Focus Assessment Report: Upper Kissimmee Subwatershed

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Steffany Olson, Santiago Acevedo, Cristina Gauthier, Amanda McDonald, Stephanie Nevadunsky, and Youchao Wang[1]

INTRODUCTION

BACKGROUND

The Northern Everglades and Estuaries Protection Program (NEEPP; Section 373.4595, Florida Statutes) directs the South Florida Water Management District (SFWMD) in cooperation with the Florida Department of Environmental Protection (FDEP) and the Florida Department of Agriculture and Consumer Services (FDACS), collectively referred to as the Coordinating Agencies, and local entities, to complete a watershed protection plan (WPP) for the Lake Okeechobee Watershed (LOW). In 2020, SFWMD began the process of reviewing all the Northern Everglades WPPs annually and committed at the February 11, 2021, SFWMD Governing Board meeting to complete basin-specific assessments in areas identified to be the highest priority for action as part of the watershed protection planning process. The purpose of the assessments is to gather information to pinpoint the most significant nutrient loading sources contributing to the water quality problems, determine what remains to be done to improve water quality, and recommend strategic actions for future planning. Information from the assessments will be used to provide information for requests for project proposals, update the WPPs and to inform future FDEP Lake Okeechobee Basin Management Action Plan (BMAP) updates. This report documents the assessment for the Upper Kissimmee Subwatershed. For the period of Water Years (WY) 2020-2024 (May 1, 2019 – April 30, 2024), the Upper Kissimmee had the highest runoff volume in the LOW (Olson et al. 2025) which is why it was selected for an assessment.

LOCATION OF SUBWATERSHED

The Upper Kissimmee Subwatershed is located at the northern-most end of the LOW (**Figure 1**). The Upper Kissimmee Subwatershed is the largest of the nine subwatersheds, covering 1,019,713 acres

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approximately one-third of the LOW. It is primarily located in Osceola County but also includes portions of Polk, Orange, and Lake counties.

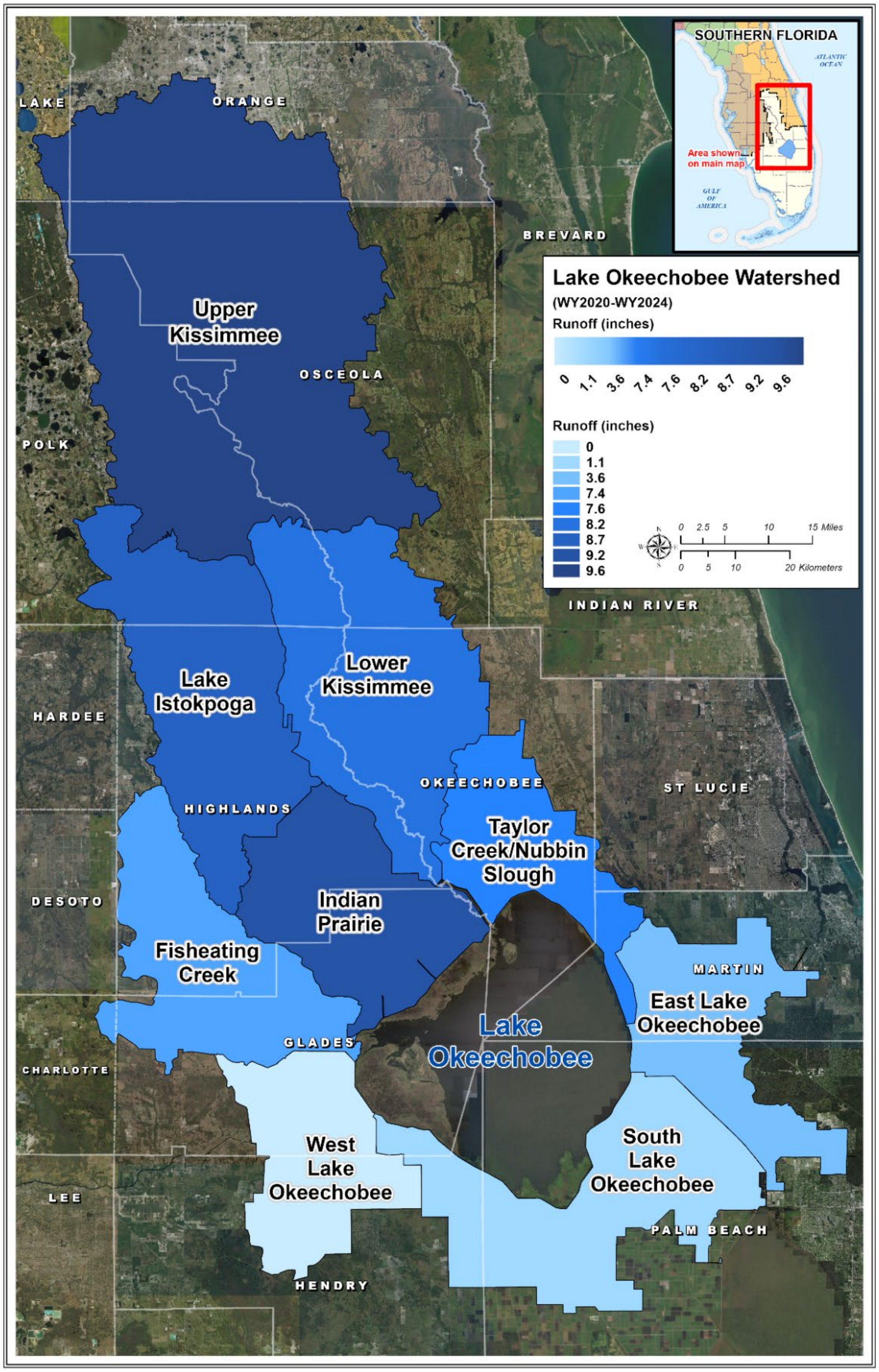


Figure 1. Runoff in inches from the subwatersheds in the LOW.

NUTRIENT AND STORAGE TARGETS

In the LOW, total phosphorus (TP) SFWMD planning targets were developed in consultation with FDEP in 2023 (Olson 2023). The methodology is based on the proportion of the TP load contributed by the subwatershed during the 5-year period from WY2014–WY2018 (May 1, 2013–April 30, 2018), as reported in Table 8B-8 of the 2019 South Florida Environmental Report – Volume I, Chapter 8 (Welch et al. 2019), and the TP total maximum daily load (TMDL) for Lake Okeechobee of 105 metric tons per year (t/yr) based on a 5-year moving average (FDEP 2001). This is the same methodology FDEP used to establish subwatershed targets in the 2020 Lake Okeechobee BMAP (FDEP 2020) and the SFWMD subwatershed planning targets are identical to the subwatershed targets in that document. The TP planning target load for the Upper Kissimmee Subwatershed is 15.9 t/yr based on a 5-year moving average (**Table 1**)**.** The purpose of the planning targets is to allow an assessment of existing and proposed projects and programs to determine where additional load reduction efforts are needed.

Table 1. TP Load (WY2014-WY2018), Percent Contribution, and TP Planning Target for the Upper Kissimmee Subwatershed.

Subwatershed	WY2014–WY2018 TP Load (t/yr)	% Contribution of Load	TP Target (t/yr)
Upper Kissimmee	90.5	15	15.9
Total Load to Lake from all 9 Subwatersheds[a]	598.4	100	105.0

[a]Does not include atmospheric deposition.

The TMDL for Lake Okeechobee does not address nitrogen, although it is a concern for Lake Okeechobee (Welch et al. 2025) as well as the downstream Caloosahatchee and St. Lucie Rivers which receive lake water and have TMDLs for nitrogen (Bailey et al. 2009 and Parmer et al. 2008, respectively). While there are no nitrogen planning targets for the Upper Kissimmee Subwatershed, the Lake Okeechobee BMAP (FDEP 2020) identified where nitrogen could be reduced through projects and programs and evaluated the total nitrogen (TN) concentrations against the benchmark of the numeric nutrient criteria (NNC) of 1.54 mg/L (FDEP 2012) to determine the targeted restoration area (TRA) TN priority for the LOW basins. This benchmark is one of four metrics used in the TRA evaluation. As part of FDEP's TRA process each basin is given a rank of 1 (highest priority), 2 (next highest priority) or 3 (to be addressed as resources allow). In the Upper Kissimmee Subwatershed, 25 basins (**Figure 2**) were evaluated for TN as part of the 2020 BMAP and the 2024 Five-Year Review of the Lake Okeechobee BMAP (FDEP 2024a). Out of the 25 basins, the Lake Kissimmee Basin (S65[2]) was ranked 2 (next highest priority after 1) and Catfish Creek, Tiger Lake, and Lake Pierce were changed from priority 3 in the 2020 BMAP to priority 2 in the Five-Year review. The other basins were either priority 3 or had insufficient data to be prioritized.

Specific storage targets have not been assigned for the Upper Kissimmee Subwatershed. The Phase II Technical Plan for the Lake Okeechobee Watershed Construction project was required by the NEEPP statute to design projects and identify additional measures needed to improve water quality and quantity, and it identified a static storage target (project capacity) range for the LOW to be 900,000 to 1,300,000 ac-ft/yr (SFWMD et al. 2008) but no specific targets were provided at the subwatershed level. In 2015, an independent technical review completed by the University of Florida Water Institute recommended conducting a strategic planning exercise to provide for additional water storage and treatment north of Lake

[2] Structures are typically labelled with a dash (S-65) but to avoid confusion with the nomenclature used to retrieve data from DBHydro and to be consistent, the dash was not used throughout this document.

Okeechobee (University of Florida, 2015). As part of the 2025 Lake Okeechobee Watershed Protection Plan (LOWPP) update, storage targets were reevaluated in the Northern Everglades Watersheds. This effort built on the work completed for the Phase II Technical Plan (SFWMD et al. 2008) and the accompanying Estuary WPPs published in 2009 (SFWMD et al. 2009a and SFWMD 2009b). The results indicated that there is a range of 481,000 to 881,000 ac-ft of unmet storage capacity needs in the LOW (Frye et al. 2025).

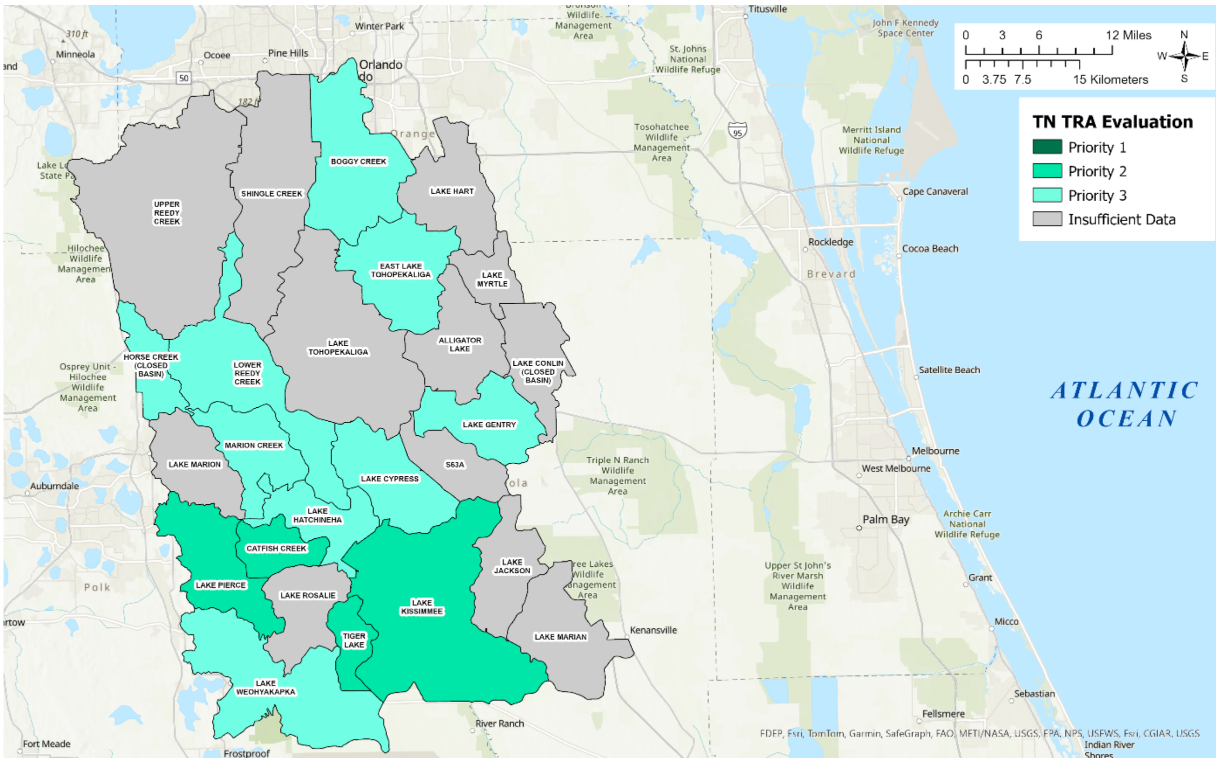


Figure 2. Upper Kissimmee Subwatershed basins evaluated by FDEP for nonpoint TN pollutant sources (FDEP 2024a).

SUBWATERSHED/BASIN OVERVIEW

HYDROLOGY

The Upper Kissimmee Subwatershed is the northern-most subwatershed in the LOW (**Figure 1**). Spanning 1,019,713 acres, it contains the "Upper Chain of Lakes" which is a series of several lakes that flow from one to the other with small, gated structures controlling flow into and out of the larger lakes (**Figure 3**). Flow direction is generally towards the central north-south axis and then south. Outflows from the subwatershed are controlled by the S65 structure located immediately downstream of Lake Kissimmee along the C-38 Canal, otherwise known as the Kissimmee River. Because of the number and size of the lakes, the Upper Kissimmee Subwatershed is 49% natural area but also includes 27% agricultural land uses and 24% non-agricultural land uses (**Figure 4**).

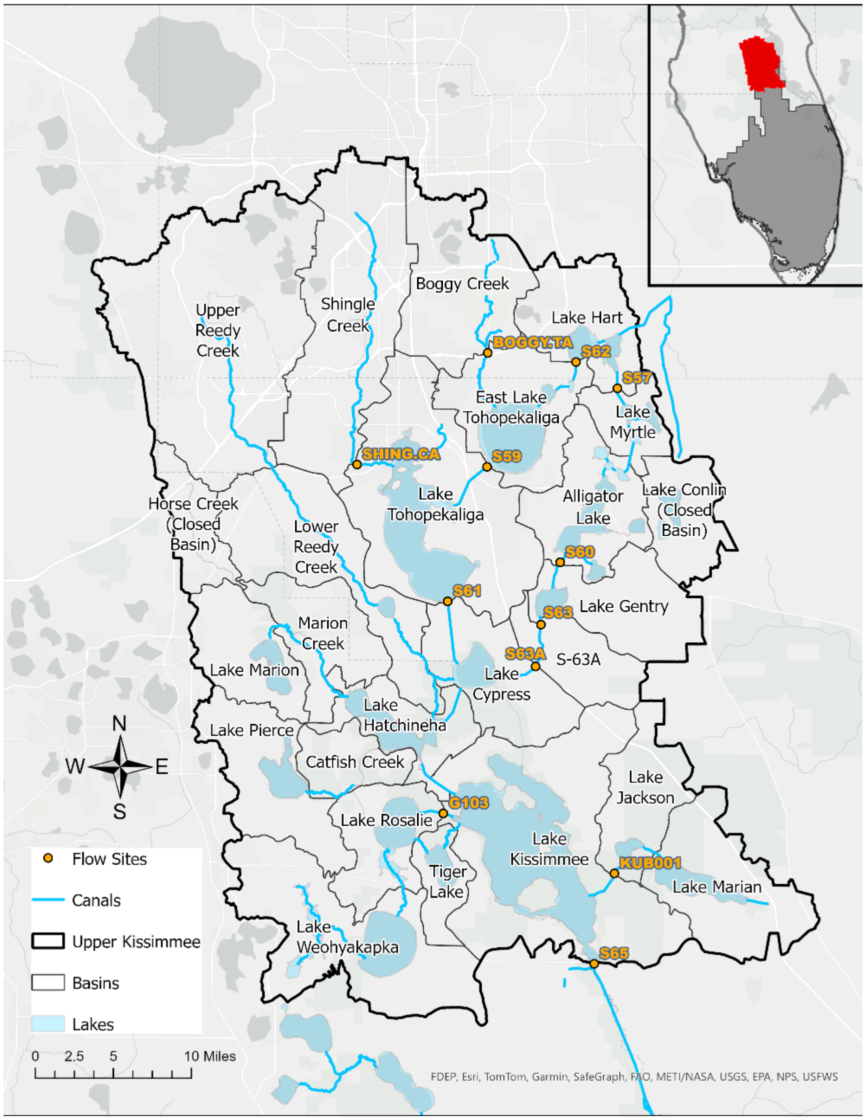


Figure 3. Hydrology of the Upper Kissimmee Subwatershed.

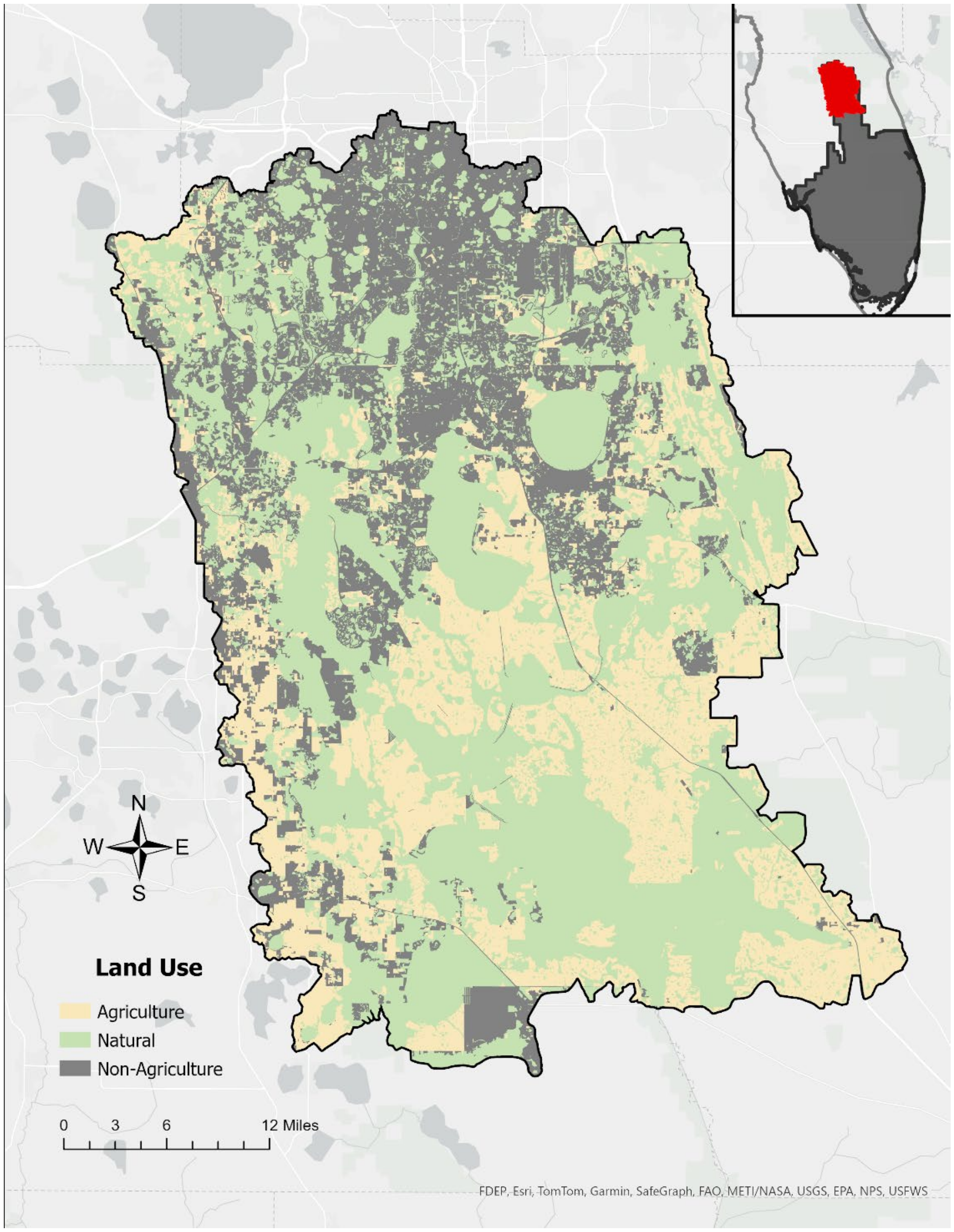


Figure 4: Land use within the Upper Kissimmee Subwatershed.

Flood Prone Basins

According to SFWMD modelers and water managers, areas within the Upper Kissimmee that have been vulnerable to storm induced rain events include Lake Hart Basin, East Lake Tohopekaliga Basin, and Lake Myrtle Basin (**Figure 3**; J. Godin, personal communication January 21, 2025). Additionally, areas of flooding vulnerability were identified near Lake Ajay in the Lake Tohopekaliga Basin (**Figure 5**), areas on the northwest side of Lake Hatchineha in the Lake Hatchineha Basin (**Figure 6**) and areas north of Lake Rosalie in the Lake Rosalie Basin (**Figure 7**; M. Ansar, personal communication, January 21, 2025). These areas were identified to determine where additional storage projects may assist with capturing localized runoff.

Figure 5. Flood prone area north of Lake Ajay.

Figure 6. Flood prone area northwest of Lake Hatchineha.

Figure 7. Flood prone area north of Lake Rosalie.

Lakes with TMDLs

Six lakes within the Upper Kissimmee Subwatershed have TMDLs established and one (Tiger Lake) is on the TMDL 2024-2026 priority list. Most were established through modeling finalized in 2013, but Lake Marion and Lake Pierce were updated in 2020 and use different units (7-year average of annual loads in kg/yr rather than annual loads in lbs/yr). The details summarized from Florida Administrative Code 62-304.515 Kissimmee River Basin TMDLs as of 2022 are found in **Table 2**. Note the second and third columns present the TP and TN TMDLs in the units used by FDEP to establish them.

Table 2. Current TMDLs within the Upper Kissimmee Subwatershed and their metric ton equivalents

Water Body	TP TMDL	TN TMDL	TP TMDL (t/yr)	TN TMDL (t/yr)
Lake Cypress	51,175 lbs/yr	1,374,801 lbs/yr	23.21	623.60
Lake Marion[a]	1,252 kg/yr	34,031 kg/yr	1.25	34.03
Lake Pierce[a]	1,398 kg/yr	35,840 kg/yr	1.40	35.84
Lake Kissimmee	126,517 lbs/yr	2,795,484 lbs/yr	57.39	1,268.01
Lake Jackson	5,553 lbs/yr	118,662 lbs/yr	2.52	53.82
Lake Marian	6,013 lbs/yr	88,122 lbs/yr	2.73	39.97

[a]While the other TMDLs are in annual loads (lbs/yr), Lake Marion and Lake Pierce are calculated as 7-year average of annual loads in kg/yr.

Headwaters Revitalization Schedule

The Kissimmee River Headwaters Revitalization Schedule (HRS) is an initiative to provide necessary flows for the restoration of the Kissimmee River ecosystem while maintaining the existing level of flood control within the Kissimmee River Basin that will impact the hydrology of the Upper Kissimmee Basin. It was authorized alongside the Kissimmee River Restoration Project (KRR) in 1992. Construction for the KRR was completed in 2021 (Koebel et al., 2025). The HRS includes modifications to the operating criteria of structures S65, S65A, and S65D; and real estate acquisition around Lakes Kissimmee, Cypress, and Hatchineha (USACE and SFWMD 2024). It will be implemented in phases to hold more water in Lakes Kissimmee, Cypress and Hatchineha. The HRS is also designed to increase littoral wetland habitat around the lakes. Other flood risk management measures include modifications to structure S65 to increase release capacity and widening of the C-36 and C-37 Canals (USACE and SFWMD, 2024). Most of the land acquisitions are completed and the projects to increase the conveyance capacity have been completed (Koebel et al., 2025). The HRS will allow lake water levels to rise up to 1.5 ft higher than the current S65 Interim Schedule to increase the combined water storage capacity of Lakes Kissimmee, Hatchineha, Cypress, and Tiger by approximately 100,000 ac-ft. This will allow storage of sufficient water to more closely approximate the historic flows needed for restoration of the downstream Kissimmee River and its floodplain wetlands. The first phase, Increment 1, began in 2024 and full implementation of the HRS is projected for 2027 (Koebel et al. 2025).

ELEVATION

The Upper Kissimmee Subwatershed has elevations ranging from approximately 17 feet to 301 feet NAVD88 **(Figure 8).** Higher elevations are concentrated in the western and northern portions along the Lake Wales Ridge, where the land rises noticeably. Lower elevations are primarily found in the southern and central areas, creating a natural gradient that gently slopes southward.

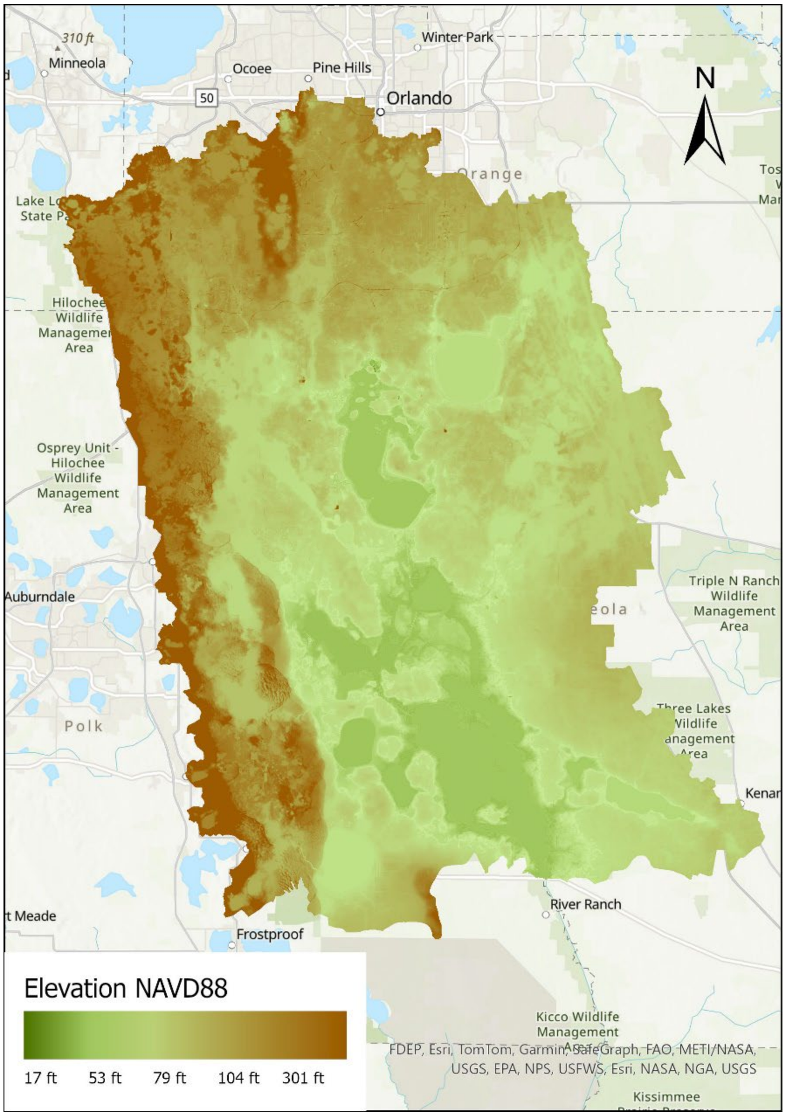


Figure 8. NAVD88 ground surface elevation of the Upper Kissimmee Subwatershed.

WATER AVAILABILITY

Water availability refers to both the quantity and timing of flows potentially accessible for projects, relative to watershed objectives and project operations. A water availability analysis was performed for the Lake Okeechobee Watershed Upper Kissimmee Subwatershed for WY2015 – WY2024 (May 1, 2014 – April 30, 2024). This analysis is reflective of a flow-frequency assessment, characterizing the statistical occurrence and magnitude of hydrologic flows, and is not a quantification of water available for consumptive or other extractive uses. It should not be interpreted as representing water that can be withdrawn without reducing downstream or ecological flows. The analysis presents flow data from 12 of the 25 Upper Kissimmee basins. Measurement of flow was not available for the remaining 13 basins. The monitoring stations and basins considered for the analysis are shown in **Table 3.** Adequate representation of water availability for the Upper Kissimmee Subwatershed by site required combining multiple station flows. Flows presented do not include non-recorded emergency discharges that may have happened as a result of storm events. The sites presented in this analysis are depicted in **Figure 3**.

Table 3. Upper Kissimmee Subwatershed Flow Monitoring Stations in DBHydro.

<table>
<tr><th>Site</th><th>Station</th><th>DBKey</th></tr>
<tr><td colspan="3">Boggy Creek Basin</td></tr>
<tr><td>BOGGY.TA</td><td>BOGGY.TA</td><td>00113</td></tr>
<tr><td colspan="3">Lake Hart Basin</td></tr>
<tr><td>S62</td><td>S62_S</td><td>91626</td></tr>
<tr><td colspan="3">Lake Myrtle</td></tr>
<tr><td>S57</td><td>S57_C</td><td>91615</td></tr>
<tr><td colspan="3">Shingle Creek Basin</td></tr>
<tr><td>SHING.CA</td><td>SHING.CA</td><td>134</td></tr>
<tr><td colspan="3">East Lake Tohopekaliga</td></tr>
<tr><td>S59</td><td>S59_S</td><td>91618</td></tr>
<tr><td colspan="3">Alligator Lake Basin</td></tr>
<tr><td>S60</td><td>S60_S</td><td>91624</td></tr>
<tr><td colspan="3">Lake Tohopekaliga Basin</td></tr>
<tr><td rowspan="2">S61</td><td>S61_S</td><td>91625</td></tr>
<tr><td>S61_LCK</td><td>WZ171</td></tr>
<tr><td colspan="3">Lake Gentry</td></tr>
<tr><td>S63</td><td>S63_S</td><td>91628</td></tr>
<tr><td colspan="3">Canoe Creek S63A Basin</td></tr>
<tr><td>S63A</td><td>S63A_S</td><td>91627</td></tr>
<tr><td colspan="3">Lake Rosalie Basin</td></tr>
<tr><td>G103</td><td>G103_S</td><td>39274</td></tr>
<tr><td colspan="3">Lake Jackson Basin</td></tr>
<tr><td>KUB001</td><td>KUB001_I</td><td>91317</td></tr>
<tr><td colspan="3">Lake Kissimmee Basin</td></tr>
<tr><td rowspan="2">S65</td><td>S65_S</td><td>91658</td></tr>
<tr><td>S65_LCK</td><td>WZ443</td></tr>
</table>

The following sections summarize the water availability analysis for each of the sites. Specifically, flow percentiles and availability are used as the main metrics. Hydrographs show the daily flow data at each station over the period of record (POR – WY2015-WY2024), and the percentile graphs show the frequency that the observed flow exceeded a given rate (e.g., flow exceeds 500 cfs 2% of the time). This can be used as a general assessment on water availability for existing and/or planned projects.

Available flow is defined for this purpose as flows at and below the 90th percentile observed during the evaluation period. However, the 90th percentile does not capture substantial volumes stemming from the hydrologic variabilities in this subwatershed. The evaluation shows that volumes from extreme events, which encompass the broad seasonal hydrology of this subwatershed, are better captured at the 95th percentile. Any volumes exceeding the available flow might be partially addressed through stormwater detention, wetland restoration, and other passive methods. For the period of record evaluated, peak flows occurred following Hurricanes Irma (2017) and Ian (2022). These extreme events are observed in all the structure hydrographs.

BOGGY CREEK BASIN: BOGGY.TA SITE

BOGGY.TA is a USGS hydrometeorological monitoring site located along Boggy Creek, approximately 5.5 miles north of East Lake Tohopekaliga (**Figure 9**). The site monitors stage and flow of Boggy Creek. The flow hydrograph (**Figure 10**) for this site reveals regular fluctuations that result from the discharge of Boggy Creek Swamp and its tributaries, which meet just upstream of the monitoring station. Outliers in regular flow can be attributed to the previously mentioned disturbances following Hurricanes Irma and Ian, observed in all stations analyzed. For this POR, the measurements at BOGGY.TA had average and median flows of 102 and 54 cfs, respectively. The peak recorded flow (4,730 cfs) occurred on 9/29/2022 as a result of Hurricane Ian. Available flow was 237 cfs at the 90th percentile and 318 cfs at the 95th percentile. Zero-flow conditions did not occur for this POR (**Figure 11**).

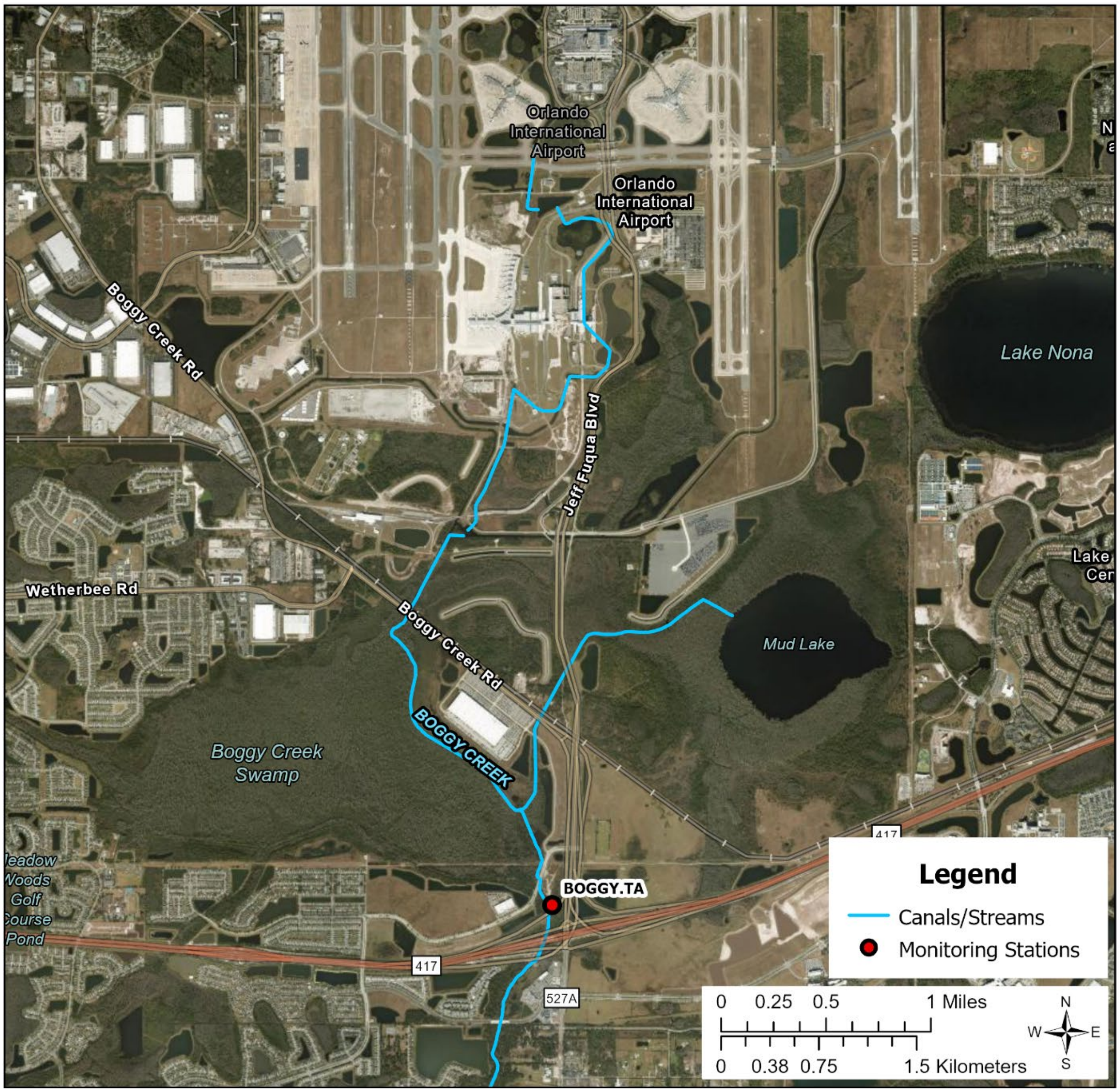


Figure 9. BOGGY.TA Flow Monitoring Station location.

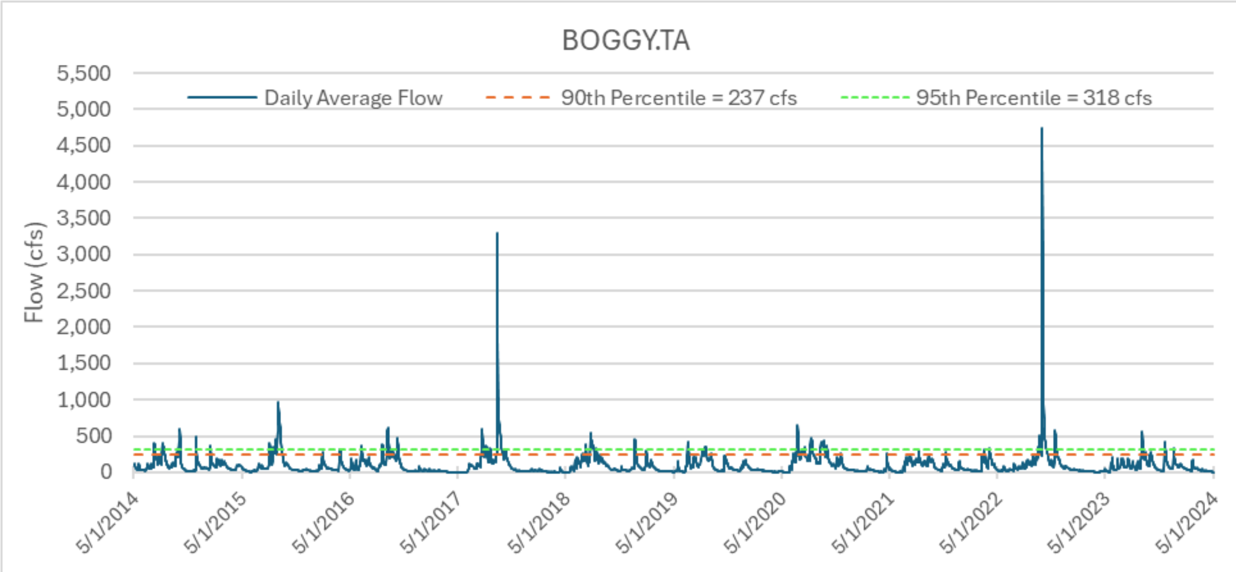


Figure 10. BOGGY.TA Monitoring Station Flow Hydrograph (data source: DBHydro).

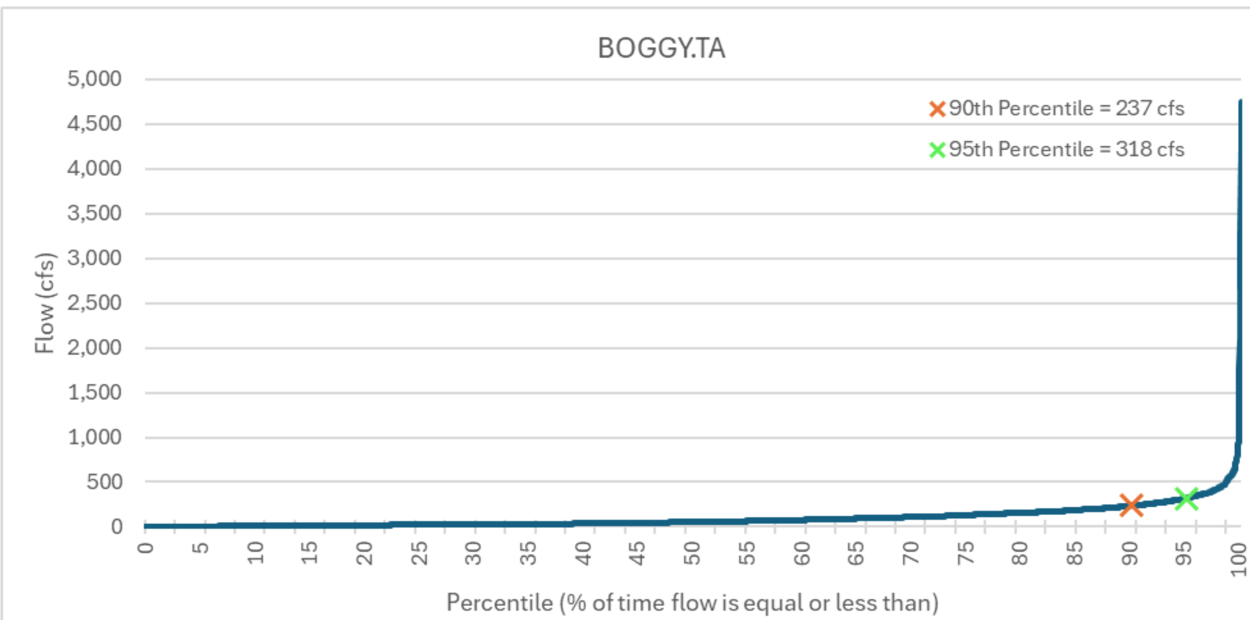


Figure 11. BOGGY.TA Exceedance Graph.

LAKE HART BASIN: S62 STRUCTURE

The S62 structure (**Table 3**) is a gated spillway located on C-29A Canal at the outlet of Lake Hart in Orange County (**Figure 12**). As the outlet for Lake Hart, this structure maintains optimum upstream water control stages in in Lake Hart, Lake Mary Jane, and the connecting C-29 Canal. It also maintains optimum upstream water control stages in C-29A Canal, acting as the headwater for this canal. The structure is operated in accordance with the Lake Hart-Mary Jane Regulation Schedule, and it is used to control upstream and downstream flood stages and velocities. The structure was originally designed to pass sufficient discharge during dry periods to maintain downstream stages and irrigation demands. The flow hydrograph (**Figure 13**) reveals regular fluctuations that result from the operational management of the structure, except for the previously mentioned disturbances following Hurricanes Irma and Ian. For this

POR, the discharge from S62 had average and median flows of 88 and 27 cfs, respectively. The peak discharge (1,393 cfs) occurred on 10/1/2022 as a result of Hurricane Ian. Available flow was 275 cfs at the 90th percentile and 402 at the 95th percentile. Zero-flow conditions occurred 36% of the time for this POR (**Figure 14**).

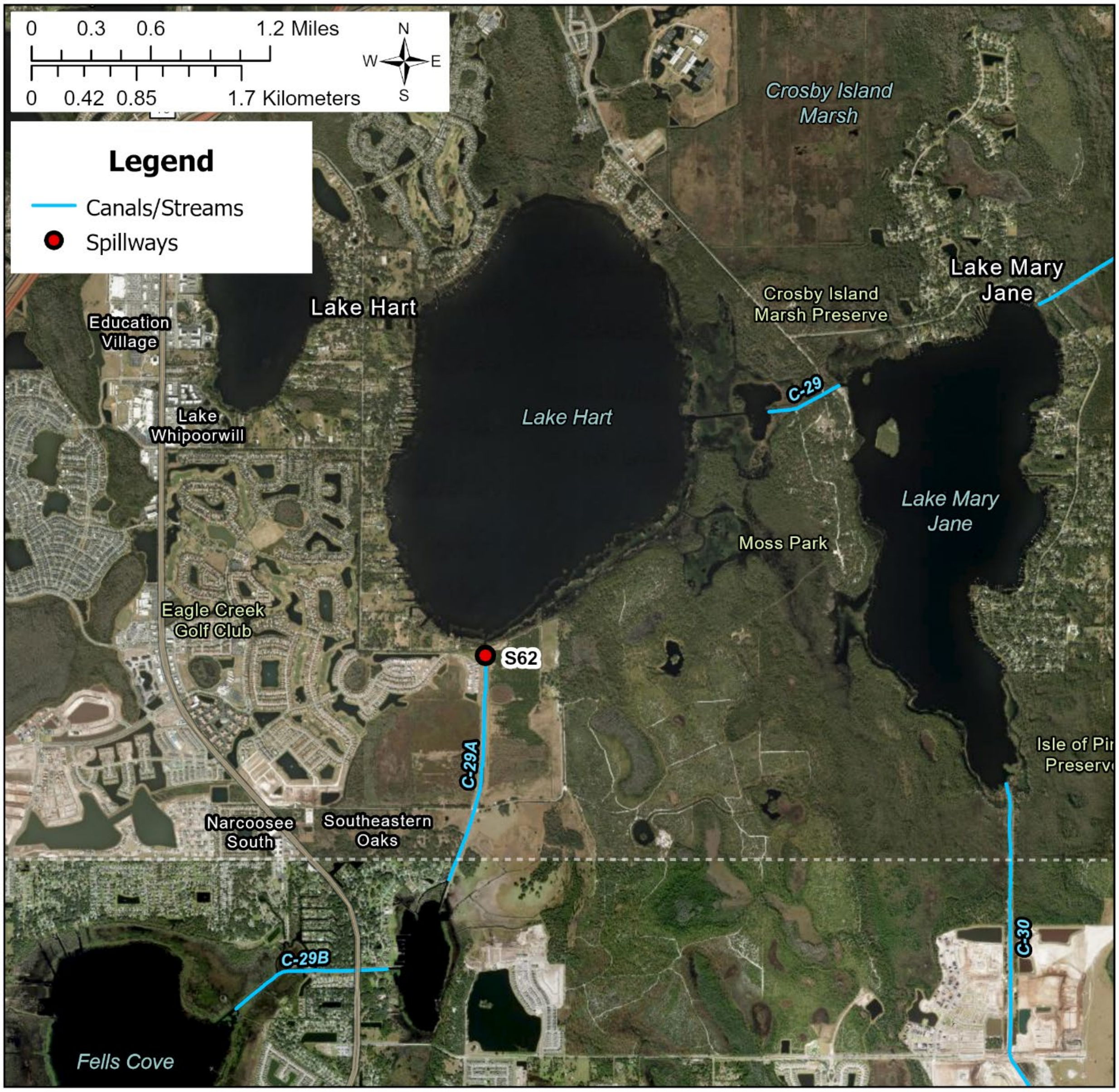


Figure 12. S62 Flow Monitoring Station location.

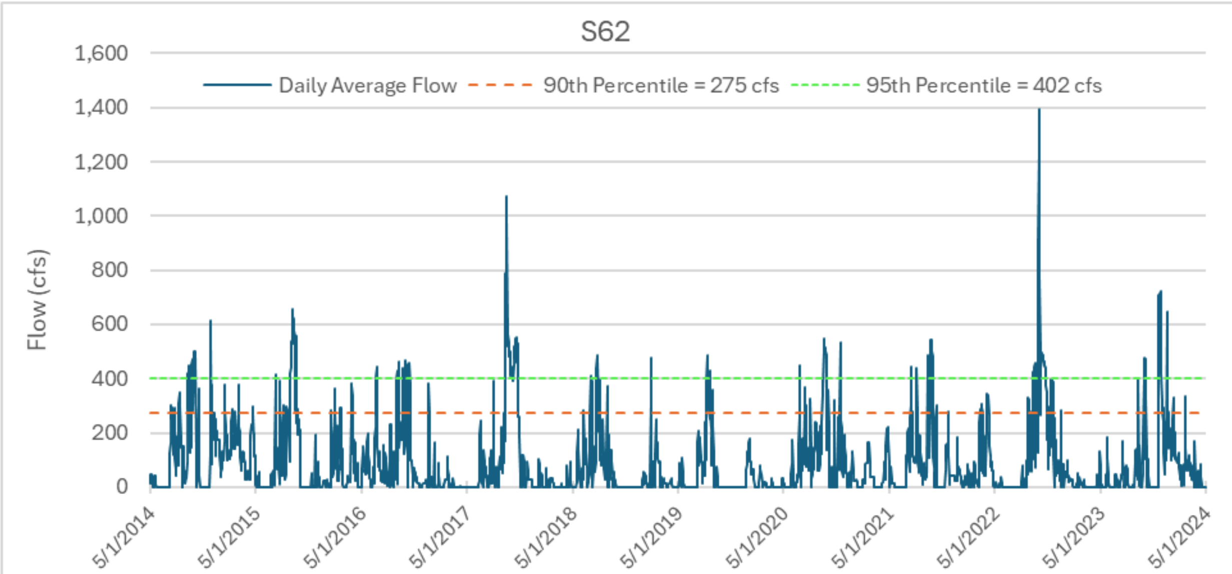


Figure 13. S62 Structure Flow Hydrograph (data source: DBHydro).

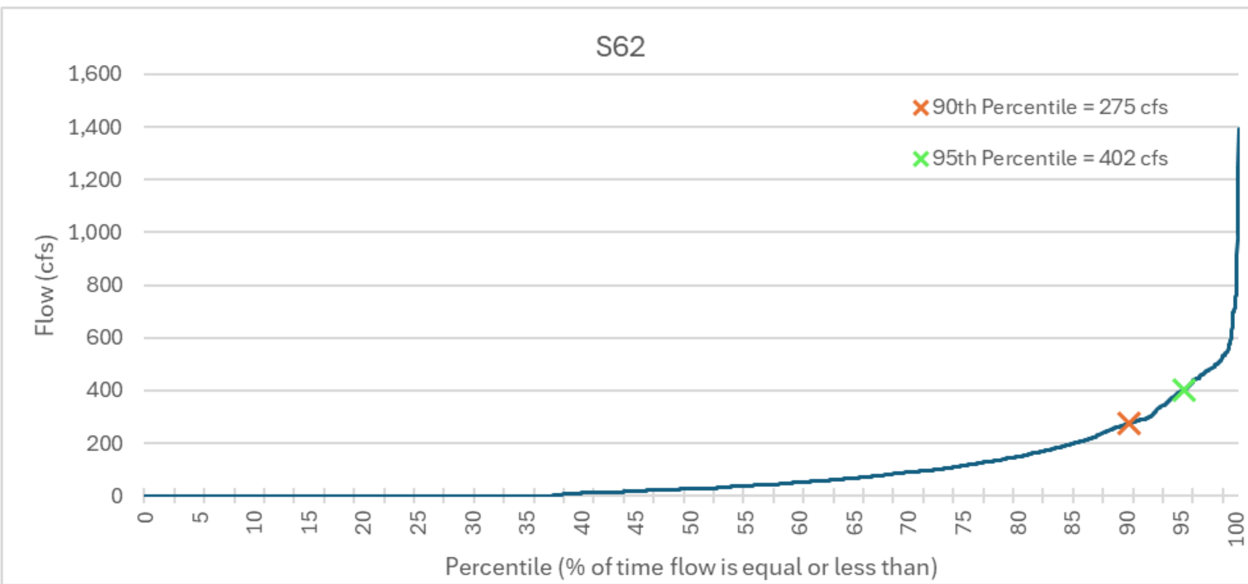


Figure 14. S62 Structure Exceedance Graph.

LAKE MYRTLE BASIN: S57 STRUCTURE

The S57 structure (**Table 3**) is a double-barreled corrugated metal pipe culvert located on C-30 Canal, downstream from Lake Myrtle (**Figure 15**). The structure consists of two (2) gates located on the south side of the structure and connecting Lakes Myrtle and Mary Jane in Osceola County. This structure is operated in accordance with the Lake Myrtle-Preston-Joel Regulation Schedule and maintains optimum upstream stages in C-30 Canal and in Lakes Myrtle, Preston, and Joel. It is also used to control upstream and downstream flood stages and velocities. The flow hydrograph (**Figure 16**) reveals fluctuations that result from the operational management of the structure in accordance with the Lake Myrtle-Preston-Joel Regulation Schedule, except for the previously mentioned disturbances following Hurricanes Irma and Ian. For the POR, the discharge from S57 had average and median flows of 30 and 10 cfs, respectively. The peak discharge (238 cfs) occurred on 10/10/2017 as a result of Hurricane Irma. A rain event on 11/16/2023 caused lake stage to increase above its regulation schedule. This resulted in the second highest discharge (222 cfs) for this structure due to operational discharges on 11/25/2023. Available flow was 92 cfs at the 90th percentile and 129 cfs at the 95th percentile. Zero-flow conditions occurred 36% of the time for this POR (**Figure 17**).

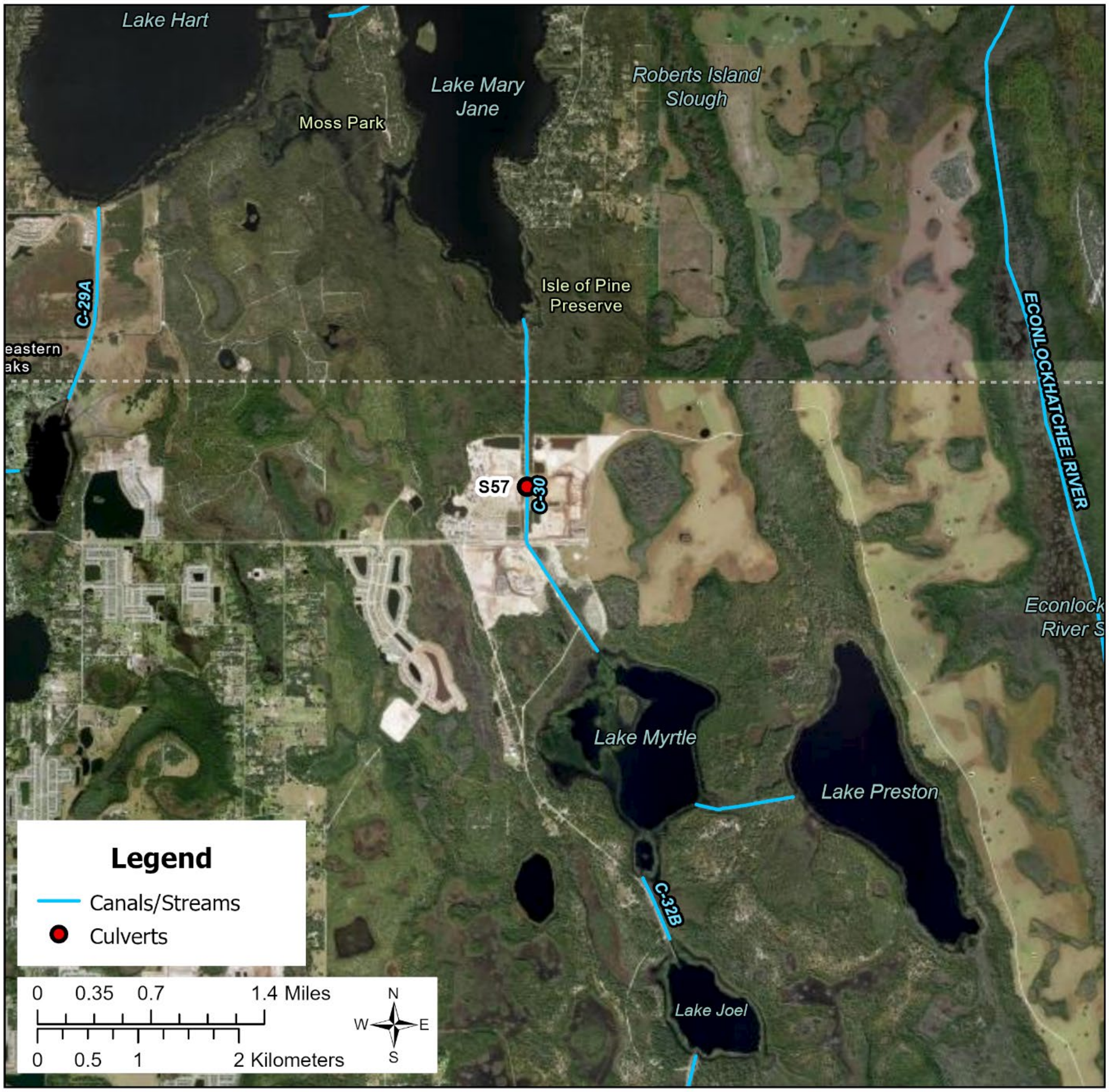


Figure 15. S57 Flow Monitoring Station location.

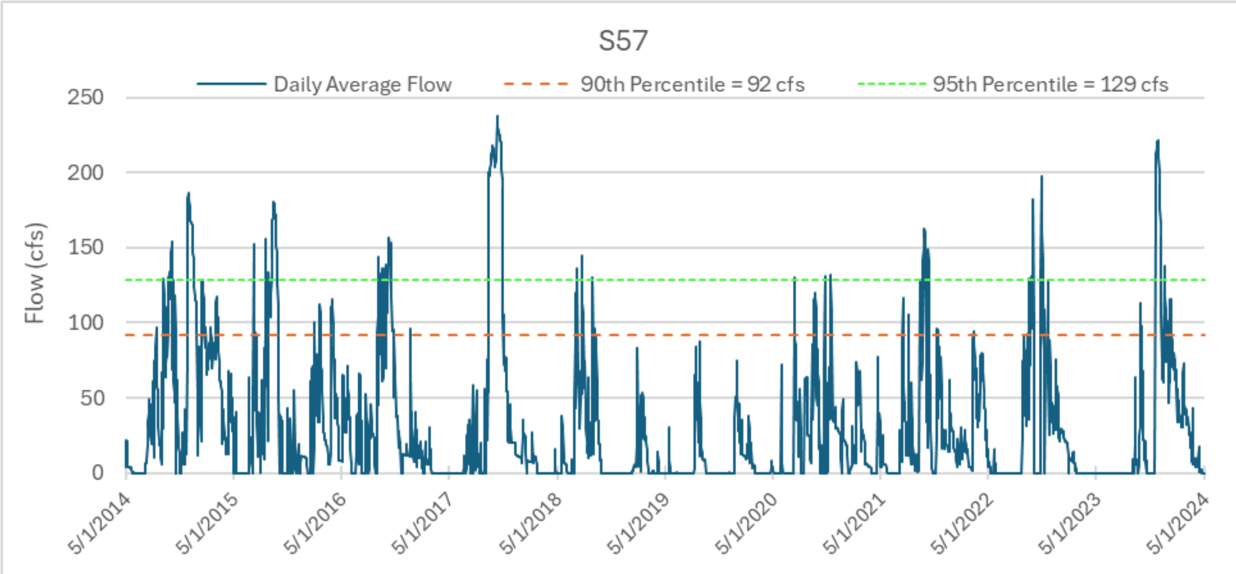


Figure 16. S57 Structure Flow Hydrograph (data source: DBHydro).

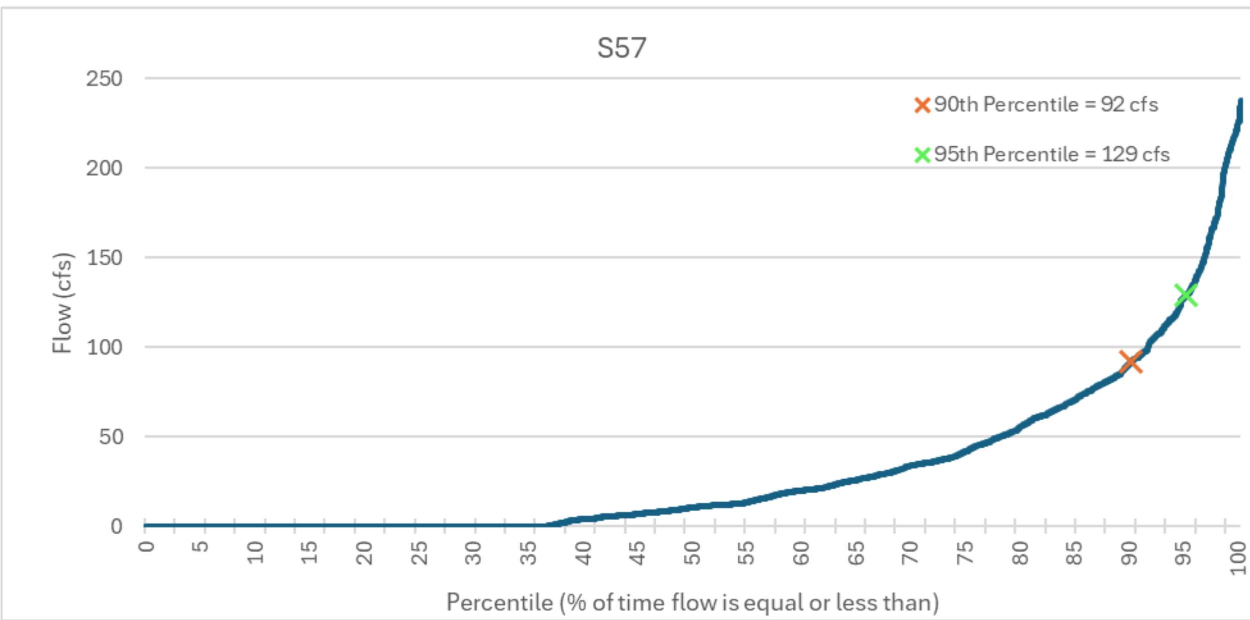


Figure 17. S57 Structure Exceedance Graph.

SHINGLE CREEK BASIN: SHING.CA SITE

SHING.CA is a USGS hydrometeorological monitoring site located along Shingle Creek, approximately 2 miles west (upstream) of Lake Tohopekaliga. The site monitors stage and flow of Shingle Creek (**Figure 18**).

The flow hydrograph (**Figure 19**) reveals regular fluctuations that result from the discharge of the Shingle Creek Basin. Outliers in the regular flow can be attributed to the previously mentioned disturbances following Hurricanes Irma and Ian that are observed in all structures and stations analyzed. For the analyzed POR, measurements at SHING.CA had average and median flows of 251 and 180 cfs, respectively. The peak recorded flow (3,750 cfs) occurred on 10/1/2022 as a result of Hurricane Ian. Available flow was 527 cfs at the 90th percentile and 665 at the 95th percentile. Zero-flow conditions occurred less than 1% of the time for this POR (**Figure 20**).

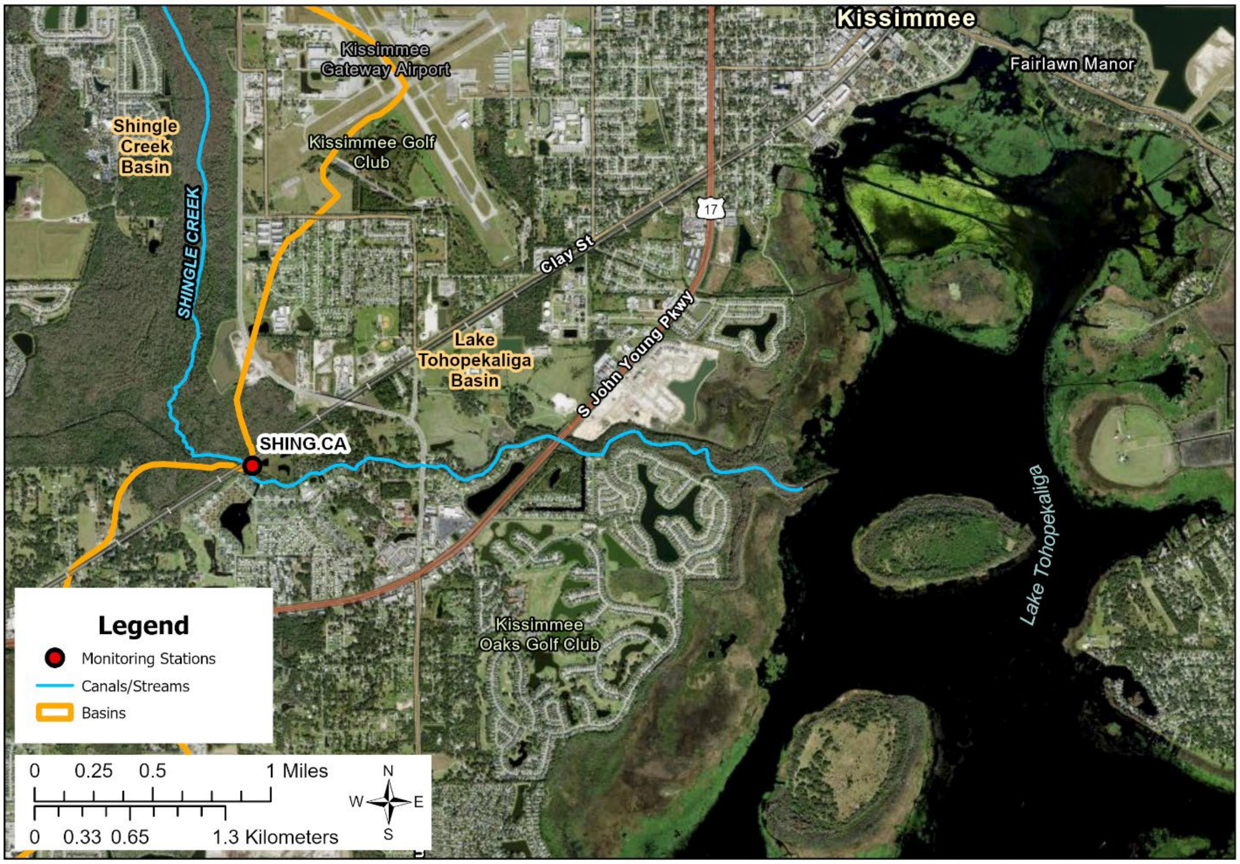


Figure 18. SHING.CA Flow Monitoring Station location.

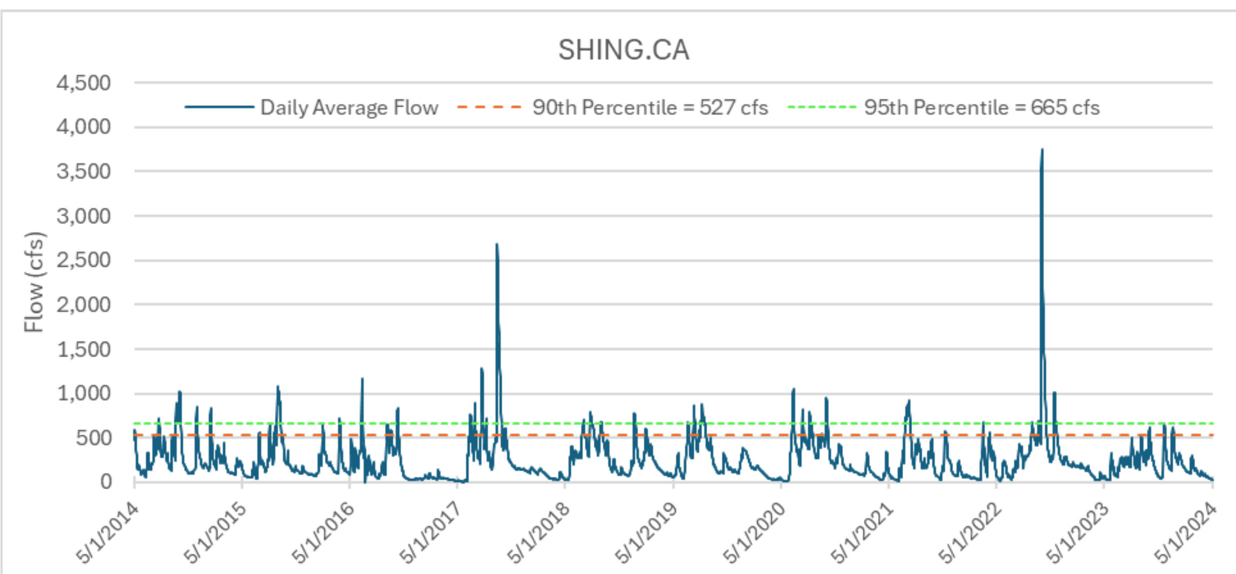


Figure 19. SHING.CA Site Flow Hydrograph (data source: DBHydro).

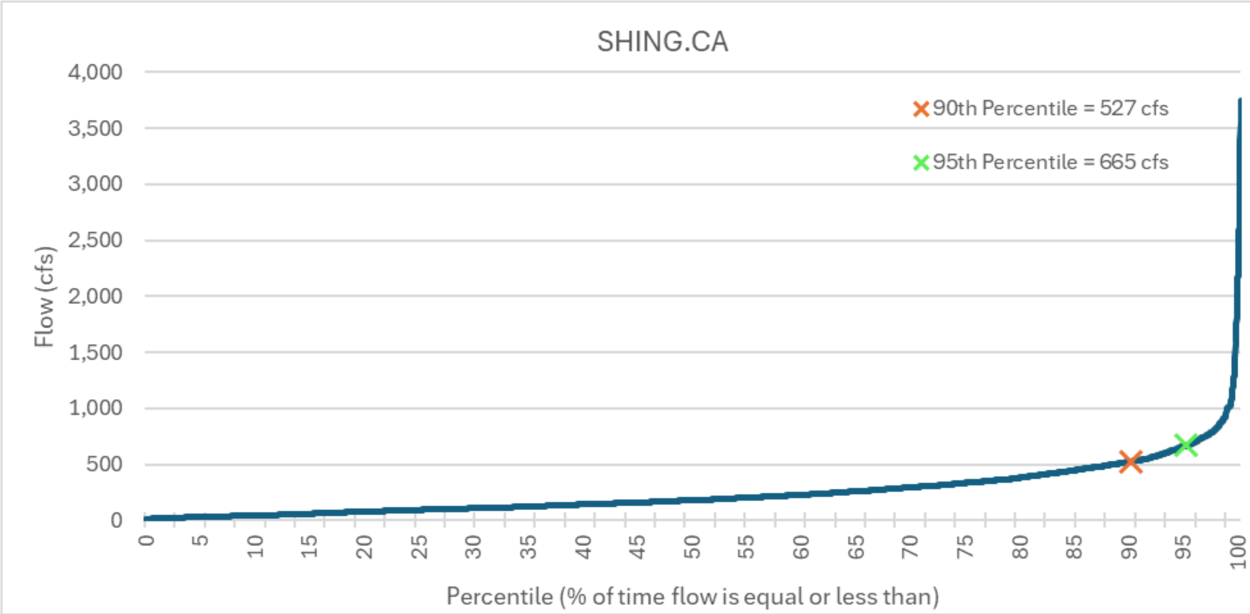


Figure 20. SHING.CA Site Exceedance Graph.

EAST LAKE TOHOPEKALIGA: S59 STRUCTURE

The S59 structure (**Table 3**) is a reinforced concrete gated spillway located on C-31 Canal and serves as the outlet of East Lake Tohopekaliga in Osceola County. This structure is operated in accordance with the East Lake Tohopekaliga Regulation Schedule to maintain optimum upstream stages in C-31 Canal and in East Lake Tohopekaliga (**Figure 21**). It is also used to control upstream and downstream flood stages and velocities. The structure was originally designed to pass sufficient discharge during dry periods to maintain downstream stages and irrigation demands. The flow hydrograph (**Figure 22**) reveals regular fluctuations that result from the operational management of the structure except for the previously mentioned disturbances following Hurricanes Irma and Ian. For the POR, discharge from S59 had average and median flows of 248 and 116 cfs, respectively. The peak discharge (1,931 cfs) occurred on 10/3/2022 as a result of Hurricane Ian. Available flow was 744 cfs at the 90th percentile and 964 cfs at the 95th percentile. Negative- and zero-flow conditions occurred 32% of the time for this POR (**Figure 23**).

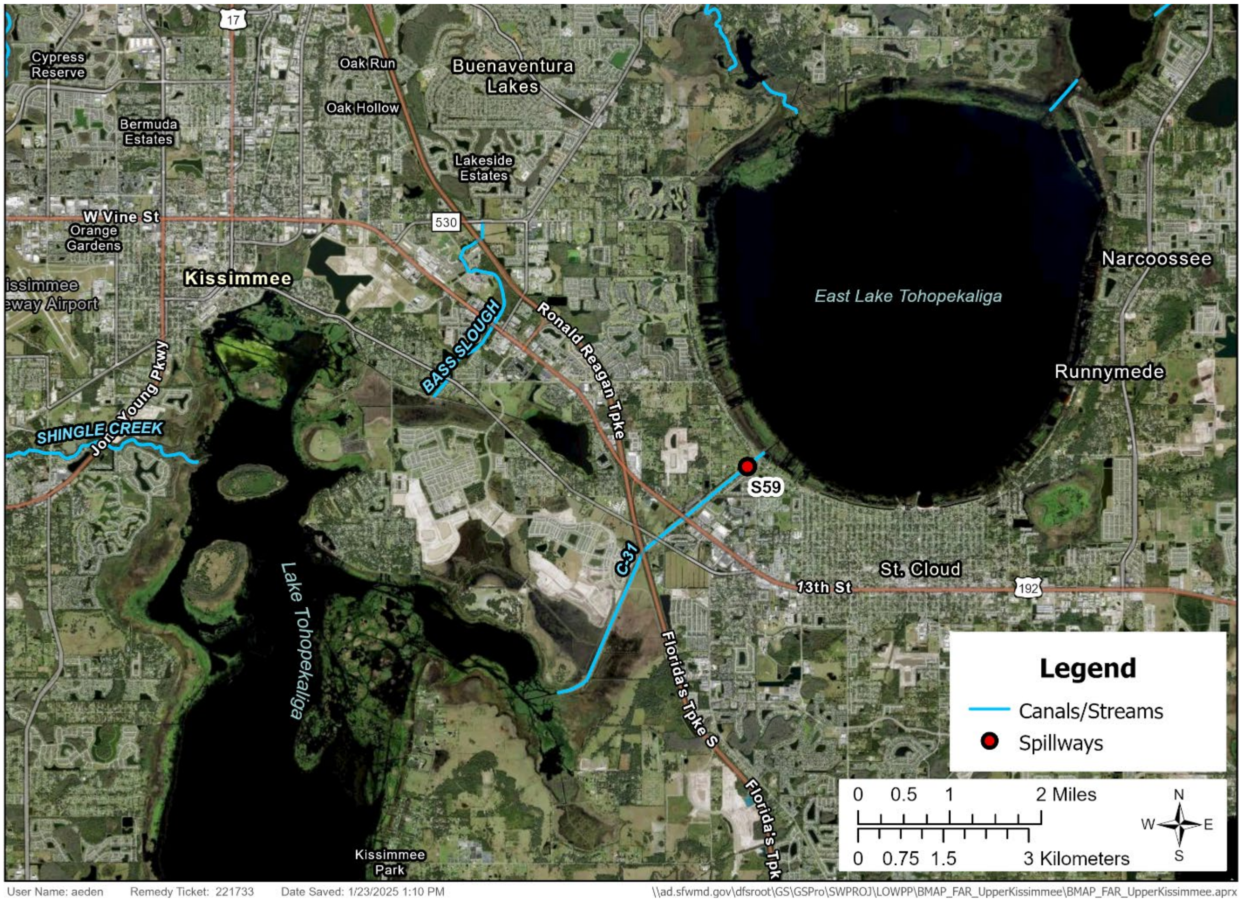


Figure 21. S59 Flow Monitoring Station location.

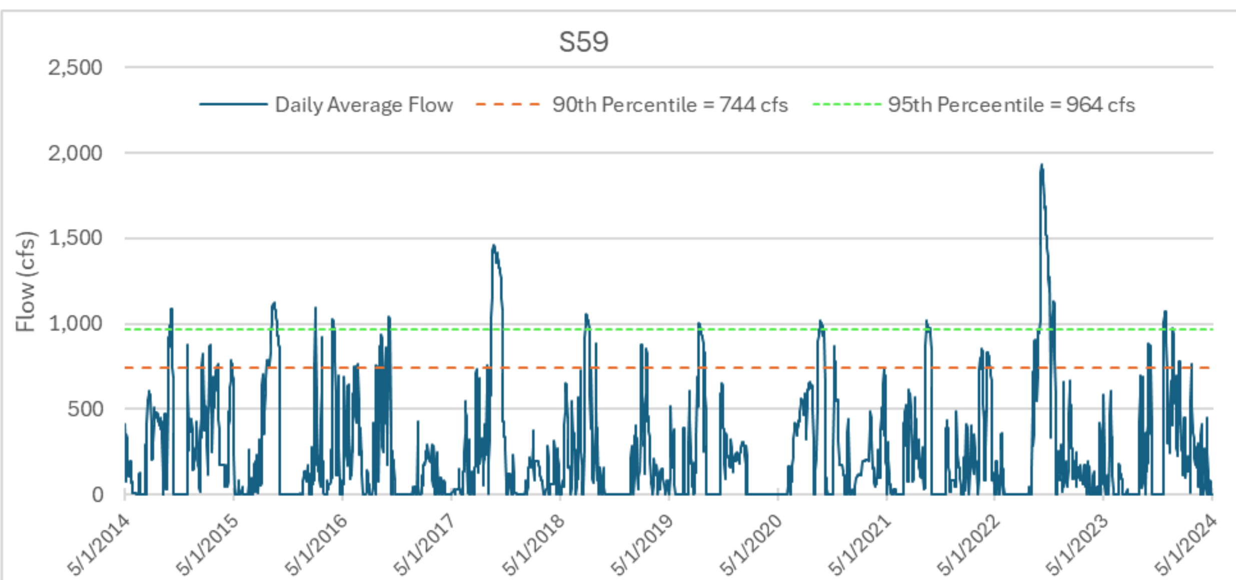


Figure 22. S59 Structure Flow Hydrograph (data source: DBHydro).

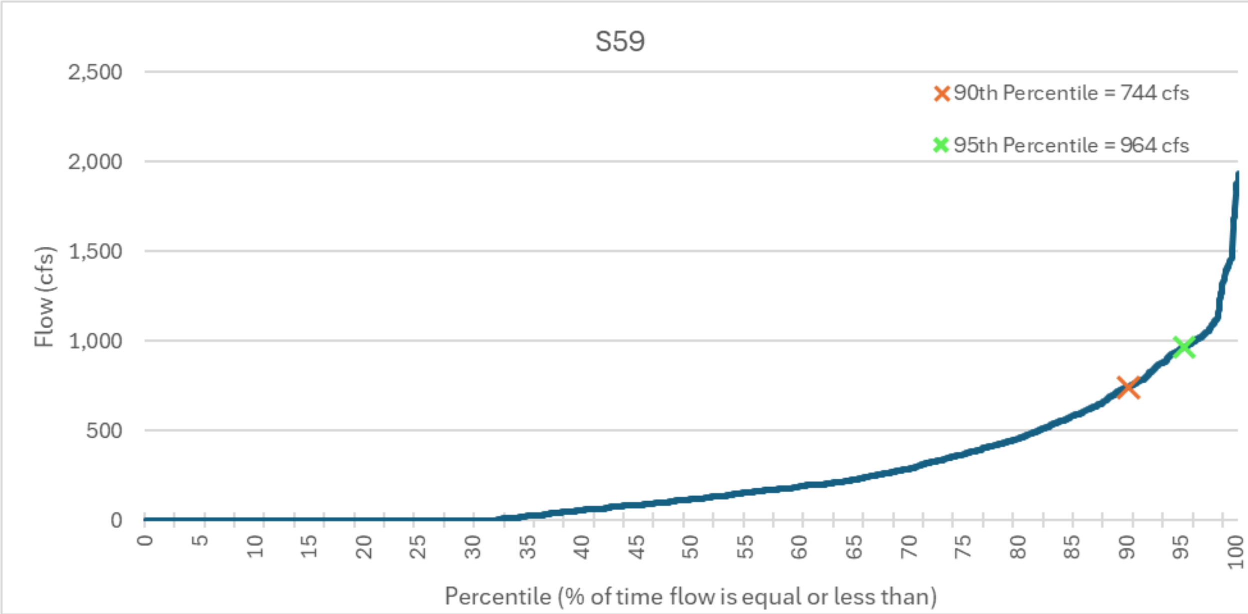


Figure 23. S59 Structure Exceedance Graph

ALLIGATOR LAKE BASIN: S60 STRUCTURE

The S60 structure (**Table 3**) is a reinforced concrete, gated spillway located on C-33 Canal between Lakes Alligator and Gentry, upstream from State Road 534 and downstream from Alligator Lake in Osceola County (**Figure 24**). This structure is operated in accordance with the Alligator Lake Regulation Schedule to maintain optimum upstream water stages in C-33 Canal and in Alligator Lake. It is also used to control upstream and downstream flood stages and velocities. The structure was originally designed to pass sufficient discharge during dry periods to maintain downstream stages and water supply demands when water is available.

The flow hydrograph (**Figure 25**) reveals fluctuations that result from the operational management of the structure in accordance with the Alligator Lake Regulation Schedule. For this POR, the discharge from S60 had average and median flows of 67 and 0 cfs, respectively. The peak discharge (866 cfs) occurred on 9/12/2017 as a result of Hurricane Irma. Available flow was 221 cfs at the 90th percentile and 365 cfs at the 95th percentile. Zero-flow conditions occurred 48% of the time for this POR (**Figure 26**).

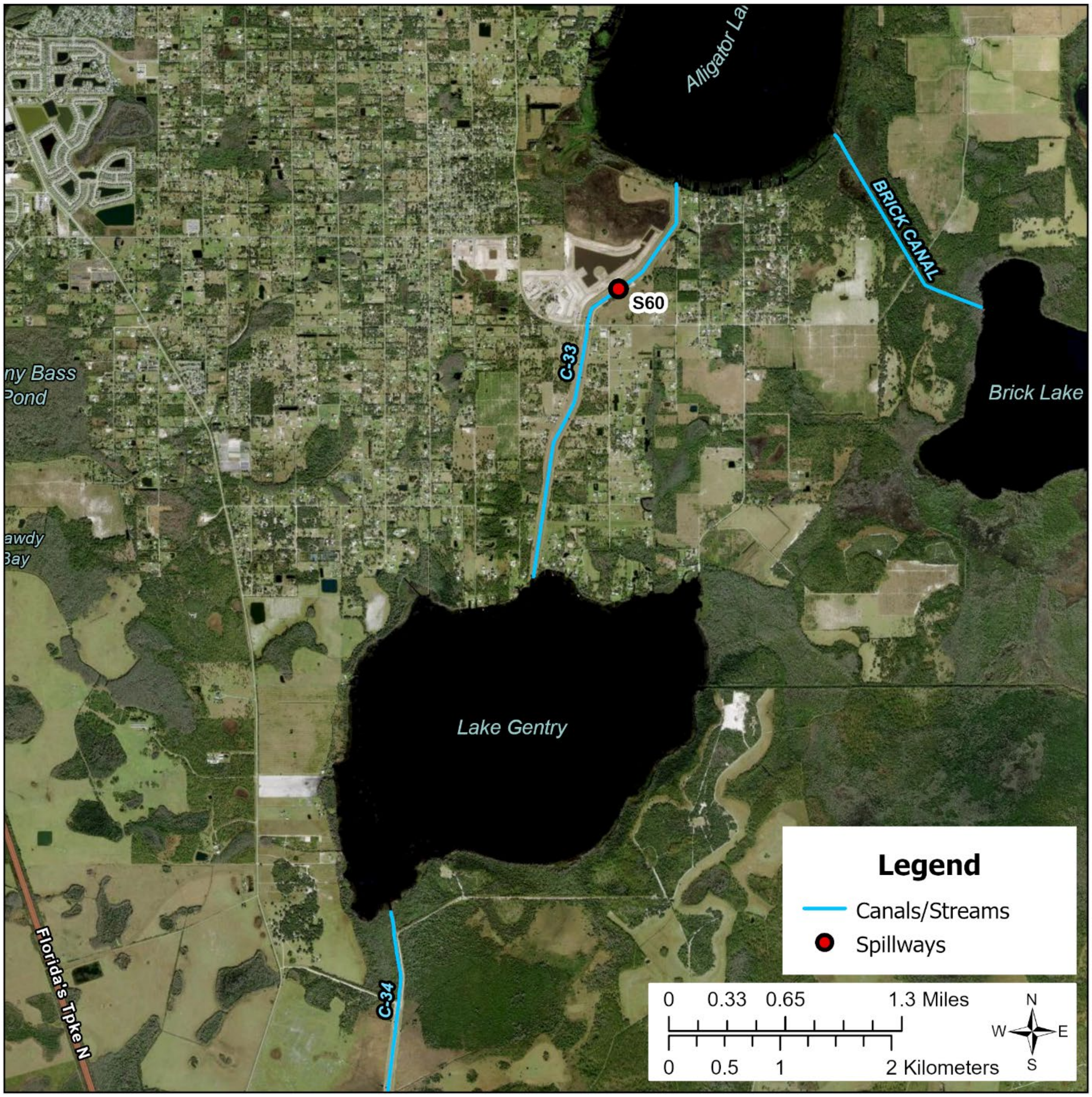


Figure 24. S60 Flow Monitoring Station location.

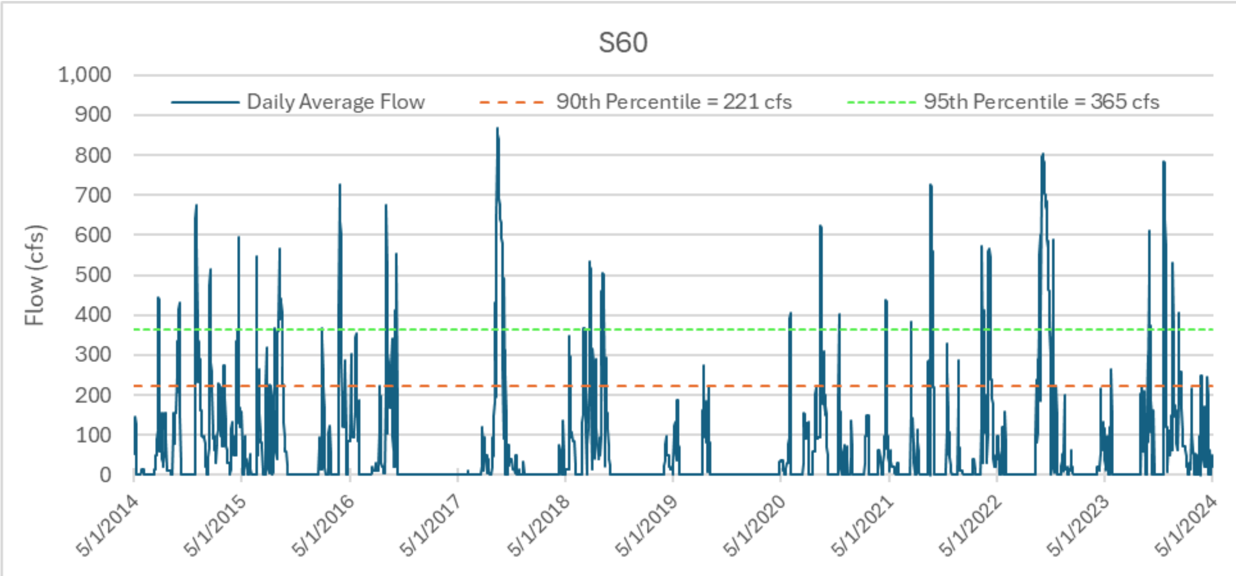


Figure 25. S60 Structure Flow Hydrograph (data source: DBHydro).

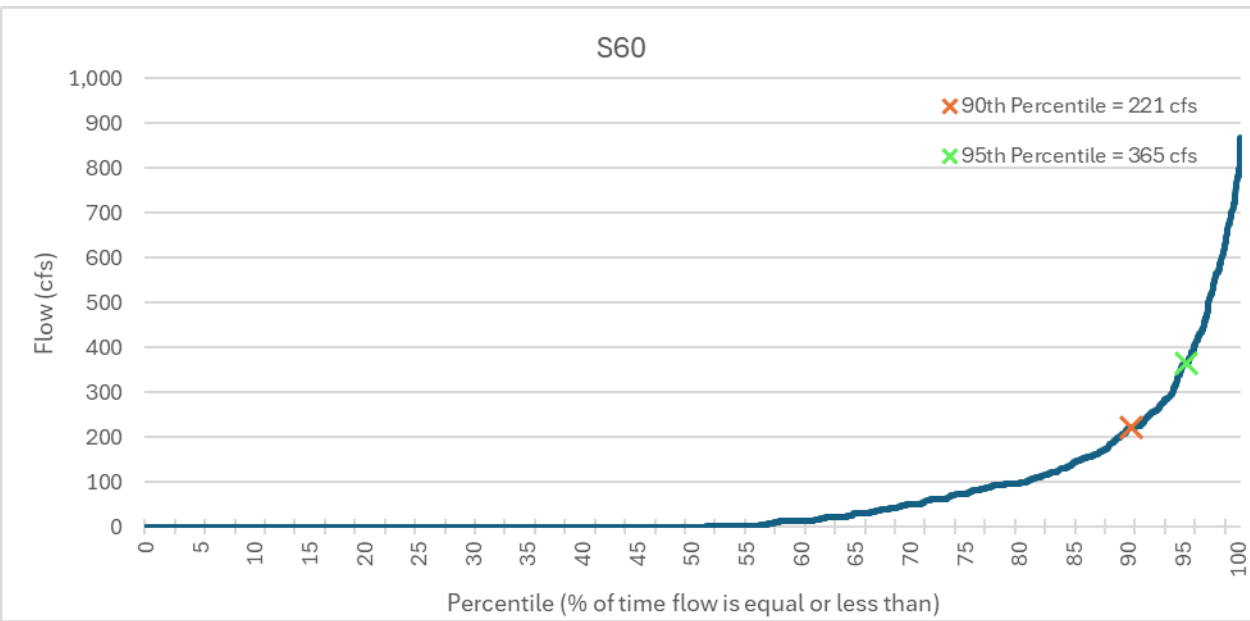


Figure 26. S60 Structure Exceedance Graph

LAKE GENTRY BASIN: S63 STRUCTURE

The S63 structure (**Table 3**) is a one-bay reinforced concrete, gated spillway located on C-34 Canal, downstream from Lake Gentry in Osceola County and upstream of S-63A Basin (**Figure 27)**. S63 is operated in accordance with the Lake Gentry Regulation Schedule to maintain optimum upstream water control stages in C-34 Canal and in Lake Gentry. It is also used to control upstream and downstream flood stages and velocities. The structure was originally designed to pass sufficient discharge during dry periods to maintain downstream stages and irrigation demands. The flow hydrograph (**Figure 28**) reveals fluctuations that result from the operational management of the structure in accordance with the Lake Gentry Regulation Schedule. For this POR, the discharge from S63 had average and median flows of 99 and 19 cfs, respectively. The peak discharge (1,090 cfs) occurred on 10/5/2022 as a result of Hurricane Ian.

Available flow was 300 cfs at the 90th percentile and 462 cfs at the 95th percentile. Zero-flow conditions occurred 44.6% of the time for this POR (**Figure 29**).

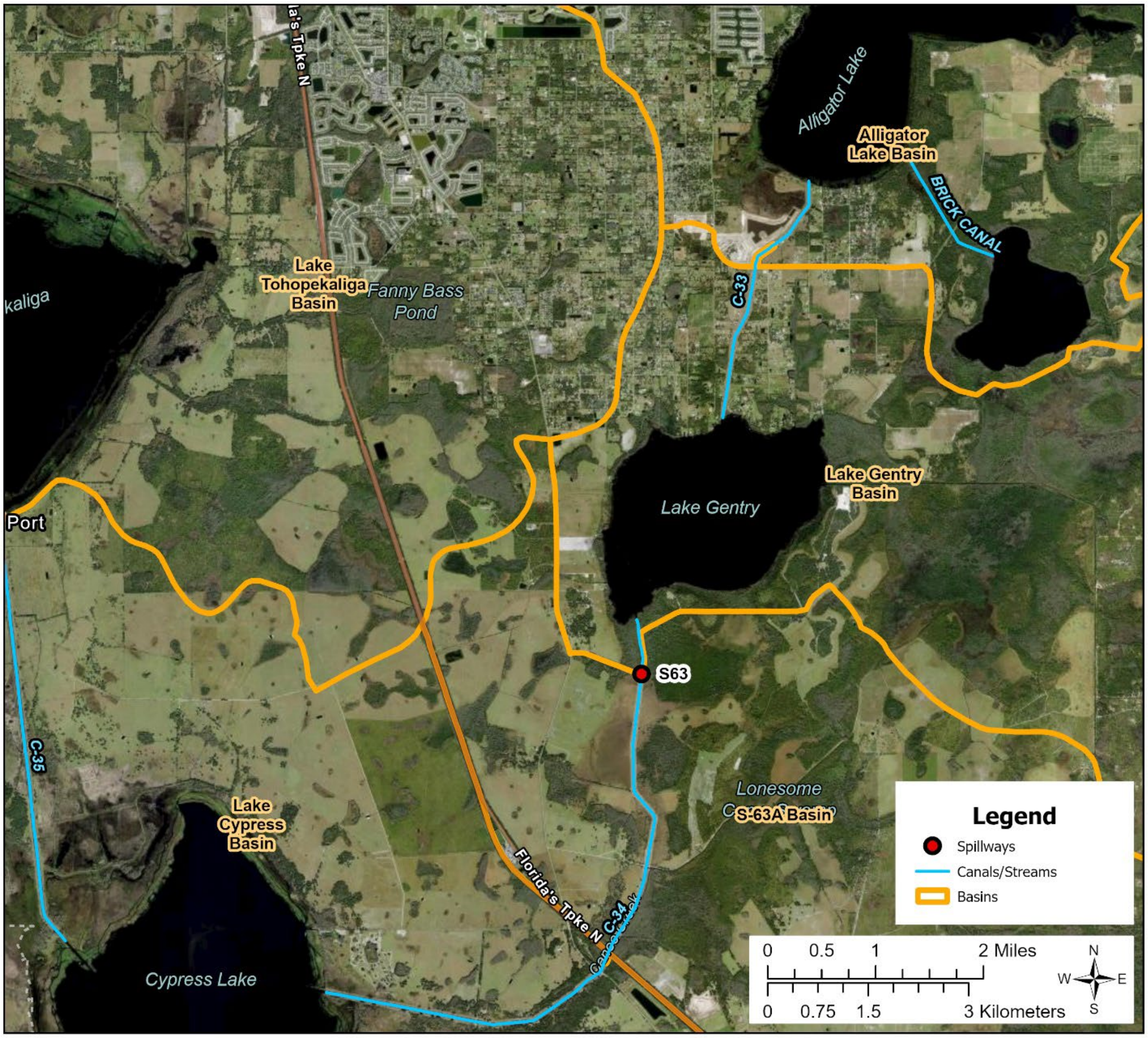


Figure 27. S63 Flow Monitoring Station location.

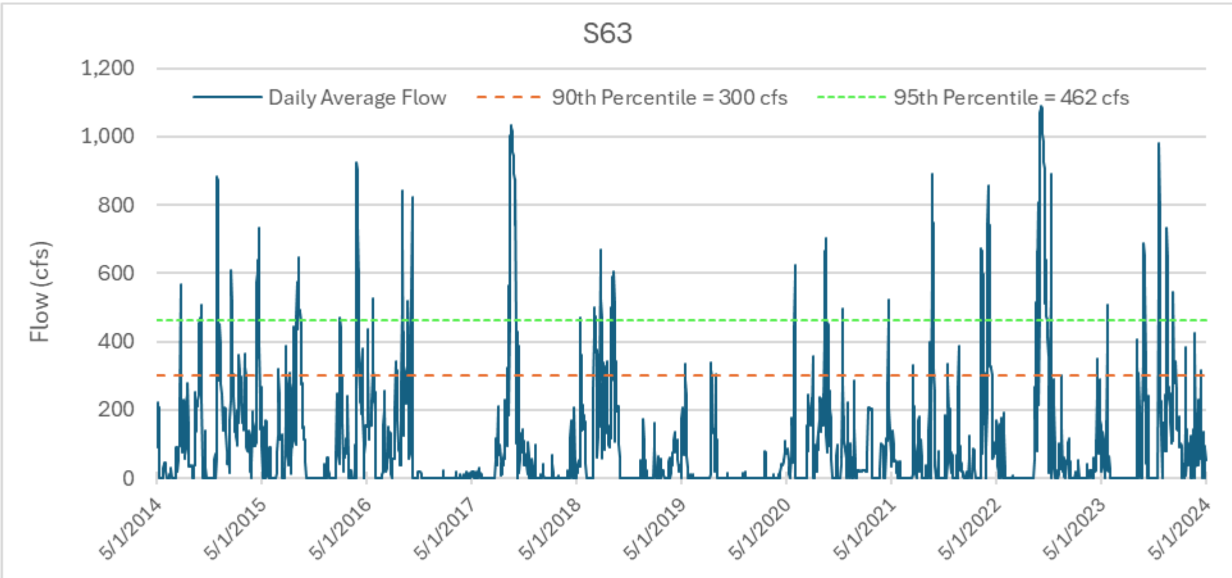


Figure 28. S63 Structure Flow Hydrograph (data source: DBHydro).

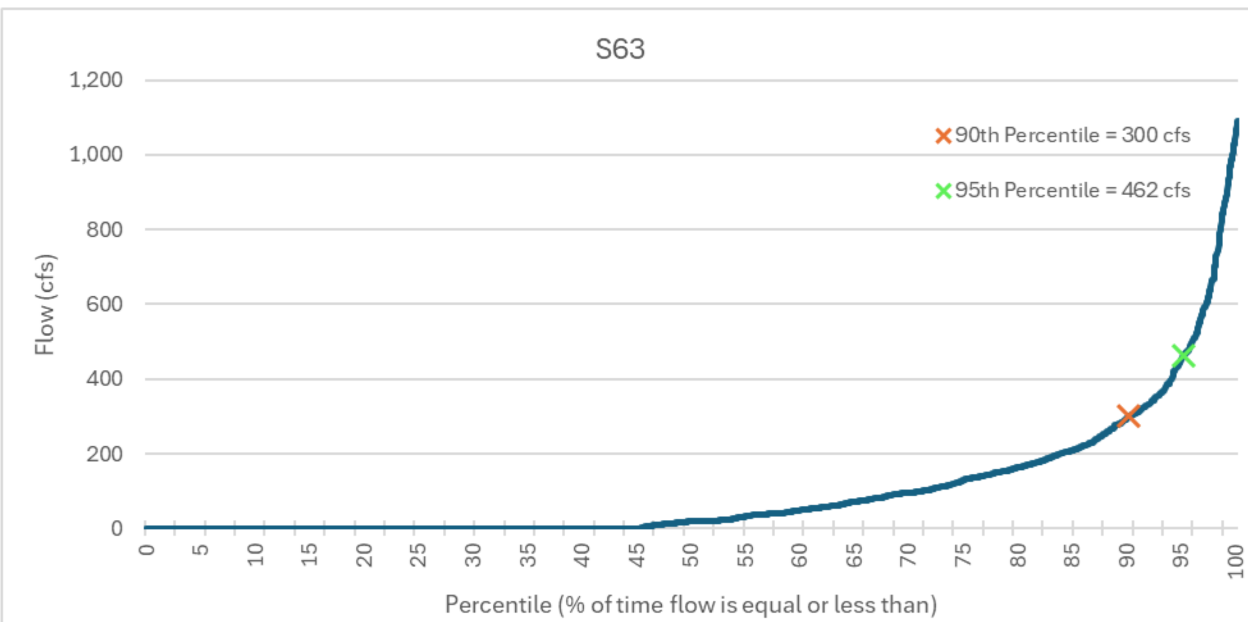


Figure 29. S63 Structure Exceedance Graph.

CANOE CREEK S63A BASIN: S63A STRUCTURE

S63A structure (**Table 3**) is a two-bay reinforced concrete, gated spillway located on C-34 Canal about 2.5 miles upstream from Lake Cypress in Osceola County. The structure is located 2.9 miles downstream of S63 (**Figure 30**). S63A maintains optimum upstream water control stages in C-34 Canal. It was originally designed to pass sufficient discharge during dry periods to maintain downstream stages and irrigation demands and to control upstream and downstream flood stages and velocities. The flow hydrograph (**Figure 31**) reveals regular fluctuations that result from the operational management of the structure except for the previously mentioned disturbances following Hurricanes Irma and Ian that are observed in all structures analyzed. For this POR, the discharge from S63A had average and median flows of 119 and 25 cfs, respectively. The peak discharge (2,797 cfs) occurred on 10/2/2022 as a result of Hurricane Ian. Available flow was 337 cfs at the 90th percentile and 550 cfs at the 95th percentile. Zero-flow conditions occurred 30.8% of the time for this POR (**Figure 32**).

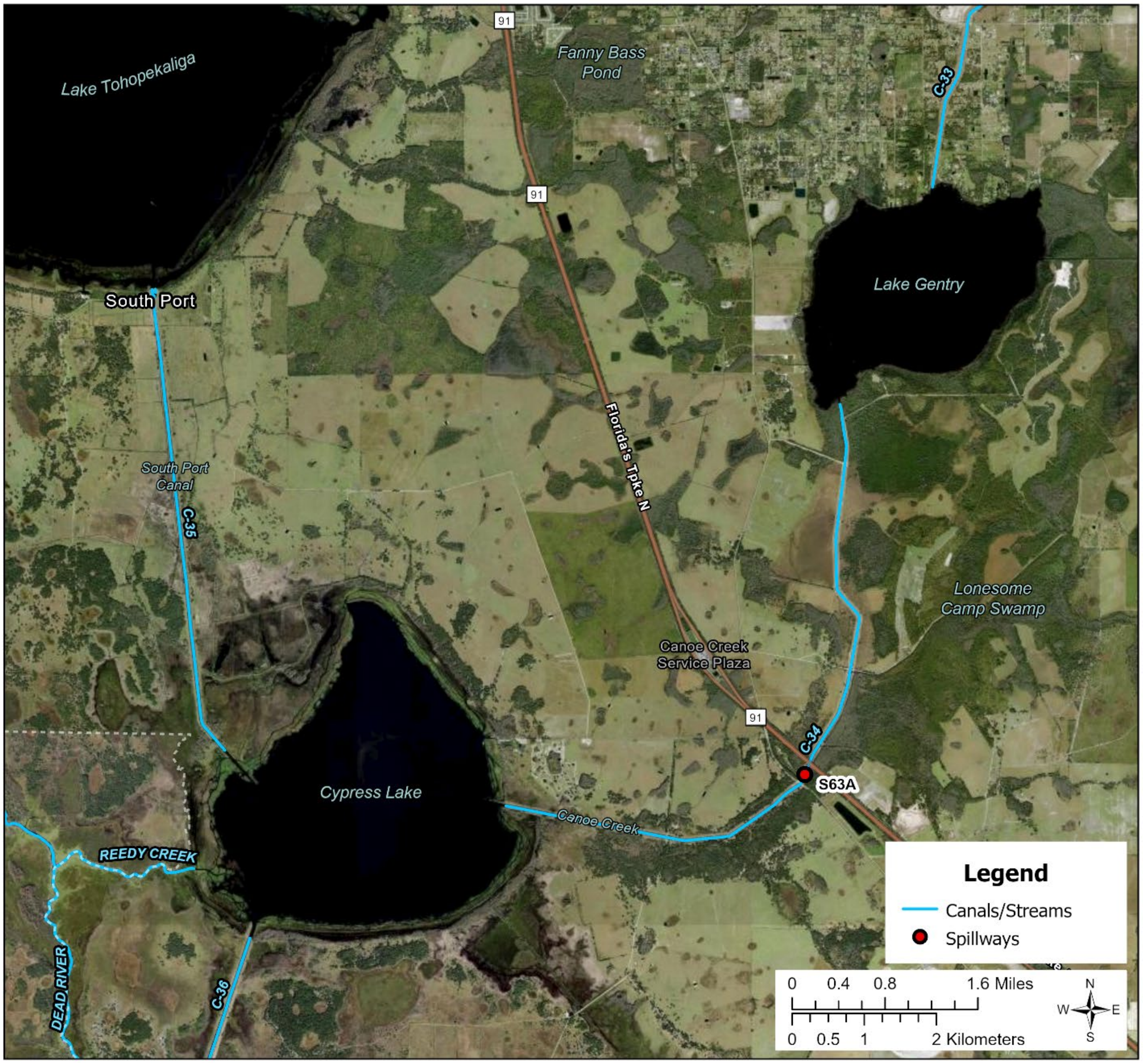


Figure 30. S63A Flow Monitoring Station location.

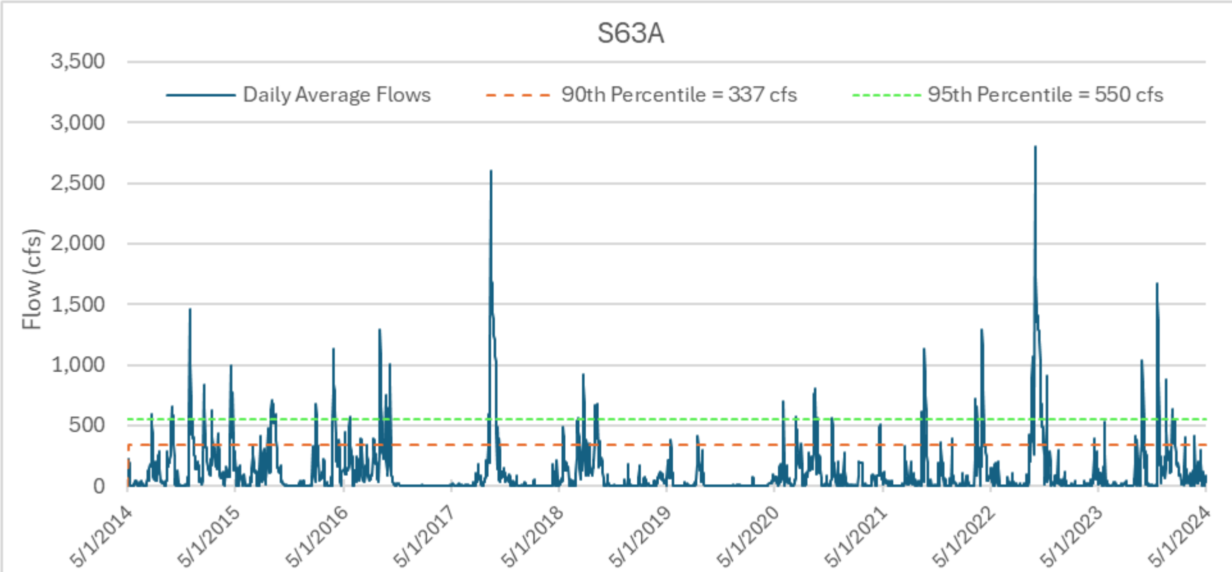


Figure 31. S63A Structure Flow Hydrograph (data source: DBHydro).

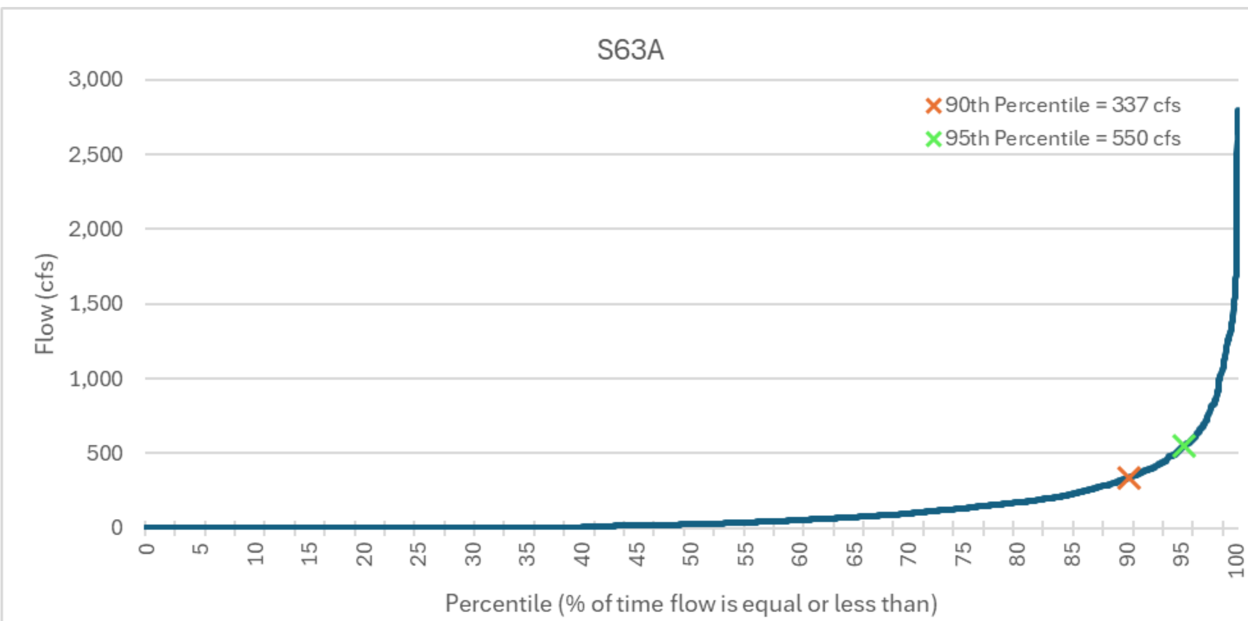


Figure 32. S63A Structure Exceedance Graph

LAKE TOHOPEKALIGA BASIN: S61 STRUCTURES

Located on C-35 Canal at the outlet of Lake Tohopekaliga in Osceola County**,** the combined flows from the S61_S and S61_LCK monitoring stations are used as the basin inflow hydrograph for S61 **(Figure 33).** The S61 structure is a gated spillway and the S61_LCK is a navigation lock with two pairs of sector gates adjacent to and east of the structure. These structures are operated in accordance with the Lake Tohopekaliga Regulation Schedule and the Army Corps of Engineers Schedule of Lock Operation to control upstream and downstream flood stages and velocities. S61 maintains optimum stages in Lake Tohopekaliga and the lock structure permits passage of vessels between Lake Tohopekaliga and other canals/lakes downstream all the way to Kissimmee River (C-38 Canal). S-61 was originally designed to pass sufficient discharge during dry periods to maintain downstream stages and water supply demands when water is available.

The flow hydrograph (**Figure 34**) reveals regular fluctuations that result from the operational management of the structure except for disturbances following Hurricanes Irma and Ian. For this POR, the discharge from S61 had average and median flows of 595 and 366 cfs, respectively. The peak discharge (3,954 cfs) occurred on 10/11/2022 and was a result of Hurricane Ian. Available flow was 1,616 cfs at the 90th percentile and 1,975 at the 95th percentile. Zero-flow conditions occurred approximately 21.4% of the time for this POR (**Figure 35**).

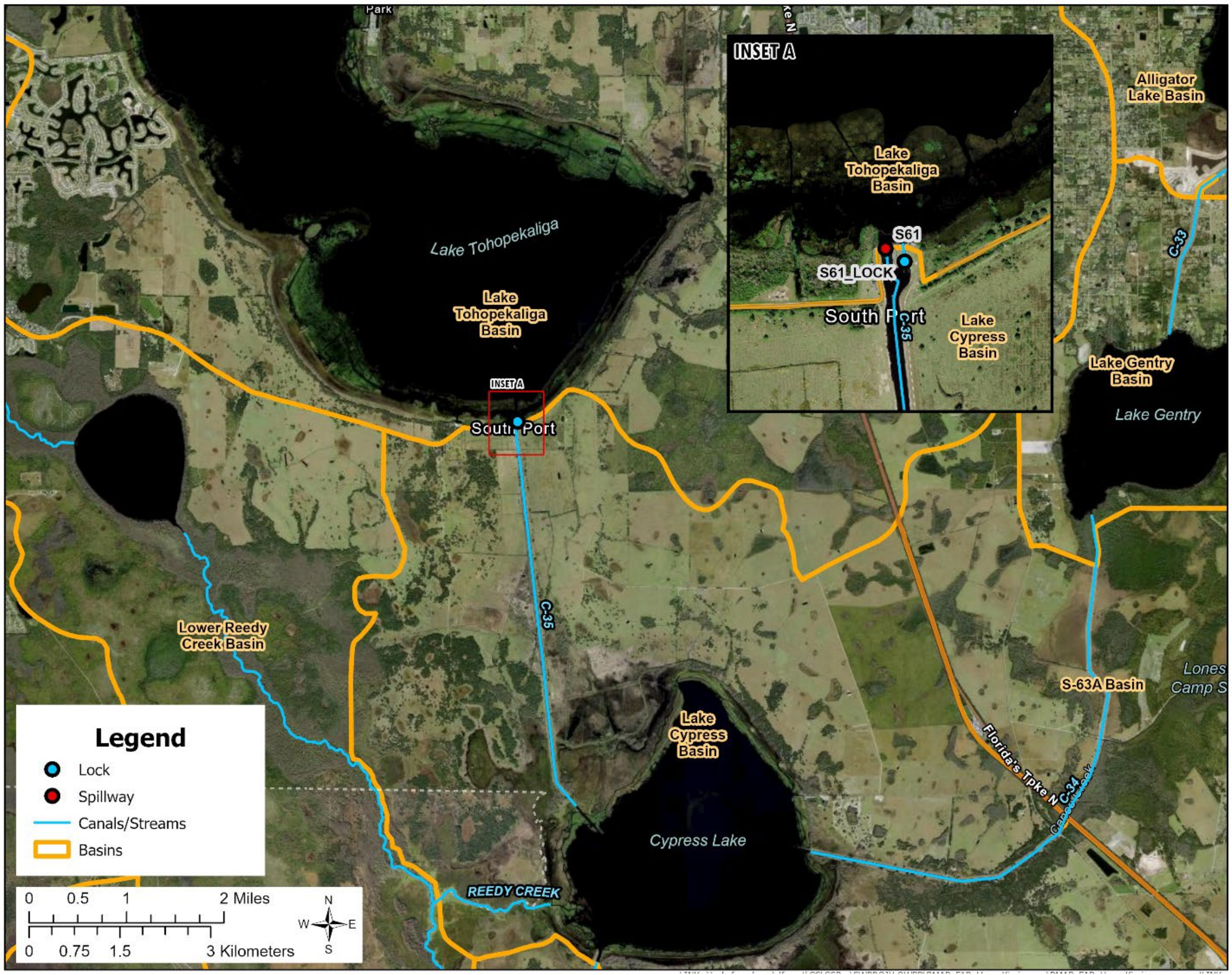


Figure 33. S61 Flow Monitoring Station locations.

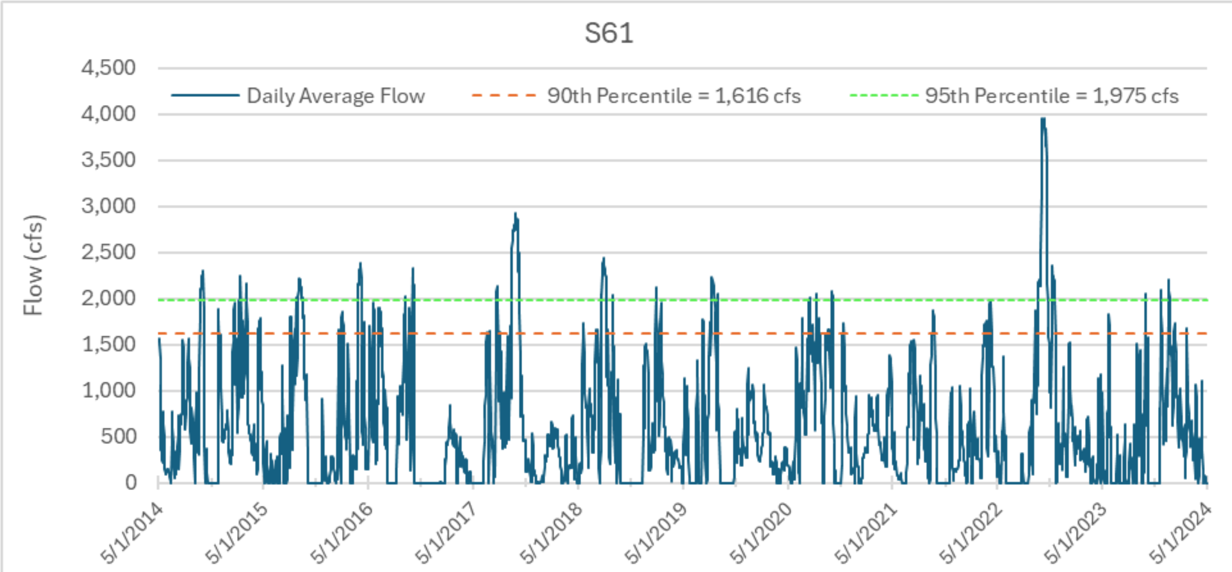


Figure 34. S61 Structures Flow Hydrograph (data source: DBHydro).

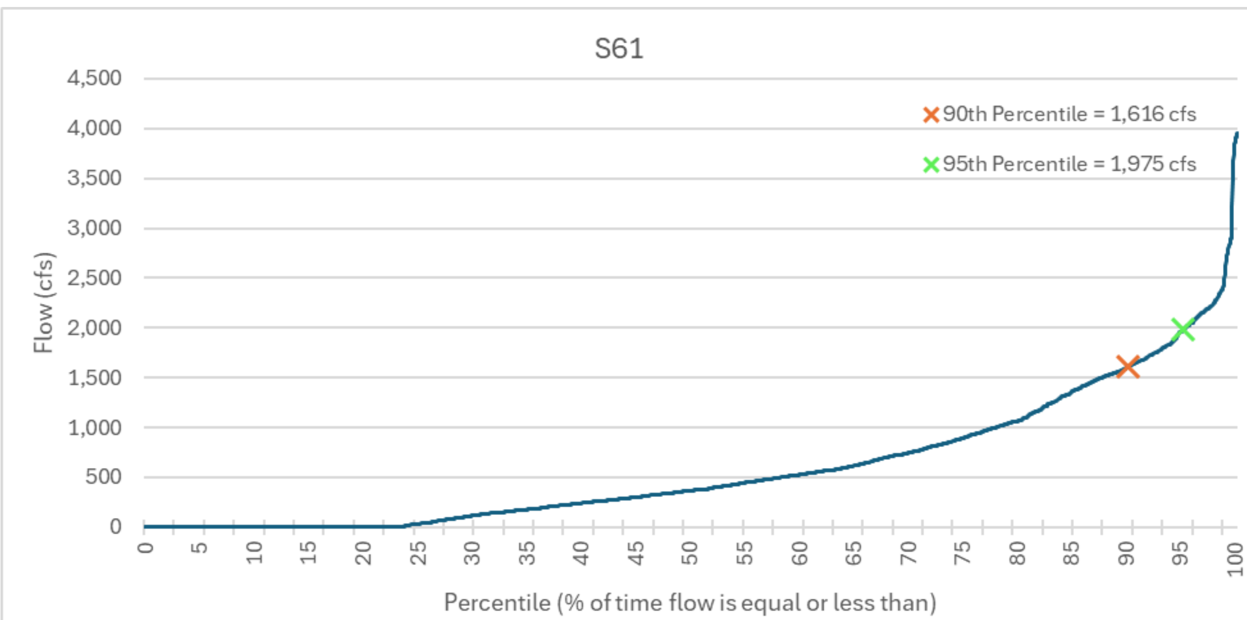


Figure 35. S61 Structures Exceedance Graph

LAKE ROSALIE BASIN: G103 STRUCTURE

G103 structure (**Table 3**) is a five-bay, steel sheet pile gated weir with a concrete cap, located on the Zipprer Canal at the northern outlet of Lake Rosalie just west of Lake Kissimmee in Osceola County (**Figure 36**). The natural outlet of Lake Rosalie is Rosalie Creek, a meandering stream at the south end of the lake, which discharges into Tiger Lake. This structure is operated in accordance with the regulation schedules of Lakes Rosalie, partially controlling Lake Rosalie water levels.

This structure was retrofitted in 2017 and data collection for the new conditions began in 2018. The POR of WY2019 through WY2024 was used for the assessment of G103 to account for post-retrofit conditions as it currently operates. The flow hydrograph (**Figure 37**) reveals fluctuations that result from the discharge of Lake Rosalie to Lake Kissimmee. For this POR, the discharge from G103 had average and median flows of 21 and 0 cfs, respectively. The peak discharge (720 cfs) occurred on 9/29/2022 as a result of Hurricane Ian. Available flow was 107 cfs at the 90th percentile and 183 cfs at the 95th percentile. Negative- or zero-flow conditions occurred approximately 85% of the time for this POR (**Figure 38**).

Figure 36. G103 Flow Monitoring Station location.

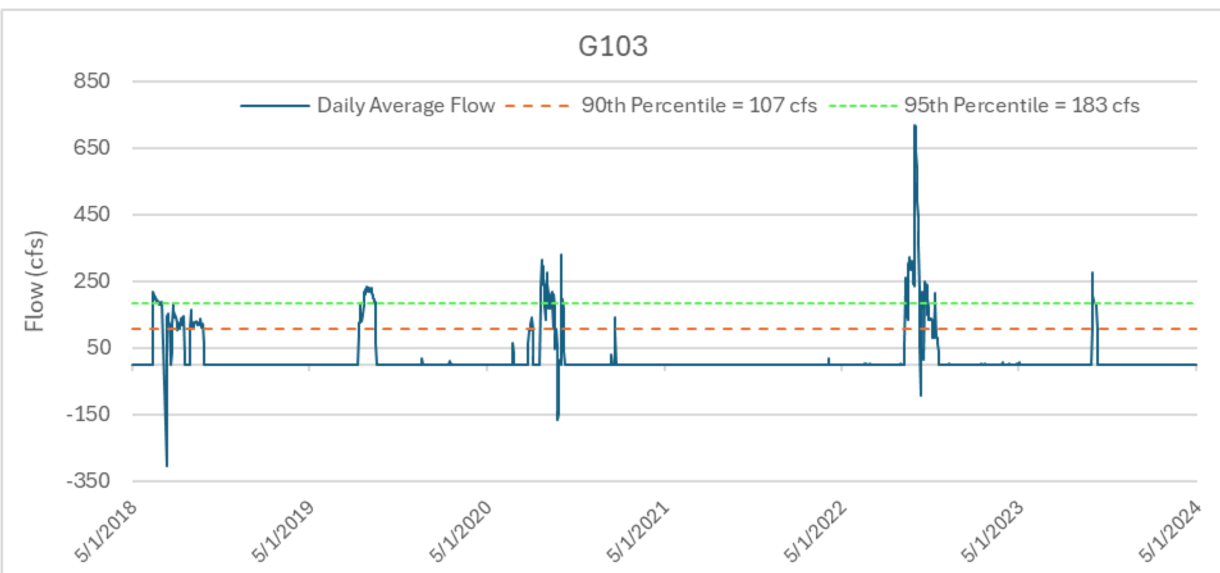


Figure 37. G103 Structure Flow Hydrograph (data source: DBHydro).

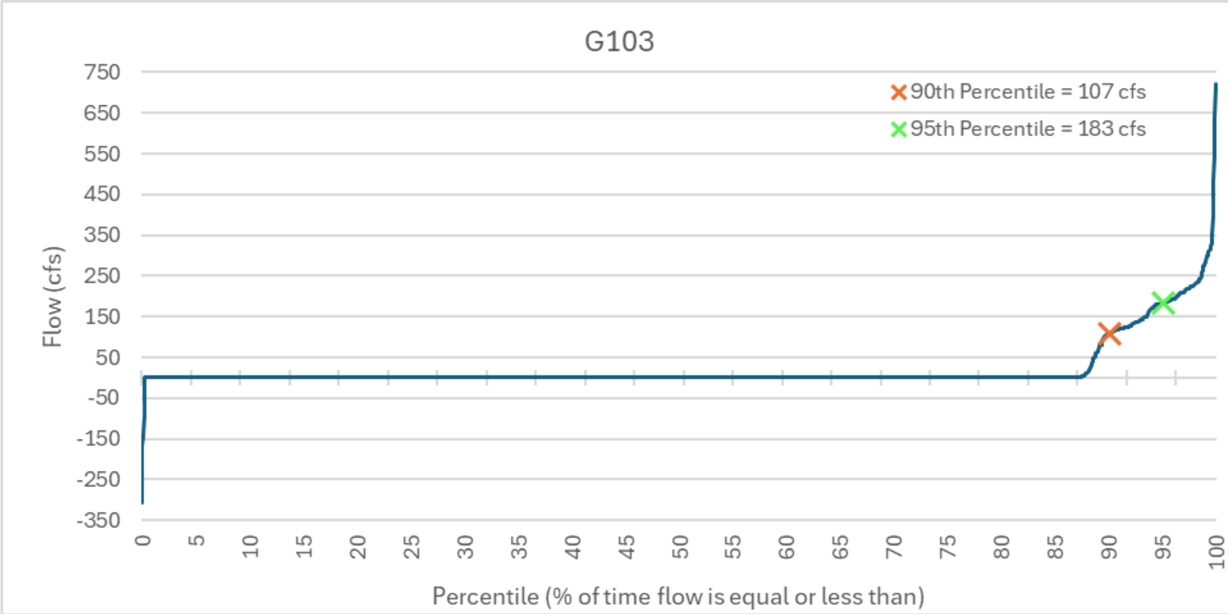


Figure 38. G103 Structure Exceedance Graph

LAKE JACKSON BASIN: KUB001_I SITE

KUB001_I is a USGS hydrometeorological monitoring site located along Jackson Canal, between Lake Jackson and Lake Kissimmee (**Figure 39**). The station measures stage and flow of the Jackson Canal. While it is located in the Lake Kissimmee Basin, it primarily represents discharges from the Lake Jackson Basin. The flow hydrograph (**Figure 40**) reveals regular fluctuations that result from the discharge of Lake Jackson to Lake Kissimmee. Outliers in the regular flow can be attributed to the previously mentioned disturbances following Hurricanes Irma and Ian which are observed in all structures and stations analyzed. For this POR, the measurements at KUB001_I had average and median flows of 33 and 5 cfs, respectively. The peak recorded flow (1,398 cfs) occurred on 9/30/2022 as a result of Hurricane Ian. Available flow was 87 cfs at the 90th percentile and 190 at the 95th percentile. Negative- or zero-flow conditions occurred 27.7% of the time for this POR (**Figure 41**).

Figure 39. KUB001_I Flow Monitoring Station location.

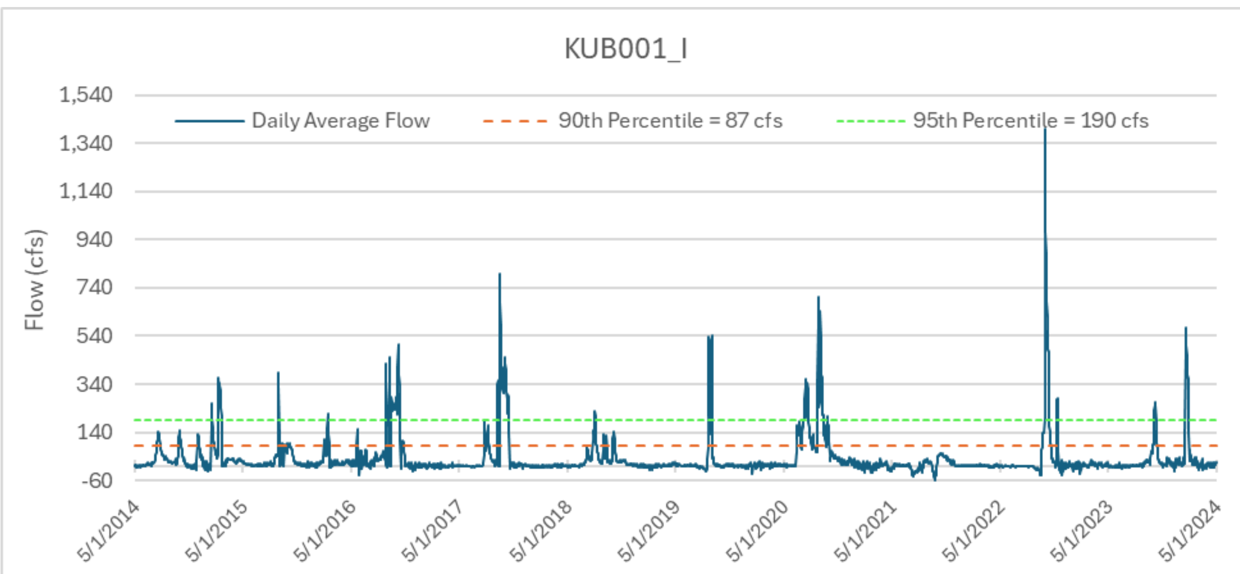


Figure 40. KUB001_I Monitoring Station Flow Hydrograph (data source: DBHydro).

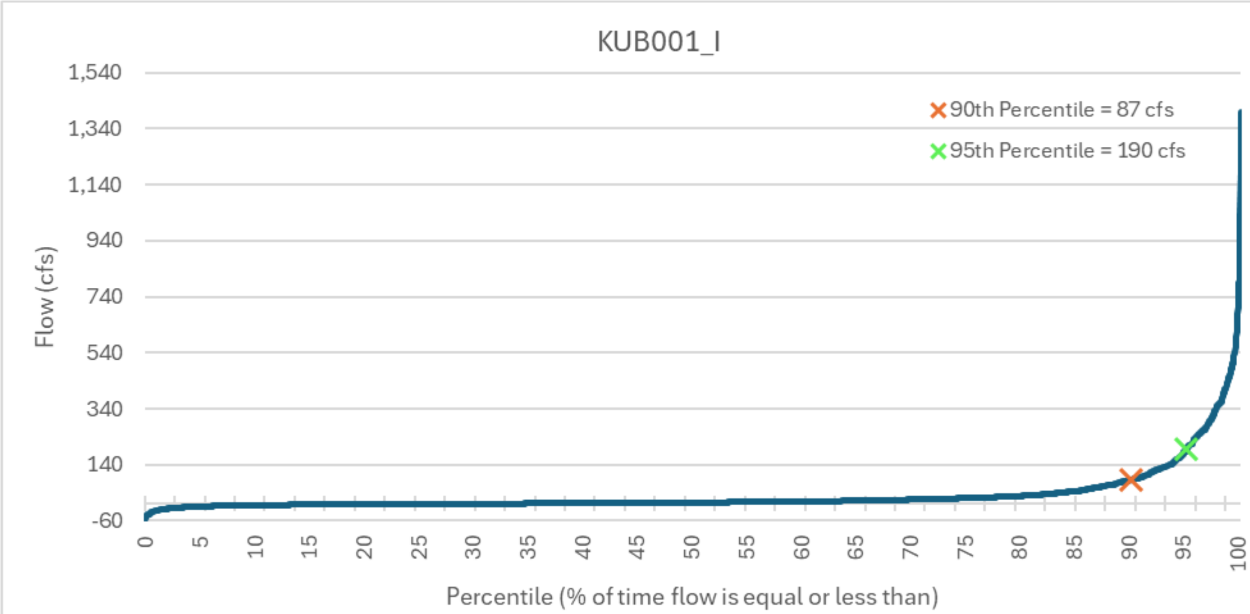


Figure 41. KUB001_I Exceedance Graph

LAKE KISSIMMEE BASIN: S65 STRUCTURES

Located on the C-38 Canal (Kissimmee River) at the upstream boundary of the Lower Kissimmee Basin, combined flows from the S65_S and S65_LCK monitoring stations are used as the basin inflow hydrograph for S65 (**Figure 42**). However, no flows were reported for S65_LCK during the WY 2015-2024 POR.

The S65 structure is a gated spillway with five vertical lift gates and S65_LCK is a navigation lock structure with two sector gates. Operations are controlled in accordance with river restoration criteria and the Lake Kissimmee Regulation schedule control stages in Lake Kissimmee and to control upstream and downstream stages and flow. It was designed to pass sufficient discharge during low-flow periods to maintain downstream stages, irrigation demands, and river restoration needs (the KRRP). Discharge at S65 and S65A as specified in the HRS are major factors in operation of these structures.

The flow hydrograph (**Figure 43**) reveals regular seasonal fluctuations that result from the operational management of the structure, with notably higher flow associated with high rainfall, for example, during and following Hurricanes Irma and Ian. For this POR, the discharge from S65 had average and median flows of 1,238 and 795 cfs, respectively. The peak discharge (13,706 cfs) occurred on 10/11/2022 and was a result of Hurricane Ian. Available flow was 2,895 cfs at the 90th percentile and 3,999 at the 95th percentile. Zero-flow conditions occurred approximately 3% of the time for this POR (**Figure 44**).

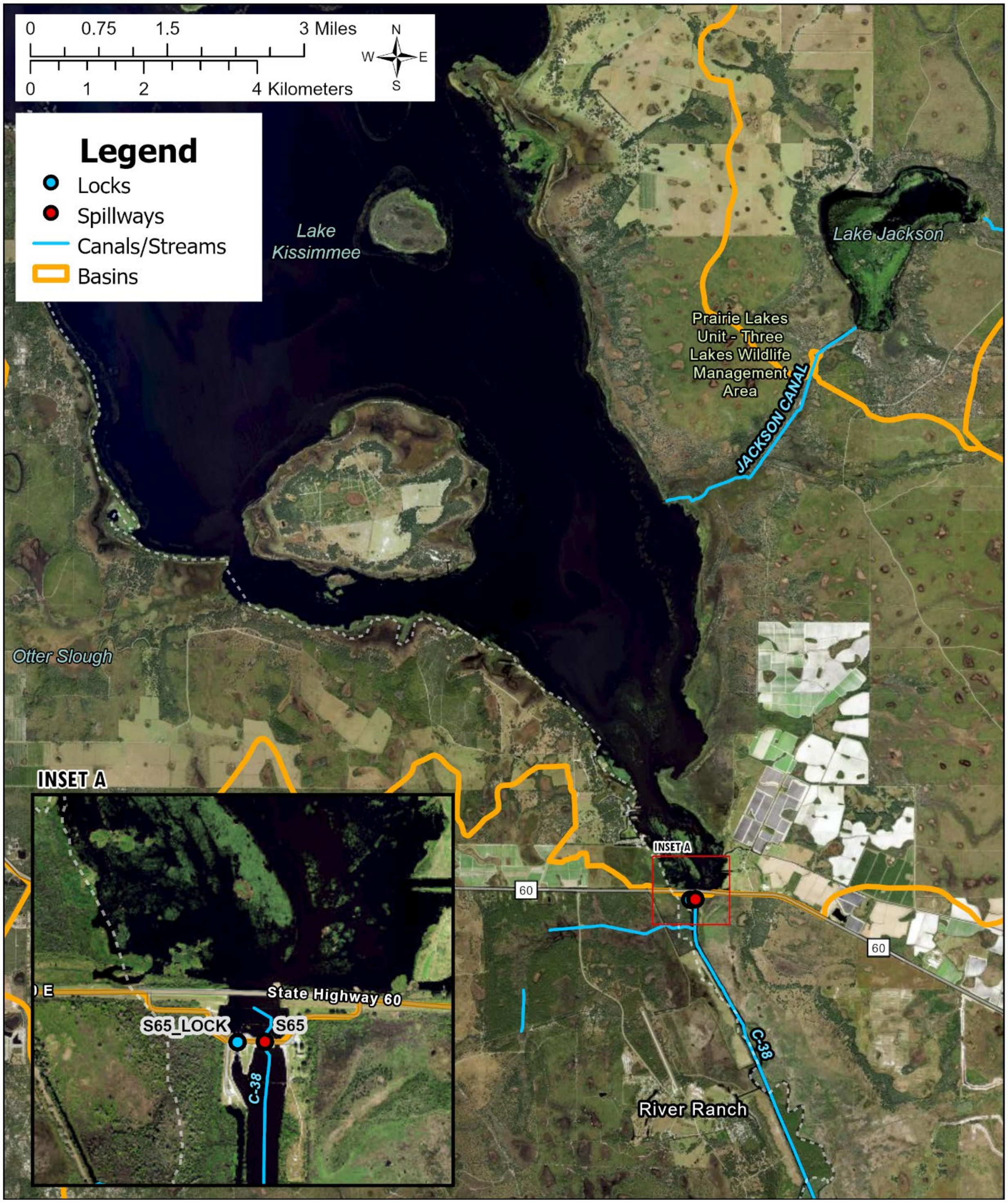


Figure 42. S65 Flow Monitoring Station locations.

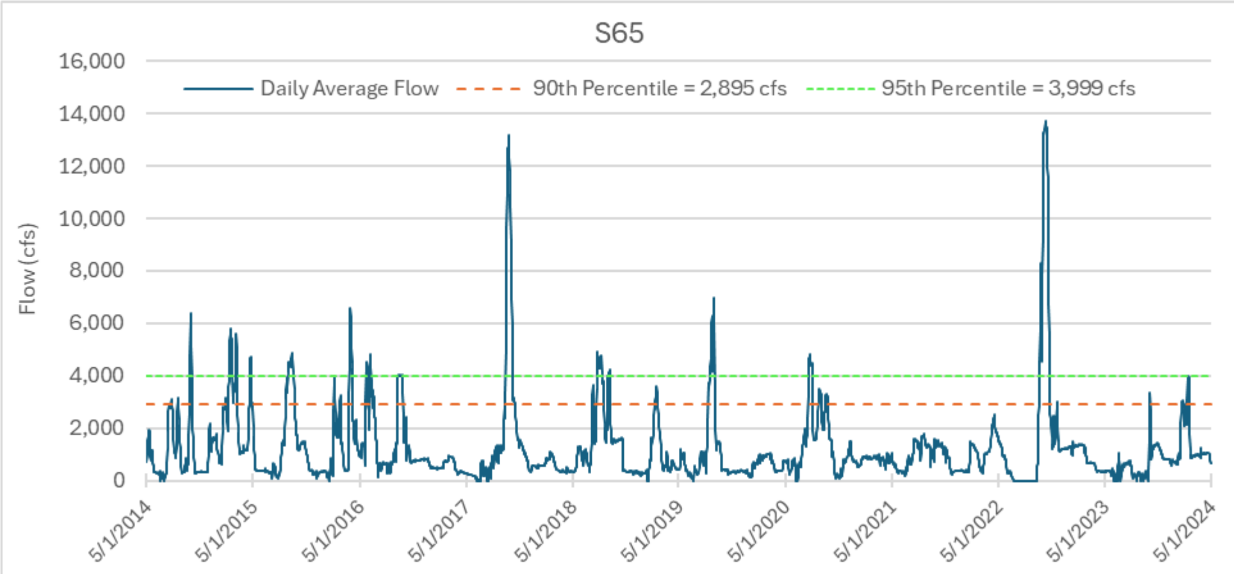


Figure 43. S65 Flow Hydrograph (data source: DBHydro).

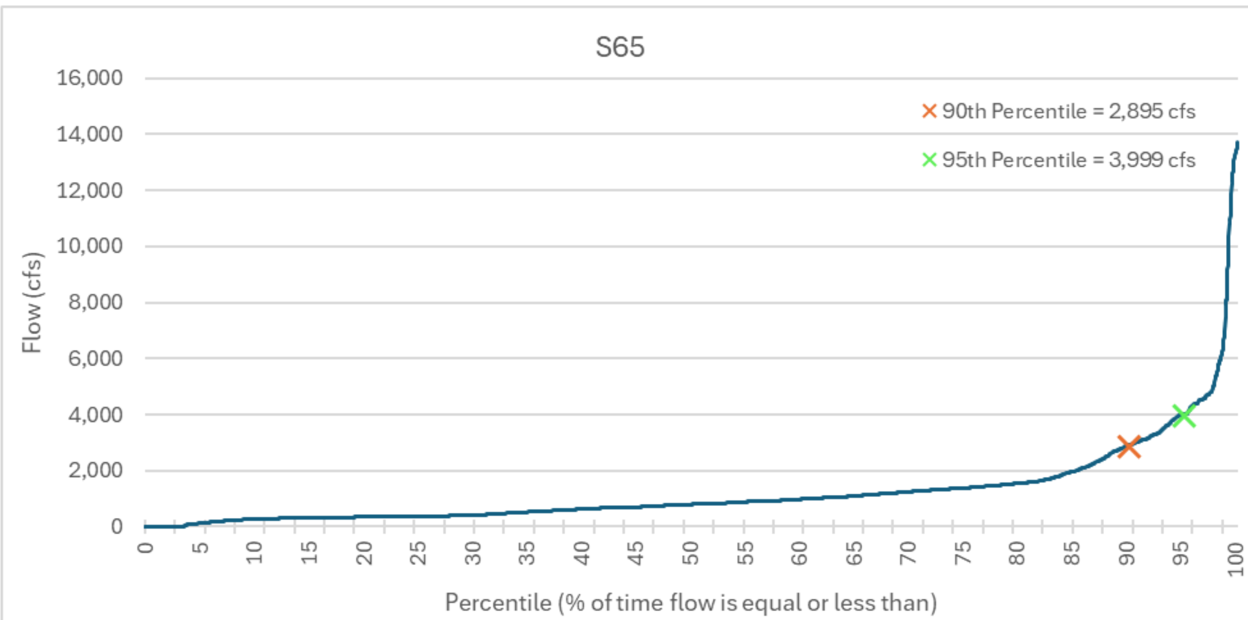


Figure 44. S65 Exceedance Graph

WATER AVAILABILITY CONCLUSION

The water availability summary for the Upper Kissimmee Watershed presented in **Table 4** shows a subset of the watershed's basins that have differing levels of flow and water availability. Flow monitoring equipment was not available for the remaining 13 basins.

The percentiles for S65 reveal potential for additional projects under careful design considerations which includes ensuring that downstream water needs are evaluated and met (e.g. KRR etc.). Such projects would have to be located in the southern portion of the Lake Kissimmee Basin, closer to the outflow structure of S65, in order to be most cost effective. In contrast, the KUB001 monitoring site, reflecting inflows to Lake Kissimmee Basin from Lake Jackson, reveals an unlikely area for project consideration due to the higher incidence of low and negative flows in that structure. Proposed projects within the Upper

Kissimmee Watershed must also take into consideration the water availability in accordance with the HRS, which is in development and may change observed conditions for the POR. Additionally, the Upper Kissimmee Subwatershed is being reviewed for the flood protection level of service (Resiliency and Flood Protection | South Florida Water Management District) which includes infrastructure upgrades to allow more drainage (SFWMD, 2025). These upgrades should also be taken into consideration in the future.

Overall, the hydrograph for S65 reveals seasonally driven discharges with intermittent extreme conditions indicated by peaks. This requires consideration in the design of potential future projects, mainly in the consistency of water deliveries needed for their operations. The projects must not adversely impact the restored river areas downstream. Basins at the north and middle areas of the watershed reveal lower flows and considerably less water availability.

The POR for which this analysis was performed included two hurricanes that impacted average flows at the structures. In order to better represent operations under normal conditions, an estimation of the water availability excluding the hurricane years was done to provide a potential range of values. Both means are shown in **Table 4**. Regardless of storm events, considerable fluctuations in seasonal flows are observed in this subwatershed. Pump design should take into consideration the size and number of pumps that can better accommodate the full range of flow conditions. Subject matter experts should take lessons learned from previous projects (ex. Nubbin Slough Stormwater Treatment Area).

Based on this water availability review the following actions are recommended:

- Consider additional stormwater detention and wetland restoration projects in the identified areas of the subwatershed with adequate flows to effectively increase the storage capacity.

Table 4: Summary of Monitoring Stations Water Availability

Basin	Station	Mean (cfs)	Mean (ac-ft/yr)	Mean (cfs) (excluding hurricanes)	Maximum (cfs)	90th Percentile (cfs)	95th Percentile (cfs)
Lake Kissimmee	S65	1,238	896,081	1,170	13,706	2,895	3,999
Lake Tohopekaliga	S61	595	430,427	578	3,954	1,616	1,975
East Lake Tohopekaliga	S59	248	179,582	237	1,931	744	964
Shingle Creek	SHING.CA	251	181,446	237	3,750	527	665
Canoe Creek	S63A	119	86,146	111	2,797	337	550
Lake Gentry	S63	99	71,598	96	1,090	300	462
Lake Hart	S62	88	63,630	85	1,393	275	402
Boggy Creek	BOGGY.TA	102	73,576	95	4,740	237	318
Alligator Lake	S60	67	48,425	64	866	221	365
Lake Rosalie	G103[a]	21	14,983	17	720	107	183
Lake Myrtle	S57	30	22,009	30	238	92	129
Lake Jackson	KUB001	33	23,741	30	1,398	87	190

[a.] G103 values are based on the data set from WY2019-WY2024.

BASIN LEVEL MONITORING ANALYSIS

SFWMD currently monitors at two hydrologic levels within the LOW: subwatershed and basin level (basin monitoring sites) and subbasin level (upstream monitoring sites) (**Figure 45**). The basin level sites have measurements of flow and nutrient concentrations so loads can be determined. The upstream level sites are used to identify areas of interest further upstream within the basin and most only have measurements of nutrient concentrations. To identify factors contributing to water quality issues, data from both levels were reviewed. This section covers the basin level analysis and the *Upstream Level Analysis* section discusses the upstream level data.

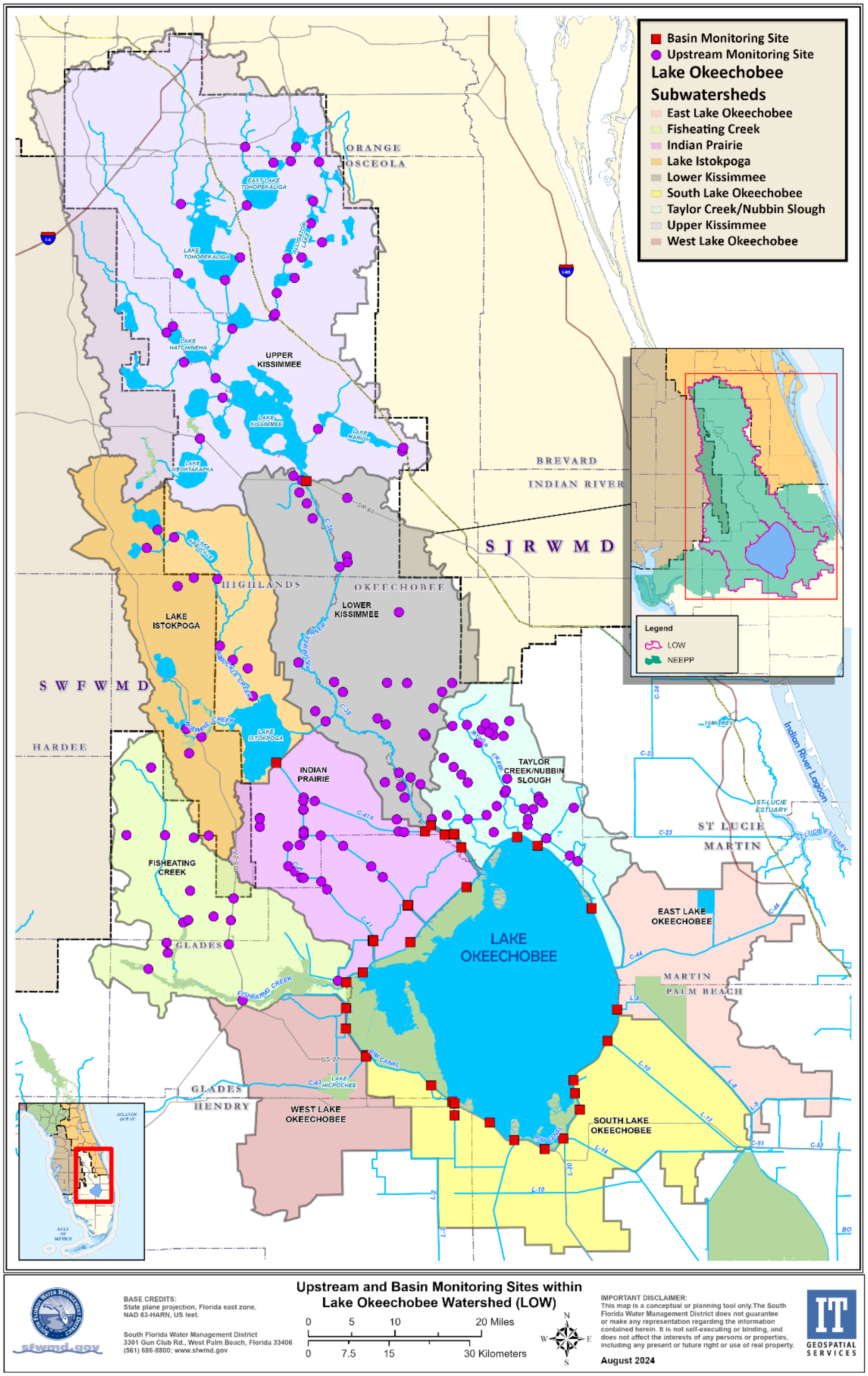


Figure 45. Upstream (purple circles) and basin (red squares) monitoring site locations within the LOW (Olson and Broling 2025).

BASIN LEVEL DATA ANALYSIS

The most recent 5-year TP and TN data for the Upper Kissimmee Subwatershed are presented in **Table 5**. The Upper Kissimmee Subwatershed had a 5-year (WY2020-WY2024) average TP load of 73 t which is 57.1 t above the planning target for this subwatershed of 15.9 t/yr.

Table 5. Upper Kissimmee Subwatershed monitoring data summarized with the 5-year average (WY2020–WY2024) (Source Tables 8B-8 and 8B-11 of Welch et al. 2025).

Water Year	Flows (ac-ft)	TP			TN		
		Load (t)	UAL (lb/ac)	FWMC (µg/L)	Load (t)	UAL (lb/ac)	FWMC (mg/L)
WY2020	643,000	75	0.16	94	1,242	2.69	1.57
WY2021	883,000	68	0.15	62	1,431	3.09	1.31
WY2022	690,000	70	0.15	83	1,300	2.81	1.53
WY2023	1,214,000	99	0.21	66	1,917	4.15	1.28
WY2024	659,000	51	0.11	62	990	2.14	1.22
Average	818,000	73	0.16	72	1,376	2.97	1.36

Figure 46 depicts annual TP loads, annual TP flow-weighted mean concentration (FWMC) and the 5-year rolling average TP load for the period of record (WY1991-WY2024), and **Figure 47** depicts annual TN loads, annual TN FWMC and the 5-year rolling average TN load for the period of record. The TP FWMCs were below FDEP's NNC of 120 µg/L for TP (FDEP 2012) every year except WY2005 (**Figure 46**). From WY1991 to WY1995, the TP FWMC was lower than 50 µg/L each year with average of 38 µg/L. The TP FWMC for the period of WY1996 to WY2024 was between 57 µg/L and 138 µg/L with average of 81 µg/L. This seems to indicate that the TP FWMCs are increasing and agrees with a recently completed trend analysis (See Trend Analysis on Basin Level Data section below). The TN FWMC was below FDEP's NNC of 1.54 mg/L (FDEP 2012) every year except WY1999, WY2009, WY2018, and WY2020 (**Figure 47**). The maximum TN FWMC observed in the WY1991 to WY2024 period was 1.58 mg/L in WY2018.

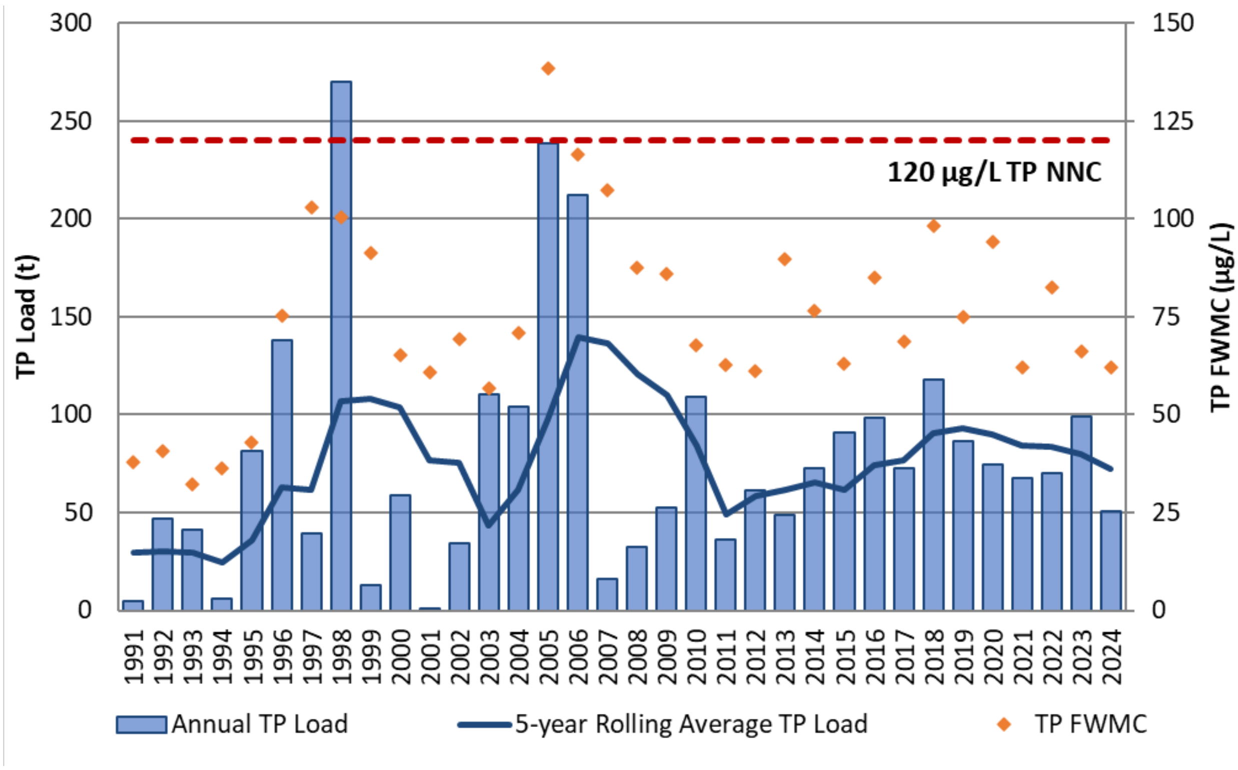


Figure 46. TP load and FWMC data for WY1991-WY2024 with the 5-year rolling average for the Upper Kissimmee Subwatershed (Note: NNC - numeric nutrient criteria).

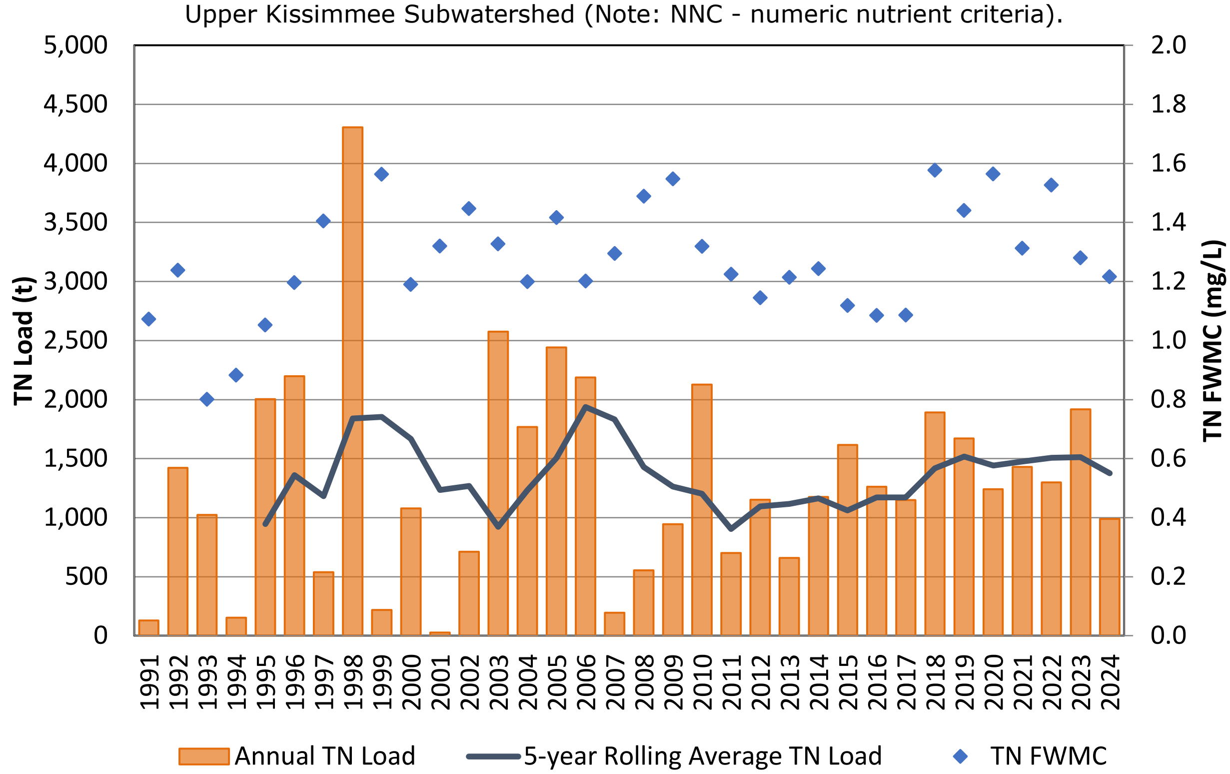


Figure 47. TN load and FWMC data for WY1991-WY2024 with the 5-year rolling average for the Upper Kissimmee Subwatershed.

Figure 48 includes TP loads as well as flows. In general, the plot indicates a pattern that the loads are heavily based on the flows. The annual flow ranged from 16,195 ac-ft in WY2001 to 2,175,265 ac-ft in WY1998 with the average annual flow of 832,271 ac-ft. The unit area flow (runoff) was calculated from the annual flow and subwatershed area. The runoff and the annual rainfall for the Upper Kissimmee Subwatershed are presented in **Figure 49**. The annual rainfall ranged from 34 inches in WY2001 to 69 inches in WY2010 with the average annual rainfall of 50 inches.

Based on the lower concentrations for this subwatershed relative to the NNC and other subwatersheds in the LOW, and the higher runoff volumes, basin level data indicate that the loads are greatly influenced by the flows. Thus, additional efforts for BMPs and projects should address storage in Upper Kissimmee.

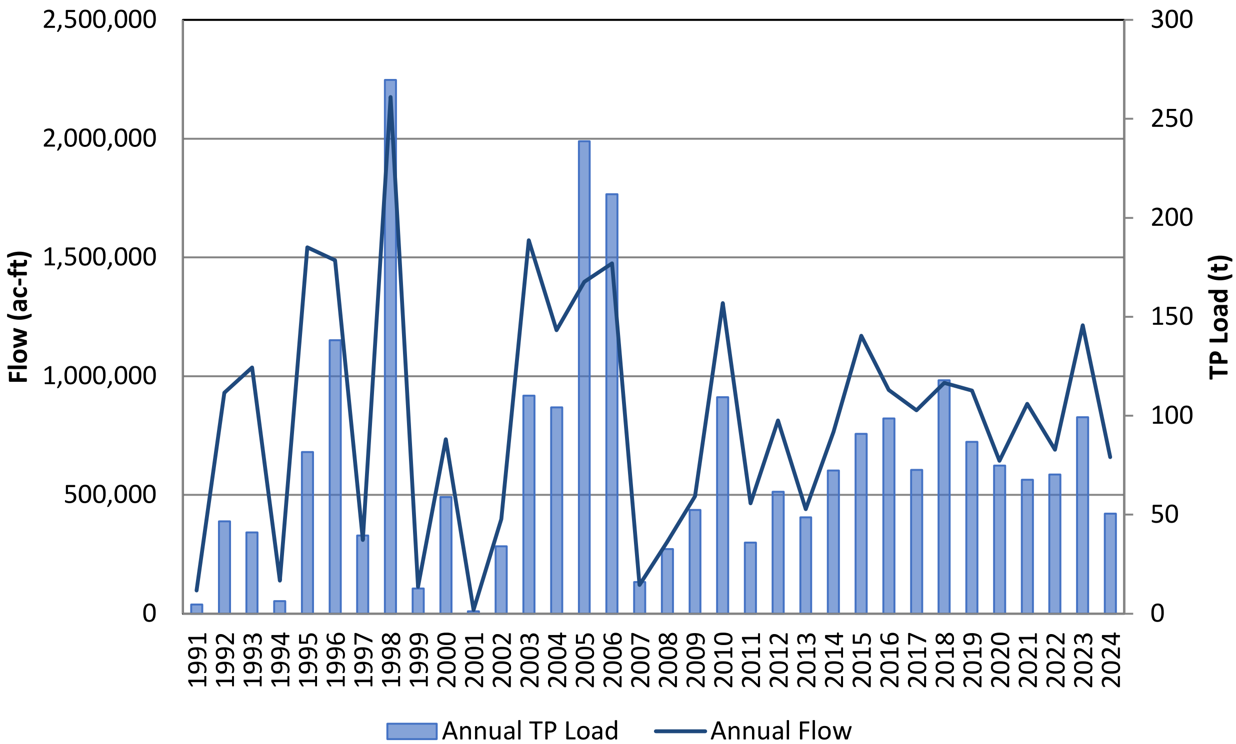


Figure 48. Annual flow and TP Load data for WY1991-WY2024 for the Upper Kissimmee Subwatershed.

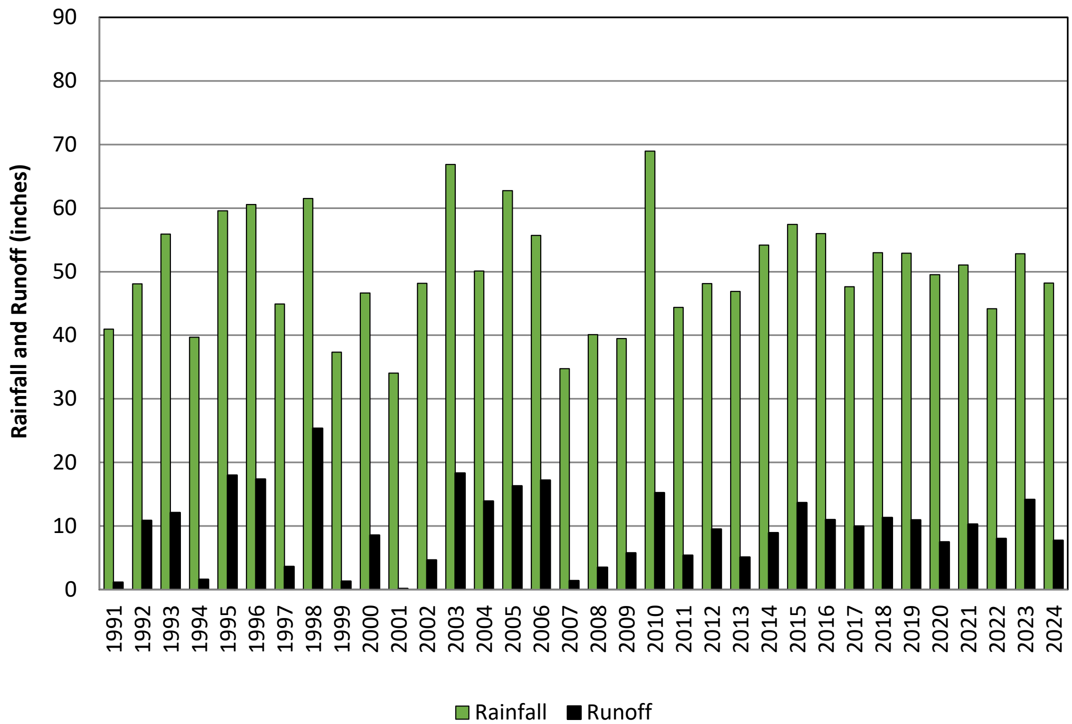


Figure 49. Annual rainfall and runoff data for WY1991-WY2024 for the Upper Kissimmee Subwatershed.

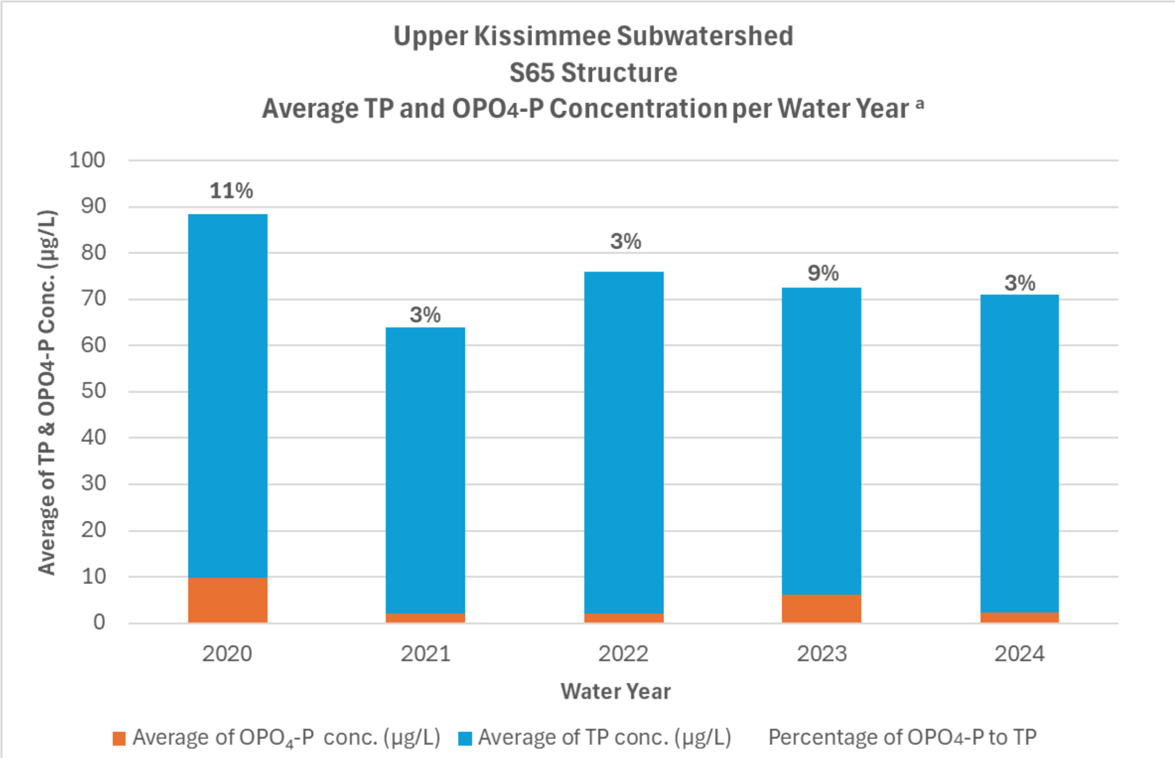
TREND ANALYSIS ON BASIN LEVEL DATA

A Seasonal Mann-Kendall test (SKT) trend analysis was completed as part of the 2025 LOWPP update (Jones and Olson 2025). A SKT is a non-parametric test often used to detect trends in water quality time series. It is a rank-order statistic that is not influenced by outliers or skewed data. A SKT was used to analyze flow, nutrient loads, and nutrient FWMCs from the LOW subwatersheds for the period of record (WY1991–WY2023) and recent 10-year period (WY2014–WY2023). The Upper Kissimmee Subwatershed did not have any statistically significant trends for the recent 10-year dataset. However, the Upper Kissimmee Subwatershed showed significant increasing trends in TP load and TP FWMC for the WY1991–WY2023 period. The increasing trends in TP FWMC suggests that nutrients from this subwatershed may be increasing but the sen slope (rate of change) for this increase is quite small 0.73 µg/L/yr (Jones and Olson 2025).

OPO_4-P AS A PERCENTAGE OF TP AND TOTAL SUSPENDED SOLID ANALYSIS

To determine orthophosphate (OPO_4-P) as a percentage of TP at the S65 structure (outlet to the Upper Kissimmee Subwatershed) a comparison was made between the TP and OPO_4-P collected at that location (**Figure 50**). Data used for this analysis were from grab samples, collected when flow was detected and both OPO_4-P and TP were sampled. **Table 6** lists the average annual concentrations, number of samples, and percentage of the data that were OPO_4-P used to create **Figure 50**. Findings show that in the most recent five years (WY2020–WY2024), TP is dominated by forms of phosphorus other than OPO4-P as the percentages of OPO_4-P to TP range from 3% to 11%.

Total suspended solids (TSS) are collected as part of the routine sampling at the S65 structure. A review of recent data indicates that TSS concentrations have averaged 12 mg/L over this period, near the method detection limit of 10 mg/L, indicating low suspended solids **(Table 7).** Note the S65 monitoring station is also immediately downstream of Lake Kissimmee which could impact water chemistry, such as perhaps settling particulate phosphorus.



[a] Only used sample collection dates that represented both TP and OPO_4-P.

Figure 50. Annual average TP and OPO_4-P concentrations at the S65 Structure and OPO_4-P expressed as a percentage of TP.

Table 6. OPO_4-P as a Percentage of TP per Water Year at the S65 Structure.

S65 Speciation Information for WY2020-WY2024				
Water Year	**Average of TP conc. (µg/L)**	**Average of OPO_4-P conc. (µg/L)**	**OPO_4-P as a Percentage of TP**	**Number of Samples[a]**
2020	89	10	11%	26
2021	64	2	3%	19
2022	76	2	3%	17
2023	73	6	9%	25
2024	71	2	3%	25
Minimum	**64**	**2**	**3%**	**17**
Maximum	**89**	**10**	**11%**	**26**
Average	**75**	**5**	**6%**	**22**

[a] Only used sample collection dates that represented both TP and OPO_4-P.

Table 7. Annual average TSS at the S65 Basin structure.

Water Year	Average of TSS conc. (mg/L)	Number of Samples
2020	13	32
2021	10	24
2022	15	23
2023	10	34
2024	13	34
Minimum	**10**	**23**
Maximum	**15**	**34**
Average	**12**	**29**

CONSIDERATION OF PASS-THROUGH FLOWS

SFWMD currently uses a mass balance approach to determine the nutrient loads and flows from the Upper Kissimmee and Lower Kissimmee Subwatersheds and this is reported annually in the South Florida Environmental Report (SFER). This approach assumes that the total nutrient loads and flows at S65 (outlet of the Upper Kissimmee Subwatershed) represent Upper Kissimmee Subwatershed runoff contributing to Lake Okeechobee inflows. However, since the Kissimmee River floodplain restoration influences S65 releases and S65 nutrient loads and flows must transit through the Lower Kissimmee Subwatershed, the observed S65 flows and loads may not all contribute to Lake Okeechobee inflows, i.e. some may be lost/assimilated in the interim basin. SFWMD currently uses a different approach (pass-through method) for basins in series in the Caloosahatchee River and St. Lucie River watersheds to determine the nutrient loads and flows discharged to the estuaries and which is intended to provide a more balanced accounting of flows and loads between these basins.

A comparison was made for the pass-through and mass balance methods to determine the phosphorus loads, flows, and flow weighted mean concentrations for the period of WY2020-WY2024 for the Upper Kissimmee and Lower Kissimmee Subwatersheds (**Figure 51**, **Tables 8-10**). The pass-through method resulted in lower phosphorus loads and flows from Upper Kissimmee, and higher loads and flows from Lower Kissimmee. For planning purposes, results from both methods will be considered to provide a range of phosphorus loads and flow reductions needed. Note that the combined subwatershed total load to Lake Okeechobee remains the same with both methods (**Table 10**). The annual flow volumes are slightly different for some years due to rounding, however the 5-year average flow volume is the same for both methods.

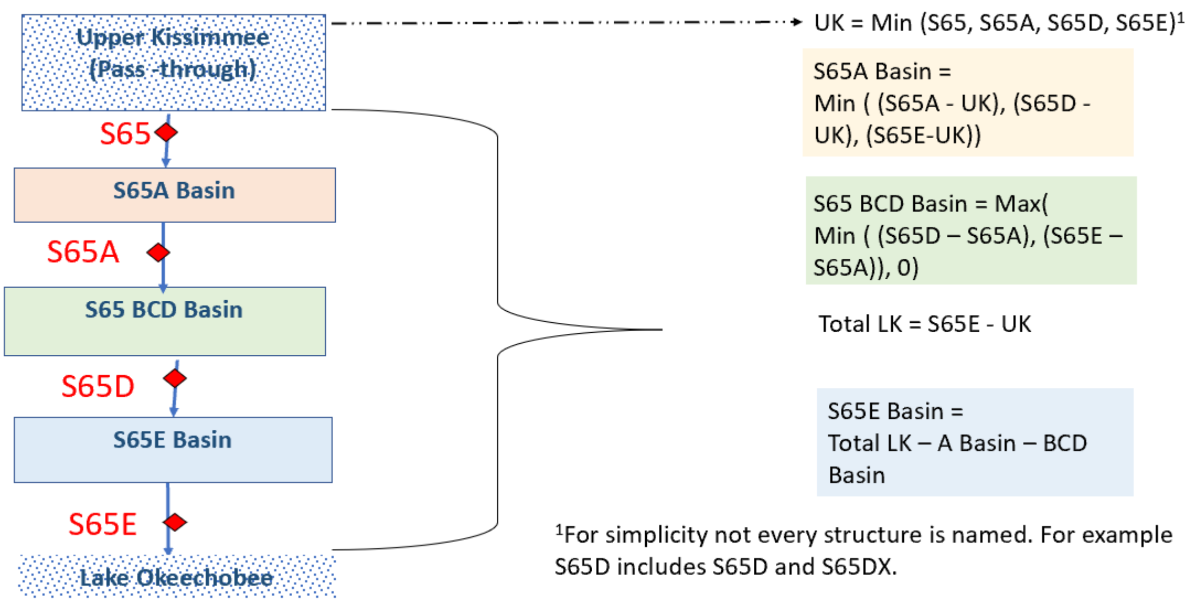


Figure 51. Methodology for Pass-Through TP load and flow calculations for Upper Kissimmee and Lower Kissimmee Subwatersheds. A daily time step is used for each pass-through calculation.

Table 8. Comparison of Pass-Through and Mass Balance Methods for the Upper Kissimmee (UK) Subwatershed.

Pass-Through Method			Mass Balance Method (SFER)		
WY	UK Flow to Lake O (ac-ft)	UK Load to Lake O (t)	WY	UK Flow (ac-ft)	UK Load (t)
2020	592,000	66	2020	643,000	75
2021	835,000	61	2021	883,000	68
2022	591,000	51	2022	690,000	70
2023	1,109,000	89	2023	1,214,000	99
2024	594,000	45	2024	659,000	51
5-year average	**744,000**	**62**	**5-year average**	**818,000**	**73**

Table 9. Comparison of the Pass-Through and Mass Balance Methods for the Lower Kissimmee (LK) Subwatershed.

Pass-Through Method			Mass Balance Method (SFER)		
WY	LK Flow to Lake O (ac-ft)	LK Load to Lake O (t)	WY	LK Flow (ac-ft)	LK Load (t)
2020	284,000	62	2020	232,000	54
2021	575,000	127	2021	527,000	120
2022	200,000	37	2022	101,000	18
2023	328,000	124	2023	224,000	114
2024	445,000	108	2024	379,000	102
5-year average	**366,000**	**92**	**5-year average**	**292,000**	**82**

Table 10. Combined Lower Kissimmee (LK) and Upper Kissimmee (UK) total flows and loads using the Pass-Through and Mass Balance methods.

Pass-Through Method			Mass Balance Method (SFER)		
WY	LK+UK Flow to Lake O (ac-ft)	LK+UK Load to Lake O (t)	WY	LK + UK Flow (ac-ft)	LK+UK Load (t)
2020	876,000	129	2020	875,000	129
2021	1,410,000	188	2021	1,410,000	188
2022	791,000	88	2022	791,000	88
2023	1,437,000	213	2023	1,438,000	213
2024	1,039,000	153	2024	1,038,000	153
5-year average	**1,110,000**	**154**	**5-year average**	**1,110,000**	**154**

PROTECTION PLAN PROJECT EVALUATION

Evaluation of the projects and practices currently implemented in the subwatershed is important to determine if adjustments are needed. While there were some stormwater activities in the 1980s and 1990s, nutrient source control activities began in the Upper Kissimmee Subwatershed in 2006, when the FDACS program expanded to the entire Lake Okeechobee Watershed (**Table 11**). Details on past projects and programs can be found in previous LOWPPs and SFERs. Additional information on completed projects by other entities, such as local counties and the Florida Department of Transportation, can be found in the Lake Okeechobee BMAP update (FDEP 2020) and the FDEP Statewide Annual Report (FDEP 2024b). The projects evaluated below include those reported on in the 2025 SFER (Welch et al. 2025).

Table 11. Timeline of major stormwater, source control activities, and treatment/storage projects within the Upper Kissimmee Subwatershed.

Date	Major Activities and Projects
1981	Florida State Stormwater Rule adopted requiring retention ponds for new developments
1995	Environmental Resource Permit Program adopted; introduced wetland and water quality requirements
1995	Phase I Municipal Separate Storm Sewer System (MS4) Permit issued for Polk County
1996	Phase I MS 4 permit issued for Orange County
1997	Phase I MS4 permit issued to City of Orlando
2003	Phase II MS4 permit issued to City of Kissimmee
2003	Phase II MS4 permit issued for Osceola County
2004	Phase II MS4 permit issue to City of St. Cloud
2006	FDACS BMP Rule adopted for all basins in the Lake Okeechobee Watershed
2007	FDACS Urban Turf Rule adopted
2010	Rough Island – Wetland Restoration Project was completed
2011	Phase I MS4 issued for Reedy Creek Improvement District
2011	Eagle Haven Ranch – Passive Dispersed Water Management Project operations began
2017	Rolling Meadows Phase I- Wetland Restoration Project completed
2021	Gardner Cobb Marsh – Wetland Restoration Project completed
2024	Partin Family Ranch – Passive Dispersed Water Management Project operations began

SFWMD PROJECTS

Currently, two SFWMD projects focus on passive water storage, which retains direct rainfall to provide storage, while three wetland restoration projects aim to reduce nutrient loading and increase water storage within the Upper Kissimmee Subwatershed. These projects may be considered for renewal prior to contract expiration, depending on performance and funding availability. **(Figure 52, Table 12).** Additionally, the HRS which is a Federal and SFWMD project discussed in the hydrology section above will be fully implemented in 2027 and is estimated to increase the water storage capacity of Lakes Kissimmee, Hatchineha, Cypress, and Tiger by approximately 100,000 ac-ft.

Eagle Haven Ranch

Eagle Haven Ranch is situated on the shores of Lake Kissimmee, with an elevation gradient of up to 18 feet from the southwest corner of the property to the lake. The project comprises five Water Management Areas (WMAs) totaling 730 acres and designed to retain stormwater runoff using a system of dynamic weirs installed in the pre-existing ditch network. These water control structures can be adjusted to release water during extreme weather events, ensuring structural integrity. As a Dispersed Water Management (DWM) Project focused on passive storage, Eagle Haven Ranch has an estimated long-term average dynamic storage (i.e. inflow minus outflow) benefit of 374 acre-feet per year. However, the 5-year average dynamic storage for WY2020-WY2024 was 826 acre-feet per year. The project has been operational since November 2011 and is currently contracted through October 2033.

Partin Family Ranch

The Partin Family Ranch Northern Everglades Watersheds Water Retention and Nutrient Load Reduction Project encompasses two WMAs totaling 3,050 acres. These WMAs include Gentry Marsh/Canoe Creek (1,090 acres) and Big Bend Swamp (1,960 acres), which feature five existing culverts and a recently installed 60-inch riser culvert to enhance water retention. The project discharges runoff into C-34 Canal along the western boundary, while an existing ridge contains the eastern boundary. As a DWM Project focused on passive storage, the Partin Family Ranch provides an estimated long-term total phosphorus (TP) removal benefit of 0.4 t/yr and total nitrogen (TN) removal benefit of 5.2 t/yr. It has an estimated dynamic storage benefit of 4,270 ac-ft. This project has been operating since May 2023 and is scheduled to continue through May 2033.

Gardner-Cobb Marsh

Gardner-Cobb Marsh, which was historically floodplain, spans 11,000 acres with drainage systems installed in the 1940s to support row crop farming and cattle grazing, which led to wetland dehydration, shifts in vegetation, and habitat degradation. Restoration efforts began in 2010 under the Natural Resource Conservation Service Wetland Reserve Program. These efforts included constructing six earthen ditch plugs and partially or completely backfilling approximately 26,944 linear feet of drainage ditches, enhancing 2,500 acres of wetlands. A second phase in 2021, in partnership with Ducks Unlimited, involved backfilling 17,365 linear feet of ditches and installing two 36-inch culverts, enhancing 6,371 acres. A proposed Phase 3 aims to backfill 20,310 linear feet of ditches and enhance 648 additional acres. Phase III is currently scheduled to start construction in FY2026. The marsh operates as a self-managed system driven primarily by precipitation and lake levels, restoring wetland habitat and improving resilience.

Rough Island

Rough Island, a 1,750-acre tract historically characterized by depressional marshes and wet prairies, was drained in the 1960s with swales and shallow ditches to expand cattle grazing following lake stage regulation in the Kissimmee Chain of Lakes. Restoration efforts, completed in 2010, involved constructing 17 earthen ditch plugs and partially backfilling 6,293 linear feet of ditches using onsite materials. These efforts enhanced approximately 1,000 acres of wetlands, restoring hydrologic function and supporting wetland-dependent species. The site operates as a self-managed system, primarily influenced by precipitation and lake levels.

Rolling Meadows

The overall goal of the Rolling Meadows project is to restore historic Lake Hatchineha floodplain wetlands and habitat within the Rolling Meadows property. Phase I Wetland Restoration was completed in March 2017. The primary objectives of this initial phase were to expand the lake's littoral zone and habitat and to increase the volume of water flowing to the Kissimmee River. Phase II focuses on enhancing 185 acres of palustrine emergent wetlands and increasing hydroperiods in the northern section of the impoundment. The proposed plan for Phase II also involves removing invasive and undesirable species (such as para grass, Cuban bulrush, Peruvian primrose, wax myrtle, and cattail) through herbicide application, followed by mechanical vegetation removal in the most affected 36-acre area. Planned infrastructure improvements include constructing a ditch plug to re-establish sheet flow, rebuilding 1,300 linear feet of the internal berm system with spillways to maintain desired water levels, and adding riprap for stabilization. These modifications are intended to improve water distribution and residence time across the northern wetland area.

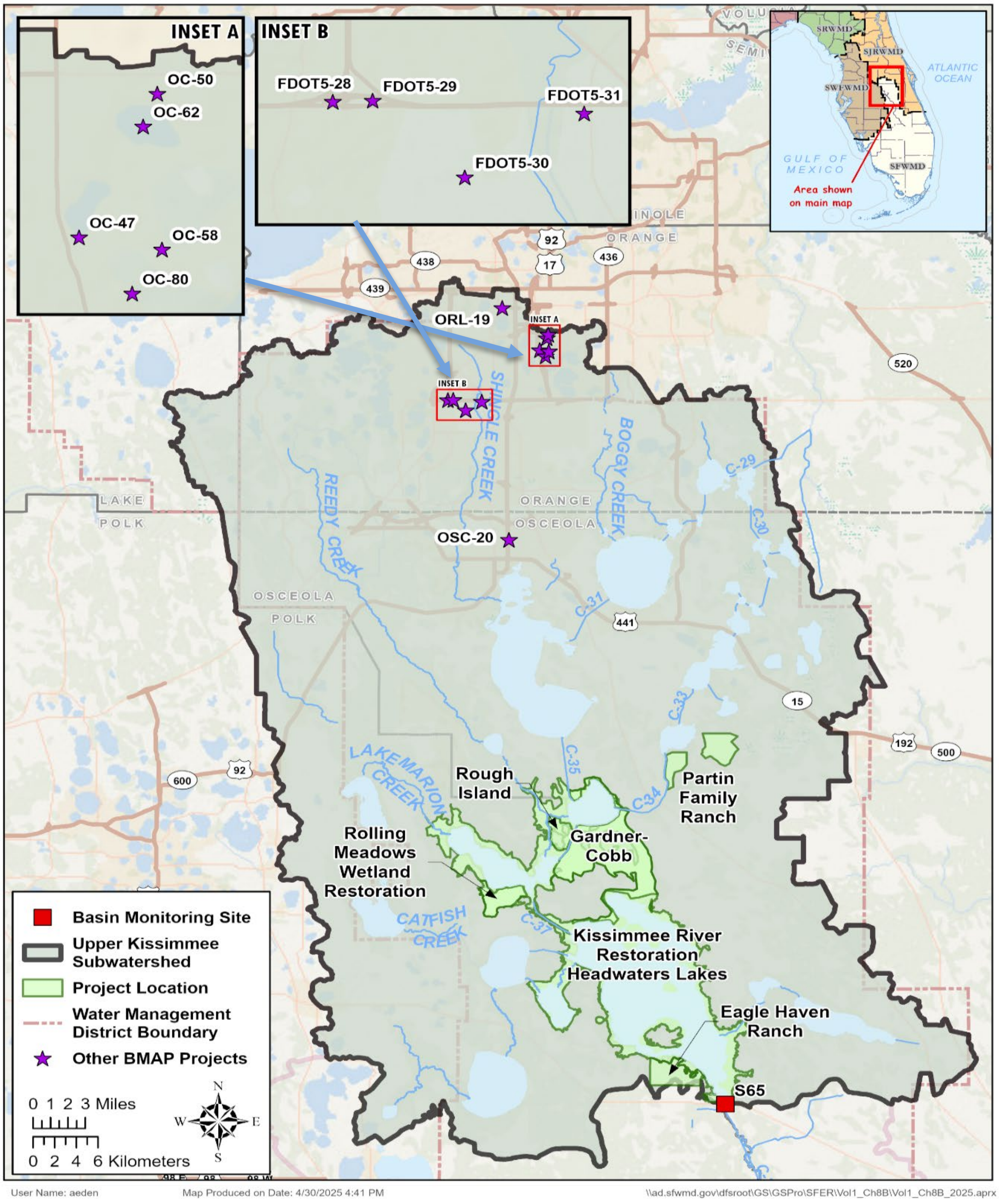


Figure 52. Current LOWPP projects and BMAP projects completed since 2020 in the Upper Kissimmee Subwatershed (Welch et al. 2025 and FDEP 2024b).

Table 12. Select Coordinating Agencies' projects in the Upper Kissimmee Subwatershed with the associated annual estimated and WY2024 storage and nutrient removal for each project (Welch et al. 2025).

Project Name	Project Area (ac)	Project Status FY2024	Description	Estimated Storage (ac-ft/yr)	WY2024 Storage (ac-ft)	Estimated TP Removal (t/yr)	WY2024 TP Removed (t)	Estimated TN Removal (t/yr)	WY2024 TN Removed (t)
Eagle Haven Ranch (Lost Oak Ranch)	730	O&M	Public-private partnership. Passive storage project consists of weirs installed in an existing ditch network to retain stormwater runoff.	374	700	0.1	0.1 [b]	1.4	1.1 [b]
Partin Family Ranch	3,050	O&M	Public-private partnership. Passive storage project retains direct rainfall and stormwater runoff within two water management areas.	4,270	N/A [c]	0.4	N/A [c]	5.2	N/A [c]
Gardner-Cobb Marsh Restoration	2,500	O&M	Hydrologic restoration (e.g. ditch plugs, backfill) to attenuate stormwater and rehydrate historic wetlands associated with the Kissimmee Chain of Lakes.	2,500	N/A [a]	N/A [a]	N/A [a]	N/A [a]	N/A [a]
Rough Island	1,000	O&M	Hydrologic restoration (e.g. ditch plugs, backfill) to attenuate stormwater and rehydrate historic wetlands associated with the Kissimmee Chain of Lakes.	N/A [a]	N/A [a]	N/A [a]	N/A [a]	N/A [a]	N/A [a]
Rolling Meadows Wetland Restoration Phase I	1,900	O&M	Restoration of historic Lake Hatchineha floodplain wetlands.	3,100	N/A [a]	N/A [a]	N/A [a]	N/A [a]	N/A [a]
Upper Kissimmee Subwatershed (approximate totals) [d]				**10,244[e]**	**700**	**0.5**	**0.1**	**6.6**	**1.1**

a. N/A – not available
b. No site-specific water quality monitoring. Nutrient benefits calculated using observed project storage and subwatershed/basin FWMC.
c. N/A – project was not in operation during WY2024.
d. Totals do not include projects where information is unavailable.
e. Estimated Storage in this table are dynamic storage (i.e. inflow minus outflow). The LOWCP storage target of 900,000 to 1,300,000 ac-ft is static storage (i.e. project capacity).

EXISTING AND FUTURE STORAGE EVALUATION

Current storage projects within the Upper Kissimmee Subwatershed are described above (**Table 12**). Additional future storage expected for this basin stems mainly from the HRS, discussed in the *Hydrology* section above, which includes modifications to structure operations and new land acquisitions in order to hold more water in the Upper Kissimmee Subwatershed. The HRS is designed to increase littoral wetland habitat which, along with flood risk management measures, can increase water storage capacity within Lakes Kissimmee, Hatchineha, Cypress, and Tiger by approximately 100,000 ac-ft.

At the time of this report, hydrologic enhancements on SFWMD-owned lands were proposed (Rolling Meadows Phase II). It remains uncertain if these efforts will contain storage components. No other future storage projects are currently in planning, design, or construction for this basin.

SFWMD is currently reviewing the Upper Kissimmee Subwatershed as part of its review of the flood protection level of service in this region (Resiliency and Flood Protection | South Florida Water Management District). Potential recommended projects as part of this review may include upgrading infrastructure to allow more drainage with additional water storage areas also being considered (SFWMD, 2025).

BMAP PROJECTS

The projects listed in **Table 13** and **Figure 52** are BMAP planned or projects completed since 2020 in the Upper Kissimmee where long-term TP reduction estimates were available. This time frame was selected as these were the projects considered when determining the additional reductions needed from this subwatershed in the Additional Nutrient Reductions and Storage Needed Section below. Entities responsible for these projects include agricultural producers, Osceola County, Orange County, City of Orlando, and FDOT District 5. Note, there are additional BMAP projects which either were completed prior to 2020 or had no estimated nutrient reduction and, therefore, are not included in the table. At the time of this analysis, data were only available from the 2023 Statewide Annual Report (FDEP 2024b). For more information on those projects see the 2020 Lake Okeechobee BMAP (FDEP 2020). Together the BMAP projects planned and completed since 2020 are expected to bring an additional long-term 0.8 t TP reduction annually.

Table 13. Planned and BMAP projects completed since 2020 with estimated long term TP load reductions (FDEP 2024b Statewide Annual Report).

Lead Entity	BMAP Project Number	Project Name	Project Description	Long Term TP Reduction (t)	Status
Osceola County	OSC-20	Lake Toho Regional Water Storage Facility (Judge Farms)	Construction of a regional stormwater pond and an alternative water supply reservoir.	0.339	Completed 2022
Orange County	OC-47	Lake Jennie Jewel Surface Water & Sediment Alum Treatment	In-lake application of alum and buffer.	0.298	Completed 2020
City of Orlando	ORL-19	BMP Cleanout	17,442 cubic feet per year of material collected from storm lines and BMP structures.	0.063	Ongoing
Orange County	OC-62	Lake Pineloch Surface Water and Sediment Alum Treatment	Whole-lake surface water and sediment inactivation alum treatment.	0.054	Completed 2021
Orange County	OC-80	Lake Gatlin Sediment Inactivation	In-lake alum surface application to sequester TP release from sediments.	0.029	Completed 2022
Orange County	OC-58	Lake Gem Mary Alum Treatment	Whole-lake surface water and sediment inactivation alum treatment.	0.005	Completed 2020
FDOT District 5	FDOT5-30	407143-5 Pond WDA 4	Add lanes and reconstruct.	0.003	Completed 2021
FDOT District 5	FDOT5-28	407143-4 Ponds WDA 2A and 2B	Add lanes and reconstruct.	0.002	Completed 2021
Orange County	OC-50	Lake Pineloch NSBB-Upflow Filter	Construct a treatment train consisting of an on-line nutrient separating baffle box and off-line upflow filter fitted with reducing media.	0.002	Completed 2021
FDOT District 5	FDOT5-29	407143-5 Pond WDA 3	Add lanes and reconstruct.	0.001	Completed 2021
FDOT District 5	FDOT5-31	407143-6 State Road 482 (Sand Lake Rd)	Overpass over Sand Lake at John Young Parkway (2 wet detention ponds for FM 407143-1).	0.001	Completed 2021
Total				**0.797**	

ADDITIONAL NUTRIENT REDUCTIONS AND STORAGE NEEDED

A review of the recent 5-year average (WY2020-WY2024) TP loading data calculated via the mass balance and the pass-through methods compared to the basin TP planning target **(Table 14)** indicates that an additional 46 to 57 t annual average reduction is needed for the Upper Kissimmee Subwatershed without any future project reductions. That assumes that all existing projects operating for at least five years have achieved their TP reduction benefits and that is reflected in the recent 5-year average water quality data. The long-term average TP load reductions from recently completed and planned projects is 1.2 t (0.4 t from the Partin Family Ranch project and 0.8 t from BMAP projects) which reduces the TP load reduction needed to 45 to 56 t annually. This highlights the substantial efforts required to achieve the TP planning target. Achieving that reduction will require additional new projects and the optimization of existing ones where possible.

Table 14. Planning targets for the Upper Kissimmee Subwatershed and the 5-year average (WY2020-WY2024) 5-year average TP loads (using pass-through and mass balance calculations) and the long-term average annual TP reductions needed to achieve the planning target.

Subwatershed	TP Planning Target (t)	TP Load WY2020-WY2024 avg (t)		TP Reduction Needed without Planned Projects Benefits (t)		Recently Completed and Planned Project Estimated TP Reductions (t)[a]	TP Reduction Needed assuming Planned Project Benefits (t)	
		Pass-Through	Mass Balance	Pass-Through	Mass Balance		Pass-Through	Mass Balance
Upper Kissimmee	15.9	62	73	46.1	57.1	1.2	44.9	55.9

[a] Assumes that all projects operating for 5 years have realized their TP reductions. Includes reductions from recently completed and planned projects where load estimates were available.

As discussed above since the TP FWMC (5-year average 72 µg/L) from this subwatershed is below the 120 µg/L NNC, storage projects may be the best way to reduce the TP loads. The static storage (project capacity) from the LOWPP projects is 11,780 ac-ft (Frye et al. 2025). There are no static (project capacity) storage targets for the Upper Kissimmee Subwatershed. Other projects, including non-protection plan projects, may provide additional storage but those storage capacities were not readily available for inclusion in this report. It is recommended that additional storage projects be developed keeping in mind the operational constraints for the downstream structures with regulation schedules. It should be realized that due to water supply and ecological needs, at times those additional projects may not be able to store water. However, they would be a great benefit to capture excess water during periods of inundation and discharge the water when needed.

TIMELINE TO ACHIEVE RECENTLY COMPLETED AND PLANNED PROJECT REDUCTIONS

To provide an estimate of the time it will take to achieve the long-term average TP load reductions from the recently operating and planned projects, the dates when operations would begin for each project were estimated (**Table 15**). Note the exact timeline for achieving reductions is not known. The TP load reductions are long-term average annual estimates and individual water years will vary due to variations in rainfall, runoff, and biological removal processes. The Upper Kissimmee Subwatershed could see the full 1.2 t/yr reduction around 2029, assuming that there are no project delays and the long-term estimated reductions are realized over a 5-year period.

Table 15. Operational dates and expected TP reductions for recently completed and planned BMAP projects in the Upper Kissimmee Subwatershed.

Project Name	Long-term Average Annual TP Reduction (t/yr)	Operation Start Date	Long-Term TP Reduction may be Realized
Lake Jennie Jewel Surface Water & Sediment Alum Treatment	0.298	2020	2025
BMP Cleanout	0.063	2020[a]	2025
Lake Gem Mary Alum Treatment	0.005	2020	2025
407143-5 Pond WDA 4	0.003	2021	2026
407143-4 Ponds WDA 2A and 2B	0.002	2021	2026
Lake Pineloch NSBB-Upflow Filter	0.002	2021	2026
407143-5 Pond WDA 3	0.001	2021	2026
407143-6 State Road 482 (Sand Lake Rd)	0.001	2021	2026
Lake Pineloch Surface Water and Sediment Alum Treatment	0.054	2021	2026
Lake Toho Regional Water Storage Facility (Judge Farms)	0.339	2022	2027
Lake Gatlin Sediment Inactivation	0.029	2022	2027
Partin Family Ranch	0.4	2024	2029
Total	**1.197**		

[a]Year when project initially began. It is an annual on-going project.

UPSTREAM LEVEL MONITORING ANALYSIS

UPSTREAM DATA

Data from upstream monitoring sites were reviewed to better understand the source of nutrients within the watershed and to better define where additional projects or program adjustments are needed. Currently, there are 31 upstream monitoring locations in the Upper Kissimmee Basin where TP, TN, OPO_4-P, NH_3-N, and NOx-N are collected (**Figures 53-54**, **Tables 16-18**). The present frequency of monitoring at most of the upstream monitoring sites is bi-weekly when flowing, but some are monitored weekly or when there is recorded flow. At most upstream monitoring locations there is no measurement of flow.

Of the 31 upstream level monitoring sites in the Upper Kissimmee Subwatershed only five had 5-year average annual TP concentrations greater than FDEP's NNC of 120 µg/L (FDEP, 2020); CL06283112, KUB009, ML22303311, ML22303313, and PA10313112. Three sites had TN concentrations greater than FDEP's NNC of 1.54 mg/L TN (FDEP, 2020); KUB009, ML22303113, and ROMCUT. ML22303113 which had the highest 5-year average concentrations of TP and TN should be further investigated along with ML22303311 since these stations are just upstream of Lake Marian which is impaired for both TP and TN. In terms of Lake Okeechobee, the concentrations at these locations may not have a lot of impact since the downstream site, LJACKDSCH, has lower concentrations of TP and TN, and negative and reverse flow conditions are observed 27.7% of the time from the Lake Jackson Basin (See Water Availability Section above). CL06283112 and PA10313112, which is downstream of a row crop area, both need to be investigated further to determine the sources of the elevated TP concentrations and potential actions that could be taken to reduce TP concentrations. KUB009 which had high concentrations of TP and TN, recently does not appear to be flowing as often (negative or no flow conditions 85% of the time; see Water Availability Section Lake Rosalie Basin: G103 Structure above). ROMCUT flows into the Rolling Meadows project. Based on data from the outlet of the project, the TN concentrations appear to be reduced after flowing through the project.

A trend analysis of the upstream data was conducted similar to the basin level data using the SKT but on monthly average TP and TN concentrations (Jones and Olson, 2025). Only 16 of the 31 upstream monitoring stations had data for more than 50% of the months during the recent 10-year period (WY2014-WY2023) and only 2 of the stations had data for more than 50% of the months during the period of record (WY1991-WY2023), so these were the only stations included in the SKT analysis. Seven stations had significant ($p<0.05$) decreasing trends during the recent 10-year period: BNSHINGLE and DLMARNCR for TN; DLONDNCR, EC-37, ET06253113, LT32263013, and ROMCUT for TP. Over the period of record, both stations (BS-59 and CREEDYBR) analyzed had significant decreasing trends for TN. No other significant trends were found. Previously, in the 2022 SFER, the trends for 14 upstream sites in the Upper Kissimmee Subwatershed over the period of WY2012-WY2020 were evaluated using SKT and reported (Zhang et al. 2022). That study also found that DLONDNCR and ET06253113 had decreasing TP concentration trends but found increasing trends at ABOGGN and BS-59. However, BS-59 had no significant trends when assessing the TP load or TP FWMC. With the addition of older (WY1991-WY2011) and newer (WY2021-WY2023) data in the 2025 study, ABOGGN did not meet the <50% missing months criteria for analysis and BS-59 did not have a significant increasing trend in TP concentrations. It should also be reiterated that ABOGGN did not have any significant trends in TP or TN concentration during the recent 10-year analysis period (WY2014-WY2023).

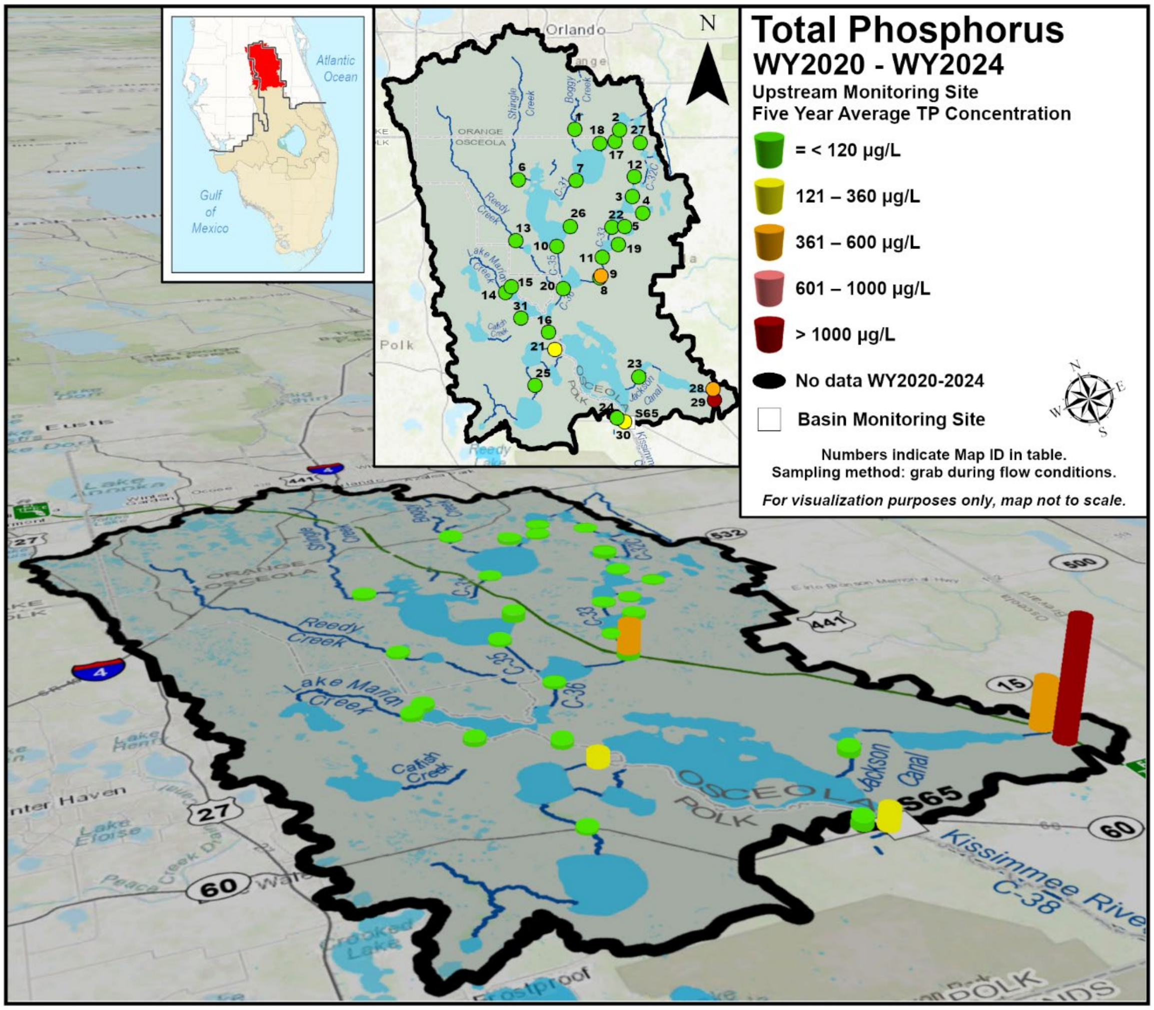


Figure 53. Most recent 5-year average TP concentrations (WY2020–WY2024) for upstream monitoring sites within the Upper Kissimmee Subwatershed. Site numbers correspond to Map IDs in **Table 16.** (Olson and Broling 2025).

In WY2022, SFWMD worked with the other Coordinating Agencies (FDEP and FDACS) to develop and implement a rapid assessment process to notify each agency and share when unusual events happen in an effort to be proactive in managing water quality issues as outlined in the 2023 Interagency Agreement. Unusual events can be when a water quality sampler observes conditions indicative of poor water quality or when SFWMD laboratory results return high nutrient values. The Coordinating Agencies Technical Team determined in the LOW samples with measurements above the absolute values of TP ≥ 5,000 micrograms per liter (µg/L) and TN values ≥ 10 milligrams per liter (mg/L) would be highlighted. SFWMD completes an initial review as soon as preliminary data are available and, if warranted, an email notification is sent to the Coordinating Agencies. As of January 2025, no rapid assessment notification trigger emails have been sent to the Coordinating Agencies for sites within the Upper Kissimmee Subwatershed as none of those sites have had concentrations greater than the absolute values since this process began.

Table 16. Most recent 5-year TP concentration data (WY2020–WY2024) for the upstream monitoring sites within the Upper Kissimmee Subwatershed. The 5-year average TP concentration is presented in **Figure 53**. (Note: Avg. – Average, Conc. – Concentration, ID – Identifier, Max. – Maximum, and Min. – Minimum, and No. – Number of Samples). (Olson and Broling 2025).

Upper Kissimmee		WY2020[a]				WY2021				WY2022				WY2023				WY2024				5-Year Avg. TP Conc. (µg/L)	5-Year TP Median Conc. (µg/L)
		No.	TP Conc. (µg/L)			No.	TP Conc. (µg/L)			No.	TP Conc. (µg/L)			No.	TP Conc. (µg/L)			No.	TP Conc. (µg/L)				
Map ID	Site		Avg.	Min.	Max.		Avg.	Min.	Max.		Avg.	Min.	Max.		Avg.	Min.	Max.		Avg.	Min.	Max.		
1	ABOGGN[b]	13	27	15	43	23	29	14	60	25	23	14	36	23	27	20	45	25	20	10	35	25	24
2	AJ33243122[b,c]	2	27	24	29	16	26	22	29	16	29	24	42	10	34	26	61	14	27	20	33	28	28
3	AL11263113[c]	0	-	-	-	11	17	13	22	7	28	23	32	9	30	19	35	10	39	32	49	28	29
4	AL24263113[c]	2	18	17	18	5	21	14	29	8	20	16	24	17	24	16	43	20	19	13	31	21	19
5	AL34263113[c]	3	39	38	41	16	25	14	43	14	24	20	37	13	24	19	30	17	23	18	36	25	23
6	BNSHINGLE[b]	14	47	30	73	23	52	26	88	21	51	28	83	24	53	30	109	24	43	25	63	49	49
7	BS-59[b]	4	19	15	28	18	21	18	27	17	17	13	23	15	23	16	33	11	24	18	29	21	21
8	CL06283111[b]	4	85	49	181	13	73	17	334	12	53	25	116	10	68	27	203	13	76	41	224	69	57
9	CL06283112	1	332	332	332	1	376	376	376	1	485	485	485	0	-	-	-	6	362	43	593	374	389
10	CL18273011[b]	10	67	27	263	21	35	21	65	19	32	20	62	15	38	25	62	15	31	19	64	38	31
11	CL19273123[b,c]	1	18	18	18	12	25	17	37	13	24	19	28	9	39	22	54	12	37	28	49	30	28
12	CO35253112[c]	0	-	-	-	13	45	40	53	10	96	48	244	8	57	41	70	14	86	51	124	71	61
13	CREEDYBR	13	47	22	78	18	34	18	52	19	28	16	39	20	59	26	96	20	33	14	64	40	35
14	DLMARNCR	25	57	29	116	22	54	32	109	25	51	27	102	22	55	23	102	25	48	22	93	53	46
15	DLONDNCR	17	55	28	143	14	55	40	95	8	47	34	80	9	48	25	67	14	37	22	66	49	44
16	EC-37	20	57	32	93	19	46	32	76	12	46	35	64	16	53	35	68	17	51	30	92	51	48
17	ET05253114	5	36	30	40	17	36	25	54	14	33	27	41	10	40	31	50	15	29	22	39	35	34
18	ET06253113	14	63	34	216	21	46	32	66	13	50	36	73	10	54	31	97	16	47	30	77	51	47
19	GENTRYDTCH	13	46	23	81	23	66	21	187	23	40	18	83	20	101	31	505	24	42	22	70	59	43
20	HL08283014[c]	4	47	29	56	20	39	21	64	17	36	26	48	14	55	32	78	15	42	25	67	42	39
21	KUB009[b]	4	222	154	274	2	82	78	86	0	-	-	-	4	92	78	110	1	73	73	73	136	92
22	LG32263124[b]	1	31	31	31	11	14	10	20	12	18	15	21	10	31	17	58	11	29	24	35	23	20
23	LJACKDSCH[b]	4	161	95	258	7	92	57	147	0	-	-	-	1	123	123	123	13	37	20	60	76	57
24	LK04313114[d]	0	-	-	-	11	70	24	231	6	127	38	388	5	123	46	347	0	-	-	-	97	57
25	LR14302912[d]	7	41	29	59	24	36	22	56	22	41	26	66	17	39	18	96	24	39	22	70	39	37
26	LT32263013	7	88	37	154	16	113	62	180	8	97	64	159	11	91	60	169	13	69	55	82	93	81
27	MJ01253123[b]	2	22	18	25	0	-	-	-	6	15	12	20	5	23	18	27	7	23	15	44	20	19
28	ML22303311[d]	0	-	-	-	10	438	164	797	1	925	925	925	1	880	880	880	3	567	204	1,010	526	488
29	ML22303313	5	1,561	654	2,657	17	1,274	625	2,186	9	1,286	634	1,831	9	1,139	337	1,778	19	1,314	644	2,392	1,293	1,278
30	PA10313112	8	150	54	492	17	89	40	316	16	524	60	1,916	12	96	48	467	15	114	45	554	205	70
31	ROMCUT	25	61	42	84	25	49	34	80	15	72	46	135	21	40	27	54	26	44	28	68	52	48

a. During WY2016, the sampling frequency of most of the upstream ambient/tributary sites was reduced from biweekly to monthly because of SFWMD resource constraints but was restored to biweekly in February 2020 (WY2020).
b. Flow data were collected by SFWMD at associated flow stations. The flow data are available in SFWMD's DBHYDRO database accessible at https://www.sfwmd.gov/science-data/dbhydro. Note there may be other flow monitoring sites in this subwatershed that can be found in the database.
c. Monitoring reinstated in February 2020 as part of SFWMD expanded monitoring.

d. Monitoring began in February 2020 as part of SFWMD expanded monitoring network.

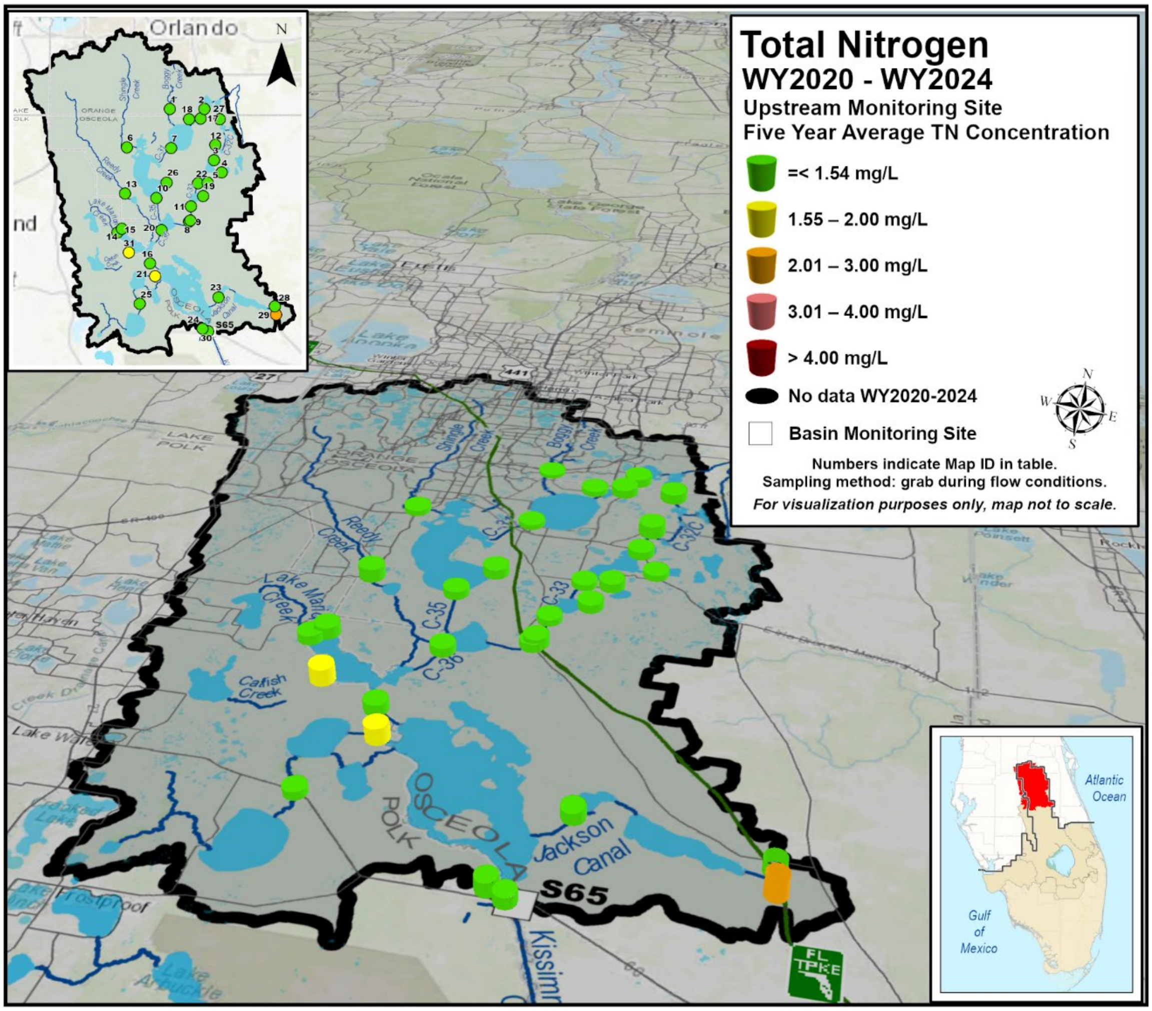


Figure 54. Most recent 5-year average TN concentrations (WY2020–WY2024) for upstream monitoring sites within the Upper Kissimmee Subwatershed. Site numbers correspond to Map IDs in **Table 17.** (Olson and Broling 2025).

Table 17. Most recent 5-year TN concentration data (WY2020–WY2024) for the upstream monitoring sites within the Upper Kissimmee Subwatershed. The 5-year average TN concentration is presented in **Figure 54**. (Note: Avg. – Average, Conc. – Concentration, ID – Identifier, Max. – Maximum, and Min. – Minimum, and No. – Number of Samples). (Olson and Broling 2025).

Upper Kissimmee		WY2020[a]				WY2021				WY2022				WY2023				WY2024				5-Year Avg. TN Conc. (mg/L)	5-Year TN Median Conc. (mg/L)
		No.	TN Conc. (mg/L)			No.	TN Conc. (mg/L)			No.	TN Conc. (mg/L)			No.	TN Conc. (mg/L)			No.	TN Conc. (mg/L)				
Map ID	Site		Avg.	Min.	Max.		Avg.	Min.	Max.		Avg.	Min.	Max.		Avg.	Min.	Max.		Avg.	Min.	Max.		
1	ABOGGN[b]	13	0.49	0.38	0.61	23	0.50	0.37	0.68	26	0.49	0.38	0.58	24	0.44	0.38	0.52	25	0.45	0.38	0.54	0.47	0.47
2	AJ33243122[b]	2	0.94	0.83	1.05	16	0.92	0.75	1.05	17	1.06	0.88	2.42	11	0.90	0.73	1.35	14	0.89	0.64	1.14	0.95	0.95
3	AL11263113	0	-	-	-	11	0.77	0.62	0.99	7	0.97	0.83	1.40	9	0.97	0.69	1.13	10	0.99	0.85	1.08	0.91	0.93
4	AL24263113	2	0.62	0.62	0.62	5	0.66	0.57	0.79	9	0.78	0.67	0.95	19	0.74	0.58	1.10	20	0.69	0.57	0.98	0.71	0.70
5	AL34263113	3	1.17	1.14	1.20	16	1.07	0.81	1.25	14	0.98	0.68	1.28	14	0.99	0.84	1.15	17	0.96	0.89	1.10	1.01	0.98
6	BNSHINGLE[b]	14	0.73	0.67	0.76	23	0.74	0.63	0.96	22	0.73	0.57	0.96	25	0.72	0.55	0.95	24	0.68	0.57	0.85	0.72	0.71
7	BS-59[b]	4	0.57	0.53	0.59	18	0.63	0.53	0.72	18	0.61	0.54	0.70	16	0.65	0.54	0.79	11	0.65	0.59	0.77	0.63	0.63
8	CL06283111[b]	1	0.97	0.97	0.97	13	0.93	0.52	2.38	12	0.85	0.67	1.38	10	0.85	0.73	0.95	12	0.92	0.77	1.68	0.89	0.84
9	CL06283112	0	-	-	-	1	1.34	1.34	1.34	1	1.88	1.88	1.88	0	-	-	-	6	1.05	0.75	1.39	1.19	1.15
10	CL18273011[b]	3	0.98	0.84	1.18	21	0.89	0.62	1.35	20	1.03	0.72	1.67	15	0.87	0.58	1.34	15	0.83	0.68	1.21	0.92	0.84
11	CL19273123[b]	1	0.60	0.60	0.60	12	0.66	0.51	0.80	13	0.71	0.58	1.21	9	0.77	0.60	0.90	12	0.76	0.71	0.85	0.72	0.70
12	CO35253112	0	-	-	-	13	1.42	0.89	1.86	10	1.44	1.19	1.80	8	1.29	1.11	1.61	14	1.44	1.22	1.72	1.41	1.41
13	CREEDYBR	13	1.37	0.70	2.03	18	1.56	1.20	2.49	20	1.71	1.21	2.62	21	1.24	0.89	1.54	20	1.38	0.43	2.16	1.45	1.38
14	DLMARNCR	25	1.11	0.81	2.92	22	0.99	0.76	1.45	26	0.96	0.73	1.83	22	1.09	0.69	1.42	25	0.88	0.73	1.12	1.00	0.93
15	DLONDNCR	17	1.31	1.01	2.09	14	1.17	0.88	1.62	8	1.55	1.19	2.20	9	1.33	0.80	1.81	14	1.19	0.92	1.60	1.29	1.19
16	EC-37	20	1.30	0.92	1.62	19	1.14	0.93	1.58	13	1.21	0.92	1.50	16	1.11	0.88	1.39	17	1.12	0.83	1.47	1.18	1.14
17	ET05253114	1	0.90	0.90	0.90	17	0.99	0.83	1.22	15	1.06	0.91	1.86	11	0.89	0.77	1.03	15	0.89	0.68	0.99	0.96	0.93
18	ET06253113	6	0.51	0.36	0.69	21	0.77	0.36	3.46	13	0.64	0.44	0.85	11	0.51	0.30	0.81	16	0.66	0.40	0.82	0.65	0.64
19	GENTRYDTCH	13	0.80	0.41	1.59	24	0.92	0.43	1.37	24	0.86	0.59	1.20	20	1.27	0.56	4.28	24	0.93	0.50	1.34	0.96	0.92
20	HL08283014	4	1.18	0.89	1.58	20	1.07	0.63	2.13	17	1.00	0.72	1.30	14	0.95	0.67	1.26	15	0.92	0.72	1.13	1.00	0.94
21	KUB009[b]	4	2.86	2.35	3.49	2	0.90	0.85	0.95	0	-	-	-	4	1.04	0.88	1.30	1	1.04	1.04	1.04	1.68	1.08
22	LG32263124[b]	0	-	-	-	11	0.59	0.51	0.66	12	0.72	0.61	1.24	10	0.79	0.58	0.99	11	0.76	0.70	0.89	0.71	0.69
23	LJACKDSCH[b]	4	1.69	1.44	2.08	7	1.29	1.11	1.59	0	-	-	-	1	1.47	1.47	1.47	13	1.25	0.94	1.47	1.34	1.31
24	LK04313114	0	-	-	-	11	1.27	0.85	2.12	6	1.73	1.43	2.34	5	1.79	1.34	2.29	0	-	-	-	1.51	1.48
25	LR14302912	7	0.76	0.63	0.97	24	0.80	0.60	1.42	23	0.88	0.66	1.35	17	0.84	0.54	1.44	24	0.93	0.56	1.30	0.86	0.80
26	LT32263013	1	0.95	0.95	0.95	16	1.18	0.64	1.47	8	1.22	1.01	1.55	11	0.99	0.66	1.45	13	0.98	0.69	1.19	1.08	1.13
27	MJ01253123[b]	0	-	-	-	0	-	-	-	6	1.30	1.22	1.36	5	1.09	0.81	1.25	7	1.12	0.69	1.28	1.17	1.24
28	ML22303311	0	-	-	-	10	1.28	0.68	1.71	1	1.93	1.93	1.93	1	1.60	1.60	1.60	3	1.61	1.12	2.33	1.41	1.41
29	ML22303313	0	-	-	-	17	2.26	1.72	3.41	9	2.28	2.10	2.82	9	2.15	1.84	2.64	19	2.15	1.30	2.77	2.21	2.16
30	PA10313112	4	1.10	0.86	1.19	17	1.17	0.99	1.84	16	1.46	0.66	2.17	12	1.10	0.82	1.33	15	1.11	0.97	1.29	1.21	1.16
31	ROMCUT	25	2.18	1.27	2.95	25	1.73	1.15	2.33	16	1.94	1.60	2.52	21	1.49	0.92	2.28	26	1.69	0.92	2.29	1.81	1.84

a. During WY2016, the sampling frequency of most of the upstream ambient/tributary sites was reduced from biweekly to monthly because of SFWMD resource constraints but was restored to biweekly in February 2020 (WY2020). Note TN monitoring began at many of the upstream monitoring locations in February 2020 as part of SFWMD expanded monitoring.
b. Flow data were collected by SFWMD at associated flow stations. The flow data are available in SFWMD's DBHYDRO database accessible at https://www.sfwmd.gov/science-data/dbhydro. Note there may be other flow monitoring sites in this subwatershed that can be found in the database.

Table 18. Five-year average data (WY2020-WY2024) for the Upper Kissimmee Subwatershed. Color bars within each cell represent the relative magnitude of each data value to the range of values for that parameter within the subwatershed for the same period. (Note: Avg. – Average, ID – Identifier, and No. – Number of Samples). (Olson and Broling 2025).

Upper Kissimmee		WY2020-WY2024									
		TP (µg/L)		OPO_4-P (µg/L)		TN (mg/L)		NH_3-N (mg/L)		NO_X-N (mg/L)	
Map ID	Site	No.	Avg.	No.	Avg.	No.	Avg.	No.	Avg.	No.	Avg.
1	ABOGGN	109	25	103	11	111	0.47	105	0.01	101	0.01
2	AJ33243122	58	28	56	2	60	0.95	58	0.02	58	0.03
3	AL11263113	37	28	34	2	37	0.91	36	0.02	35	0.03
4	AL24263113	52	21	29	6	55	0.71	34	0.02	34	0.01
5	AL34263113	63	25	57	5	64	1.01	63	0.04	62	0.05
6	BNSHINGLE	106	49	103	26	108	0.72	102	0.02	96	0.02
7	BS-59	65	21	63	2	67	0.63	65	0.01	61	0.01
8	CL06283111	52	69	47	25	48	0.89	47	0.03	45	0.01
9	CL06283112	9	374	8	160	8	1.19	8	0.04	7	0.01
10	CL18273011	80	38	71	3	74	0.92	72	0.02	71	0.01
11	CL19273123	47	30	45	3	47	0.72	46	0.01	45	0.01
12	CO35253112	45	71	42	10	45	1.41	44	0.04	45	0.05
13	CREEDYBR	90	40	86	15	92	1.45	87	0.04	81	0.02
14	DLMARNCR	119	53	97	21	120	1.00	96	0.02	100	0.06
15	DLONDNCR	62	49	47	19	62	1.29	46	0.03	48	0.02
16	EC-37	84	51	65	6	85	1.18	69	0.04	69	0.03
17	ET05253114	61	35	50	6	59	0.96	53	0.03	54	0.04
18	ET06253113	74	51	21	13	67	0.65	21	0.03	21	0.03
19	GENTRYDTCH	103	59	67	30	105	0.96	67	0.03	70	0.02
20	HL08283014	70	42	67	4	70	1.00	67	0.03	67	0.02
21	KUB009	11	136	6	32	11	1.68	7	0.05	7	0.03
22	LG32263124	45	23	42	2	44	0.71	42	0.01	42	0.03
23	LJACKDSCH	25	76	20	14	25	1.34	22	0.03	22	0.01
24	LK04313114	22	97	5	57	22	1.51	5	0.04	5	0.02
25	LR14302912	94	39	88	3	95	0.86	91	0.03	93	0.04
26	LT32263013	55	93	47	37	49	1.08	49	0.05	47	0.11
27	MJ01253123	20	20	17	2	18	1.17	17	0.04	17	0.03
28	ML22303311	15	526	15	419	15	1.41	15	0.17	14	0.05
29	ML22303313	59	1293	53	1137	54	2.21	54	0.14	53	0.02
30	PA10313112	68	205	42	153	64	1.21	42	0.05	43	0.06
31	ROMCUT	112	52	104	3	113	1.81	94	0.25	95	0.18

UPSTREAM OPO_4-P AS A PERCENTAGE OF TP ANALYSIS

To assess how much of the TP consists of OPO_4-P (a soluble form), a comparison was made between total TP and OPO_4-P concentrations collected from grab samples. Data used in this analysis included samples only collected during flow conditions on dates when both TP and OPO_4-P measurements were available. **Table 19** summarizes the average TP and OPO_4-P concentrations, sample counts, and OPO_4-P as a percentage of TP for each station from WY2020 to WY2024. These data were used to create the map shown in **Figure 55**, which illustrates the spatial distribution of OPO_4-P as a percentage of TP across the Upper Kissimmee watershed.

The stations were arbitrarily categorized into three groups based on OPO_4-P as a percentage of TP: low (0–25%), moderate (26–59%), and high (60–90%). If in the low or moderate range, phosphorus is predominantly in forms other than OPO4-P. If in the high range, OPO4-P is the dominant form, reflecting a greater proportion of dissolved phosphorus.

A clear spatial trend is evident in OPO_4-P as a percentage of TP increasing from northern and central regions toward the southern portion of the watershed. The northern and central regions generally exhibit low to moderate OPO_4-P as a percentage of TP, this may be due to the influence of lakes and wetlands acting as natural filters. In contrast, the southern areas, which may be influenced by nearby agricultural and ranching lands, show higher OPO_4-P as a percentage of TP, indicating elevated soluble phosphorus.

It's important to note that while two stations may share similar OPO4-P/TP percentages, their actual phosphorus concentrations can differ by orders of magnitude, which may influence management priorities. To see the TP concentration data for each station, please refer to **Table 16** and **Figure 53** above.

Table 19. OPO4-P as a percentage of TP in the Upper Kissimmee Upstream Monitoring Sites for the 5-year period from WY2020-WY2024.

Speciation Upstream Monitoring Sites for WY2020-WY2024					
Map ID	**Site**	**Average of TP conc. (µg/L)**	**Average of OPO_4-P conc. (µg/L)**	**Percentage of OPO_4-P to TP**	**Number of Samples[a]**
1	ABOGGN	25	12	47%	103
2	AJ33243122 (S62)	28	2	8%	55
3	AL11263113	28	2	9%	34
4	AL24263113	20	6	31%	28
5	AL34263113	25	5	19%	57
6	BNSHINGLE	50	27	54%	102
7	BS-59 (S59)	22	2	10%	79
8	CL06283111 (S63A)	68	25	37%	47
9	CL06283112	379	160	42%	8
10	CL18273011 (S61)	34	3	7%	70
11	CL19273123 (S63)	29	3	10%	45
12	CO35253112	70	10	14%	42
13	CREEDYBR	46	19	41%	88
14	DLMARNCR	53	21	39%	96
15	DLONDNCR	46	19	42%	48
16	EC-37	47	6	13%	64
17	ET05253114	33	6	17%	49
18	ET06253113	43	13	30%	21
19	GENTRYDTCH	66	30	46%	66
20	HL08283014	42	4	10%	77
21	KUB009	89	32	36%	6
22	LG32263124 (S60)	22	2	11%	42
23	LJACKDSCH	61	14	23%	20
24	LK04313114	96	57	60%	5
25	LR14302912	38	3	8%	87
26	LT32263013	93	37	40%	47
27	MJ01253123	19	2	12%	17
28	ML22303311	526	419	80%	15
29	ML22303313	1258	1137	90%	53
30	PA10313112	202	153	76%	42
31	ROMCUT	52	3	5%	104
	Minimum	**19**	**2**	**5%**	**5**
	Maximum	**1258**	**1137**	**90%**	**104**
	Average	**116**	**72**	**31%**	**52**

[a] Only used sample collection dates that represented both TP and OPO_4-P.

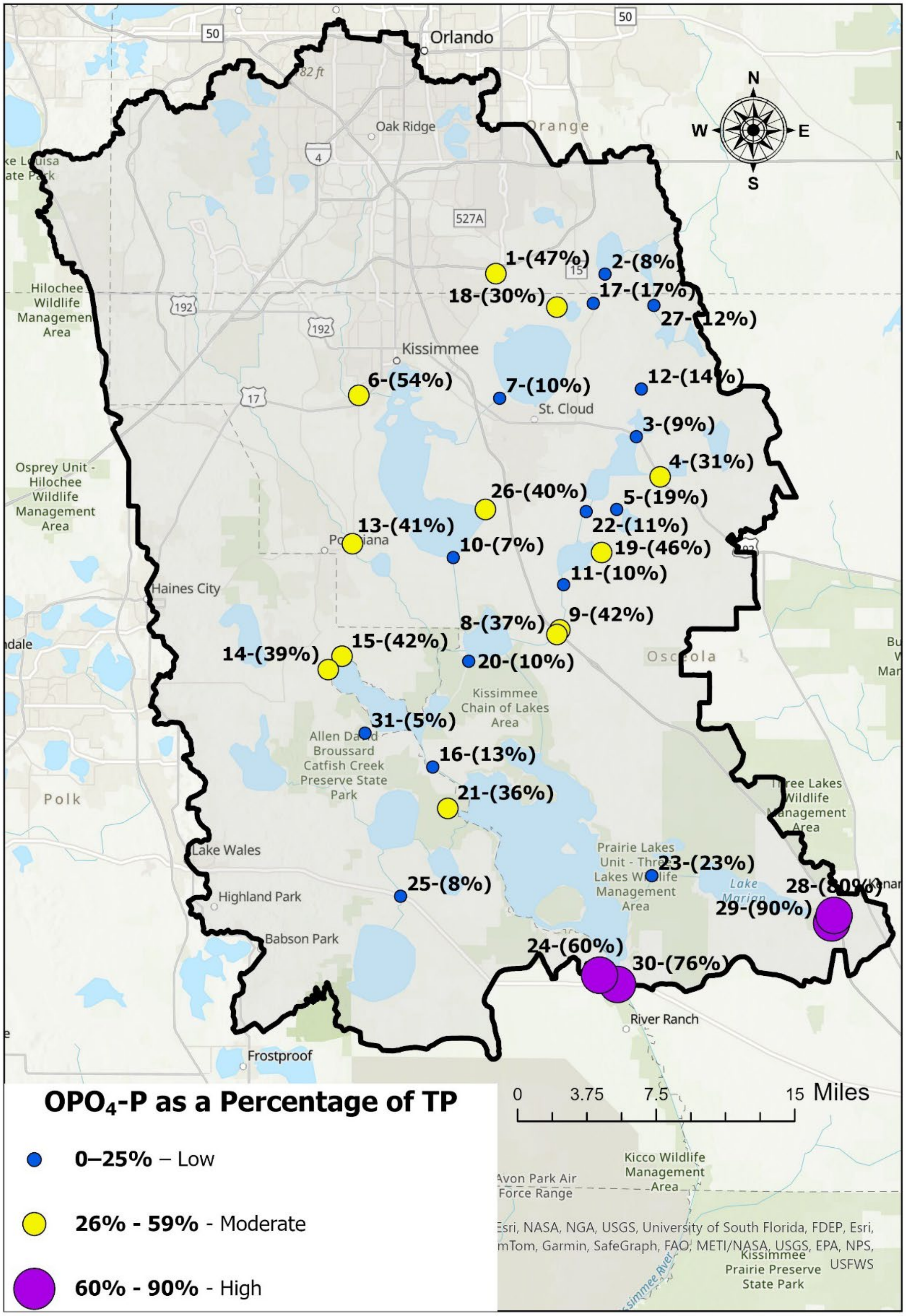


Figure 55. Five-year average OPO_4-P as a percentage of TP (WY2020–WY2024) for upstream monitoring sites within the Upper Kissimmee Subwatershed. Site numbers correspond to Map IDs in **Table 19**.

UPSTREAM PHOSPHORUS LOAD DATA

Phosphorus loading data from the upstream monitoring sites were reviewed to better understand basin contributions to the watershed and to better define where additional projects or program adjustments are needed. TP loading rates vary from year to year because of fluctuating rainfall and weather patterns, changes in land use, and varying operations of water control structures. The most recent five-year average TP load in metric tons for upstream water quality monitoring sites with flow data are presented in **Figure 56** and **Table 20.** Note that flows and loads from upstream basins are not subtracted out from the downstream basin totals in this analysis. Also, note that the areas on the map without color do not have flow monitoring therefore phosphorus loads cannot be calculated from those areas.

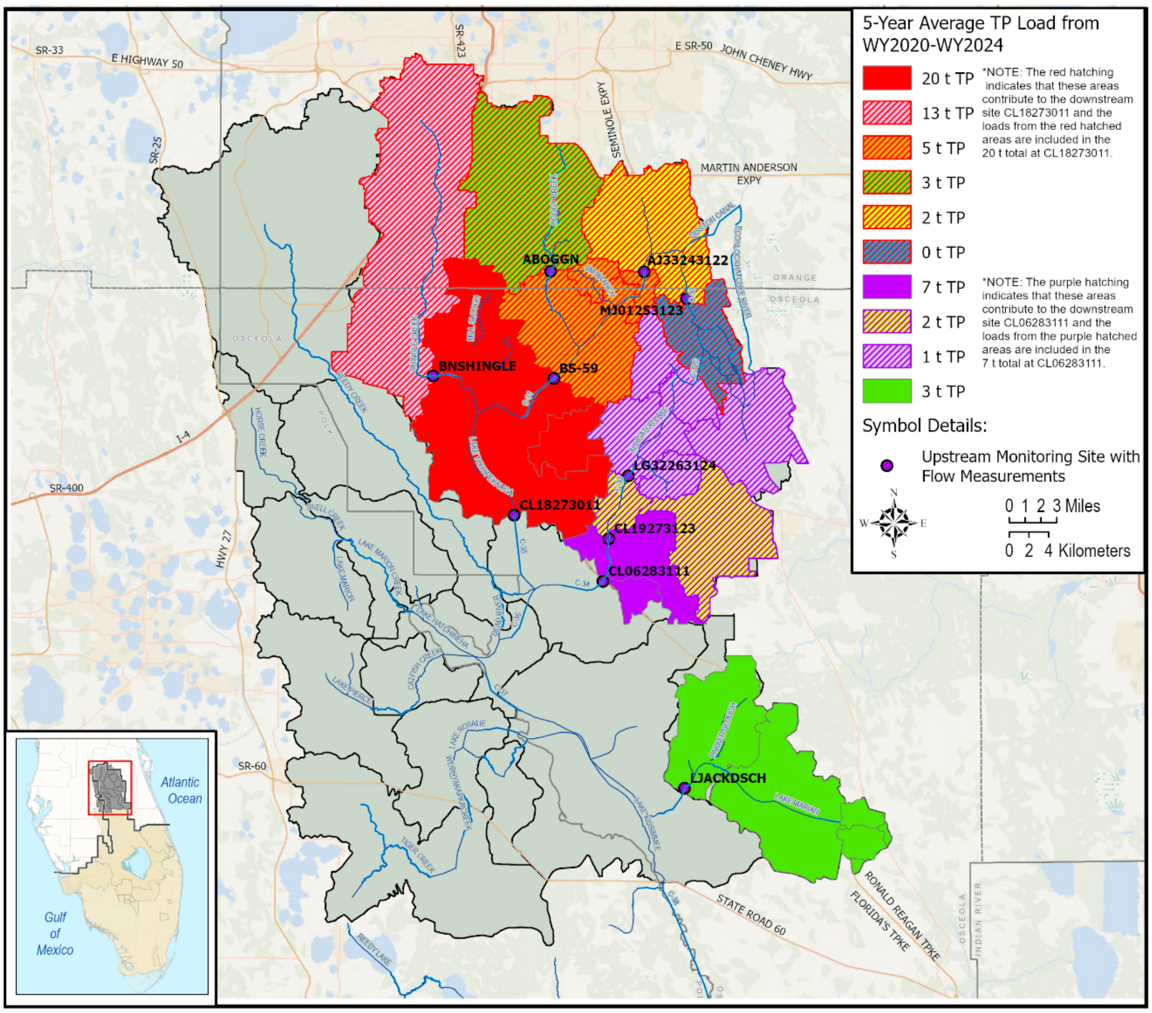


Figure 56. Five-year average TP load (WY2020–WY2024) in metric tons (t) for upstream monitoring sites with flow measurements within the Upper Kissimmee Subwatershed (Olson and Broling 2025).

The highest five-year average TP loads were observed at Lake Tohopekaliga inflow and outflow sites. The BNSHINGLE site, with 12.7 t/yr, captures flows from Shingle Creek basin to Lake Tohopekaliga while site CL18273011, with 20.4 t/yr, outflows from Lake Tohopekaliga to Lake Cypress basin. It is important to note the basins upstream of CL18273011, which are depicted with red hatching in **Figure 56**, all contribute to the loads and flows at that site. For the past WY, the outflow from Lake Tohopekaliga to Lake Cypress continued to have the highest load (site CL18273011) followed by site CL06283111, which flows from S-63A basin to Lake Cypress. In general, the loads appear to be related more to flows rather than higher TP concentrations (**Table 20**).

Table 20. Most recent 5-year TP load, flow, and FWMC estimates (WY2020–WY2024) for the upstream monitoring sites with associated flow measurements within the Upper Kissimmee Subwatershed. (Note: WQ No. – Number of Water Quality Samples.) [a] (Olson and Broling 2025).

Site	WY2020				WY2021				WY2022				WY2023				WY2024				5-Year Average TP Load (t)
	WQ No.	TP Load (t)	Total Flow (ac-ft)	TP FWMC (µg/L)	WQ No.	TP Load (t)	Total Flow (ac-ft)	TP FWMC (µg/L)	WQ No.	TP Load (t)	Total Flow (ac-ft)	TP FWMC (µg/L)	WQ No.	TP Load (t)	Total Flow (ac-ft)	TP FWMC (µg/L)	WQ No.	TP Load (t)	Total Flow (ac-ft)	TP FWMC (µg/L)	
ABOGGN	15	1.8	55,211	27	24	3.4	87,495	32	25	2.0	65,399	24	23	3.7	101,012	30	25	1.6	62,804	21	2.5
BNSHINGLE	14	11.4	171,330	54	24	14.2	194,247	59	21	10.9	159,780	55	25	18.9	233,666	66	24	7.9	146,468	44	12.7
BS-59	12	3.1	121,879	21	19	5.4	204,118	21	19	3.8	178,396	17	19	6.9	231,254	24	16	4.8	165,189	23	4.8
CL06283111	4	2.5	19,057	108	13	7.6	78,622	78	12	5.1	79,165	53	11	9.2	125,730	59	13	8.3	95,367	70	6.5
CL18273011	10	28.0	355,627	64	21	22.1	504,627	36	19	16.7	392,636	34	15	21.5	443,495	39	15	13.9	361,318	31	20.4
LG32263124	1	0.3	10,419	27	11	0.8	44,233	15	12	1.1	49,551	19	10	2.2	66,529	27	11	2.1	56,990	29	1.3
MJ01253123	2	0.2	5,556	24	0	0.5	18,230	22	6	0.4	22,149	16	5	0.5	17,682	23	7	0.7	23,392	24	0.5
AJ33243122	2	0.9	30,415	24	16	2.3	70,945	27	16	2.4	66,284	29	10	3.1	72,856	34	14	2.0	63,724	26	2.1
CL19273123	1	0.4	17,092	18	12	2.2	70,014	26	13	2.0	71,040	23	9	3.8	92,163	33	12	3.5	78,241	36	2.4
LJACKDSCH	4	2.2	11,921	148	7	5.2	47,295	89	0	0.3	2,728	96	1	4.4	29,201	121	13	1.0	21,999	37	2.6

a. Key to units: µg/L – microgram(s) per liter; ac-ft – acre-foot (feet); and t – metric ton(s).

The long-term trends in TP loads and FWMCs in the Upper Kissimmee Subwatershed for the period of WY2012-WY2020 for seven upstream sites and the S65 basin level site were evaluated using SKT and reported in the 2022 SFER (Zhang et al. 2022). That study found that three of the upstream stations had statically significant trends. ABOGGN had increasing trends in TP load and FWMC. BNSHINGLE had increasing trends in flow and TP load. CL06283111 had a decreasing trend in TP loads. The S65 basin monitoring site also had an increasing trend in TP loads.

SUMMARY AND DISCUSSION

The Upper Kissimmee Subwatershed has the largest amount of runoff in the LOW. While the TP FWMCs from the subwatershed outlet at S65 have an increasing statistical trend, it is at a very small rate. Also, the TP FWMCs have been below the FDEP's NNC of 120 µg/L (FDEP 2012) every year except WY2005 (138 µg/L). The most recent 5-year average was 72 µg/L which was the lowest 5-year average TP FWMC at a basin/subwatershed outlet in the Northern Everglades.

It is important to recognize that the S65 monitoring station is located just downstream of Lake Kissimmee which may influence nutrient inputs from this subwatershed. However, since the majority of the upstream stations (26 out of 31) have 5-year average annual TP concentrations below the 120 µg/L FDEP BMAP NNC, the overall nutrient levels from this subwatershed appear to be low. Of the five stations with 5-year average annual TP concentrations greater than 120 µg/L, two have very high TP concentrations that may impact Lake Marian but not Lake Okeechobee, one has not had flow recently, and two, CL06283112 and PA10313112, should be investigated further. None of the upstream stations showed an increasing trend in TP concentrations and in fact 7 stations had decreasing TP trends in the period of WY2014-WY2023 in the recently completed study (Jones and Olson, 2025). Four of the upstream stations in the southern end of the subwatershed had a high percentage OPO_4-P to TP indicating high amounts of soluble phosphorus. Load from the upstream stations with flow indicates that 27 t of TP comes from the northeast portion of the subwatershed and appears to be more related to flows than TP concentrations. Since increasing trends were found at S65 and decreasing trends found upstream, SFWMD should continue to monitor Lake Kissimmee closely as it could be contributing to the increasing trends at S65.

Overall, the data analyses suggest that SFWMD projects should focus on storage since reducing the runoff volumes which are the highest in the LOW may make a bigger impact on reducing nutrient loads than treatment since phosphorus concentrations are the lowest in the Northern Everglades from this subwatershed. However, storage projects will need to consider the operational constraints of the downstream structures with regulation schedules when developing their operation plans. Projects may have to contend with ecological and consumptive users downstream which are realized in the operational schedules for structures. Those need to be considered during planning when developing operation plans. These projects may only be able to store water at certain times of the year and should be designed with operational discharge structures to release water at appropriate times for water supply and ecological considerations. In those localized areas with higher TP concentrations, treatment projects should be considered so long as there is enough water available for a viable project. Also, SFWMD should consider adding flow stations to quantify flows from the northwestern and western areas of the subwatershed.

Lastly, it is important to note that while SFWMD projects should focus on storage, it is also critical that source controls within this subwatershed continue to be implemented and maintained so the low nutrient concentrations observed persist. Also, the areas within the watershed where high concentrations were noted, should be investigated to see if additional source controls may be used to reduce concentrations further at those locations.

PROJECT OPPORTUNITIES

In this subwatershed there is a need for storage and wetland restoration projects. SFWMD is planning to fund future storage projects within the Upper Kissimmee Subwatershed through a procurement solicitation. The sections below discuss the public land ownership and propose criteria for future project evaluations.

PUBLIC LAND OWNERSHIP

In order to determine SFWMD regional project opportunities, the availability of public land to house those potential projects must be determined. The Upper Kissimmee Subwatershed is 66% privately owned. The Board of Trustees of the Internal Improvement Fund of the State of Florida (TIITF) own 94,345 acres or 9% of the subwatershed, but upon closer inspection some of that land is within lakes (such as Lake Rosalie; **Figure 57**) or already contains state parks or other managed land (such as Lake Kissimmee State Park between Lake Rosalie and Lake Kissimmee). The SFWMD owns 54,454 acreas (5%) with some projects already planned and in progress.

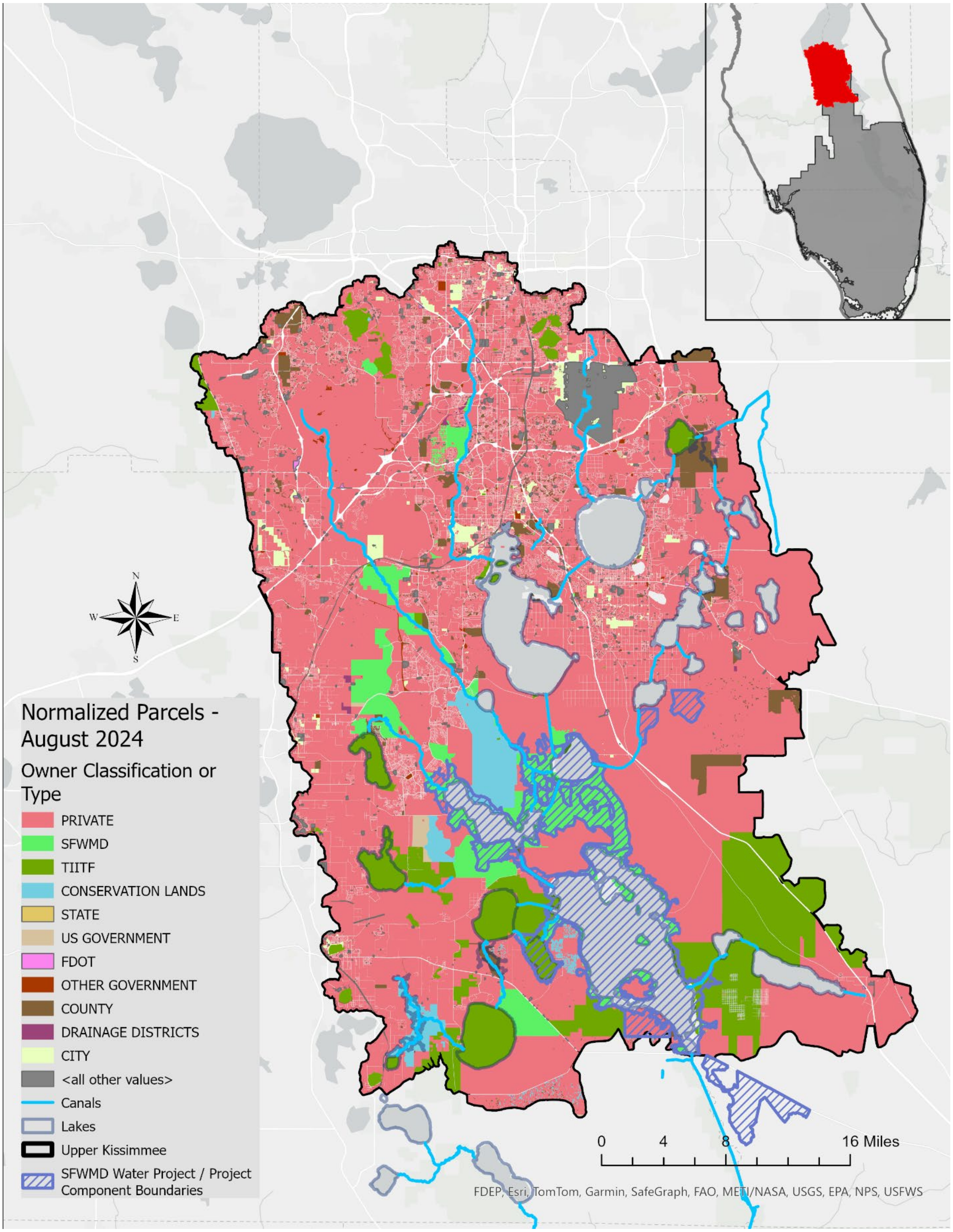


Figure 57. Property ownership within the Upper Kissimmee Subwatershed with the lakes outlined to identify them.

PROJECT CRITERIA FOR FUTURE REQUEST FOR PROPOSALS

SFWMD is planning to seek out partnerships for projects in the Upper Kissimmee Subwatershed. Projects can be passive (retains rainfall) or active (inflow from pumps). Based on the summary above, future procurement solicitations should consider the following criteria for project evaluation:

1. Preference will be given to projects with operational discharge structures, that allow them to discharge to the regional system.
2. Project operation plans (generally applicable to active projects) must be carefully developed and may be constrained by water availability per the operation plans and regulation schedules at nearby and downstream structures and waterbodies. Nearby downstream structure operation plans, hydrographs, lake stages, rainfall, and flows must be considered when developing the project operation plan and potential project benefits. Note that the project may not be able to detain water at certain time of the year or under certain hydrologic conditions. A detailed project analysis must be provided to SFWMD that estimates the proposed benefits and identifies the potential operations plan along with a technical justification for both. Hydrographs and regulation schedules for the structures throughout the Kissimmee River Basin can be found on the U.S. Army Corps of Engineers website (https://w3.saj.usace.army.mil/h2o/plots.htm). Other resources to assist in the development of a technical justification include the weekly water conditions report (The Weekly Environmental Conditions Report is available via email and text (SMS). Register online and select the Email or SMS/Text Message option from the drop-down menu. Then click "Submit."), Chapter 9 of the SFER (Chapter 9), and the DBHydro Insights application (https://insights.sfwmd.gov/#/homepage).
3. As in the previous bullet, projects need to be located where there is available water to be stored.
    a. Projects in the following basins should be ranked higher based on the water availability analysis completed above.
        i. Lake Kissimmee Basin
        ii. Lake Tohopekaliga Basin
        iii. East Lake Tohopekaliga Basin
        iv. Shingle Creek Basin
    b. Respondents should be allowed to provide water availability technical justification if they are in a different basin and will be evaluated by SFWMD on a case-by-case basis.
4. Projects should maximize the project storage benefit.
    a. Respondents will need to provide a technical justification for the proposed storage benefit.
    b. Respondents must also demonstrate that the volume of water stored will not harm nearby restoration projects, impact water supply, or impair ecological benefits.
5. Projects in areas that flow to sites with greater TP concentrations shall be ranked higher. Respondents must demonstrate that their project is upstream of a SFWMD monitoring site or provide their own water quality monitoring data for the project area. TP 5-year average TP concentration data should be ranked as follows
    a. ≥120 µg/L – 1 (highest priority based on the NNC of 120 µg/L)
    b. ≥72 but <120 µg/L – 2
    c. ≥40 but < 72 µg/L – 3
    d. <40 µg/L – 4 (lowest priority based on in-lake target of 40 µg/L)

6. Projects located at lower elevations and close to downstream receiving water bodies will receive higher rankings.
7. Projects that have effective water retention or return to groundwater limiting return to surface water will be ranked higher.
8. Projects located in the flood prone areas defined below will be ranked higher:
    a. Lake Tohopekaliga Basin (upstream of Lake Ajay)
    b. East Lake Tohopekaliga Basin
    c. Lake Rosalie Basin (areas north of Lake Rosalie)
    d. Lake Hart Basin
    e. Lake Myrtle Basin
    f. Lake Hatchineha Basin (northwest side of the lake)
9. Projects located upstream of lakes with TMDLs or Pollutant Reduction Plans (example Lake Tohopekaliga and East Lake Tohopekaliga) will be ranked higher. Note, if the respondent provides evidence that the project will otherwise address an existing nutrient impairment, that will also be ranked higher.
    a. Lake Cypress
    b. Lake Marion
    c. Lake Pierce
    d. Lake Jackson
    e. Lake Kissimmee
    f. Lake Marian
    g. Lake Tohopekaliga
    h. East Lake Tohopekaliga

REPORT ASSUMPTIONS

It should be noted that several assumptions were made when producing this document. The major assumptions are provided below.

1. Reductions were based on the 5-year period of WY2020-WY2024 because the TMDL is based on a 5-year rolling average. This assumes that future water years will behave similarly, and they could be very different in terms of rainfall, loads, and flows.
2. It assumes that all projects will achieve the long-term expected nutrient reductions at not only the project outlet but that these reductions will also be realized at the structures flowing into Lake Okeechobee.
3. The timeline assumes that the projects will be completed on time and will achieve their long-term estimated reductions after five years of operations.
4. The recommendations in this report are based on current conditions for SFWMD structures which may be revised as part of the resiliency studies or as part of the HRS.

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