 2024, Governor Ron DeSantis signed Senate Bill 7040 into law, which updates Florida's stormwater rules and design criteria to protect the state's waterways. The new regulations aim to manage runoff from developments, ensuring that future stormwater systems are better maintained. Entities will be required to develop estimates for the expected routine maintenance costs and to certify that they have the financial capability to maintain the stormwater system over time. The rule will also provide for more consistent oversight through a required periodic inspection routine and reporting on the inspection results to the permitting agency. Additionally, the new rule establishes requirements for applicants to demonstrate, through calculations or modeling, that the future stormwater management systems would provide additional treatment to meet new Environmental Resource Permits stormwater treatment performance standards for an 80 percent reduction for TP and 55 percent reduction for TN, along with additional requirements that would apply where a project discharges to Outstanding Florida Waters or impaired waters. Additional permitting requirements to protect ground water can be found within the Applicant Handbook Volume I, Section 8.5.2.

In addition, using the 2020 Census data, DEP is coordinating with the United States Environmental Protection Agency to determine whether additional local governments throughout the state meet the thresholds for a National Pollutant Discharge Elimination System Municipal Separate Storm Sewer System (MS4) permit. If any are identified in the LOW, those new MS4 permittees will be identified as part of the next BMAP update.

DEP also has several funding sources available to implement projects and innovative technologies to help achieve nutrient load reduction goals:

- The Innovative Technologies Grant Program is available to local governments for projects that evaluate and implement innovative technologies and short-term solutions to combat algal blooms and nutrient enrichment, restore and preserve Florida waterbodies, and implement certain water quality treatment technologies. Eligible projects will prevent, mitigate or clean-up harmful algal blooms, with an emphasis on projects that prevent blooms through nutrient reductions. Projects that improve the ability to predict and monitor harmful algal blooms are also considered for funding.
- The Water Quality Improvement Grant Program (previously known as the Wastewater Grant Program) is available to local governments for projects that improve the quality of waters that are not attaining nutrient standards, have an established TMDL or are located within a BMAP area. Eligible projects include those identified through the BMAP process and listed in STAR, listed in a city or county capital improvement element pursuant to section 163.3177(3)(a)4.b., F.S., or identified in a WWTF plan or OSTDS remediation plan developed pursuant to sections 403.067(7)(a)9.a. and b., F.S. Projects that demonstrate the maximum estimated reduction in nutrient load per project, are cost-effective, demonstrate project readiness and are in locations where reductions are needed most to attain the water quality standards will be prioritized. More information about the grant program, including the full list of eligible projects may be found here: <https://protectingfloridatogether.gov/state-action/grants-submissions>.
- The Caloosahatchee Water Quality Improvements Grant Program is available to local governments for projects that improve the water quality within the Caloosahatchee River Watershed. Eligible projects will include watershed solutions and projects identified and listed in STAR are prioritized for funding.

As of June 2024, DEP has provided 218 awards for over \$429 million in the NEEPP watersheds for quality improvement projects from the Water Quality Improvement and Caloosahatchee Water Quality Improvement Grant Programs.

### **2.3. Water Quality Monitoring and Evaluation**

The Lake Okeechobee BMAP monitoring plan was designed to enhance the understanding of basin loads, identify areas with high nutrient concentrations and track water quality trends. The information gathered through the monitoring plan measures progress toward achieving the TMDLs and provides a better understanding of watershed loading. The BMAP monitoring plan consists of ambient water quality sampling, sampling at discharge structures, and flow monitoring, with stations organized into a three-tier system, which is detailed in full in the 2020 BMAP document (DEP 2020), to prioritize which stations are used to track water quality trends in the BMAP. Generally, Tier 1 stations are the primary/priority stations to track BMAP progress and water quality trends, Tier 2 stations provide secondary information to help focus and adaptively manage implementation efforts and Tier 3 stations are flow and/or stage gauges.

### **2.3.1. Ambient Water Quality Monitoring**

Focused objectives are critical for a monitoring strategy to provide the information needed to evaluate implementation success. The primary and secondary objectives of the monitoring strategy for the LOW, described below, are to evaluate the success of the BMAP, help interpret the data collected, and provide information for potential future refinements of the BMAP.

#### ***Primary Objective***

- To continue to track trends in TP loads and concentrations by sub-watershed.

#### ***Secondary Objectives***

- To continue to track trends in TN loads and concentrations by sub-watershed.
- To continue to identify areas within the watershed with elevated TP loading to better focus management efforts.
- To continue to measure the effectiveness of individual or collective projects in reaching TMDL target-pollutant loadings.

To achieve the objectives above, the monitoring strategy focuses on the following suggested parameters:

- Total Phosphorus (TP)
- Orthophosphate (as P)
- Nitrate/Nitrite (as N)
- Nitrogen, Ammonia
- Total Kjeldahl Nitrogen
- Total Nitrogen (TN)
- Dissolved Oxygen
- Chlorophyll *a*
- pH
- Temperature
- Specific Conductance
- Total Suspended Solids
- Turbidity
- Alkalinity
- Biochemical Oxygen Demand
- Color

The stakeholders responsible for monitoring continue to sample their sites and upload the data to the Watershed Information Network (WIN) database.



### 2.3.2. Water Quality Evaluation

To help track implementation progress for the LOW BMAP, a water quality evaluation was completed using data available as of May 31, 2024. Trend analyses were conducted as part of the 2020 Five-Year Review and updated for this 2024 Five-Year Review to track changes in nutrient concentrations in the LOW. The results from the water quality trend analyses for the LOW sub-watersheds are described below. **Appendix A** describes the methods used to retrieve, process and analyze the data.

#### 2.3.2.1. Data Management and Processing

Data were collated from the previous 5-year trend analysis and new data retrieved from the WIN database. The analysis was conducted using five water years (WYs) of data from before BMAP adoption and ten WYs of data from after BMAP adoption, for a period of record (POR) extending from May 1, 2008, through April 30, 2024. The evaluation used data from the Tier 1 and Tier 2 BMAP monitoring stations. Concentrations, rather than nutrient loads, are analyzed as few locations have adequate flow data to calculate loads for a trend analysis. The TN and TP analyses are comprised of over 21,000 records, from 242 stations throughout the BMAP. Available data were used to calculate TN from its constituents, if necessary, where TN was not reported (described in **Appendix A**). Monthly medians were calculated for TN and TP where multiple, non-duplicated samples were reported in a month. The analysis used the Seasonal Kendall test, which is robust in respect to missing data; therefore, a 50 percent cut-off was used to select basins with adequate data for the trend analysis. The requirement for five years of continuous data was maintained from the 2020 Five-Year Review to ensure a robust analysis.

#### 2.3.2.2. Statistical Analyses

Autocorrelation was tested using the autocorrelation function in R v.4.0.4 on monthly median values (see **Table A-2** in **Appendix A**). Trends were analyzed using the U.S. Geological Survey (USGS) Seasonal Kendall formula, provided as a Window's executable program (Helsel et al. 2006). For basins with multiple stations, trends were also analyzed by station if the station followed the data requirements.

#### 2.3.2.3. Seasonal Kendall Trend Results for Basins

Several basins in the Upper Kissimmee and Indian Prairie sub-watersheds show a decreasing trend in TP (**Table 5**), although the magnitude of the trends indicate only gradual change suggesting that more work will be needed to achieve restoration goals.

Overall, the slopes for all the basins suggest gradual change in any direction. This is indicative of the time it takes to see effective changes from water quality restoration projects throughout the watershed. It is encouraging to see several basins tilt towards the decreasing trend in TP, and as more work is completed throughout the LOW, we expect to see greater rates of change over time in the direction of the significant decreasing trend.

**Table 7** details the results of the Seasonal Kendall test for TP by basin in the LOW, and **Figure 4** and **Figure 5** show the TP trend results for each basin.

**Table 5. Results of the Seasonal Kendall test for TP by basin**

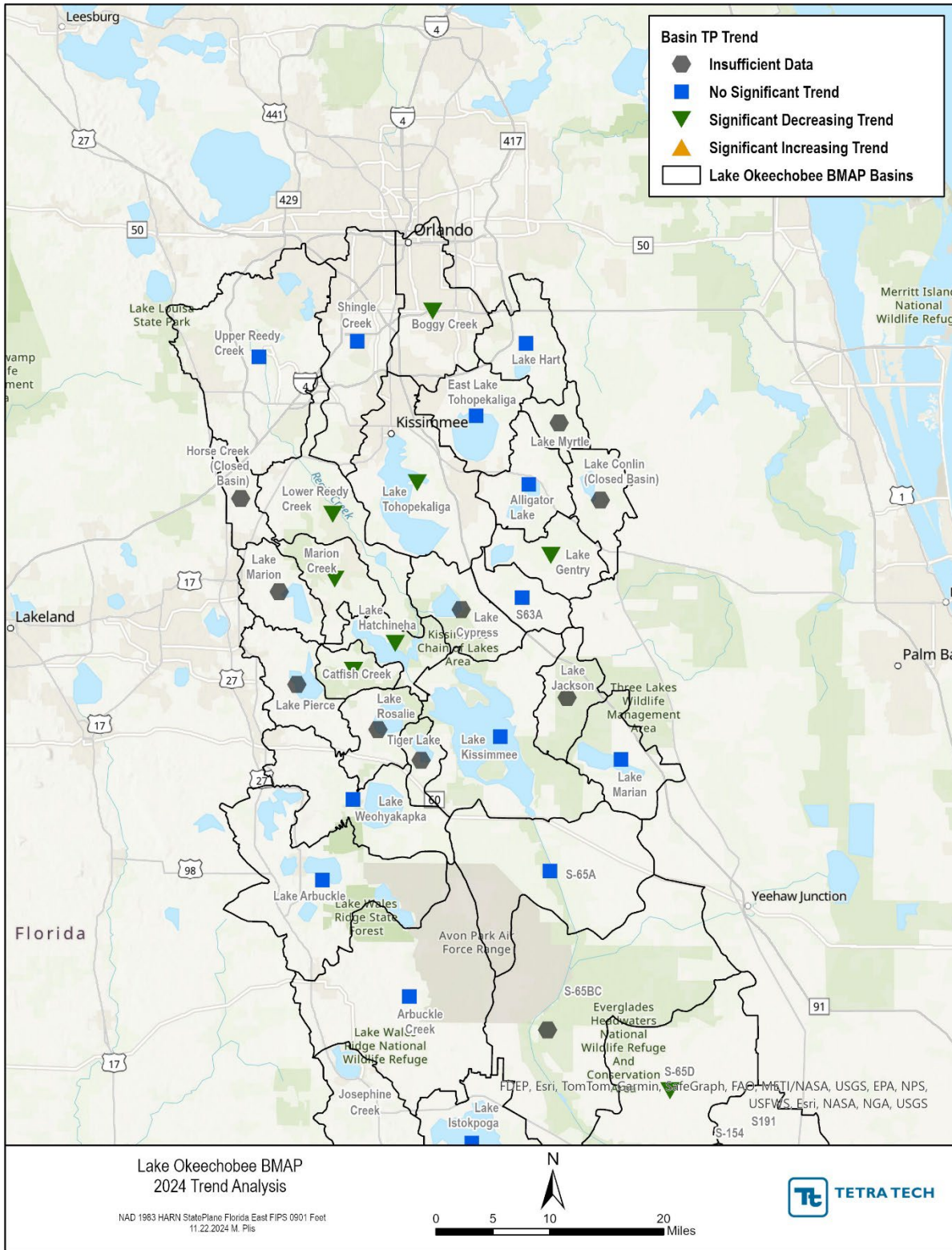
Note: Cells marked with a – indicate insufficient data. See Appendix A for details on data sufficiency requirements.

\*\* p-values of less than 0.05 indicate a significant trend.

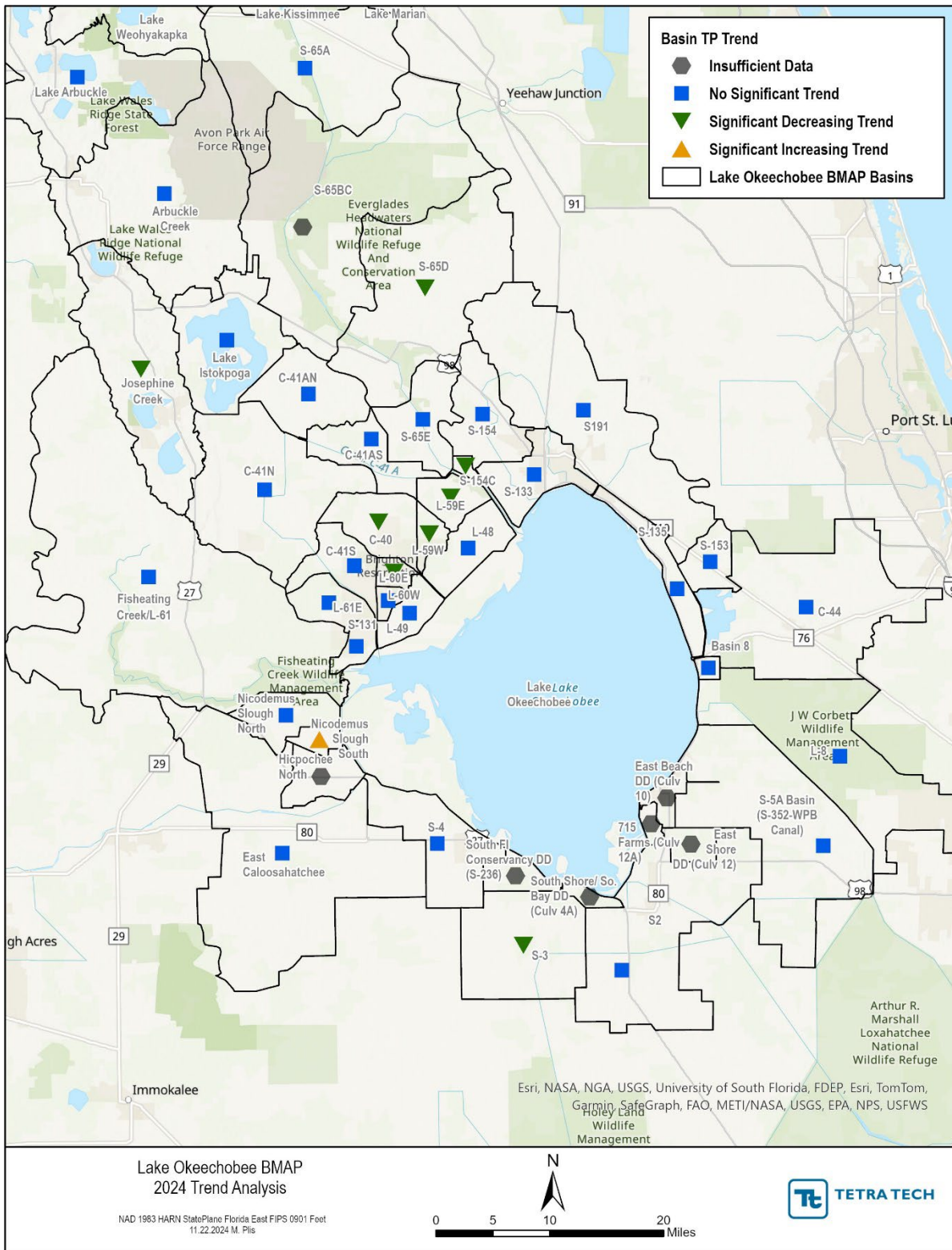
Subwatershed	Basin	Tau	Kendall S	Slope	p-value**	Trend
Upper Kissimmee	Alligator Lake	0.04	6	0.0001667	0.7648	No Significant Trend
Lake Istokpoga	Arbuckle Creek	-0.065	-27	-0.001036	0.4218	No Significant Trend
Upper Kissimmee	Boggy Creek	-0.396	-109	-0.0022	0.0193	<b>Significant Decreasing Trend</b>
Indian Prairie	C-40	-0.483	-152	-0.01125	0.0159	<b>Significant Decreasing Trend</b>
Indian Prairie	C-41	-0.046	-18	-0.001471	0.5853	No Significant Trend
Indian Prairie	C-41A	0.149	48	0.001825	0.084	No Significant Trend
East Lake Okeechobee	C-44/Basin 8/S-153	-0.119	-39	-0.004125	0.3784	No Significant Trend
Upper Kissimmee	Catfish Creek	-0.477	-104	-0.004	0	<b>Significant Decreasing Trend</b>
West Lake Okeechobee	East Caloosahatchee	-0.034	-11	-0.000604	0.7134	No Significant Trend
Upper Kissimmee	East Lake Tohopekaliga	-0.152	-49	-0.000625	0.0774	No Significant Trend
South Lake Okeechobee	East Shore WCD (Culv 12)	—	—	—	—	—
Fisheating Creek	Fisheating Creek/L-61	0.117	46	0.00545	0.1486	No Significant Trend
West Lake Okeechobee	Hicpochee North	—	—	—	—	—
Upper Kissimmee	Horse Creek	—	—	—	—	—
Indian Prairie	In canal to lake	0.36	36	0.006583	0.0088	<b>Significant Increasing Trend</b>
Lake Istokpoga	Josephine Creek	-0.495	-156	-0.003	0	<b>Significant Decreasing Trend</b>
Lower Kissimmee	Kissimmee River	-0.186	-66	-0.002604	0.0253	<b>Significant Decreasing Trend</b>
Indian Prairie	L-48	-0.019	-6	-0.000325	0.8542	No Significant Trend
Indian Prairie	L-49	-0.149	-47	-0.0008	0.0854	No Significant Trend
Indian Prairie	L-59E	-0.275	-83	-0.0082	0.0017	<b>Significant Decreasing Trend</b>
Indian Prairie	L-59W	-0.344	-78	-0.0081	0.0004	<b>Significant Decreasing Trend</b>
Indian Prairie	L-60E	-0.373	-50	-0.005929	0.0014	<b>Significant Decreasing Trend</b>
Indian Prairie	L-60W	-0.152	-15	-0.002	0.2767	No Significant Trend
Indian Prairie	L-61E	0.144	15	0.0045	0.3007	No Significant Trend
East Lake Okeechobee	L-8	-0.148	-39	-0.002417	0.1134	No Significant Trend
Lake Istokpoga	Lake Arbuckle	-0.034	-14	-0.000464	0.8515	No Significant Trend
Upper Kissimmee	Lake Cypress	—	—	—	—	—

Subwatershed	Basin	Tau	Kendall S	Slope	p-value**	Trend
Upper Kissimmee	Lake Gentry	-0.329	-68	-0.00525	0.0012	<b>Significant Decreasing Trend</b>
Upper Kissimmee	Lake Hart	0.068	14	0.0005	0.5339	No Significant Trend
Upper Kissimmee	Lake Hatchinea	-0.321	-97	-0.0025	0.0002	<b>Significant Decreasing Trend</b>
Lake Istokpoga	Lake Istokpoga	0.02	8	0.0001339	0.8265	No Significant Trend
Upper Kissimmee	Lake Jackson	—	—	—	—	—
Upper Kissimmee	Lake Kissimmee	-0.177	-57	-0.001388	0.2814	No Significant Trend
Upper Kissimmee	Lake Marian	0.128	5	0.04733	0.5919	No Significant Trend
Upper Kissimmee	Lake Marion	—	—	—	—	—
Upper Kissimmee	Lake Pierce	—	—	—	—	—
Upper Kissimmee	Lake Rosalie	—	—	—	—	—
Upper Kissimmee	Lake Tohopekaliga	-0.273	-110	-0.0023	0.0006	<b>Significant Decreasing Trend</b>
Upper Kissimmee	Lake Weohyakapka	0.068	8	0.0003333	0.6183	No Significant Trend
Upper Kissimmee	Lower Reedy Creek	-0.395	-90	-0.004667	0	<b>Significant Decreasing Trend</b>
Upper Kissimmee	Marion Creek	-0.371	-117	-0.004	0.0077	<b>Significant Decreasing Trend</b>
Fisheating Creek	Nicodemus Slough North	0.123	13	0.002042	0.3625	No Significant Trend
West Lake Okeechobee	Nicodemus Slough South	0.406	93	0.0085	0	<b>Significant Increasing Trend</b>
Indian Prairie	S-131	0.05	16	0.0016	0.5819	No Significant Trend
Taylor Creek/Nubbins Slough	S-133	-0.09	-36	-0.003	0.2673	No Significant Trend
Taylor Creek/Nubbins Slough	S-135	0.056	18	0.0015	0.7992	No Significant Trend
Taylor Creek/Nubbins Slough	S-154	-0.09	-35	-0.0065	0.2785	No Significant Trend
Taylor Creek/Nubbins Slough	S-154C	-0.284	-58	-0.02242	0.0051	<b>Significant Decreasing Trend</b>
Taylor Creek/Nubbins Slough	S191	0.055	25	0.0037	0.6162	No Significant Trend
South Lake Okeechobee	S2	-0.006	-2	-0.00055	0.9707	No Significant Trend
South Lake Okeechobee	S-3	-0.199	-64	-0.005063	0.0206	<b>Significant Decreasing Trend</b>

Subwatershed	Basin	Tau	Kendall S	Slope	p-value**	Trend
South Lake Okeechobee	S-4	0.064	21	0.002625	0.469	No Significant Trend
South Lake Okeechobee	S-5A Basin (S-352-West Palm Beach [WPB] Canal)	0.05	16	0.001	0.5819	No Significant Trend
Upper Kissimmee	S63A	0.094	10	0.0008333	0.5238	No Significant Trend
Lower Kissimmee	S-65A	-0.236	-78	-0.001683	0.1549	No Significant Trend
Lower Kissimmee	S-65E	0.002	1	0.0000625	1	No Significant Trend
Upper Kissimmee	Shingle Creek	-0.039	-6	-0.000517	0.7778	No Significant Trend
South Lake Okeechobee	South Florida Conservancy District (S-236)	—	—	—	—	—
Upper Kissimmee	Tiger Lake	—	—	—	—	—
Upper Kissimmee	Upper Reedy Creek	0.186	38	0.001	0.2118	No Significant Trend



**Figure 4. Results of Seasonal Kendall test for TP by basin in northern LOW**



**Figure 5. Results of Seasonal Kendall Test for TP by basin in the southern LOW**

## **2.4. TRA Approach**

To better prioritize and focus resources to achieve restoration most efficiently in the LOW, DEP developed the TRA approach, which is described in full in the 2020 BMAP document (DEP 2020). This approach uses measured data collected throughout the watershed to evaluate TP and TN concentrations in each of the basins. In conjunction with concentration, the approach looks at flows, past trends and unit area loading targets across the watershed to prioritize where resources are most needed. Priorities were set as 1, 2 or 3 with 1 being the highest priority. The TRA approach allows DEP and stakeholders to prioritize areas with the greatest need for water quality restoration projects based on water quality monitoring data. **Figure 6** and **Figure 7** provides the TRA evaluation results based on data from WY2019 through WY2023. **Appendix B** contains the tabulated results.

Overall, basins closest to Lake Okeechobee are in the most need of water quality restoration projects addressing both TP and TN. These results have been consistent over the last five years, and the Coordinating Agencies continue to work to investigate these basins and collaborate on placement of projects through interagency workgroups.

Basins in the Upper Kissimmee sub-watershed show relatively less priority for projects than basins surrounding Lake Okeechobee, but project implementation should continue in these areas so that progress towards achieving the TMDL can be made.

There are several basins that had insufficient data to run the analysis. This insufficiency is likely a result of newer monitoring programs that have not been in place for five or more years as of WY2023. There are still a couple of basins without sufficient monitoring stations, and DEP continues to work with its partners to close those remaining water quality monitoring gaps.

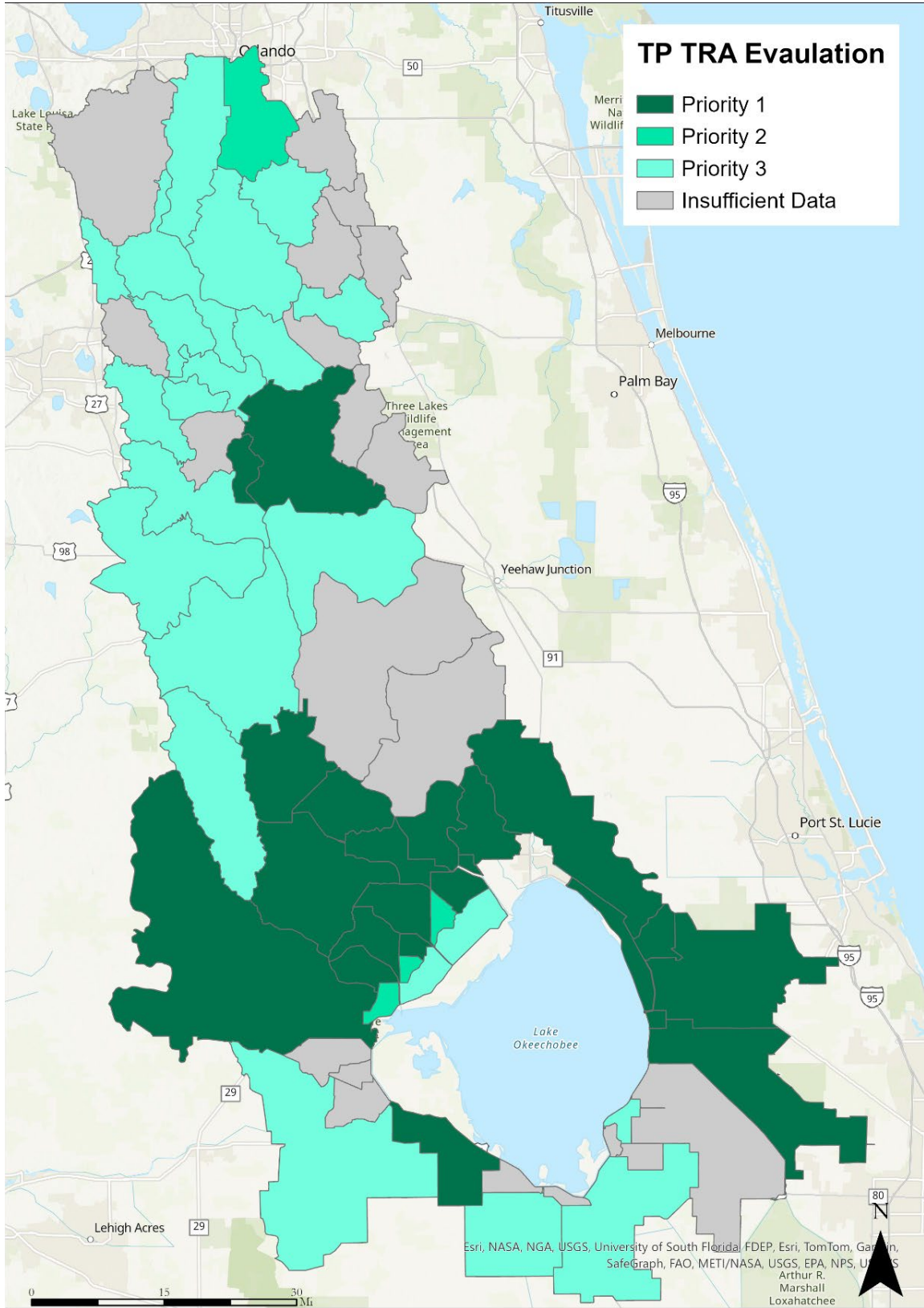


Figure 6. TP TRA results



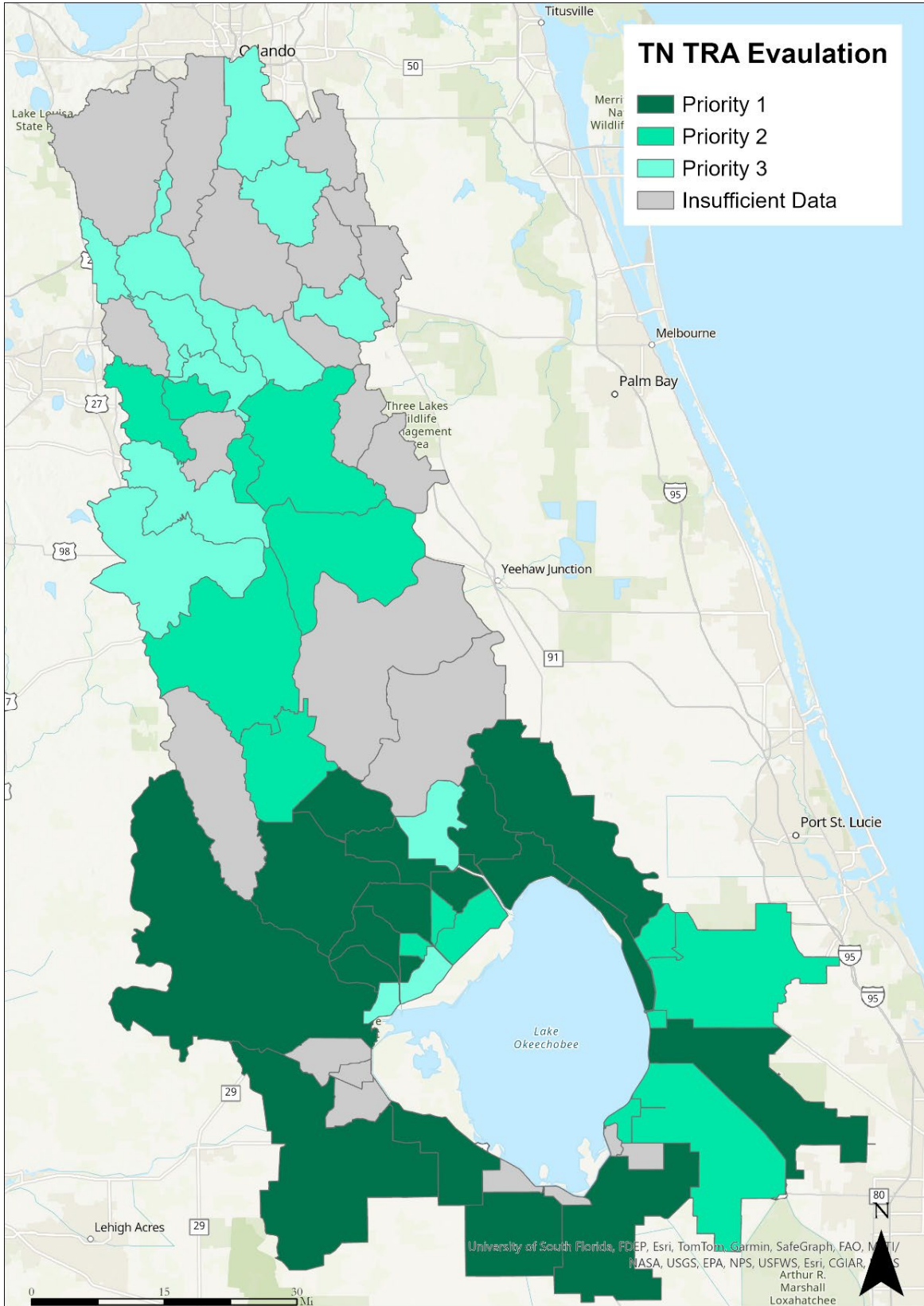


Figure 7. TN TRA results

## Chapter 3: Recommendations

---

The BMAP implements phased TP reductions according to subparagraph 403.067(7)(a)1., F.S. The purpose of this 2024 Five-Year Review is to evaluate implementation activities that have taken place during the first and second 5-year phases. The recommendations included here are for future implementation activities that may be incorporated into a revised BMAP and adopted by Secretarial Order.

This first and second phases of the BMAP included significant restoration efforts by stakeholders. Through December 31, 2023, 292 projects were completed, and an additional 60 projects were underway or planned. Based on the load estimation shapefile developed from WAM, the completed activities in the LOW are estimated to achieve total reductions of 243,895 lbs/yr of TP, which is 42 percent of the reductions needed to meet the TMDL.

Recommendations for consideration in the next BMAP update are summarized in the sections below.

### 3.1. Milestones

The Lake Okeechobee BMAP is governed by sections 373.4595 and 403.067, F.S.

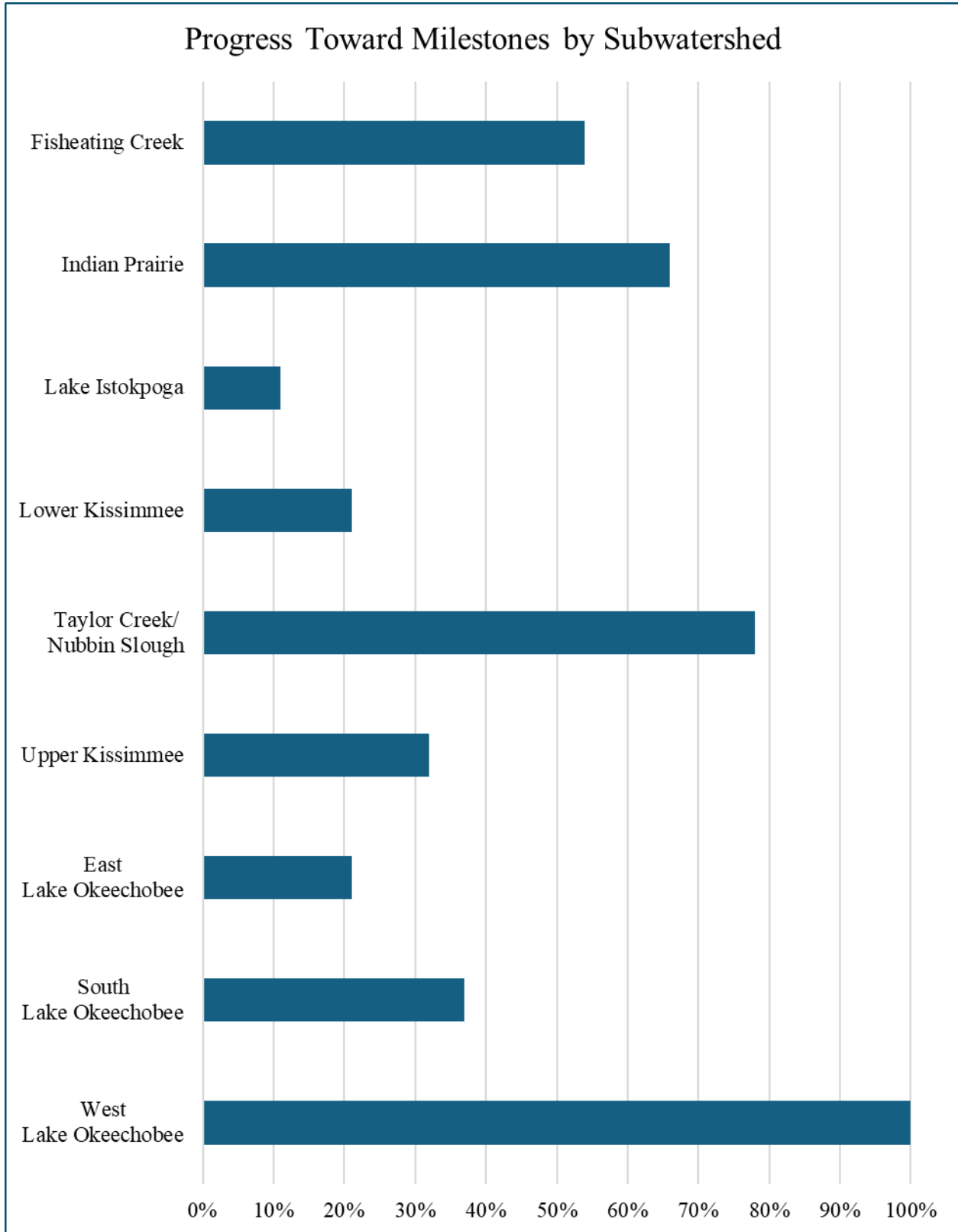
The Five-Year Review documents progress and allows stakeholder involvement in the methods of assessing progress and revising the BMAP as appropriate. The projects and activities identified in the BMAP are key to reducing TP in the watershed and lake. The estimated benefits of these implemented activities should be tracked to show stakeholder efforts by determining a percentage towards the total required reductions to be achieved at each milestone. Stakeholders in the Lake Okeechobee BMAP area aim to meet 100 percent of the required reductions within 20 years (2034) of BMAP adoption. The following percent reduction goals are proposed for each milestone based on the sub-watershed targets updated with the 2024 South Florida Environmental Report (SFER) (SFWMD 2024) loading information:

- 5-year milestone - 2019 (Years 1 to 5, including projects completed after January 1, 2009): 15 percent or 86,707 lbs/yr (39 mt/yr) TP.
- 10-year milestone - 2024 (Years 6 to 10): 40 percent or 231,218 lbs/yr (105 mt/yr) TP.
- 15-year milestone - 2029 (Years 11 to 15): 75 percent or 433,535 lbs/yr (197 mt/yr) TP.
- 20-year milestone - 2034 (Years 16 to 20): 100 percent or 578,046 lbs/yr (262 mt/yr) TP.

Of the 352 total projects accounted for in the BMAP, 213 projects have been completed, with an additional 79 projects that are ongoing activities. **Figure 8** shows the 5-, 10-, 15-, and 20-year milestones as well as the cumulative TP reductions over time as projects are completed in each reporting period. The 5-year milestone was met in 2019 with an estimated 217,929 lbs/yr TP reductions calculated for completed and ongoing projects. As of December 31, 2023, the 10-year milestone appears to have been met with an estimated 243,895 lbs/yr TP reductions calculated from completed and ongoing projects. More projects will be needed to meet the 15- and 20-year milestones.

During the annual review of BMAP implementation efforts, project-specific information may be revised and updated, resulting in changes to the reductions for those projects. The revisions may increase or decrease reductions, and DEP will work with stakeholders to address revisions as they are identified.

Projects included in this review are necessary components for restoration. Many projects are not far enough along in their development and implementation to quantify TP reductions. As part of each Five-Year Review, DEP will evaluate progress and consider additional projects submitted to confirm whether efforts are on track to meet the TMDL in 2034.



**Figure 84. Estimated progress towards the Lake Okeechobee BMAP TP milestones**

### **3.2. Water Quality Monitoring Revisions**

The Five-Year Review of the Lake Okeechobee BMAP provides an opportunity to improve key components of the plan and make further progress to achieve the TMDL. Great efforts were made to expand water quality monitoring during the last five years throughout the LOW, and DEP will continue to work with its partners to fill in the remaining gaps in the water quality monitoring network.

### **3.3. Wastewater and OSTDS Plans**

Subparagraph 403.067(7)(a)9., F.S., states that in BMAP watersheds with at least 20 percent of the nutrient loading from WWTF or OSTDS, local governments must develop a plan to address any necessary construction, expansion or upgrades to address these sources. The plans are to be developed in cooperation with DEP, water management districts and adjacent stakeholders. The plan must name responsible parties and include permitted capacity, average nutrient load, projected timeline for improvements and projected cost for improvements. These plans must be incorporated into the updated BMAP no later than July 1, 2025. DEP has collected these plans from the local governments for inclusion in the next BMAP update.

DEP will include a new OSTDS requirement in the next BMAP update that is consistent with House Bill 1379 (2023) (Chapter 2023-169, Laws of Florida) that prohibits new conventional systems on lots of one acre or less within the BMAP area unless they are enhanced nutrient reducing OSTDS or other wastewater systems achieving 65 percent reduction when sewer is not available. DEP will work with stakeholders on refining OSTDS requirements in BMAP areas.

### **3.4. Future Model Update**

DEP will be developing a new Hydrological Simulation Program-FORTRAN (HSPF) model for the LOW to support a future BMAP update. The goal is to prepare a model that represents TP and TN loading throughout the watershed to estimate the nutrient load reaching Lake Okeechobee. Stakeholder participation will be key in developing this new model to ensure success. It is anticipated that the model will be complete in 2027. After completion, DEP will update the BMAP.

## References

---

- Betts, A., P. Jones, S. Ollis, S. Olson, X. Pernet, S. Sculley, Z. Welch, and J. Zhang. 2020. Appendix 8A-1: Lake Okeechobee Watershed Protection Plan 2020 Update. In: *2020 South Florida Environmental Report – Volume I*, South Florida Water Management District, West Palm Beach, FL. Final Report, March 1, 2020
- EIP. 2023. *Design Documentation Report for Basis of Design: Lower Kissimmee Basin Stormwater Treatment Area, Okeechobee County, Florida*. Final Report prepared under Contract 4600004527 by Ecosystem Investment Partners for the South Florida Water Management District, West Palm Beach, FL. February 2023.
- Florida Department of Agriculture and Consumer Services (FDACS). 2024. Status of Implementation of Agricultural Nonpoint Source Best Management Practices. Report to the Governor, the President of the Senate, and the Speaker of the House Pursuant to Section 403.0675(2), F.S. Publication No: FDACS-P-01924 Rev. 07/24.
- Florida Department of Environmental Protection (DEP). 2001. *Total maximum daily load for total phosphorus in Lake Okeechobee*. Tallahassee, FL.
- Florida Department of Environmental Protection (DEP). 2020. *Lake Okeechobee Basin Management Action Plan*. Tallahassee, FL: Division of Environmental Assessment and Restoration.
- Florida Department of Environmental Protection (DEP). 2024. *2023 Statewide Annual Report on Total Maximum Daily Loads, Basin Management Action Plans, Minimum Flows or Minimum Water Levels, and Recovery or Prevention Strategies*. Tallahassee, FL: Division of Environmental Assessment and Restoration.
- Helsel, D.R., D.K. Mueller, and J.R. Slack. 2006. Computer program for the Kendall family of trend tests. U.S. Geological Survey Scientific Investigations Report 2005–5275.
- SFWMD, DEP and FDACS. 2007. *Lake Okeechobee Protection Program, Lake Okeechobee Protection Plan Evaluation Report*. South Florida Water Management District, West Palm Beach, FL; Florida Department of Environmental Protection, Tallahassee, FL; and Florida Department of Agriculture and Consumer Services, Tallahassee, FL. Final Report, February 23, 2007.
- SFWMD, DEP and FDACS. 2008. *Lake Okeechobee Watershed Construction Project, Phase II Technical Plan*. South Florida Water Management District, West Palm Beach, FL; Florida Department of Environmental Protection, Tallahassee, FL; and Florida Department of Agriculture and Consumer Services, Tallahassee, FL. Final Report, February 2008.
- SFWMD and USACE. 2021. 2021 Aquifer Storage and Recovery Science Plan. Final Report.

SFWMD and USACE. 2022. 2022 Aquifer Storage and Recovery Science Plan. Draft – October 2022.

Welch, Z., P. Jones, and A. Betts. 2024. Chapter 8B: Lake Okeechobee Watershed Protection Plan 2025 Update. In: *Draft 2025 South Florida Environmental Report – Volume I*, South Florida Water Management District, West Palm Beach, FL. Draft Report, to be published in November 2024.

## Appendices

---

### Appendix A: Water Quality Data Processing and Analysis Methods

For the Five-Year Review of the Lake Okeechobee BMAP, trend analyses were conducted on available data from Tier 1 and Tier 2 stations for the period from May 1, 2008, to April 30, 2024. Data were retrieved from WIN and processed according to the procedure outlined in the next section.

The nonparametric Seasonal Kendall Test was used to identify monotonic trends in the data. This statistical technique was chosen because data are not required to conform to a particular distribution and the results are robust against outliers and gaps in the data record. **Section 2.3.2** summarizes the results of the Seasonal Kendall analysis, and details of the techniques are provided below.

#### Data Management and Processing

The POR for this analysis was May 1, 2008, to April 30, 2024, to allow a sufficient data record for trend analysis including periods before and after BMAP adoption in December 2014, and to remain consistent with the established WY in the region (May 1–April 30).

TP was the only parameter used in this analysis, and SFWMD provided TP data for the Tier 1 and Tier 2 stations. **Table A-1** list the POR and data availability for the monthly series of TP data for each station.

Data retrieved from WIN were further processed with standard quality control checks and statistical diagnostics, including removing data with fatal qualifier codes, the assessment of temporal independence and serial correlation. After quality control processing was completed, monthly aggregated values were calculated for each month with more than one sampling event. The monthly series was the final dataset used in statistical and trend analyses. Specific data processing and steps and methodology are provided in the following sections.

#### Statistical Analyses

The Seasonal Kendall Test was used to identify monotonic trends in the TP load (Tier 1), flow weighted mean concentration (Tier 1), or concentration (Tier 2) data, which were dependent on station type. The USGS Fortran code for the Seasonal Kendall Test was used to compute a tau, raw p-value and slope for each parameter series using months as "seasons." The program also provides a p-value adjusted for covariance caused by serial correlation.

Autocorrelation function analysis was conducted on the monthly TP series for each station to identify the presence of seasonality and serial correlation. If a series showed significant autocorrelation at the 12-month lag, it was considered to exhibit serial correlation, and the adjusted p-value was selected as the representative p-value for the series. If no serial correlation was detected, then the raw p-value was reported. Trends in the data series were considered statistically



significant if the appropriate p-value was less than 0.05, with a positive Sen slope indicating an increasing trend and a negative Sen slope indicating a decreasing trend.

## Data Download

Station data were provided by SFWMD to assess TP concentrations for Tier 2 stations and TP flow weighted means and loads at Tier 1 structure stations for the designated POR of May 1, 2008, through April 30, 2024.

## Data Processing (in order of operation)

- Most data processing was conducted by SFWMD for the final *2023 SFER – Volume I, Chapter 8B*. Data processing conducted by SFWMD included the calculations of monthly surface water flows and nutrient (TP and TN) loads for the major drainage basins into Lake Okeechobee, as well as discharges from Lakes Istokpoga and Kissimmee. Data were based on stations where flows are continuously monitored and TP and TN samples are collected weekly, if flowing; otherwise, monthly at a minimum. Basin load and flow data were used to estimate nutrient flow weighted mean concentrations. The SFER lists annual flows and nutrient loads to Lake Okeechobee for each water year.
- Data Qualifiers:
  - Data with result qualifiers of "G," "H," "K," "L," "N," "O," "Q," "V," "Y," or "?" were not used in the analysis, as per Table 1, Data Qualifier Codes, in Rule 62-160.700, Florida Administrative Code, Quality Assurance, and recent DEP decisions.
  - Only grab samples were used in the analysis of concentration data.
  - Both grab and automatic composite samples were used in the analysis of flow weighted mean concentration and load data (as calculated and provided by SFWMD from flow and concentration data).
  - Data with a result qualifier of "J" were reviewed.
  - Data with a result qualifier of "U" were reviewed:
    - If not already present, a result qualifier of "U" was assigned to any data with a result value of "\*Non-Detect."
    - Data with a result value of "\*Not Reported" were deleted unless they also had a value qualifier of "U."
    - Data with a result qualifier of "U" were processed in accordance with Rule 62-303.320(12), Florida Administrative Code, Aquatic Life-Based Water Quality Criteria Assessment. Results with the "U" data qualifier code reported by a laboratory were assessed as half the reported result or half the criterion (whichever was lower).

- Sample Depth:
  - Samples were not filtered by sample depth.
- Nutrient Characteristic Selection:
  - TP: "Phosphorus as P," "Phosphorus-Total."
- Accounting for Duplicate Samples:
  - If samples were found to share the same station, characteristic, date, and time, they were flagged and reviewed.
  - The median of the duplicate samples was used as the reported value.
- Temporal Processing:
  - Monthly Time Series: If multiple data points existed within a month, the monthly median was calculated for each month.
- Processing for Statistical Tests:
  - Data were processed according to the needs of each statistical test (autocorrelation function or trend) and formatted for use in the R statistical program or USGS Fortran code.
  - Sampling Frequency:
    - Monthly data series were used for analysis.
    - Stations were separated into two analysis groups based on whether they had more or less than 50 percent of available points.
    - Only station datasets with greater than 50 percent of available data points were used for analysis.

## **Trend Analysis**

- Autocorrelation Function:
  - Conducted to analyze seasonal patterns or serial correlation (using monthly seasons).
  - For the purposes of Seasonal Kendall analysis, statistically significant correlation on the 12-month lag was considered to be representative of serial correlation.
- Seasonal Kendall Tau Test:
  - Statistical Test Description: A nonparametric statistical test that does not require data to conform to a specific distribution and is not sensitive to outliers or data gaps.
    - Identifies monotonic trends in the datasets.

- Yields statistical significance value and direction of trend (increasing or decreasing).
- Accounts for seasonal data patterns (using months as seasons).
- Use in Trend Analysis:
  - Serial correlation was identified with ACFs prior to trend analysis.
  - USGS Fortran code for Seasonal Kendall Tau Test was used to produce tau, p-value, adjusted p-value and Sen slope:
    - Raw p-value was used for series with no serial correlation detected.
    - Adjusted p-value was used if serial correlation was identified.
  - Tau, p-value and slope were used to interpret the significance and direction of a monotonic trend.

**Table A-1. POR for Stations TP concentration data series**

Note: Percent Complete is the percentage of data relative to the ideal sampling frequency of one sample per month multiplied by the number of years.

Station	Number of Samples	WY Range	Number Years	Percent Complete
51242	1	2017-2017	1	8%
2255600	51	2016-2024	9	47%
2256500	48	2016-2024	9	44%
2269520	93	2017-2024	8	97%
2271500	92	2017-2024	8	96%
2273230	60	2016-2024	9	56%
2275197	64	2016-2024	9	59%
02270500 (30854)	106	2016-2024	9	98%
02273198 (30853)	105	2016-2024	9	97%
18085 (S65A)	93	2017-2024	8	97%
18130 (S65E)	95	2017-2024	8	99%
34008 (ROMCUT)	78	2017-2024	8	81%
4002 (C03)	42	2017-2024	8	44%
5147 (C10A)	85	2017-2024	8	89%
5158 (C5A)	80	2017-2024	8	83%
AB27343014	71	2017-2024	8	74%
ABOGGN	81	2017-2024	8	84%
AJ33243122	37	2020-2024	5	62%
AL11263113	28	2021-2024	4	58%
AL24263113	32	2020-2024	5	53%
AL34263113	43	2020-2024	5	72%
AM22323213	21	2021-2024	4	44%
AM27323211	6	Gaps in Data	3	17%

Florida Department of Environmental Protection  
 Draft 2024 Five-Year Review of the Lake Okeechobee Basin Management Action Plan |  
 Fiscal Year 2024 – 2025 | Report

Station	Number of Samples	WY Range	Number Years	Percent Complete
AR06333013	89	2017-2024	8	93%
AR18343012	70	2017-2024	8	73%
AR21343013	15	2021-2024	4	31%
Arbuckle1	26	2018-2024	7	31%
Bass Slough at Boggy Creek	28	2017-2024	8	29%
Bass Slough at Timothy Lane	27	2017-2024	8	28%
BB16313214	26	2017-2024	8	27%
BH04392912	47	2017-2024	8	49%
BM15313111	18	2021-2024	4	38%
BN03332911	89	2017-2024	8	93%
BN08332912	33	2020-2024	5	55%
BNSHINGLE	87	2017-2024	8	91%
Boggy Creek A (Tradeport)	21	2018-2023	6	29%
BS-59	84	2017-2024	8	88%
Buck Lake	26	2017-2024	8	27%
C-12E	74	2018-2024	7	88%
C38W	70	Gaps in Data	7	83%
C44SC14	27	2020-2024	5	45%
C44SC19	37	2020-2024	5	62%
C44SC2	19	Gaps in Data	3	53%
C44SC23	18	2021-2024	4	38%
C44SC24	25	2020-2024	5	42%
C44SC5	30	2020-2024	5	50%
CL06283111	51	2017-2024	8	53%
CL06283112	6	Gaps in Data	3	17%
CL18273011	71	2017-2024	8	74%
CL19273123	31	2020-2024	5	52%
CO35253112	32	2021-2024	4	67%
CREEDYBR	79	2017-2024	8	82%
CRFW01	19	2021-2024	4	40%
CRFW02	24	2020-2024	5	40%
CRFW03	24	2021-2024	4	50%
CRFW05	27	2020-2024	5	45%
CRFW30	27	2021-2024	4	56%
CULV5	56	Gaps in Data	7	67%
CY05353444	36	2017-2024	8	38%
CY06363411	25	2020-2024	5	42%
CY17353413	22	2020-2024	5	37%
DLMARNCR	93	2017-2024	8	97%
DLONDNCR	56	2017-2024	8	58%
East City Ditch Outfall	29	2017-2024	8	30%

Station	Number of Samples	WY Range	Number Years	Percent Complete
EC-37	83	2017-2024	8	86%
ET05253114	61	2017-2024	8	64%
ET06253113	76	2017-2024	8	79%
FE03382911	33	2020-2024	5	55%
FE20393013	28	2020-2024	5	47%
FE21392913	22	Gaps in Data	7	26%
FE21392914	21	Gaps in Data	6	29%
FE26362812	62	2017-2024	8	65%
FE29403212	22	2020-2024	5	37%
FE32372814	27	2017-2024	8	28%
FECSR78	94	2017-2024	8	98%
G207	51	2017-2024	8	53%
G208	47	2017-2024	8	49%
G3SD0087	20	2018-2022	5	33%
G4CE0070 (Tiger1-G4CE0070)	8	2018-2021	4	17%
GA09393011	42	2020-2024	5	70%
GENTRYDTCH	74	2017-2024	8	77%
GG05403011	17	Gaps in Data	3	47%
GT07402911	10	Gaps in Data	3	28%
HART: Lake Hart Outflow at S-62 (Clap Sims Duda)	22	2018-2024	7	26%
HL08283014	45	2020-2024	5	75%
Horse Crk2	27	2018-2024	7	32%
HP06393242	68	2017-2024	8	71%
HP09383151	37	2020-2024	5	62%
HP10383112	33	2020-2024	5	55%
HP11373132	34	2017-2024	8	35%
HP15373112	39	2020-2024	5	65%
HP21383121	17	2021-2024	4	35%
HP22373112	36	2020-2024	5	60%
HP23373111	4	Gaps in Data	2	17%
HP24373013	24	2020-2024	5	40%
HP25373013	85	2017-2024	8	89%
HP27383124	46	2020-2024	5	77%
HP27383134	22	2021-2024	4	46%
HP28383112	35	2021-2024	4	73%
HP34373124	1	2024-2024	1	8%
HP35373113	3	2021-2022	2	13%
HP36373013	2	2022-2022	1	17%
HS06402911	20	2021-2024	4	42%
IC35313112	24	2020-2024	5	40%

Florida Department of Environmental Protection  
 Draft 2024 Five-Year Review of the Lake Okeechobee Basin Management Action Plan |  
 Fiscal Year 2024 – 2025 | Report

Station	Number of Samples	WY Range	Number Years	Percent Complete
INDUSCAN	94	2017-2024	8	98%
IP01383122	45	2020-2024	5	75%
IP09383232	64	2017-2024	8	67%
IP24383214	9	2020-2024	5	15%
IP29383313	30	2021-2024	4	63%
JO16362914	18	2021-2024	4	38%
JO33352914	48	2020-2024	5	80%
JUDGES_DCH	6	2016-2019	4	13%
KR05373311	19	2020-2024	5	32%
KR16373414	27	2020-2024	5	45%
KR17373513	63	2015-2024	10	53%
KR20373413	14	2020-2024	5	23%
KR23313113	8	Gaps in Data	4	17%
KR24353114	29	Gaps in Data	7	35%
KR29353334	3	Gaps in Data	3	8%
KR30353214	10	2020-2024	5	17%
KR30353312	13	Gaps in Data	6	18%
KR32343214	23	Gaps in Data	6	32%
KR36363312	11	2021-2022	2	46%
KREA 01	48	2017-2024	8	50%
KREA 04	35	2017-2024	8	36%
KREA 100	50	2020-2024	5	83%
KREA 14	46	Gaps in Data	9	43%
KREA 17A	63	2017-2024	8	66%
KREA 20	32	2015-2024	10	27%
KREA 22	72	2017-2024	8	75%
KREA 23	60	2017-2024	8	63%
KREA 25	12	Gaps in Data	6	17%
KREA 28	14	2017-2019	3	39%
KREA 30 A	12	Gaps in Data	6	17%
KREA 41A	44	2016-2024	9	41%
KREA 91	92	2017-2024	8	96%
KREA 92	93	2017-2024	8	97%
KREA 93	94	2017-2024	8	98%
KREA 94	94	2017-2024	8	98%
KREA 97	93	2017-2024	8	97%
KREA 98	93	2017-2024	8	97%
KUB009	24	Gaps in Data	7	29%
L59E	79	2017-2024	8	82%
L59W	65	2017-2024	8	68%
L60E	62	2017-2024	8	65%

Florida Department of Environmental Protection  
 Draft 2024 Five-Year Review of the Lake Okeechobee Basin Management Action Plan |  
 Fiscal Year 2024 – 2025 | Report

Station	Number of Samples	WY Range	Number Years	Percent Complete
L60W	53	2017-2024	8	55%
L61E	53	2017-2024	8	55%
Lake Fran	29	2017-2024	8	30%
Lake Mare Prairie	26	2017-2024	8	27%
LB29353513	29	2020-2024	5	48%
LG32263124	45	2017-2024	8	47%
LI02362923	92	2017-2024	8	96%
LJACKDSCH	32	Gaps in Data	7	38%
LK04313114	13	2021-2023	3	36%
LM29373514	49	Gaps in Data	6	68%
LR14302912	49	2020-2024	5	82%
LT32263013	65	2015-2024	10	54%
LV14322813	49	2017-2024	8	51%
Mill Slough at Mill Run Blvd.	27	2017-2024	8	28%
Mill Slough Outfall	29	2017-2024	8	30%
MJ01253123	28	Gaps in Data	7	33%
ML22303311	12	2021-2024	4	25%
ML22303313	31	2020-2024	5	52%
MS05373613	13	Gaps in Data	3	36%
MS08373611	14	2021-2024	4	29%
MS08373624	18	Gaps in Data	6	25%
Mud Lake	12	2017-2020	4	25%
OK09353212	52	2017-2024	8	54%
OT29353514	10	2020-2024	5	17%
OT32353511	23	2020-2024	5	38%
OT34353513	23	2020-2024	5	38%
PA10313112	40	2020-2024	5	67%
PARTIN_CNL	22	2015-2021	7	26%
PB24392912	78	2017-2024	8	81%
Pierce1	25	2018-2024	7	30%
PL01382911	39	2020-2024	5	65%
RC-13H	24	2018-2024	7	29%
RC-13L	38	2020-2024	5	63%
RD01322813	62	Gaps in Data	7	74%
RD08322913	93	2017-2024	8	97%
RS23402811	7	2022-2024	3	19%
RUNNYMEDE	15	Gaps in Data	5	25%
S127	94	2017-2024	8	98%
S129	93	2017-2024	8	97%
S131	94	2017-2024	8	98%
S133	95	2017-2024	8	99%

Station	Number of Samples	WY Range	Number Years	Percent Complete
S135	94	2017-2024	8	98%
S153	19	2021-2024	4	40%
S154	87	2017-2024	8	91%
S154C	72	2017-2024	8	75%
S169	93	2017-2024	8	97%
S191	93	2017-2024	8	97%
S2	93	2017-2024	8	97%
S-236	48	Gaps in Data	7	57%
S275 (C-12)	2	2020-2020	1	17%
S3	94	2017-2024	8	98%
S308C	95	2017-2024	8	99%
S351	87	2017-2024	8	91%
S352	94	2017-2024	8	98%
S354	89	2017-2024	8	93%
S4	94	2017-2024	8	98%
S-47D (CRFW33)	25	2020-2024	5	42%
S65	88	2017-2024	8	92%
S65A	93	2017-2024	8	97%
S65D	57	2020-2024	5	95%
S68	105	2016-2024	9	97%
S71	94	2017-2024	8	98%
S72	92	2017-2024	8	96%
S77	94	2017-2024	8	98%
S84	94	2017-2024	8	98%
SCD	24	2018-2024	7	29%
SD13373111	44	2020-2024	5	73%
SD28373312	32	2020-2024	5	53%
SD33373314	18	Gaps in Data	4	38%
Shingle Creek (Central FL Pkwy.)	24	2018-2024	7	29%
Shingle Creek at John Young Pkwy.	28	2017-2024	8	29%
Shingle Creek at Town Center Blvd.	29	2017-2024	8	30%
Shingle Creek at Yates Rd.	29	2017-2024	8	30%
SM21333314	25	2021-2024	4	52%
TC03373511	48	2015-2024	10	40%
TC09373513	58	Gaps in Data	7	69%
TC27353413	30	Gaps in Data	9	28%
TCNS 201	50	2017-2024	8	52%
TCNS 204	45	2017-2024	8	47%
TCNS 207	45	2017-2024	8	47%
TCNS 209	35	2017-2024	8	36%
TCNS 213	70	2017-2024	8	73%



Station	Number of Samples	WY Range	Number Years	Percent Complete
TCNS 214	68	2017-2024	8	71%
TCNS 217	61	2017-2024	8	64%
TCNS 220	48	2017-2024	8	50%
TCNS 222	75	2017-2024	8	78%
TCNS 228	14	Gaps in Data	6	19%
TCNS 230	13	Gaps in Data	6	18%
TCNS 233	29	Gaps in Data	7	35%
TCNS 249	30	2017-2024	8	31%
Tiger1 (Tiger1-G4CE0070)	25	2018-2024	7	30%
TS26363411	5	2021-2022	2	21%
TS36363411	12	Gaps in Data	6	17%
Turkey Lake (North)	27	2017-2024	8	28%
Turkey Lake (South)	27	2017-2024	8	28%
Weohyakpakal	25	2018-2024	7	30%
West City Ditch at Hacienda Circle	28	2017-2024	8	29%

## Appendix B: TRA Tabulated Results

Below are the tabulated TRA results as described in Section 2.4.

**Table B-1. TRA Results**

Subwatershed	Basin	Final TN Priority Category	Final TP Priority Category
East Lake Okeechobee	C-44/Basin 8/S-153	2	1
East Lake Okeechobee	L-8	1	1
Fisheating Creek	Fisheating Creek/L-61	1	1
Fisheating Creek	Nicodemus Slough North	Insufficient Data	Insufficient Data
Indian Prairie	C-40	1	1
Indian Prairie	C-41	1	1
Indian Prairie	C-41A	1	1
Indian Prairie	L-48	2	3
Indian Prairie	L-49	3	3
Indian Prairie	L-59E	1	1
Indian Prairie	L-59W	2	2
Indian Prairie	L-60E	2	1
Indian Prairie	L-60W	1	2
Indian Prairie	L-61E	1	1
Indian Prairie	S-131	3	2
Lake Istokpoga	Arbuckle Creek	2	3
Lake Istokpoga	Josephine Creek	Insufficient Data	3
Lake Istokpoga	Lake Arbuckle	3	3
Lake Istokpoga	Lake Istokpoga	2	1
Lower Kissimmee	Kissimmee River	Insufficient Data	Insufficient Data
Lower Kissimmee	S-65A	2	3
Lower Kissimmee	S-65E	3	1
South Lake Okeechobee	715 Farms (Culv 12A)	Insufficient Data	Insufficient Data
South Lake Okeechobee	East Beach DD (Culv 10)	2	3
South Lake Okeechobee	East Shore DD (Culv 12)	Insufficient Data	Insufficient Data
South Lake Okeechobee	S2	1	3
South Lake Okeechobee	S-3	1	3
South Lake Okeechobee	S-4	1	1
South Lake Okeechobee	S-5A Basin (S-352-WPB Canal)	2	Insufficient Data
South Lake Okeechobee	South FL Conservancy DD (S-236)	Insufficient Data	Insufficient Data
South Lake Okeechobee	South Shore/ So. Bay DD (Culv 4A)	Insufficient Data	Insufficient Data
Taylor Creek/Nubbin Slough	S-133	1	1
Taylor Creek/Nubbin Slough	S-135	1	1
Taylor Creek/Nubbin Slough	S-154	1	1
Taylor Creek/Nubbin Slough	S-154C	1	1
Taylor Creek/Nubbin Slough	S191	1	1

Subwatershed	Basin	Final TN Priority Category	Final TP Priority Category
Upper Kissimmee	Alligator Lake	Insufficient Data	Insufficient Data
Upper Kissimmee	Boggy Creek	3	2
Upper Kissimmee	Catfish Creek	2	3
Upper Kissimmee	East Lake Tohopekaliga	3	3
Upper Kissimmee	Horse Creek (Closed Basin)	3	3
Upper Kissimmee	Lake Conlin (Closed Basin)	Insufficient Data	Insufficient Data
Upper Kissimmee	Lake Cypress	3	3
Upper Kissimmee	Lake Gentry	3	3
Upper Kissimmee	Lake Hart	Insufficient Data	Insufficient Data
Upper Kissimmee	Lake Hatchineha	3	3
Upper Kissimmee	Lake Jackson	Insufficient Data	Insufficient Data
Upper Kissimmee	Lake Kissimmee	2	1
Upper Kissimmee	Lake Marian	Insufficient Data	Insufficient Data
Upper Kissimmee	Lake Marion	Insufficient Data	Insufficient Data
Upper Kissimmee	Lake Myrtle	Insufficient Data	Insufficient Data
Upper Kissimmee	Lake Pierce	2	3
Upper Kissimmee	Lake Rosalie	Insufficient Data	Insufficient Data
Upper Kissimmee	Lake Tohopekaliga	Insufficient Data	3
Upper Kissimmee	Lake Weohyakapka	3	3
Upper Kissimmee	Lower Reedy Creek	3	3
Upper Kissimmee	Marion Creek	3	3
Upper Kissimmee	S63A	Insufficient Data	Insufficient Data
Upper Kissimmee	Shingle Creek	Insufficient Data	3
Upper Kissimmee	Tiger Lake	2	1
Upper Kissimmee	Upper Reedy Creek	Insufficient Data	Insufficient Data
West Lake Okeechobee	East Caloosahatchee	1	3
West Lake Okeechobee	Hicpochee North	Insufficient Data	Insufficient Data
West Lake Okeechobee	Nicodemus Slough South	Insufficient Data	Insufficient Data