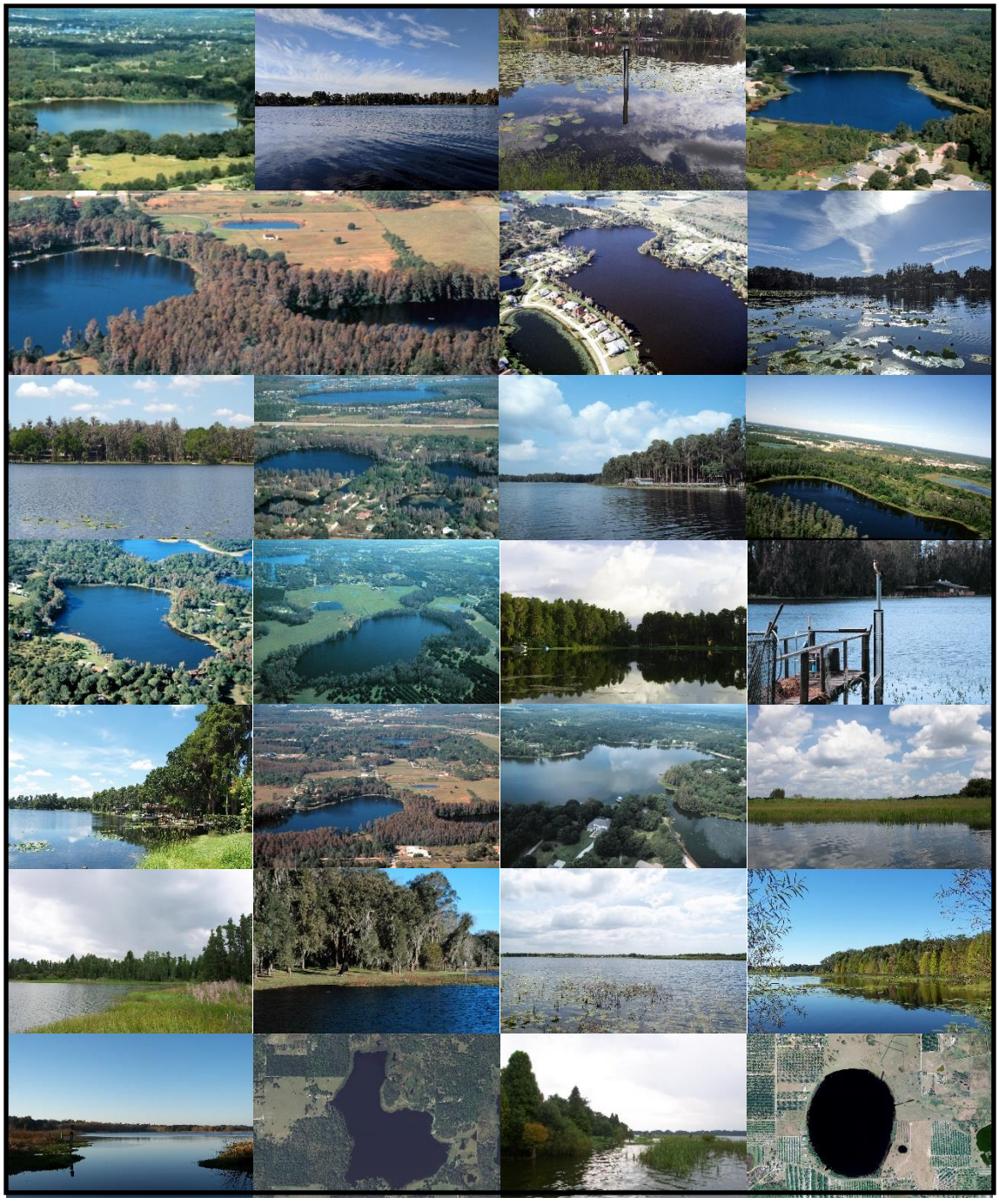
Revised Minimum Levels Based on Reevaluation of Minimum Levels Adopted for 29 Lakes in the Southwest Florida Water Management District



October 8, 2021

Resource Evaluation Section
Water Resources Bureau
Southwest Florida
Water Management District

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Water Resources Bureau
Southwest Florida Water Management District
2379 Broad Street
Brooksville, Florida 34604-6899

Governing Board Approved: May 25, 2021
Effective in Rule 40D-8.624: September 27, 2021

Cover: First Row: Hillsborough County Lakes Bird (2002); Brant (2017); Crystal (2013); Cypress Lake (2002); Second Row: Dosson and Sunshine (1996); Fairy (1997); Halfmoon (2020); Third Row: Hanna (2007); Helen, Ellen and Barbara (1998); Hobbs (1998); Jackson (1996); Fourth Row: Juanita (1997); Merrywater (1998); Saddleback (2001); Sapphire (1998); Fifth Row: Strawberry (2007); Sunset (1996); Taylor (2002); Wimauma (2002); Sixth Row: Pasco County Lakes Clear (2002); Hancock (1998); Hernando County Lakes Hunters (2007); Lindsey (2003); Seventh Row: Mountain (2004); Neff (2006); Polk County Lake Parker (2002, 2006). Southwest Florida Water Management District files.

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Introduction

Executive Summary

Section 373.0421(5), Florida Statutes (F.S.), directs that minimum levels "…shall be reevaluated periodically and revised as needed." The lakes identified in this report currently have Minimum Lake Levels established at the Historic P50, where the Historic P50 is the median water level estimated to occur in the total absence of withdrawals. However, Section 373.042(1)(b), F.S., defines the minimum water level of a surface water body as "…the level of surface water at which further withdrawals would be significantly harmful to the water resources or ecology of the area." In developing minimum levels, 373.0421(1)(a), F.S., further directs that consideration shall be given to "…changes and structural alterations to watersheds, surface waters, and aquifers and the effects such changes or alterations have had, and the constraints such changes or alterations have placed, on the hydrology…" provided the level does not allow significant harm "…caused by withdrawals."

After further consideration of the effects of watershed changes and structural alterations, reevaluation was identified as necessary for 29 lakes with Minimum Lake Levels established at the Historic P50. The minimum levels implement a change that protects the lakes from significant harm, as required by Section 373.042(1)(b), F.S. and Section 62-40.473, Florida Administrative Code (F.A.C.), while also acknowledging the effects that watershed changes and structural alterations have placed on each lake relative to historic hydrologic conditions, as directed by Section 373.0421(1)(a), F.S.

As part of the reevaluation, recommended minimum levels were developed using the best information available, as required by Section 373.042(1), F.S., and were based on consideration of all relevant environmental values identified in the Florida Water Resource Implementation Rule (62-40.473, F.A.C) for the setting of minimum levels. No revisions to guidance levels occurred at this time, except that guidance levels changed for Lakes Cypress and Halfmoon in Hillsborough County due to the availability of better information for these two lakes.

The minimum levels were adopted by the Governing Board on May 25, 2021 and became effective on September 27, 2021.

Minimum Flows and Levels Program Overview

Legal Directives

Section 373.042, F.S., directs the Department of Environmental Protection or the water management districts to establish minimum flows and levels (MFLs) for lakes, wetlands, rivers and aquifers. Section 373.042(1)(a), F.S., states that "[t]he minimum flow for a given watercourse shall be the limit at which further withdrawals would be significantly harmful to the water resources or ecology of the area." Section 373.042(1)(b), F.S., defines the minimum water level of an aquifer or surface water body as "…the level of groundwater in an aquifer and the level of surface water at which further withdrawals would be significantly harmful to the water resources or ecology of the area." MFLs are established and used by the Southwest Florida Water Management District (SWFWMD or District) for water resource planning, as one of the criteria used for evaluating water use permit applications, and for the design, construction and use of surface water management systems.

Established MFLs are key components of resource protection, recovery and regulatory compliance, as Section 373.0421(2) F.S., requires the development of a recovery or prevention strategy for water bodies "[i]f the existing flow or level in a water body is below, or is projected to fall within 20 years below, the applicable minimum flow or level established pursuant to S. 373.042." Section 373.0421(2)(a), F.S., requires that recovery or prevention strategies be developed to: "(a) [a]chieve recovery to the established minimum flow or level as soon as practicable; or (b) [p]revent the existing flow or level from falling below the established minimum flow or level." Periodic reevaluation and, as necessary, revision of established minimum flows and levels are required by Section 373.0421(3), F.S.

Minimum flows and levels are to be established based upon the best information available, and when appropriate, may be calculated to reflect seasonal variations (Section 373.042(1), F.S.). Also, establishment of MFLs is to involve consideration of, and at the governing board or department's discretion, may provide for the protection of nonconsumptive uses (Section 373.042(1), F.S.). Consideration must also be given to "…changes and structural alterations to watersheds, surface waters and aquifers, and the effects such changes or alterations have had, and the constraints such changes or alterations have placed, on the hydrology of the affected watershed, surface water, or aquifer…", with the requirement that these considerations shall not allow significant harm caused by withdrawals (Section 373.0421(1)(a), F.S.). Sections 373.042 and 373.0421, F.S. provide additional information regarding the prioritization and scheduling of minimum flows and levels, the independent scientific review of scientific or technical data, methodologies, models and scientific and technical assumptions employed in each model

used to establish a minimum flow or level, and exclusions that may be considered when identifying the need for MFLs establishment.

The Florida Water Resource Implementation Rule (Section 62-40.473, F.A.C.), provides additional guidance for the establishment of MFLs, requiring that "…consideration shall be given to natural seasonal fluctuations in water flows or levels, nonconsumptive uses, and environmental values associated with coastal, estuarine, riverine, spring, aquatic and wetlands ecology, including: a) Recreation in and on the water; b) Fish and wildlife habitats and the passage of fish; c) estuarine resources; d) Transfer of detrital material; e) Maintenance of freshwater storage and supply; f) Aesthetic and scenic attributes; g) Filtration and absorption of nutrients and other pollutants; h) Sediment loads; i) Water quality; and j) Navigation."

Rule 62-40.473, F.A.C., also indicates that "[m]inimum flows and levels should be expressed as multiple flows or levels defining a minimum hydrologic regime, to the extent practical and necessary to establish the limit beyond which further withdrawals would be significantly harmful to the water resources or the ecology of the area as provided in Section 373.042(1), F.S." It further notes that "…a minimum flow or level need not be expressed as multiple flows or levels if other resource protection tools, such as reservations implemented to protect fish and wildlife or public health and safety, that provide equivalent or greater protection of the hydrologic regime of the water body, are developed and adopted in coordination with the minimum flow or level." The rule also includes provisions addressing: protection of MFLs during the construction and operation of water resource projects; the issuance of permits pursuant to Section 373.086 and Parts II and IV of Chapter 373, F.S.; water shortage declarations; development of recovery or prevention strategies, development and updates to a minimum flow and level priority list and schedule, and peer review for MFLs establishment.

Development of Minimum Lake Levels in the Southwest Florida Water Management District

Programmatic Description and Major Assumptions

Since the enactment of the Florida Water Resources Act of 1972 (Chapter 373, F.S.), in which the legislative directive to establish MFLs originated, and following subsequent modifications to this directive and adoption of relevant requirements in the Water Resource Implementation Rule, the District has actively pursued the adoption, i.e., establishment, of MFLs for priority water bodies. The District implements established MFLs primarily through its water supply planning, water use permitting and environmental resource permitting programs and through the funding of water resource and water supply development projects that are part of a recovery or prevention strategy. The District's MFLs program addresses all relevant requirements expressed in the Florida Water Resources Act and the Water Resource Implementation Rule.

A substantial portion of the District's organizational resources has been dedicated to its MFLs Program, which logistically addresses six major tasks: 1) development and reassessment of methods for establishing MFLs; 2) adoption of MFLs for priority water bodies (including the prioritization of water bodies and facilitation of public and independent scientific review of proposed MFLs and methods used for their development); 3) monitoring and MFLs status assessments, i.e., compliance evaluations; 4) development and implementation of recovery strategies; 5) MFLs compliance reporting; and 6) ongoing support for minimum flow and level regulatory concerns and prevention strategies. Many of these tasks are discussed or addressed in this report; additional information on all tasks associated with the District's MFLs Program is summarized by Hancock et al. (2010).

The District's MFLs Program is implemented based on three fundamental assumptions. First, it is assumed that many water resource values and associated features are dependent upon and affected by long-term hydrology and/or changes in long-term hydrology. Second, it is assumed that relationships between some of these variables can be quantified and used to develop significant harm thresholds or criteria that are useful for establishing MFLs. Third, the approach assumes that alternative hydrologic regimes may exist that differ from non-withdrawal impacted conditions but are sufficient to protect water resources and the ecology of these resources from significant harm.

Support for these assumptions is provided by a large body of published scientific work addressing relationships between hydrology, ecology and human-use values associated with water resources (e.g,. Postel and Richter 2003; Wantzen et al. 2008; Poff et al. 2010; Poff and Zimmerman 2010). This information has been used by the District and other

water management districts within the state to identify significant harm thresholds or criteria supporting development of MFLs for hundreds of water bodies, as summarized in the numerous publications associated with these efforts (e.g., SFWMD 2000, 2006; Flannery et al. 2002; SRWMD 2004, 2005; Neubauer et al. 2008; Mace 2009).

With regard to the assumption associated with alternative hydrologic regimes, consider a historic condition for an unaltered river or lake system with no local groundwater or surface water withdrawal impacts. A new hydrologic regime for the system would be associated with each increase in water use, from small withdrawals that have no measurable effect on the historic regime to large withdrawals that could substantially alter the regime. A threshold hydrologic regime may exist that is lower or less than the historic regime, but which protects the water resources and ecology of the system from significant harm. This threshold regime could conceptually allow for water withdrawals, while protecting the water resources and ecology of the area. Thus, MFLs may represent minimum acceptable rather than historic or potentially optimal hydrologic conditions.

Development of Lake Minimum Level Supporting Criteria: Consideration of Environmental Values and Structural Alterations

For priority lakes, the Southwest Florida Water Management District develops two minimum water levels to ensure protection of the hydrologic regime from significant harm, as well as two guidance levels, which primarily provide advisory information on the typical water level fluctuations expected within the lake (Rule 40D-8.624, F.A.C.). Establishment and assessment of these levels includes the development of water level percentiles: the P10 represents the water level equaled or exceeded ten percent of the time, the P50 represents the water level equaled or exceeded fifty percent of the time, and the P90 represents the water level equaled or exceeded ninety percent of the time. The Minimum Lake Level (MLL) is set at an elevation that the lake's water level must equal or exceed fifty percent of the time (required P50). The High Minimum Lake Level (HMLL) is set at an elevation that the lake's water level must equal or exceed ten percent of the time (required P10). Historic percentiles are those estimated to occur under existing structural alterations but in the absence of withdrawals. The High Guidance Level is established at the Historic P10, while the Low Guidance Level is established at the Historic P90. All levels are expressed as elevations in feet above the National Geodetic Vertical Datum of 1929 (ft NGVD29).

The District has developed specific methodologies for establishing minimum levels for lakes and subjected the methodologies to independent, scientific peer-review. SWFWMD (1999a), Leeper et al. (2001), and Hancock (2007) describe lake-specific significant change standards that can be used to support the establishment of minimum levels for lakes. The standards are assessed to identify possible thresholds in the P50 for

preventing significant harm to environmental values associated with lakes in accordance with guidance provided in the Florida Water Resource Implementation Rule (62-40.473, F.A.C.) (Table 1).

- The *Aesthetics Standard* is developed to protect aesthetic values associated with the inundation of lake basins. The standard is intended to protect aesthetic values associated with the median lake stage from diminishing beyond the values associated with the lake when it is staged at the Historic P90. The Aesthetics Standard is established at the Historic P90.
- The *Basin Connectivity Standard* is developed to protect surface water connections between lake basins or sub-basins to allow for movement of aquatic biota, such as fish, and support recreational use of the lake. The standard is based on the elevation of lake sediments at a critical high spot between lake basins or lake sub-basins, identification of water depths sufficient for movement of biota and/or watercraft across the critical high spot and use of Historic lake stage data or appropriate surrogates.
- The *Cypress Standard* is developed to protect lake-fringing cypress wetlands. The standard is based on the subtraction of 1.8 feet from the Normal Pool elevation, where the latter represents a periodic high-water level elevation (typically the P10 or higher) estimated from biologic indicators. The standard is appropriate for potential application to lakes that have not been significantly structurally altered, have a measurable and reliable Normal Pool, and have at least a half-acre of lake-fringing cypress wetlands.
- The *Dock-Use Standard* is developed to provide for sufficient water depth at the end of existing docks to permit mooring of boats and prevent adverse impacts to bottom-dwelling plants and animals caused by boat operation. The standard is based on the elevation of lake sediments at the end of existing docks, a 2-foot water depth for boat mooring, and use of Historic lake stage data or appropriate surrogates.
- The *Lake Mixing Standard* is developed to prevent significant changes in patterns of wind-driven mixing of the lake water column and sediment re-suspension. The standard is established at the highest elevation at or below the Historic P50 elevation where the dynamic ratio (the square root of the lake surface area divided by its mean depth) shifts from a value of <0.8 to a value >0.8, or from a value >0.8 to a value of <0.8 (Bachmann et al., 2000).
- The *Recreation/Ski Standard* is developed to identify the lowest elevation within the lake basin that will contain an area suitable for safe water skiing. The standard is based on the lowest elevation within the basin that can contain a 5-foot deep ski corridor delineated as a circular area with a radius of 418 feet, or a rectangular ski corridor 200 feet in width and 2,000 feet in length, and use of Historic lake stage data or appropriate surrogates.

- The *Species Richness Standard* is developed to prevent a decline in the number of bird species that may be expected to occur at or utilize a lake. Based on an empirical relationship between lake surface area and the number of birds expected to occur at a lake, the standard is established at the lowest elevation associated with less than a 15 percent reduction in lake surface area relative to the lake area at the Historic P50 elevation.
- The *Wetland Offset Standard* is developed to protect lake-fringing wetlands. The Wetland Offset Standard was derived by converting the Cypress Standard into an equivalent value calculated using the Historic P50 (instead of the Normal Pool elevation), which allows application to lakes which lack a measurable Normal Pool elevation and/or which are structurally altered. The Wetland Offset Elevation is calculated by subtracting 0.8 feet from the Historic P50.

Information regarding the development of adopted methods for establishing minimum lake levels is included in SWFWMD (1999a, b), Leeper et al. (2001), and Hancock (2007). Additional information relevant to developing lake levels is presented by Schultz et al. (2004), Carr and Rochow (2004), Caffrey et al. (2006, 2007), Carr et al. (2006), Hancock (2006), Hoyer et al. (2006), Leeper (2006), and Emery et al. (2009). Independent scientific peer-review findings regarding the lake level methods are summarized by Bedient et al. (1999), Dierberg and Wagner (2001), and Wagner and Dierberg (2006).

In accordance with Section 373.0421(1)(a), F.S., when establishing MFLs, the District must consider "…changes and structural alterations to watersheds, surface waters and aquifers, and the effects such changes or alterations have had, and the constraints such changes or alterations have placed, on the hydrology." As required by statute, the District does not establish MFLs that would allow significant harm caused by withdrawals when considering the changes, alterations and their associated effects and constraints. These considerations are based on review and analysis of best information available, such as water level records, environmental and construction permit information, water control structure and drainage alteration histories, and observation of current site conditions.

When establishing, reviewing or implementing MFLs, considerations of changes and structural alterations may be used to:

- adjust measured flow or water level historical records to account for existing changes/alterations;
- model or simulate flow or water level records that reflect long-term conditions that would be expected based on existing changes/alterations and in the absence of measurable withdrawal impacts;
- develop or identify significant harm standards, thresholds and other criteria;
- aid in the characterization or classification of lake types or classes based on the changes/alterations;

Table 1. Environmental values from the Water Resource Implementation Rule (62-40.473, F.A.C.), and the Significant Change Standards (and other information) associated with each that are considered when establishing minimum flows and levels.

Environmental Value	**Associated Significant Change Standards and Other Information for Consideration**
Recreation in and on the water	Aesthetics Standard, Basin Connectivity Standard, Dock-Use Standard, Herbaceous Wetland Information, Recreation/Ski Standard, Species Richness Standard, Submersed Aquatic Macrophyte Information
Fish and wildlife habitats and the passage of fish	Basin Connectivity Standard, Cypress Standard, Herbaceous Wetland Information, Species Richness Standard, Submersed Aquatic Macrophyte Information, Wetland Offset
Estuarine resources	*This value is not applicable for consideration for most priority lakes.*
Transfer of detrital material	Basin Connectivity Standard, Cypress Standard, Herbaceous Wetland Information, Lake Mixing Standard, Submersed Aquatic Macrophyte Information, Wetland Offset
Maintenance of freshwater storage and supply	*This value is addressed by development of minimum levels based on appropriate significant change standards and other information and use of minimum levels in permitting programs.*
Aesthetic and scenic attributes	Aesthetics Standard, Dock-Use Standard, Cypress Standard, Herbaceous Wetland Information, Species Richness Standard, Submersed Aquatic Macrophyte Information, Wetland Offset
Filtration and absorption of nutrients and other pollutants	Cypress Standard, Lake Mixing Standard, Herbaceous Wetland Information, Submersed Aquatic Macrophyte Information, Wetland Offset
Sediment loads	*This value is not applicable for consideration for most priority lakes.*
Water quality	Dock-Use Standard, Cypress Standard, Herbaceous Wetland Information, Lake Mixing Standard, Submersed Aquatic Macrophyte Information, Wetland Offset
Navigation	Basin Connectivity Standard, Dock-Use Standard, Submersed Aquatic Macrophyte Information

- evaluate the status of water bodies with proposed or established MFLs (i.e., determine whether the flow and/or water level are below, or are projected to fall below the applicable minimum flow or level).

Need for Reevaluation of Lake Minimum Levels

The 29 lakes identified in this report currently have MLLs established at the Historic P50, where the Historic P50 is the median water level estimated to occur in the total absence of withdrawals. Previously, a lake's MLL was set at the Historic P50 if: 1) the lake was considered significantly structurally altered for a lake with over a half-acre of fringing cypress wetlands, or 2) any lake change standard exceeded the Historic P50 for a lake with less than a half-acre of fringing cypress wetlands. This approach was not able to fully consider the applicability of each standard to the lake given the lake's unique hydrologic behavior and limitations induced by structural alterations.

Section 373.0421(5), F.S., directs that minimum levels "…shall be reevaluated periodically and revised as needed." Section 373.042(1)(b), F.S., defines the minimum water level of a surface water body as "…the level of surface water at which further withdrawals would be significantly harmful to the water resources or ecology of the area." In developing minimum levels, 373.0421(1)(a), F.S., further directs that consideration shall be given to "…changes and structural alterations to watersheds, surface waters, and aquifers and the effects such changes or alterations have had, and the constraints such changes or alterations have placed, on the hydrology…" provided the level does not allow significant harm "…caused by withdrawals."

After further consideration of the effects of watershed changes and structural alterations, reevaluation was identified as necessary for 29 lakes with MLLs established at the Historic P50. The MLLs and HMLLs implement a change that protects the lakes from significant harm, as required by Section 373.042(1)(b), F.S. and Section 62-40.473, F.A.C., while also acknowledging the effects that watershed changes and structural alterations have placed on the lake relative to historic hydrologic conditions, as directed by Section 373.0421(1)(a), F.S.

As part of the reevaluation, recommended minimum levels were developed using the best information available, as required by Section 373.042(1), F.S., and were based on consideration of all relevant environmental values identified in the Florida Water Resource Implementation Rule (Rule 62-40.473, F.A.C.), for the setting of minimum levels. The results are summarized in Table 2, with details provided for each lake in the following section. No revisions to guidance levels occurred, except that guidance levels changed for Lakes Cypress and Halfmoon in Hillsborough County due to the availability of better information regarding appropriate guidance levels for these two lakes.

Table 2. Summary of previously adopted and currently adopted minimum lake levels for 29 lakes.

County	Name	Previous HMLL (ft NGVD29)	Adopted HMLL (ft NGVD29)	Previous MLL (ft NGVD29)	Adopted MLL (ft NGVD29)
Hillsborough	Bird	50.0	49.3	48.8	48.1
Hillsborough	Brant	58.3	57.6	56.7	55.9
Hillsborough	Crystal	60.4	59.8	59.0	58.2
Hillsborough	Cypress*	48.9	48.9	47.9	47.4
Hillsborough	Dosson & Sunshine	53.9	53.2	52.8	52.1
Hillsborough	Fairy (Maurine)	33.4	32.5	32.4	32.1
Hillsborough	Halfmoon*	43.3	42.5	42.3	41.1
Hillsborough	Hanna	61.5	61.2	60.0	59.2
Hillsborough	Helen & Ellen & Barbara	53.2	53.1	52.2	51.4
Hillsborough	Hobbs	65.7	64.9	64.0	63.2
Hillsborough	Jackson	33.0	32.2	32.0	31.2
Hillsborough	Juanita	41.8	41.0	40.3	39.5
Hillsborough	Merrywater	57.4	56.6	56.0	55.2
Hillsborough	Saddleback	54.6	53.6	53.1	52.7
Hillsborough	Sapphire	63.5	62.7	61.8	61.0
Hillsborough	Strawberry	60.1	59.3	59.1	58.3
Hillsborough	Sunset	33.6	32.8	32.3	31.5
Hillsborough	Taylor	38.2	37.6	37.2	36.6
Hillsborough	Wimauma	83.9	81.0	79.2	78.4
Pasco	Clear	127.0	126.2	125.7	124.9
Pasco	Hancock	102.5	101.7	100.2	99.4
Hernando	Hunters	19.3	18.6	17.1	16.4
Hernando	Lindsey	68.5	67.6	66.1	65.3
Hernando	Mountain	102.8	102.0	99.5	98.7
Hernando	Neff	102.2	100.7	94.5	93.7
Polk	Parker	130.6	130.3	129.6	129.3

** The High and Low Guidance Levels for Lakes Cypress and Halfmoon in Hillsborough County were also revised, due to the availability of better information regarding appropriate guidance levels for these two lakes. See the lakes' individual sections for more information.*

Results of Minimum Lake Level Reevaluations

Hillsborough County

Bird Lake

Bird Lake is located in Hillsborough County (Figure 1). A description of the lake and its hydrogeologic setting is available in Carr et al. (2015). As described in Carr et al. (2015), water level data for the lake span from 1977 to present and currently continue to be collected on a monthly basis by the District (Figure 2).

Carr et al. (2015) developed significant change standards and Historic percentiles for Bird Lake. The standards are assessed to identify possible thresholds in the P50 for preventing significant harm to natural system values associated with lakes in accordance with guidance provided in the Florida Water Resource Implementation Rule (62-40.473, F.A.C.). Other information taken into consideration in the development of minimum levels includes potential changes in the coverage of herbaceous wetland vegetation and aquatic plants, flooding of residential dwellings and infrastructure, and the health, safety and welfare of the public. Based on these factors, the most appropriate elevation for use as the MLL corresponds to the Species Richness Standard, which represents the most appropriate standard below the Historic P50, where the Historic P50 is the median water level estimated to occur in the total absence of withdrawals. The HMLL is then calculated by adding the difference between the Historic P10 and Historic P50 to the MLL. No revisions to guidance levels occurred.

Using the status assessment process described in Basso et al. (2020), to assess status for Bird Lake, the P10 and P50 from 2010-2019 observed stage data are compared to, respectively, the HMLL and MLL (Table 3). Based on the 2010-2019 observed stage data, both the HMLL and MLL are considered met for Bird Lake.

Table 3. Minimum levels and initial status assessment for Bird Lake.

Percentile	Minimum Levels (ft NGVD29)	Status Stage Data (2010-2019) (ft NGVD29)	Status (ft)
P10	49.3	50.2	+0.9
P50	48.1	49.6	+1.5

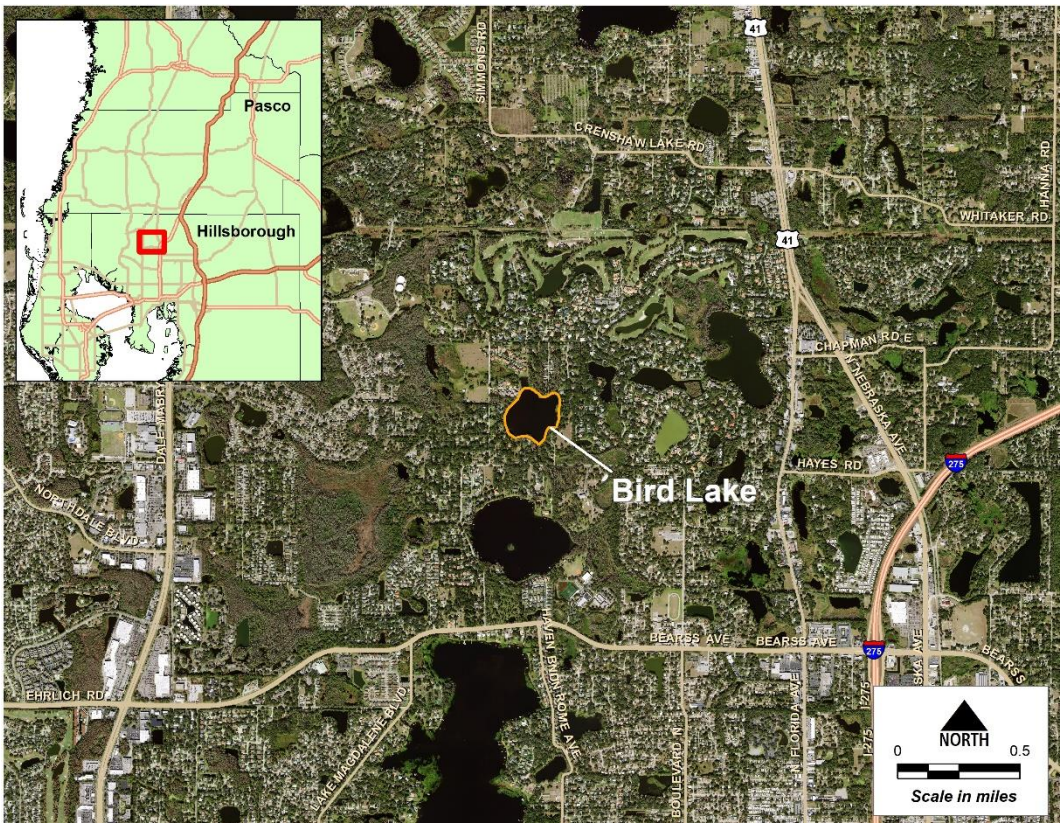

Figure 1. Location of Bird Lake in Hillsborough County, Florida.

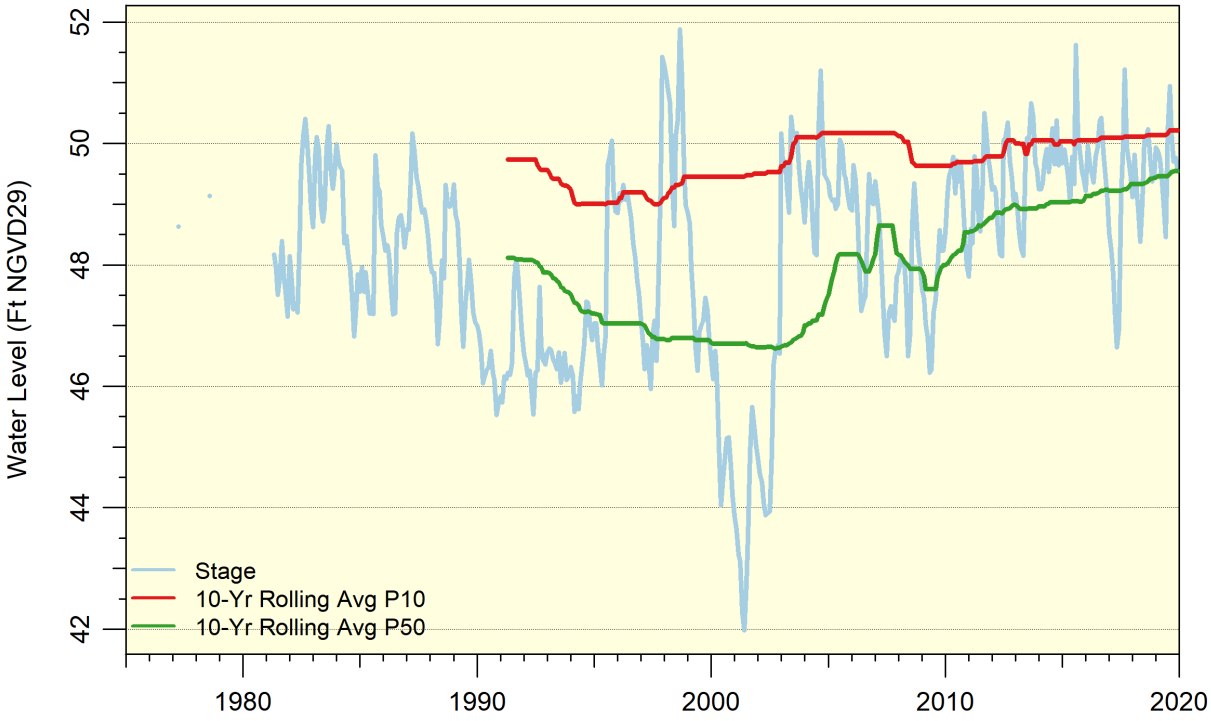

Figure 2. Hydrograph and rolling 10-year P10 and P50 for Bird Lake.

Brant Lake

Brant Lake is located in Hillsborough County (Figure 3). A description of the lake and its hydrogeologic setting is available in Carr et al. (2018a). As described in Carr et al. (2018a), water level data for the lake span from 1971 to present and currently continue to be collected on a twice weekly basis by the District (Figure 4).

Carr et al. (2018) developed significant change standards and Historic percentiles for Brant Lake. The standards are assessed to identify possible thresholds in the P50 for preventing significant harm to natural system values associated with lakes in accordance with guidance provided in the Florida Water Resource Implementation Rule (62-40.473, F.A.C.). Other information taken into consideration in the development of minimum levels includes potential changes in the coverage of herbaceous wetland vegetation and aquatic plants, flooding of residential dwellings and infrastructure, and the health, safety and welfare of the public. Based on these factors, the most appropriate elevation for use as the MLL corresponds to the Wetland Offset Standard, which represents the most appropriate standard below the Historic P50, where the Historic P50 is the median water level estimated to occur in the total absence of withdrawals. The HMLL is then calculated by adding the difference between the Historic P10 and Historic P50 to the MLL. No revisions to guidance levels occurred.

Using the status assessment process described in Basso et al. (2020), to assess status for Brant Lake, the P10 and P50 from 2010-2019 observed stage data are compared to, respectively, the HMLL and MLL (Table 4). Based on the 2010-2019 observed stage data, both the HMLL and MLL are considered met for Brant Lake.

Table 4. Minimum levels and initial status assessment for Brant Lake.

Percentile	Minimum Levels (ft NGVD29)	Status Stage Data (2010-2019) (ft NGVD29)	Status (ft)
P10	57.6	58.4	+0.8
P50	55.9	57.8	+1.9

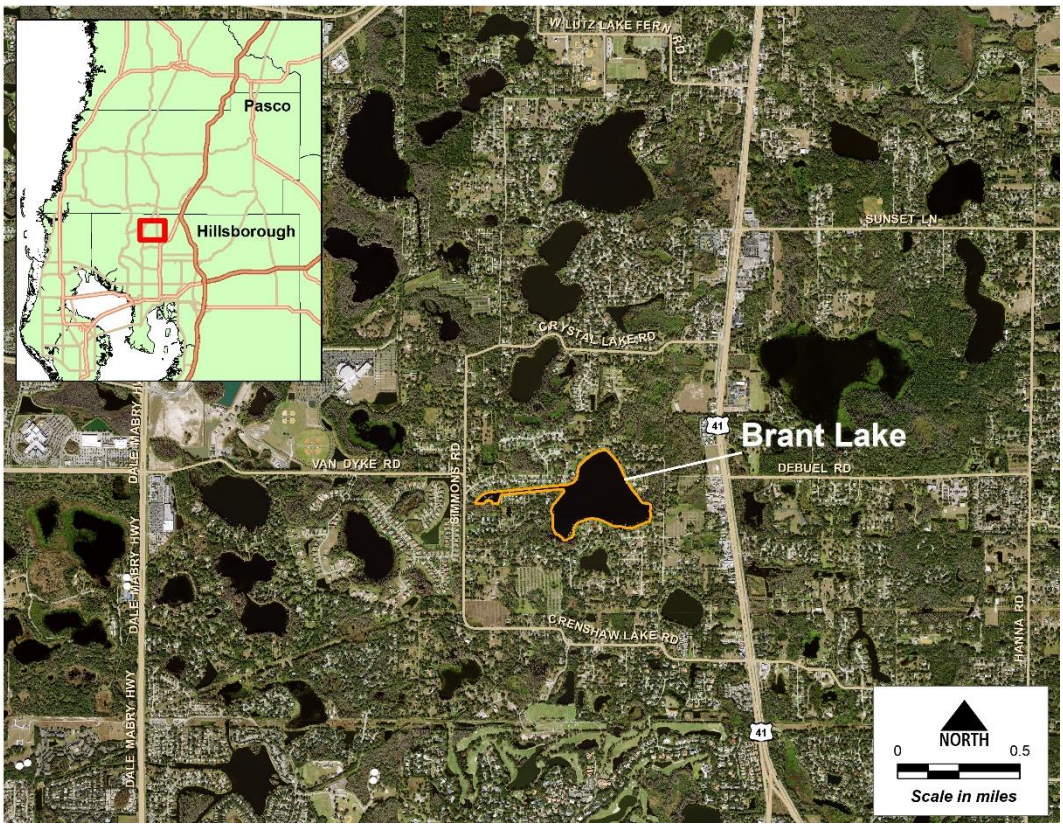

Figure 3. Location of Brant Lake in Hillsborough County, Florida.

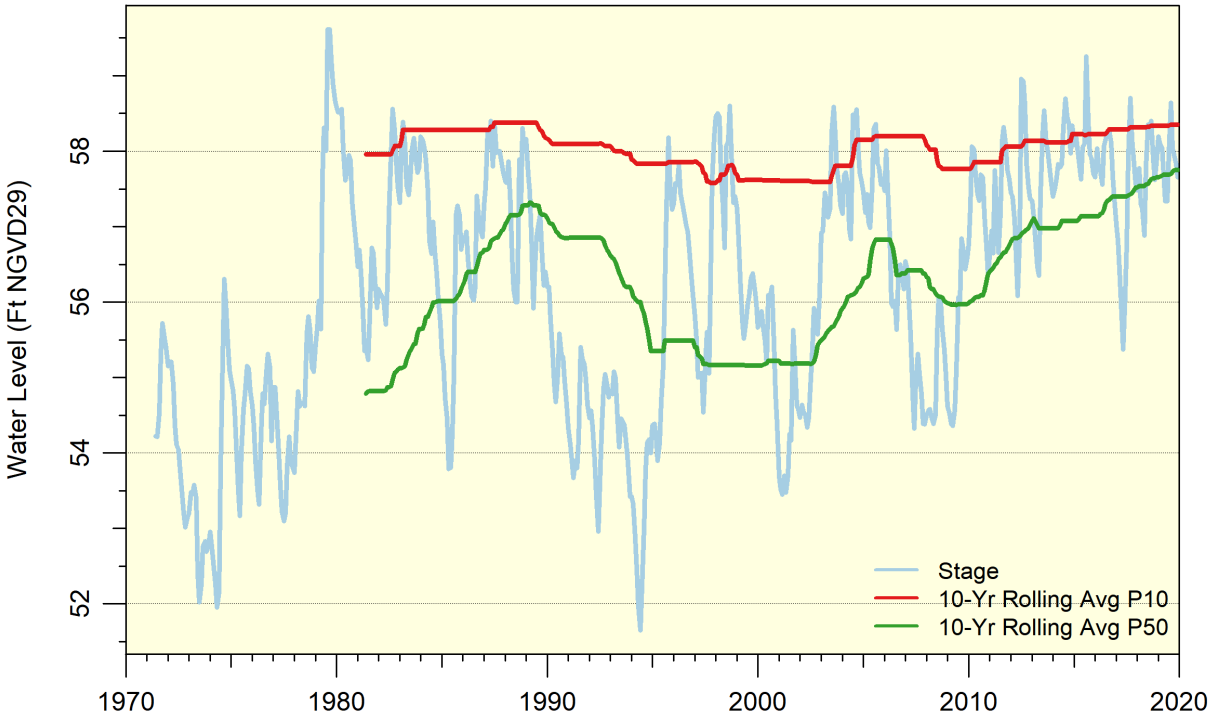

Figure 4. Hydrograph and rolling 10-year P10 and P50 for Brant Lake.

Crystal Lake

Crystal Lake is located in Hillsborough County (Figure 5). A description of the lake and its hydrogeologic setting is available in Carr et al. (2015a). As described in Carr et al. (2015a), water level data for the lake span from 1972 to present and currently continue to be collected on a monthly basis by the District (Figure 6).

Carr et al. (2015a) developed significant change standards and Historic percentiles for Crystal Lake. The standards are assessed to identify possible thresholds in the P50 for preventing significant harm to natural system values associated with lakes in accordance with guidance provided in the Florida Water Resource Implementation Rule (62-40.473, F.A.C.). Other information taken into consideration in the development of minimum levels includes potential changes in the coverage of herbaceous wetland vegetation and aquatic plants, flooding of residential dwellings and infrastructure, and the health, safety and welfare of the public. Based on these factors, the most appropriate elevation for use as the MLL corresponds to the Wetland Offset Standard, which represents the most appropriate standard below the Historic P50, where the Historic P50 is the median water level estimated to occur in the total absence of withdrawals. The HMLL is then calculated by adding the difference between the Historic P10 and Historic P50 to the MLL. No revisions to guidance levels occurred.

Using the status assessment process described in Basso et al. (2020), to assess status for Crystal Lake, the P10 and P50 from 2010-2019 observed stage data are compared to, respectively, the HMLL and MLL (Table 5). Based on the 2010-2019 observed stage data, both the HMLL and MLL are considered met for Crystal Lake.

Table 5. Minimum levels and initial status assessment for Crystal Lake.

Percentile	Minimum Levels (ft NGVD29)	Status Stage Data (2010-2019) (ft NGVD29)	Status (ft)
P10	59.8	60.5	+0.7
P50	58.2	59.7	+1.5

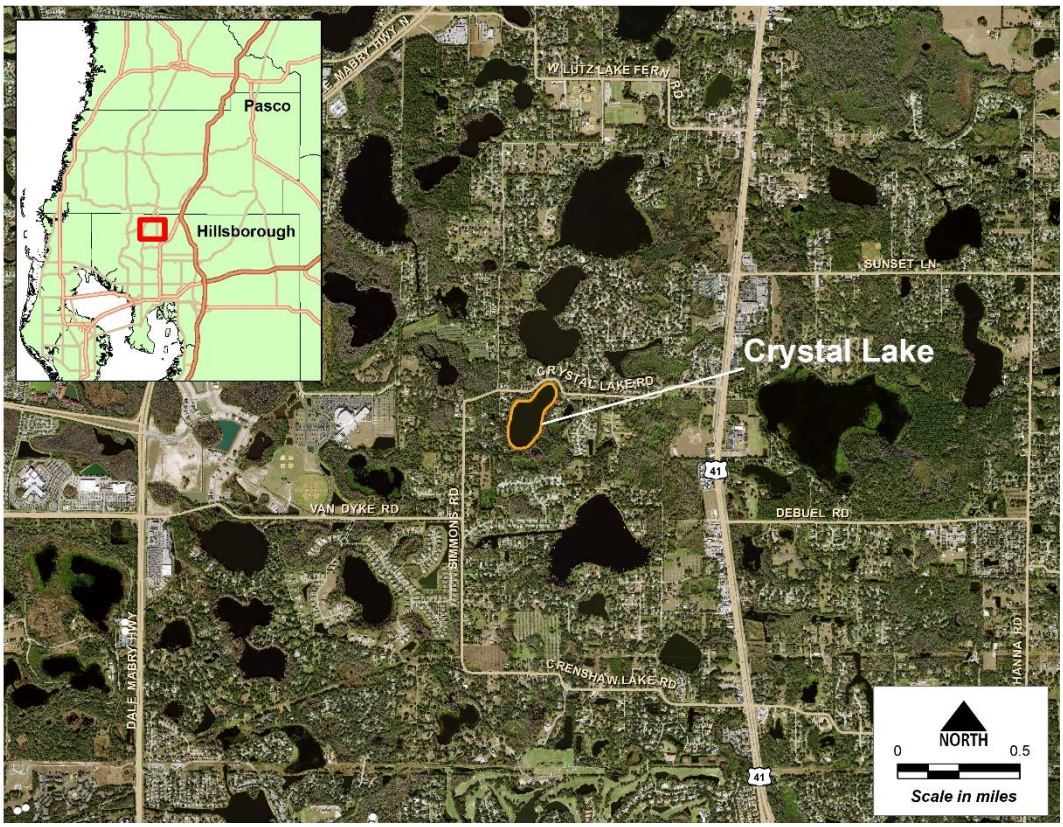

Figure 5. Location of Crystal Lake in Hillsborough County, Florida.

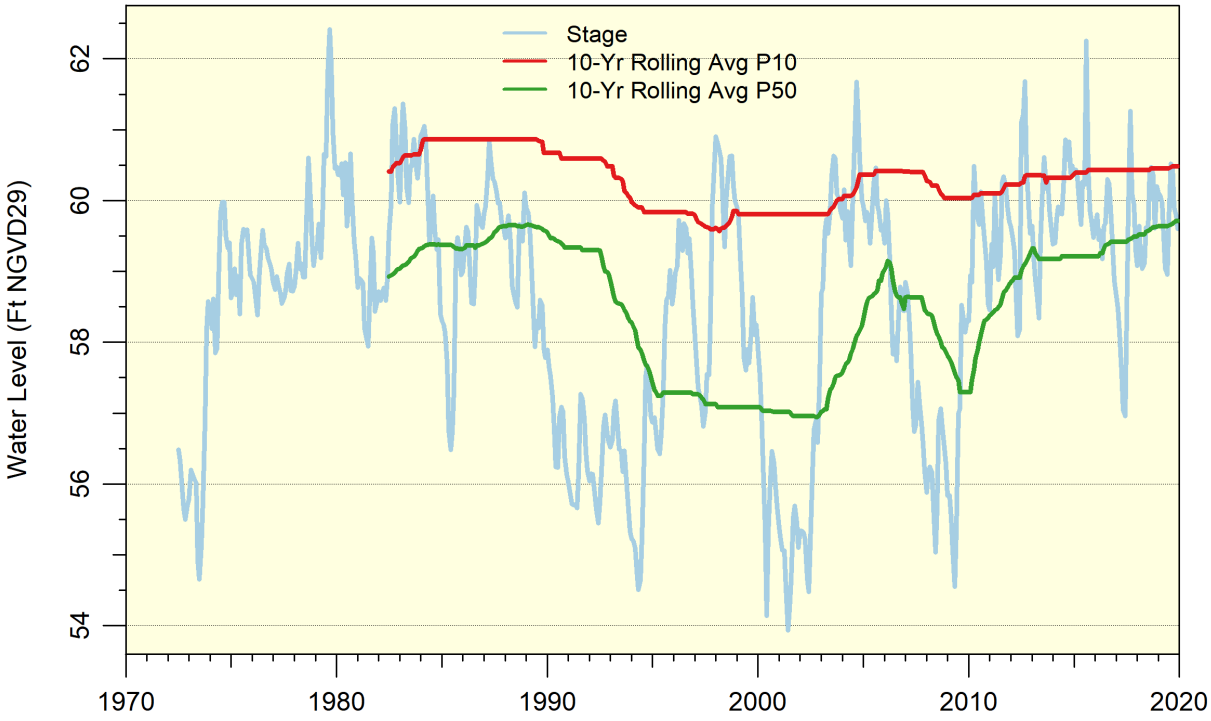

Figure 6. Hydrograph and rolling 10-year P10 and P50 for Crystal Lake.

Cypress Lake

Cypress Lake is located in Hillsborough County (Figure 7). A description of the lake and its hydrogeologic setting is available in Venning and Smith (2020). As described in Venning and Smith (2020), water level data for the lake span from 1993 to present and currently continue to be collected on a monthly basis by the District (Figure 8).

Venning and Smith (2020) developed significant change standards and Historic percentiles for Cypress Lake. The standards are assessed to identify possible thresholds in the P50 for preventing significant harm to natural system values associated with lakes in accordance with guidance provided in the Florida Water Resource Implementation Rule (62-40.473, F.A.C.). Other information taken into consideration in the development of minimum levels includes potential changes in the coverage of herbaceous wetland vegetation and aquatic plants, flooding of residential dwellings and infrastructure, and the health, safety and welfare of the public. Based on these factors, the most appropriate elevation for use as the MLL corresponds to the Wetland Offset Standard, which represents the most appropriate standard below the Historic P50, where the Historic P50 is the median water level estimated to occur in the total absence of withdrawals. The HMLL is then calculated by adding the difference between the Historic P10 and Historic P50 to the MLL. Additionally, the High Guidance Level is 49.7 ft NGVD29 based on the Historic P10 calculated in Venning and Smith (2020), and the Low Guidance Level is 45.6 ft NGVD29 based on the Historic P90 calculated in Venning and Smith (2020).

Using the status assessment process described in Basso et al. (2020), to assess status for Cypress Lake, the P10 and P50 from 2010-2019 observed stage data are compared to, respectively, the HMLL and MLL (Table 6). Based on the 2010-2019 observed stage data, both the HMLL and MLL are considered met for Cypress Lake.

Table 6. Minimum levels and initial status assessment for Cypress Lake.

Percentile	Minimum Levels (ft NGVD29)	Status Stage Data (2010-2019) (ft NGVD29)	Status (ft)
P10	48.9	49.3	+0.4
P50	47.4	48.8	+1.4

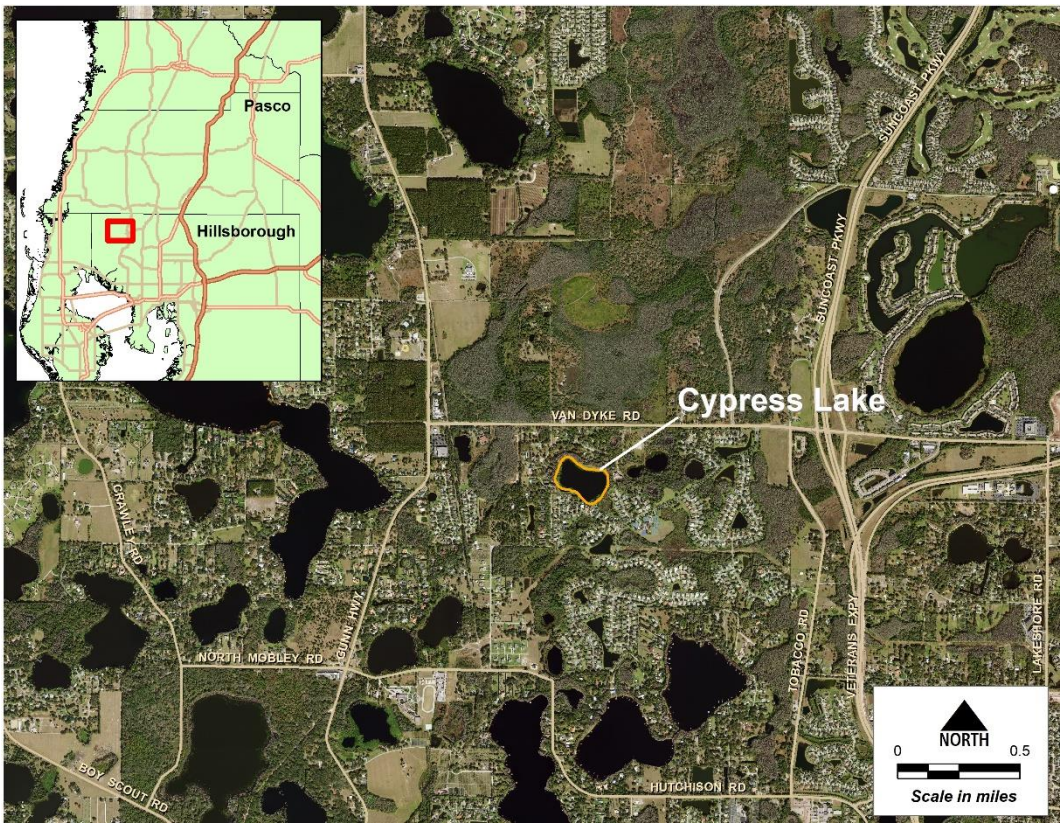

Figure 7. Location of Cypress Lake in Hillsborough County, Florida.

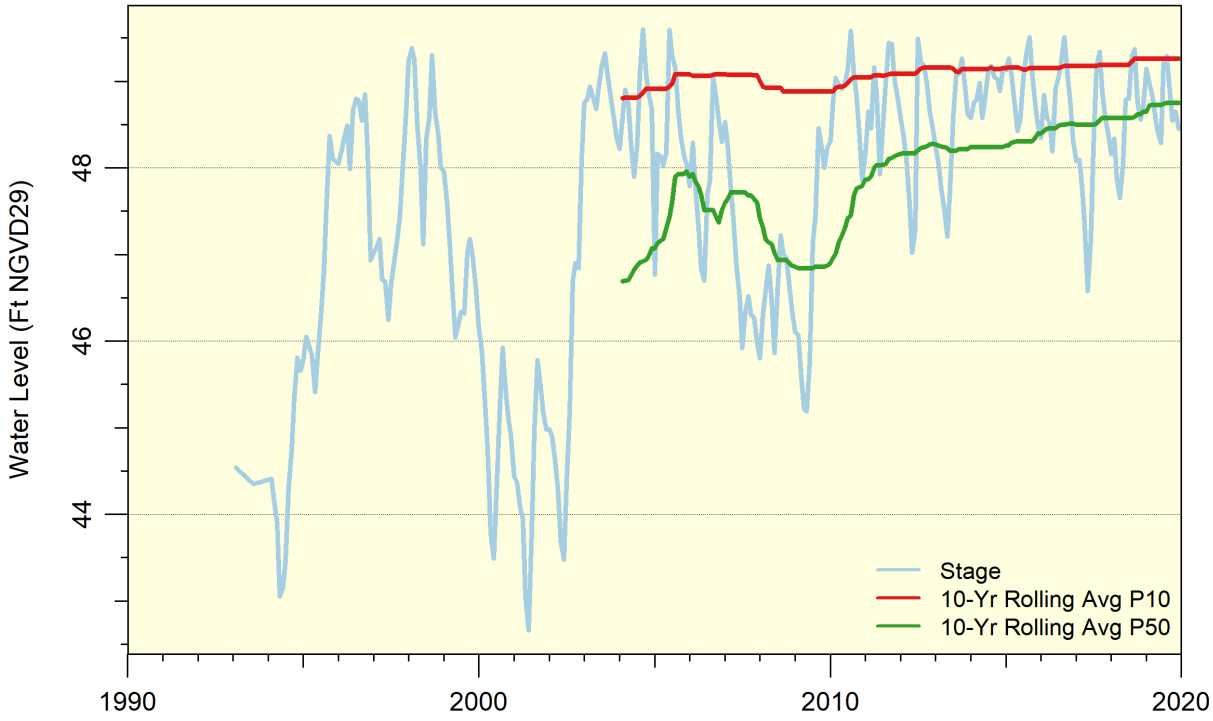

Figure 8. Hydrograph and rolling 10-year P10 and P50 for Cypress Lake.

Lakes Dosson and Sunshine

Lakes Dosson and Sunshine are located in Hillsborough County (Figure 9). A description of the lakes and their hydrogeologic setting is available in Carr et al. (2018b). As described in Carr et al. (2018b), water level data for the lakes span from 1974 to present and currently continue to be collected on a twice weekly basis by the District (Figure 10). As noted in Carr et al. (2018b), the lakes are equalized by a dredged canal and so share minimum levels.

Carr et al. (2018b) developed significant change standards and Historic percentiles for Lakes Dosson and Sunshine. The standards are assessed to identify possible thresholds in the P50 for preventing significant harm to natural system values associated with lakes in accordance with guidance provided in the Florida Water Resource Implementation Rule (62-40.473, F.A.C.). Other information taken into consideration in the development of minimum levels includes potential changes in the coverage of herbaceous wetland vegetation and aquatic plants, flooding of residential dwellings and infrastructure, and the health, safety and welfare of the public. Based on these factors, the most appropriate elevation for use as the MLL corresponds to the Dock-Use Standard, which represents the most appropriate standard below the Historic P50, where the Historic P50 is the median water level estimated to occur in the total absence of withdrawals. The HMLL is then calculated by adding the difference between the Historic P10 and Historic P50 to the MLL. No revisions to guidance levels occurred.

Using the status assessment process described in Basso et al. (2020), to assess status for Lakes Dosson and Sunshine, the P10 and P50 from 2010-2019 observed stage data are compared to, respectively, the HMLL and MLL (Table 7). Based on the 2010-2019 observed stage data, both the HMLL and MLL are considered met for Lakes Dosson and Sunshine.

Table 7. Minimum levels and initial status assessment for Lakes Dosson and Sunshine.

Percentile	Minimum Levels (ft NGVD29)	Status Stage Data (2010-2019) (ft NGVD29)	Status (ft)
P10	53.2	54.1	+0.9
P50	52.1	53.4	+1.3

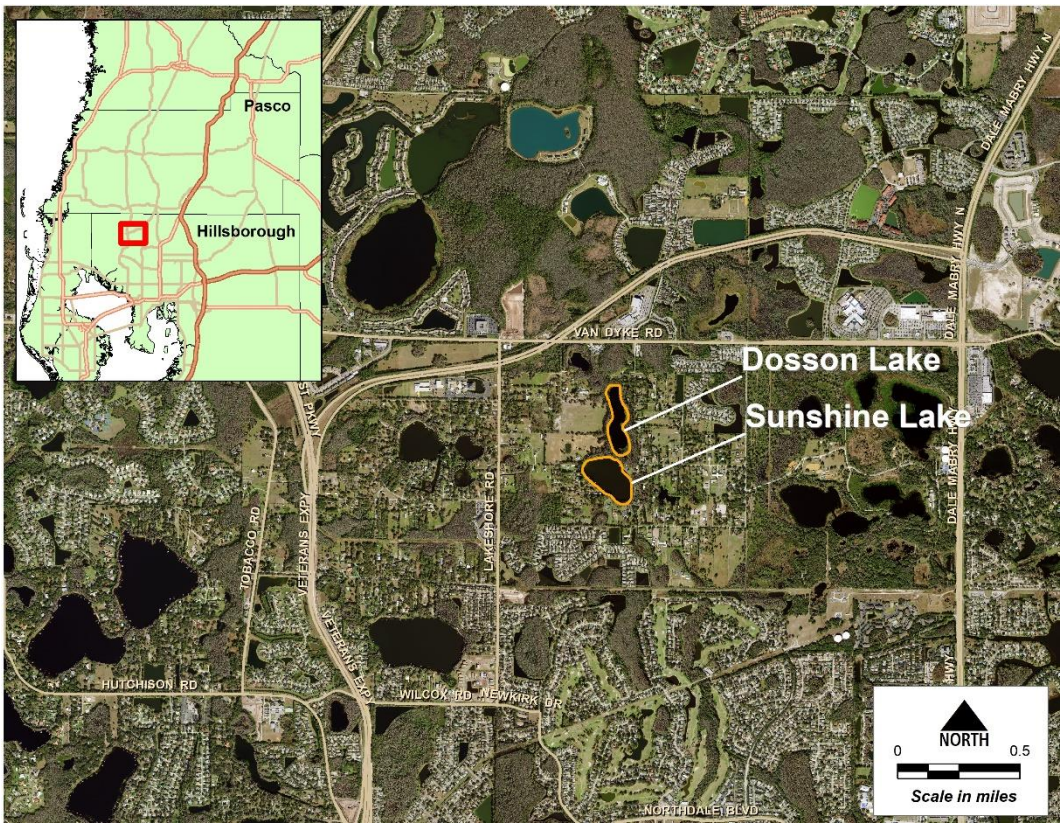

Figure 9. Location of Lakes Dosson and Sunshine in Hillsborough County, Florida.

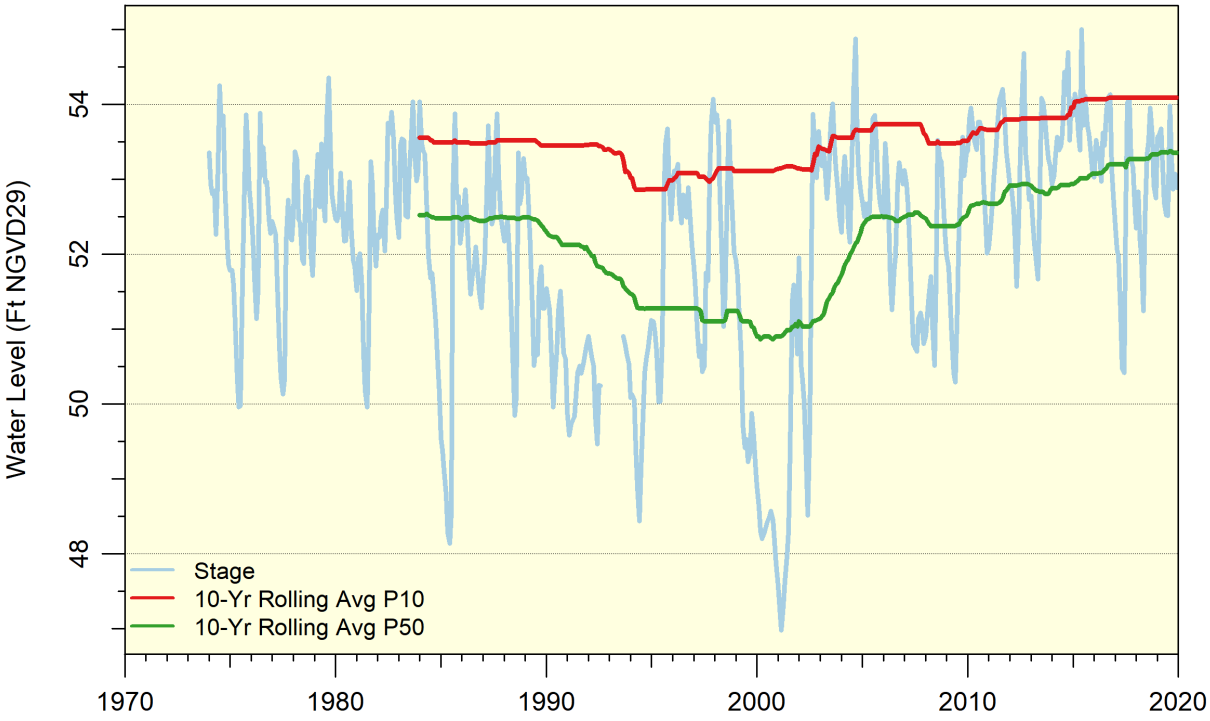

Figure 10. Hydrograph and rolling 10-year P10 and P50 for Lakes Dosson and Sunshine.

Fairy (Maurine) Lake

Fairy Lake is located in Hillsborough County (Figure 11). A description of the lake and its hydrogeologic setting is available in Leeper (2003a). As described in Leeper (2003a), water level data for the lake span from 1977 to present and currently continue to be collected on a monthly basis by the District (Figure 12).

Leeper (2003a) developed significant change standards and Historic percentiles for Fairy Lake. The standards are assessed to identify possible thresholds in the P50 for preventing significant harm to natural system values associated with lakes in accordance with guidance provided in the Florida Water Resource Implementation Rule (62-40.473, F.A.C.). Other information taken into consideration in the development of minimum levels includes potential changes in the coverage of herbaceous wetland vegetation and aquatic plants, flooding of residential dwellings and infrastructure, and the health, safety and welfare of the public. Based on these factors, the most appropriate elevation for use as the MLL corresponds to the Recreation/Ski Standard, which represents the most appropriate standard below the Historic P50, where the Historic P50 is the median water level estimated to occur in the total absence of withdrawals. The HMLL is then calculated by adding the difference between the P10 and P50 from 2019-2019 observed stage data. No revisions to guidance levels occurred.

Using the status assessment process described in Basso et al. (2020), to assess status for Fairy Lake, the P10 and P50 from 2010-2019 observed stage data are compared to, respectively, the HMLL and MLL (Table 8). Based on the 2010-2019 observed stage data, both the HMLL and MLL are considered met for Fairy Lake.

Table 8. Minimum levels and initial status assessment for Fairy Lake.

Percentile	Minimum Levels (ft NGVD29)	Status Stage Data (2010-2019) (ft NGVD29)	Status (ft)
P10	32.5	33.3	+0.8
P50	32.1	32.9	+0.8

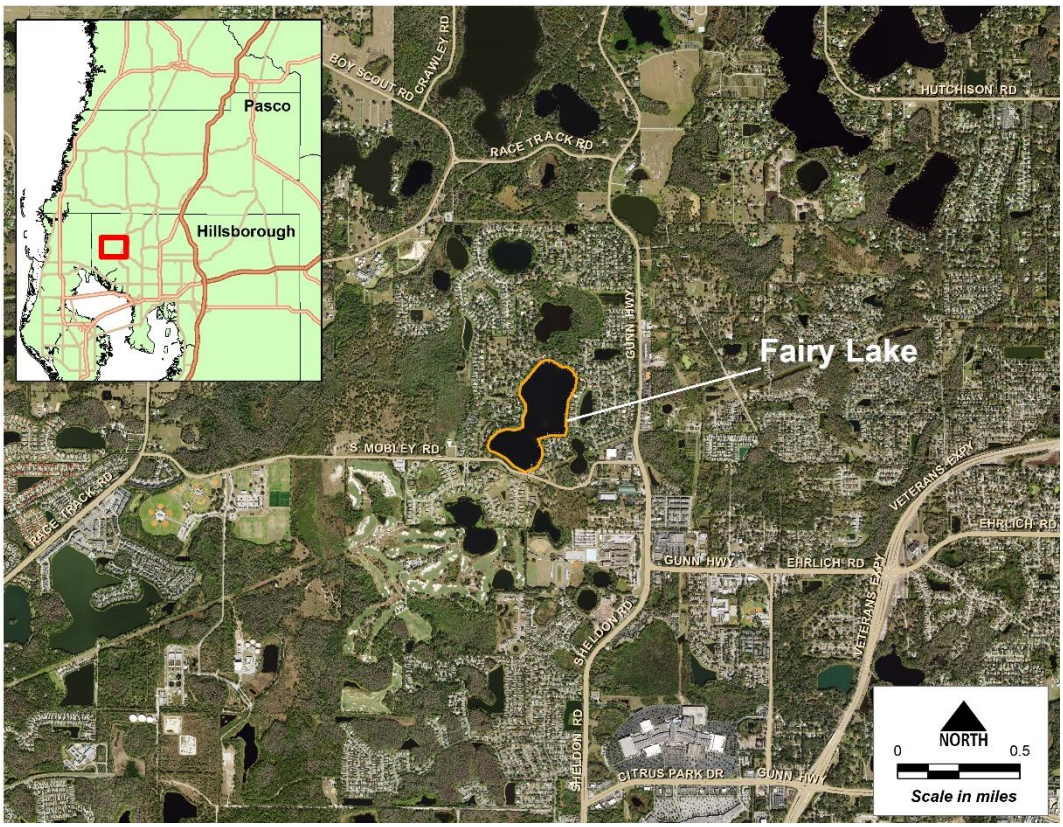

Figure 11. Location of Fairy (Maurine) Lake in Hillsborough County, Florida.

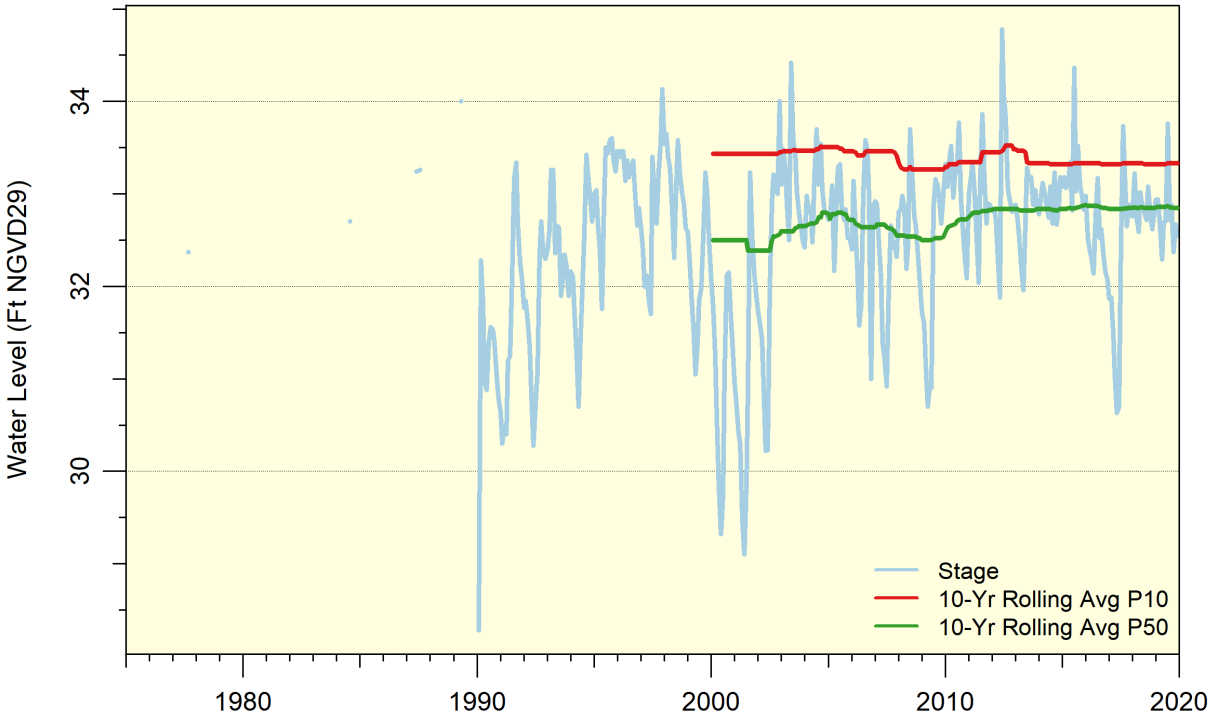

Figure 12. Hydrograph and rolling 10-year P10 and P50 for Fairy (Maurine) Lake.

Halfmoon Lake

Halfmoon Lake is located in Hillsborough County (Figure 13). A description of the lake and its hydrogeologic setting is available in Campbell and Cameron (2020). As described in Campbell and Cameron (2020), water level data for the lake span from 1977 to present and currently continue to be collected on a monthly basis by the District (Figure 14).

Campbell and Cameron (2020) developed significant change standards and Historic percentiles for Halfmoon Lake. The standards are assessed to identify possible thresholds in the P50 for preventing significant harm to natural system values associated with lakes in accordance with guidance provided in the Florida Water Resource Implementation Rule (62-40.473, F.A.C.). Other information taken into consideration in the development of minimum levels includes potential changes in the coverage of herbaceous wetland vegetation and aquatic plants, flooding of residential dwellings and infrastructure, and the health, safety and welfare of the public. Based on these factors, the most appropriate elevation for use as the MLL corresponds to the Wetland Offset Standard, which represents the most appropriate standard below the Historic P50, where the Historic P50 is the median water level estimated to occur in the total absence of withdrawals. The HMLL is then calculated by adding the difference between the Historic P10 and Historic P50 to the MLL. Additionally, the High Guidance Level is 43.3 ft NGVD29 based on the Historic P10 calculated in Campbell and Cameron (2020), and the Low Guidance Level is 40.4 ft NGVD29 based on the Historic P90 calculated in Campbell and Cameron (2020).

Using the status assessment process described in Basso et al. (2020), to assess status for Halfmoon Lake, the P10 and P50 from 2010-2019 observed stage data are compared to, respectively, the HMLL and MLL (Table 9). Based on the 2010-2019 observed stage data, both the HMLL and MLL are considered met for Halfmoon Lake.

Table 9. Minimum levels and initial status assessment for Halfmoon Lake.

Percentile	Minimum Levels (ft NGVD29)	Status Stage Data (2010-2019) (ft NGVD29)	Status (ft)
P10	42.5	43.4	+0.9
P50	41.1	42.9	+1.8

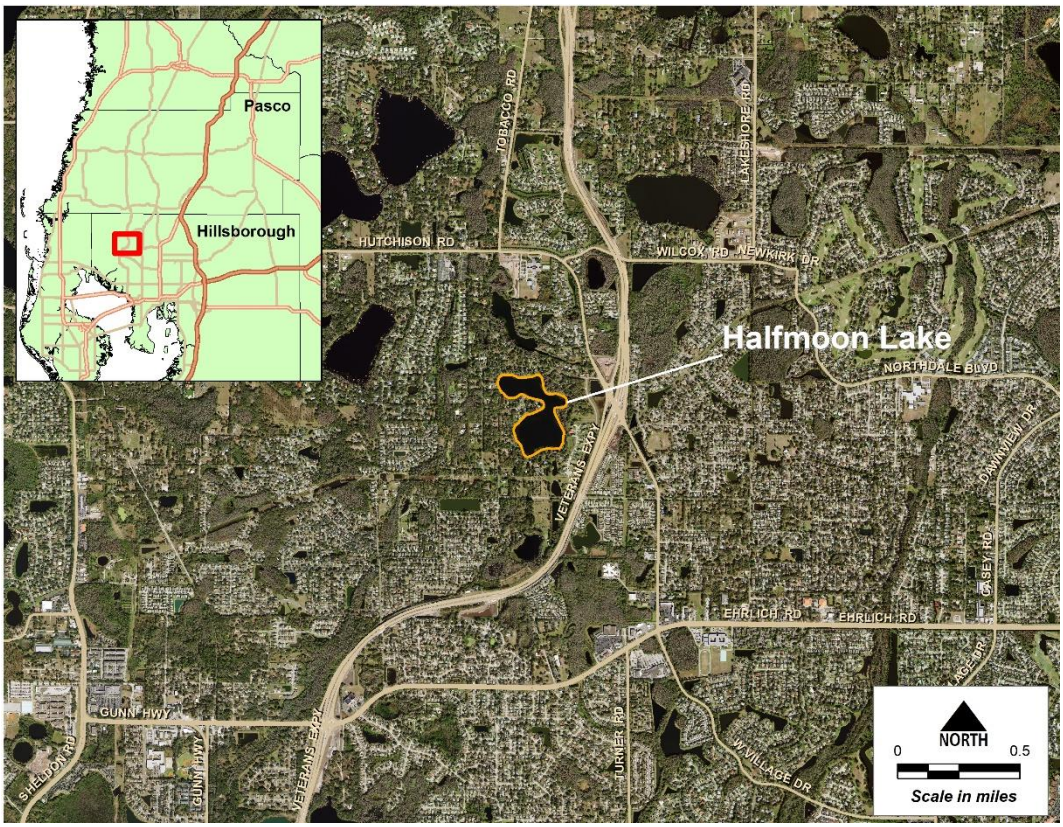

Figure 13. Location of Halfmoon Lake in Hillsborough County, Florida.

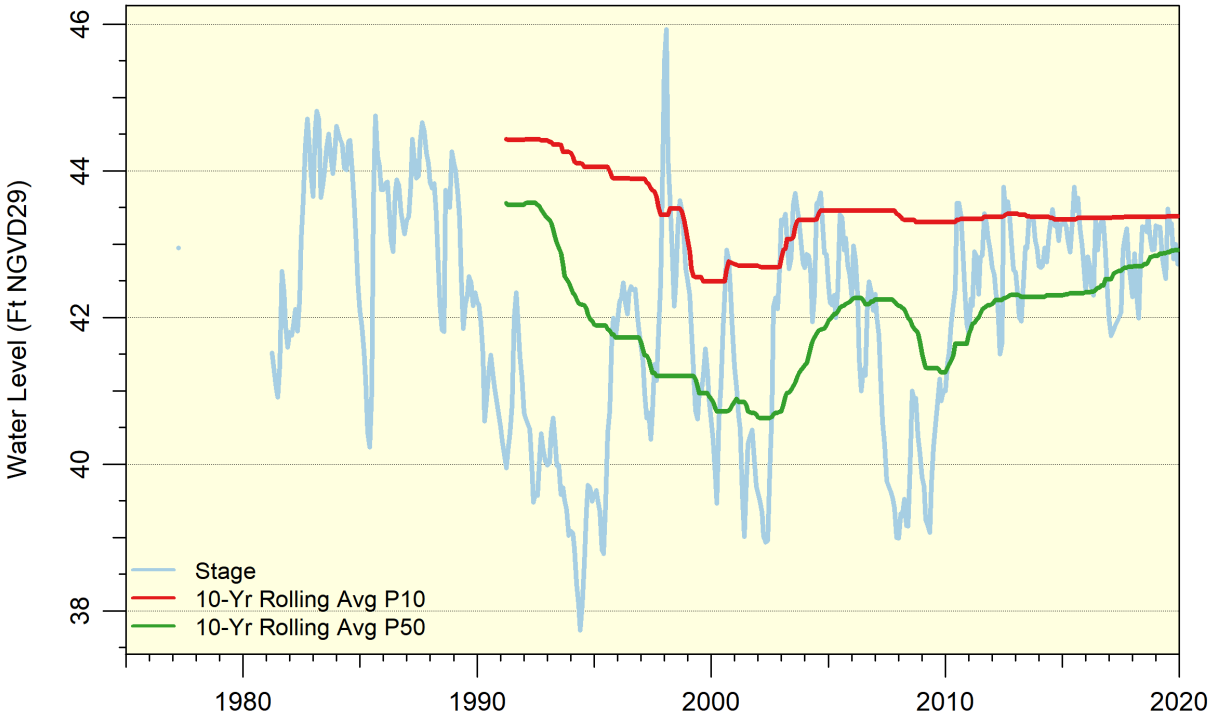

Figure 14. Hydrograph and rolling 10-year P10 and P50 for Halfmoon Lake.

Lake Hanna

Lake Hanna is located in Hillsborough County (Figure 15). A description of the lake and its hydrogeologic setting is available in Kolasa et al. (2015). As described in Kolasa et al. (2015), water level data for the lake span from 1946 to present and currently continue to be collected on a daily basis by the District (Figure 16).

Kolasa et al. (2015) developed significant change standards and Historic percentiles for Lake Hanna. The standards are assessed to identify possible thresholds in the P50 for preventing significant harm to natural system values associated with lakes in accordance with guidance provided in the Florida Water Resource Implementation Rule (62-40.473, F.A.C.). Other information taken into consideration in the development of minimum levels includes potential changes in the coverage of herbaceous wetland vegetation and aquatic plants, flooding of residential dwellings and infrastructure, and the health, safety and welfare of the public. Based on these factors, the most appropriate elevation for use as the MLL corresponds to the Wetland Offset Standard, which represents the most appropriate standard below the Historic P50, where the Historic P50 is the median water level estimated to occur in the total absence of withdrawals. The HMLL is then calculated by adding the difference between the Historic P10 and Historic P50 to the MLL. No revisions to guidance levels occurred.

Using the status assessment process described in Basso et al. (2020), to assess status for Lake Hanna, the P10 and P50 from 2010-2019 observed stage data are compared to, respectively, the HMLL and MLL (Table 10). Based on the 2010-2019 observed stage data, both the HMLL and MLL are considered met for Lake Hanna.

Table 10. Minimum levels and initial status assessment for Lake Hanna.

Percentile	Minimum Levels (ft NGVD29)	Status Stage Data (2010-2019) (ft NGVD29)	Status (ft)
P10	61.2	61.6	+0.4
P50	59.2	61.2	+2.0

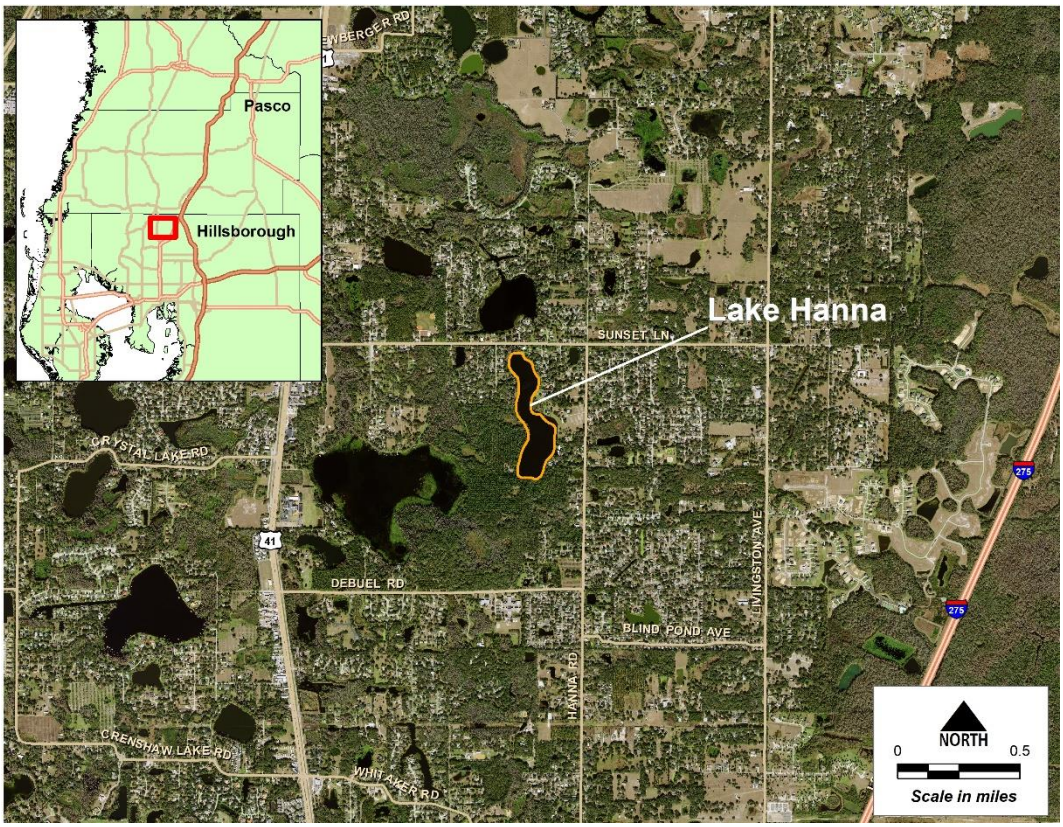

Figure 15. Location of Lake Hanna in Hillsborough County, Florida.

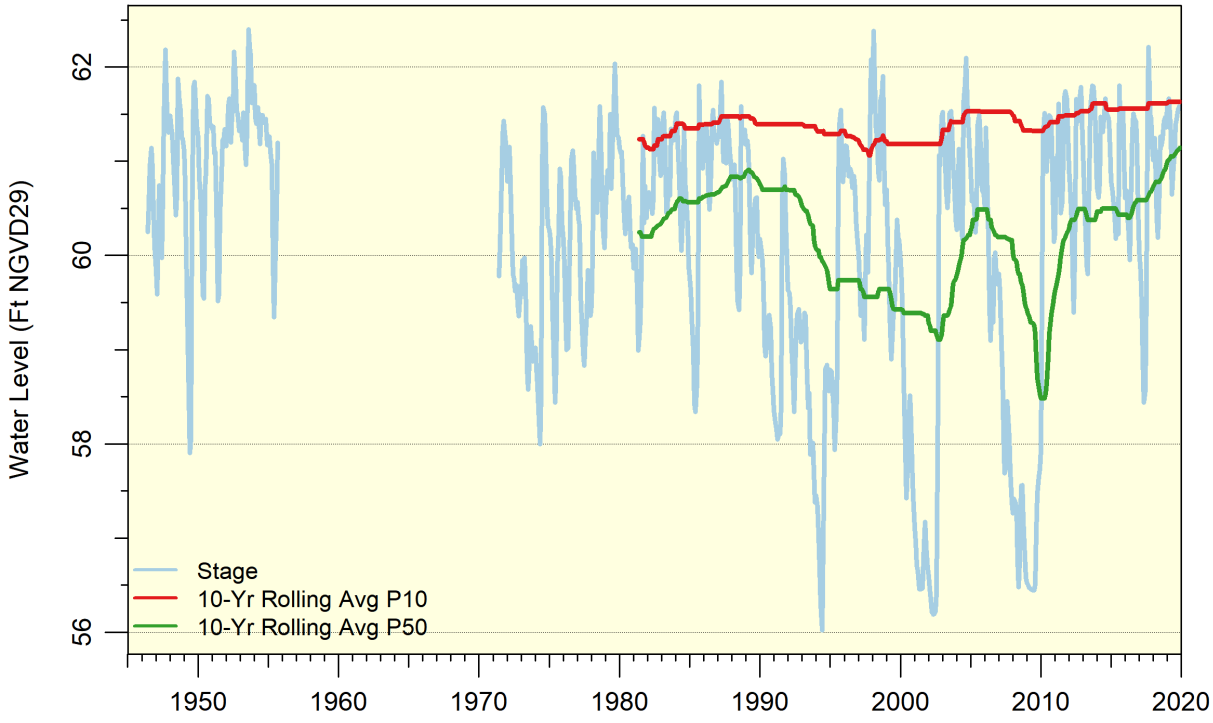

Figure 16. Hydrograph and rolling 10-year P10 and P50 for Lake Hanna.

Lakes Helen, Ellen and Barbara

Lakes Helen, Ellen and Barbara are located in Hillsborough County (Figure 17). A description of the lakes and their hydrogeologic setting is available in Leeper (2003c). As described in Leeper (2003c), water level data for the lakes span from 1993 to present and currently continue to be collected on a monthly basis by the District (Figure 18). As noted in Leeper (2003c), the lakes are equalized by dredged canals and so share minimum levels.

Leeper (2003c) developed significant change standards and Historic percentiles for Lakes Helen, Ellen and Barbara. Additionally, the Wetland Offset Standard elevation was calculated based on the methodology described in Hancock (2007). The standards are assessed to identify possible thresholds in the P50 for preventing significant harm to natural system values associated with lakes in accordance with guidance provided in the Florida Water Resource Implementation Rule (62-40.473, F.A.C.). Other information taken into consideration in the development of minimum levels includes potential changes in the coverage of herbaceous wetland vegetation and aquatic plants, flooding of residential dwellings and infrastructure, and the health, safety and welfare of the public. Based on these factors, the most appropriate elevation for use as the MLL corresponds to the Wetland Offset Standard, which represents the most appropriate standard below the Historic P50, where the Historic P50 is the median water level estimated to occur in the total absence of withdrawals. The HMLL is then calculated by adding the P10-P50 Reference Lake Water Regime (RLWR50) value of 1.0 feet to the MLL (SWFWMD, 1999a). No revisions to guidance levels occurred.

Using the status assessment process described in Basso et al. (2020), to assess status for Lakes Helen, Ellen and Barbara, the P10 and P50 from 2010-2019 observed stage data are compared to, respectively, the HMLL and MLL (Table 11). Based on the 2010-2019 observed stage data, both the HMLL and MLL are considered met.

Table 11. Minimum levels and initial status assessment for Lakes Helen, Ellen and Barbara.

Percentile	Minimum Levels (ft NGVD29)	Status Stage Data (2010-2019) (ft NGVD29)	Status (ft)
P10	53.1	53.9	+0.8
P50	51.4	53.2	+1.8

Figure 17. Location of Lakes Helen, Ellen and Barbara in Hillsborough County, Florida.

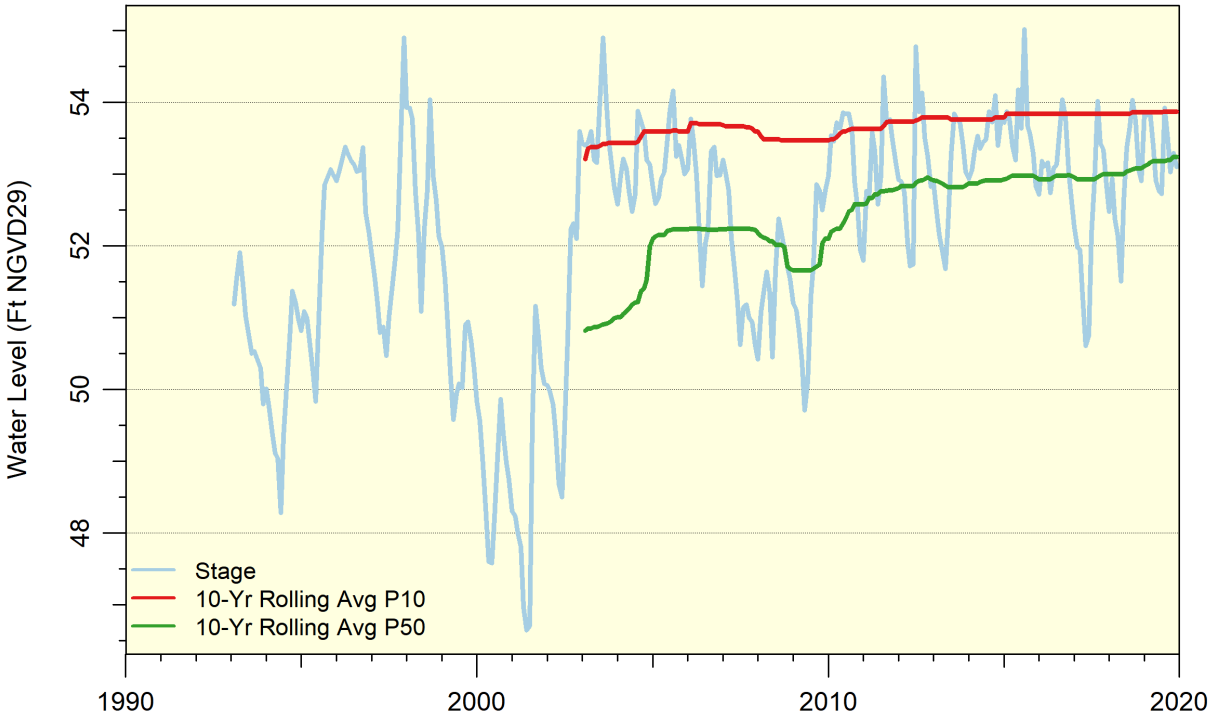

Figure 18. Hydrograph and rolling 10-year P10 and P50 for Lakes Barbara, Helen and Ellen.

Lake Hobbs

Lake Hobbs is located in Hillsborough County (Figure 19). A description of the lake and its hydrogeologic setting is available in Uranowski et al. (2015). As described in Uranowski et al. (2015), water level data for the lake span from 1946 to present and currently continue to be collected on a monthly basis by the District (Figure 20).

Uranowski et al. (2015) developed significant change standards and Historic percentiles for Lake Hobbs. The standards are assessed to identify possible thresholds in the P50 for preventing significant harm to natural system values associated with lakes in accordance with guidance provided in the Florida Water Resource Implementation Rule (62-40.473, F.A.C.). Other information taken into consideration in the development of minimum levels includes potential changes in the coverage of herbaceous wetland vegetation and aquatic plants, flooding of residential dwellings and infrastructure, and the health, safety and welfare of the public. Based on these factors, the most appropriate elevation for use as the MLL corresponds to the Wetland Offset Standard, which represents the most appropriate standard below the Historic P50, where the Historic P50 is the median water level estimated to occur in the total absence of withdrawals. The HMLL is then calculated by adding the difference between the Historic P10 and Historic P50 to the MLL. No revisions to guidance levels occurred.

Using the status assessment process described in Basso et al. (2020), to assess status for Lake Hobbs, the P10 and P50 from 2010-2019 observed stage data are compared to, respectively, the HMLL and MLL (Table 12). Based on the 2010-2019 observed stage data, both the HMLL and MLL are considered met for Lake Hobbs.

Table 12. Minimum levels and initial status assessment for Lake Hobbs.

Percentile	Minimum Levels (ft NGVD29)	Status Stage Data (2010-2019) (ft NGVD29)	Status (ft)
P10	64.9	65.8	+0.9
P50	63.2	64.7	+1.5

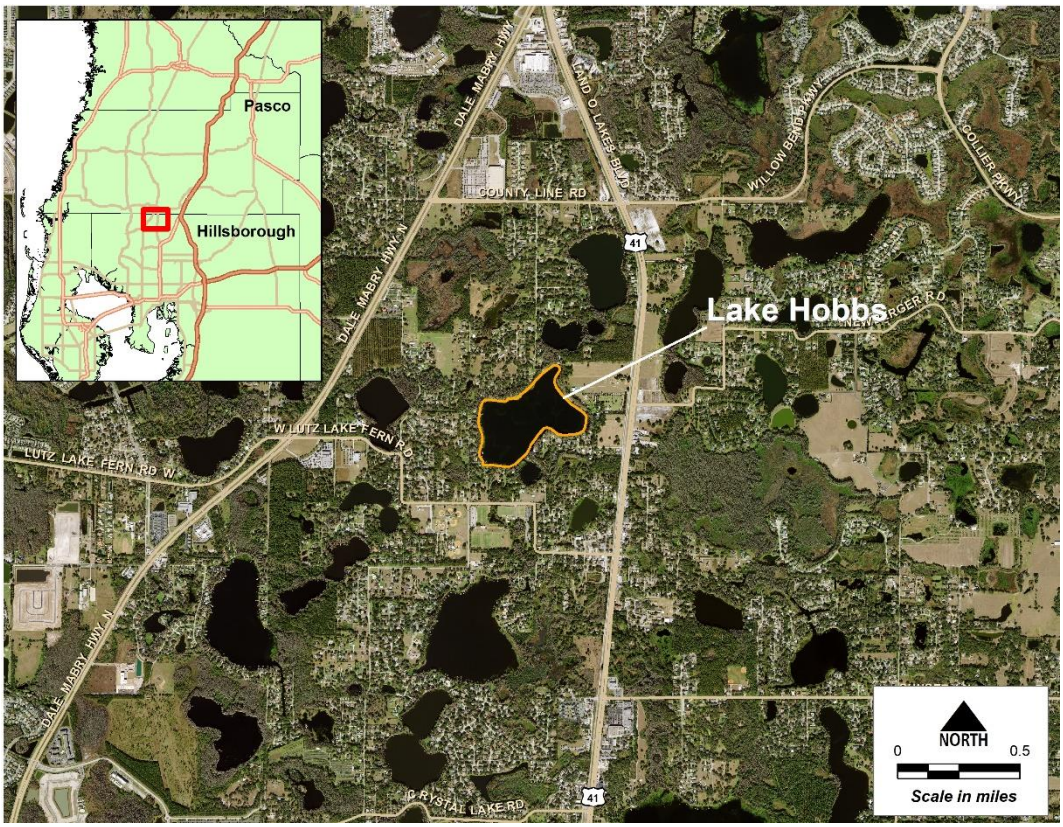

Figure 19. Location of Lake Hobbs in Hillsborough County, Florida.

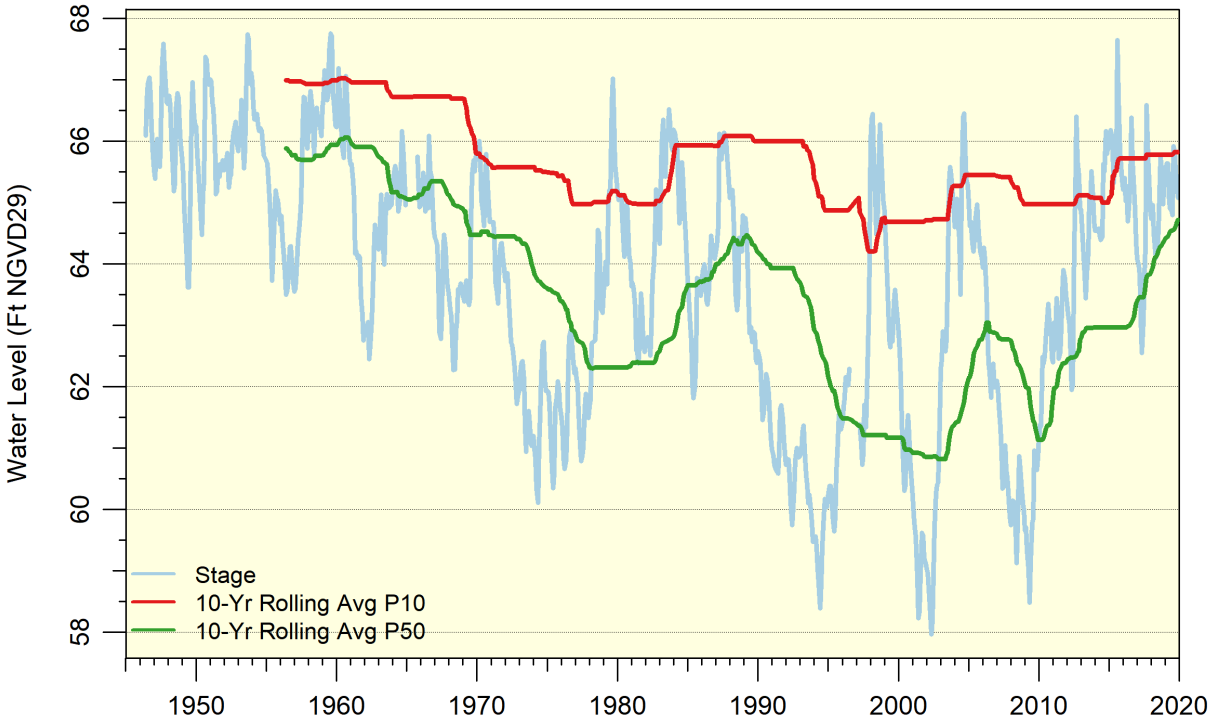

Figure 20. Hydrograph and rolling 10-year P10 and P50 for Lake Hobbs.

Lake Jackson

Lake Jackson is located in Hillsborough County (Figure 21). A description of the lake and its hydrogeologic setting is available in Leeper (2004a). As described in Leeper (2004a), water level data for the lake span from 1973 to present and currently continue to be collected on a monthly basis by the District (Figure 22).

Leeper (2004a) developed significant change standards and Historic percentiles for Lake Jackson. Additionally, the Wetland Offset Standard elevation was calculated based on the methodology described in Hancock (2007). The standards are assessed to identify possible thresholds in the P50 for preventing significant harm to natural system values associated with lakes in accordance with guidance provided in the Florida Water Resource Implementation Rule (62-40.473, F.A.C.). Other information taken into consideration in the development of minimum levels includes potential changes in the coverage of herbaceous wetland vegetation and aquatic plants, flooding of residential dwellings and infrastructure, and the health, safety and welfare of the public. Based on these factors, the most appropriate elevation for use as the MLL corresponds to the Wetland Offset Standard, which represents the most appropriate standard below the Historic P50, where the Historic P50 is the median water level estimated to occur in the total absence of withdrawals. The HMLL is then calculated by adding the P10-P50 Reference Lake Water Regime (RLWR50) value of 1.0 feet to the MLL (SWFWMD, 1999a). No revisions to guidance levels occurred.

Using the status assessment process described in Basso et al. (2020), to assess status for Lake Jackson, the P10 and P50 from 2010-2019 observed stage data are compared to, respectively, the HMLL and MLL (Table 13). Based on the 2010-2019 observed stage data, both the HMLL and MLL are considered met for Lake Jackson.

Table 13. Minimum levels and initial status assessment for Lake Jackson.

Percentile	Minimum Levels (ft NGVD29)	Status Stage Data (2010-2019) (ft NGVD29)	Status (ft)
P10	32.2	33.9	+1.7
P50	31.2	33.1	+1.9

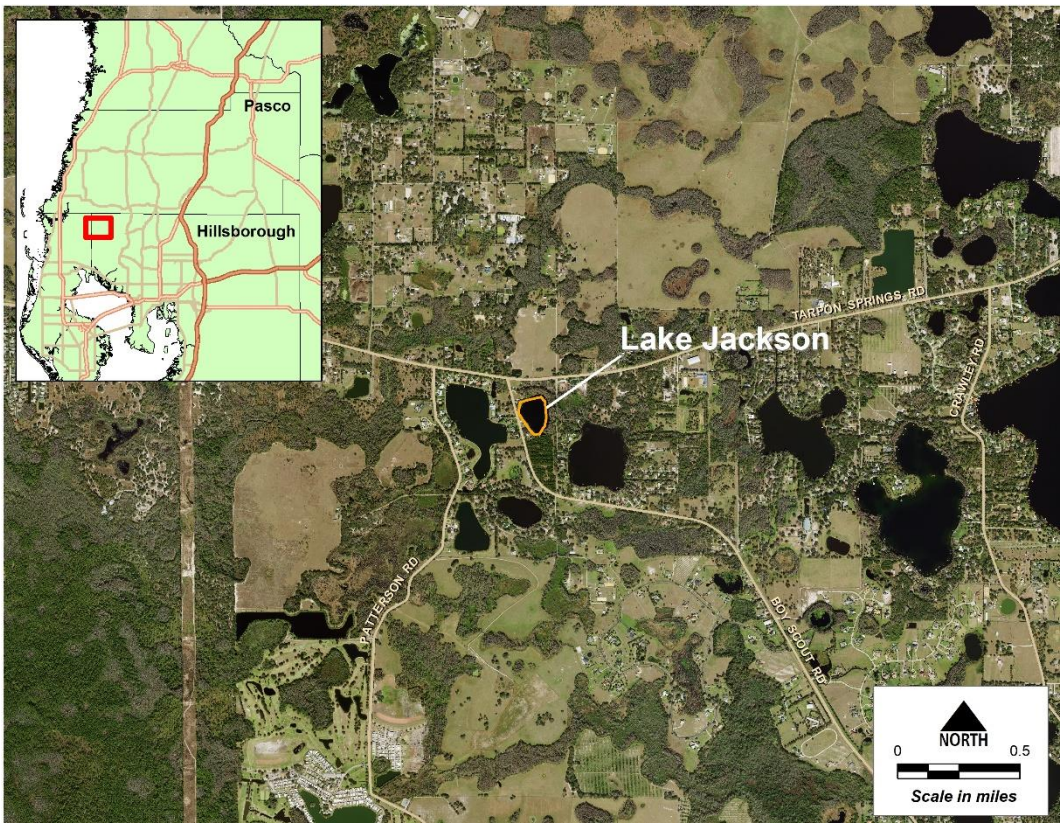

Figure 21. Location of Lake Jackson in Hillsborough County, Florida.

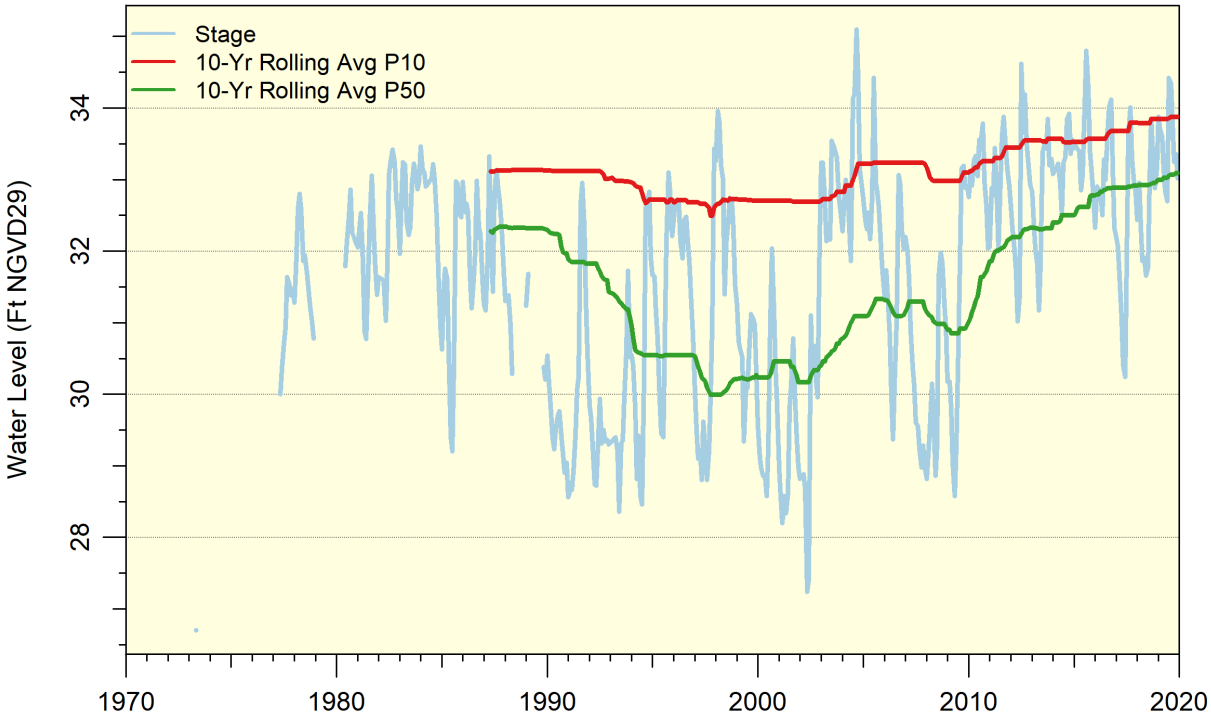

Figure 22. Hydrograph and rolling 10-year P10 and P50 for Lake Jackson.

Lake Juanita

Lake Juanita is located in Hillsborough County (Figure 23). A description of the lake and its hydrogeologic setting is available in Swindasz et al. (2018). As described in Swindasz et al. (2018), water level data for the lake span from 1971 to present and currently continue to be collected on a monthly basis by the District (Figure 24).

Swindasz et al. (2018) developed significant change standards and Historic percentiles for Lake Juanita. The standards are assessed to identify possible thresholds in the P50 for preventing significant harm to natural system values associated with lakes in accordance with guidance provided in the Florida Water Resource Implementation Rule (62-40.473, F.A.C.). Other information taken into consideration in the development of minimum levels includes potential changes in the coverage of herbaceous wetland vegetation and aquatic plants, flooding of residential dwellings and infrastructure, and the health, safety and welfare of the public. Based on these factors, the most appropriate elevation for use as the MLL corresponds to the Wetland Offset Standard, which represents the most appropriate standard below the Historic P50, where the Historic P50 is the median water level estimated to occur in the total absence of withdrawals. The HMLL is then calculated by adding the difference between the Historic P10 and Historic P50 to the MLL. No revisions to guidance levels occurred.

Using the status assessment process described in Basso et al. (2020), to assess status for Lake Juanita, the P10 and P50 from 2010-2019 observed stage data are compared to, respectively, the HMLL and MLL (Table 14). Based on the 2010-2019 observed stage data, both the HMLL and MLL are considered met for Lake Juanita.

Table 14. Minimum levels and initial status assessment for Lake Juanita.

Percentile	Minimum Levels (ft NGVD29)	Status Stage Data (2010-2019) (ft NGVD29)	Status (ft)
P10	41.0	42.2	+1.2
P50	39.5	41.2	+1.7

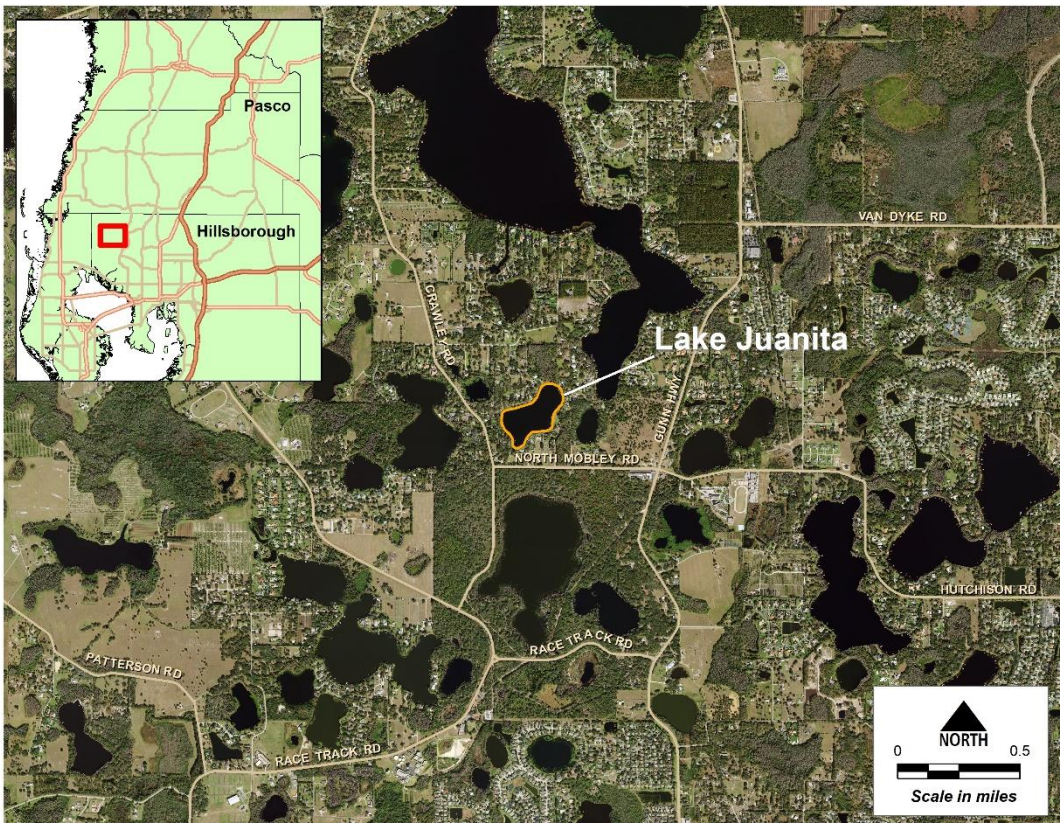

Figure 23. Location of Lake Juanita in Hillsborough County, Florida.

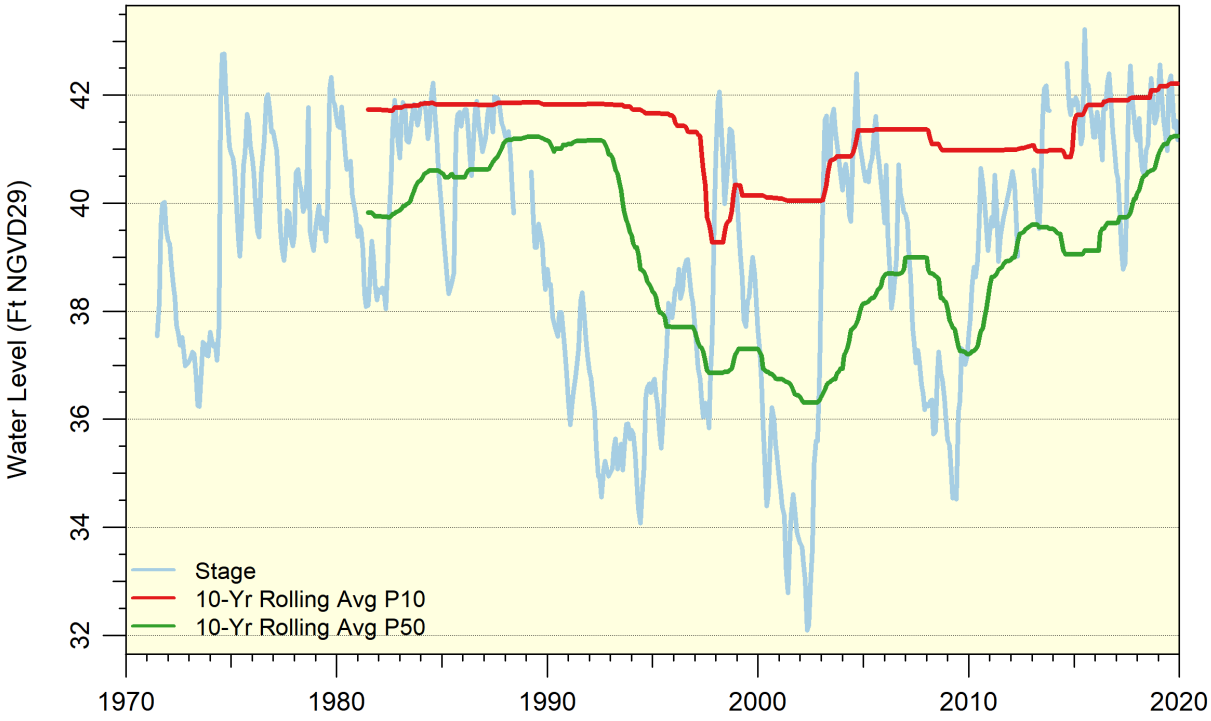

Figure 24. Hydrograph and rolling 10-year P10 and P50 for Lake Juanita.

Lake Merrywater

Lake Merrywater is located in Hillsborough County (Figure 25). A description of the lake and its hydrogeologic setting is available in Campbell and Hancock (2017). As described in Campbell and Hancock (2017), water level data for the lake span from 1977 to present and currently continue to be collected on a monthly basis by the District (Figure 26).

Campbell and Hancock (2017) developed significant change standards and Historic percentiles for Lake Merrywater. The standards are assessed to identify possible thresholds in the P50 for preventing significant harm to natural system values associated with lakes in accordance with guidance provided in the Florida Water Resource Implementation Rule (62-40.473, F.A.C.). Other information taken into consideration in the development of minimum levels includes potential changes in the coverage of herbaceous wetland vegetation and aquatic plants, flooding of residential dwellings and infrastructure, and the health, safety and welfare of the public. Based on these factors, the most appropriate elevation for use as the MLL corresponds to the Wetland Offset Standard, which represents the most appropriate standard below the Historic P50, where the Historic P50 is the median water level estimated to occur in the total absence of withdrawals. The HMLL is then calculated by adding the difference between the Historic P10 and Historic P50 to the MLL. No revisions to guidance levels occurred.

Using the status assessment process described in Basso et al. (2020), to assess status for Lake Merrywater, the P10 and P50 from 2010-2019 observed stage data are compared to, respectively, the HMLL and MLL (Table 15). Based on the 2010-2019 observed stage data, both the HMLL and MLL are considered met for Lake Merrywater.

Table 15. Minimum levels and initial status assessment for Lake Merrywater.

Percentile	Minimum Levels (ft NGVD29)	Status Stage Data (2010-2019) (ft NGVD29)	Status (ft)
P10	56.6	57.6	+1.0
P50	55.2	57.3	+2.1

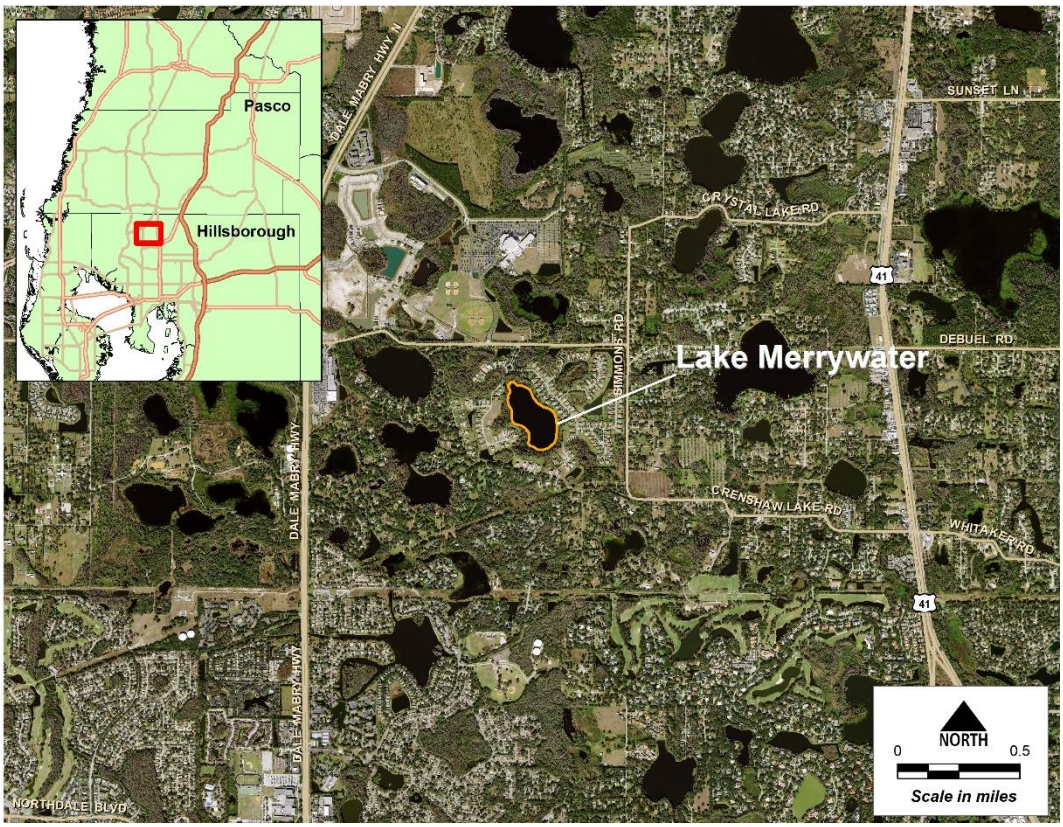

Figure 25. Location of Lake Merrywater in Hillsborough County, Florida.

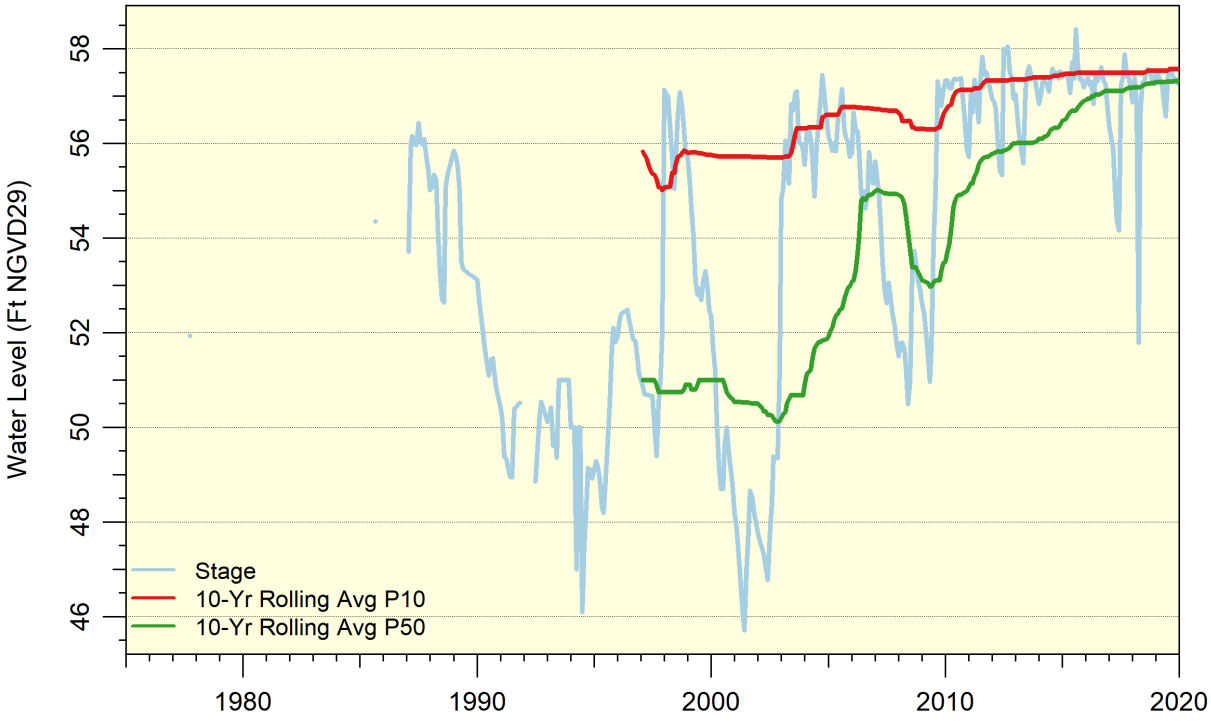

Figure 26. Hydrograph and rolling 10-year P10 and P50 for Lake Merrywater.

Saddleback Lake

Saddleback Lake is located in Hillsborough County (Figure 27). A description of the lake and its hydrogeologic setting is available in Swindasz et al. (2018). As described in Swindasz et al. (2018), water level data for the lake span from 1971 to present and currently continue to be collected on a monthly basis by the District (Figure 28).

Swindasz et al. (2018) developed significant change standards and Historic percentiles for Saddleback Lake. The standards are assessed to identify possible thresholds in the P50 for preventing significant harm to natural system values associated with lakes in accordance with guidance provided in the Florida Water Resource Implementation Rule (62-40.473, F.A.C.). Other information taken into consideration in the development of minimum levels includes potential changes in the coverage of herbaceous wetland vegetation and aquatic plants, flooding of residential dwellings and infrastructure, and the health, safety and welfare of the public. Based on these factors, the most appropriate elevation for use as the MLL corresponds to the Basin Connectivity Standard, which represents the most appropriate standard below the Historic P50, where the Historic P50 is the median water level estimated to occur in the total absence of withdrawals. The HMLL is then calculated by adding the difference between the P10 and P50 from 2019-2019 observed stage data. No revisions to guidance levels occurred.

Using the status assessment process described in Basso et al. (2020), to assess status for Saddleback Lake, the P10 and P50 from 2010-2019 observed stage data are compared to, respectively, the HMLL and MLL (Table 16). Based on the 2010-2019 observed stage data, both the HMLL and MLL are considered met for Saddleback Lake.

Table 16. Minimum levels and initial status assessment for Saddleback Lake.

Percentile	Minimum Levels (ft NGVD29)	Status Stage Data (2010-2019) (ft NGVD29)	Status (ft)
P10	53.6	54.6	+1.0
P50	52.7	53.7	+1.0

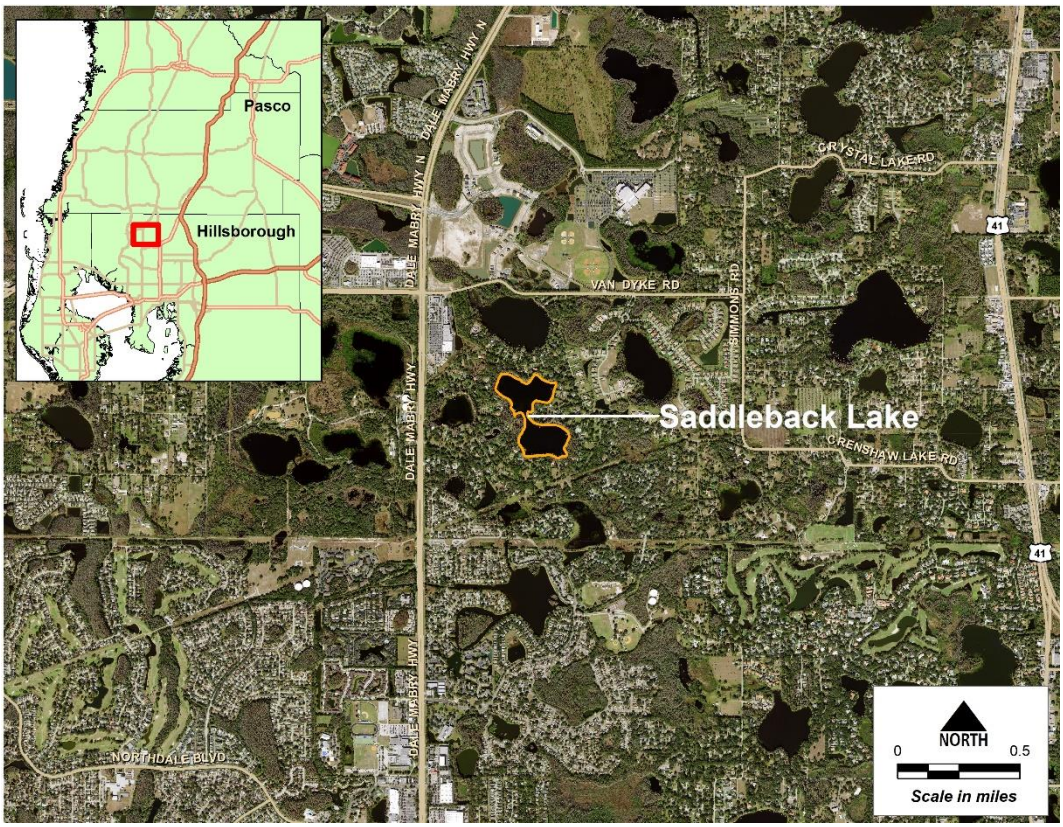

Figure 27. Location of Saddleback Lake in Hillsborough County, Florida.

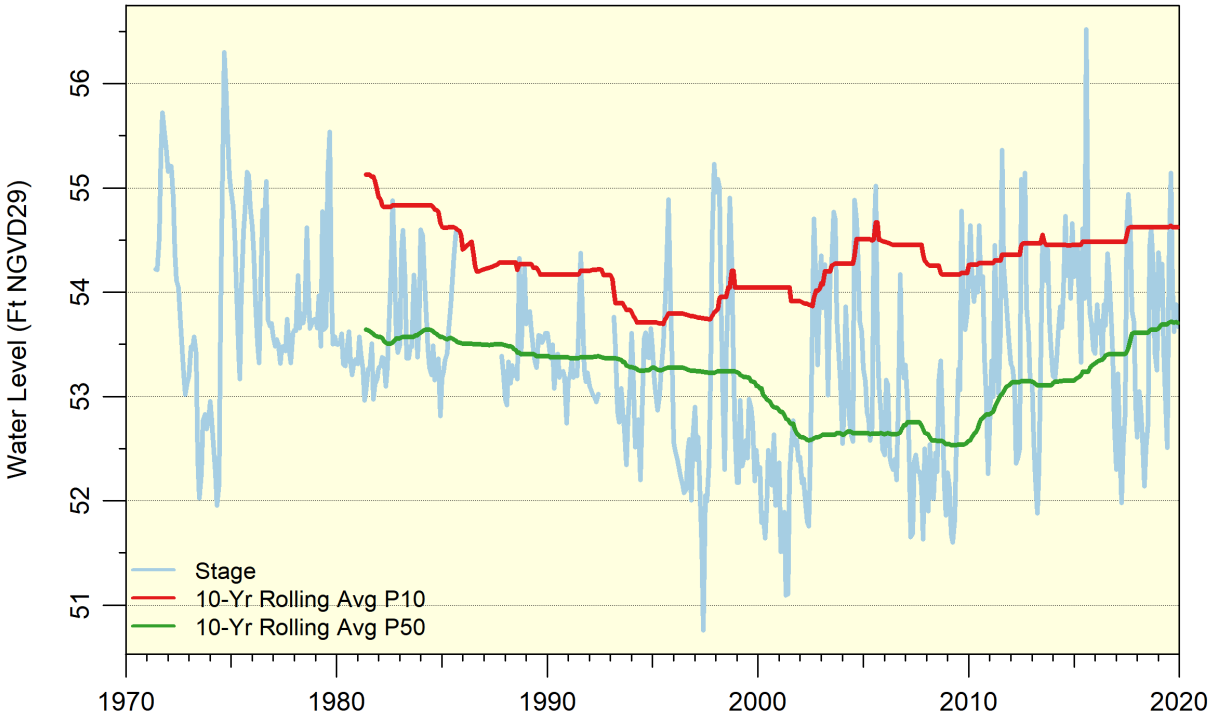

Figure 28. Hydrograph and rolling 10-year P10 and P50 for Saddleback Lake.

Sapphire Lake

Sapphire Lake is located in Hillsborough County (Figure 29). A description of the lake and its hydrogeologic setting is available in Hurst et al. (2019). As described in Hurst et al. (2019), water level data for the lake span from 1993 to present and currently continue to be collected on a monthly basis by the District (Figure 30).

Hurst et al. (2019) developed significant change standards and Historic percentiles for Sapphire Lake. The standards are assessed to identify possible thresholds in the P50 for preventing significant harm to natural system values associated with lakes in accordance with guidance provided in the Florida Water Resource Implementation Rule (62-40.473, F.A.C.). Other information taken into consideration in the development of minimum levels includes potential changes in the coverage of herbaceous wetland vegetation and aquatic plants, flooding of residential dwellings and infrastructure, and the health, safety and welfare of the public. Based on these factors, the most appropriate elevation for use as the MLL corresponds to the Wetland Offset Standard, which represents the most appropriate standard below the Historic P50, where the Historic P50 is the median water level estimated to occur in the total absence of withdrawals. The HMLL is then calculated by adding the difference between the Historic P10 and Historic P50 to the MLL. No revisions to guidance levels occurred.

Using the status assessment process described in Basso et al. (2020), to assess status for Sapphire Lake, the P10 and P50 from 2010-2019 observed stage data are compared to, respectively, the HMLL and MLL (Table 17). Based on the 2010-2019 observed stage data, both the HMLL and MLL are considered met for Sapphire Lake.

Table 17. Minimum levels and initial status assessment for Sapphire Lake.

Percentile	Minimum Levels (ft NGVD29)	Status Stage Data (2010-2019) (ft NGVD29)	Status (ft)
P10	62.7	63.6	+0.9
P50	61.0	62.7	+1.7

Figure 29. Location of Sapphire Lake in Hillsborough County, Florida.

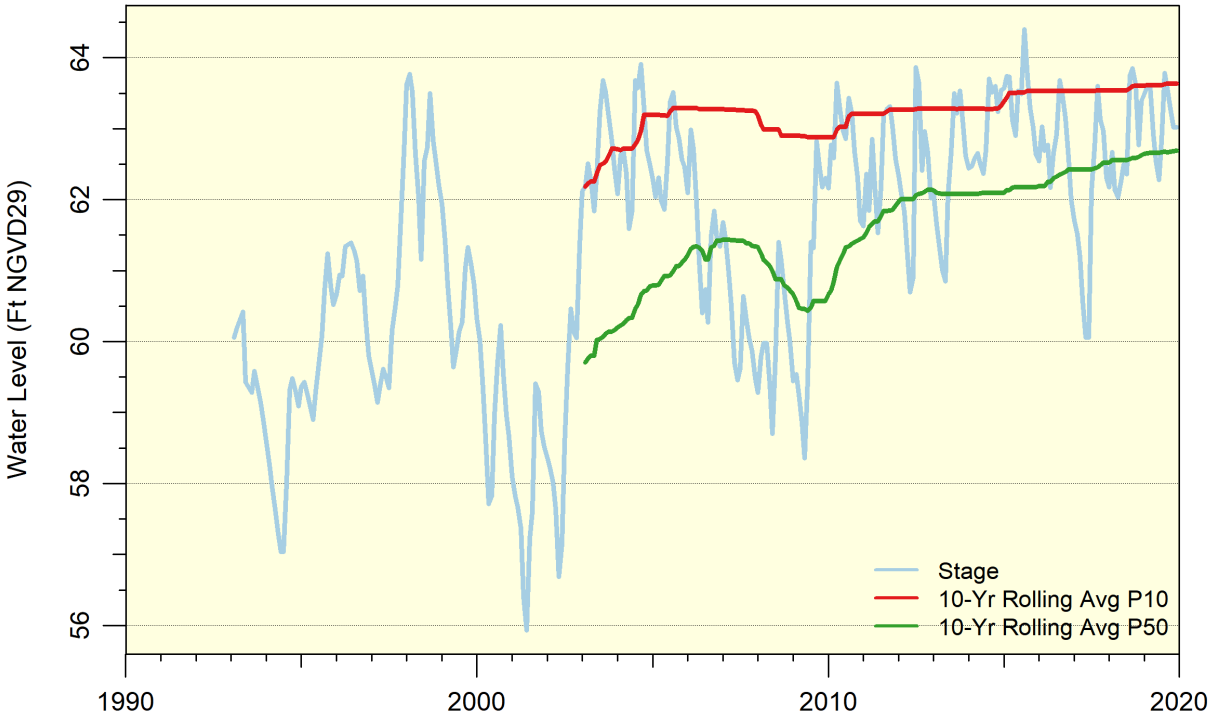

Figure 30. Hydrograph and rolling 10-year P10 and P50 for Sapphire Lake.

Strawberry (North Crystal) Lake

Strawberry Lake is located in Hillsborough County (Figure 31). A description of the lake and its hydrogeologic setting is available in Leeper (2004d). As described in Leeper (2004d), water level data for the lake span from 1971 to present and currently continue to be collected on a monthly basis by the District (Figure 32).

Leeper (2004d) developed significant change standards and Historic percentiles for Strawberry Lake. Additionally, the Wetland Offset Standard elevation was calculated based on the methodology described in Hancock (2007). The standards are assessed to identify possible thresholds in the P50 for preventing significant harm to natural system values associated with lakes in accordance with guidance provided in the Florida Water Resource Implementation Rule (62-40.473, F.A.C.). Other information taken into consideration in the development of minimum levels includes potential changes in the coverage of herbaceous wetland vegetation and aquatic plants, flooding of residential dwellings and infrastructure, and the health, safety and welfare of the public. Based on these factors, the most appropriate elevation for use as the MLL corresponds to the Wetland Offset Standard, which represents the most appropriate standard below the Historic P50, where the Historic P50 is the median water level estimated to occur in the total absence of withdrawals. The HMLL is then calculated by adding the P10-P50 Reference Lake Water Regime (RLWR50) value of 1.0 feet to the MLL (SWFWMD, 1999a). No revisions to guidance levels occurred.

Using the status assessment process described in Basso et al. (2020), to assess status for Strawberry Lake, the P10 and P50 from 2010-2019 observed stage data are compared to, respectively, the HMLL and MLL (Table 18). Based on the 2010-2019 observed stage data, both the HMLL and MLL are considered met for Strawberry Lake.

Table 18. Minimum levels and initial status assessment for Strawberry Lake.

Percentile	Minimum Levels (ft NGVD29)	Status Stage Data (2010-2019) (ft NGVD29)	Status (ft)
P10	59.3	60.6	+1.3
P50	58.3	60.0	+1.7

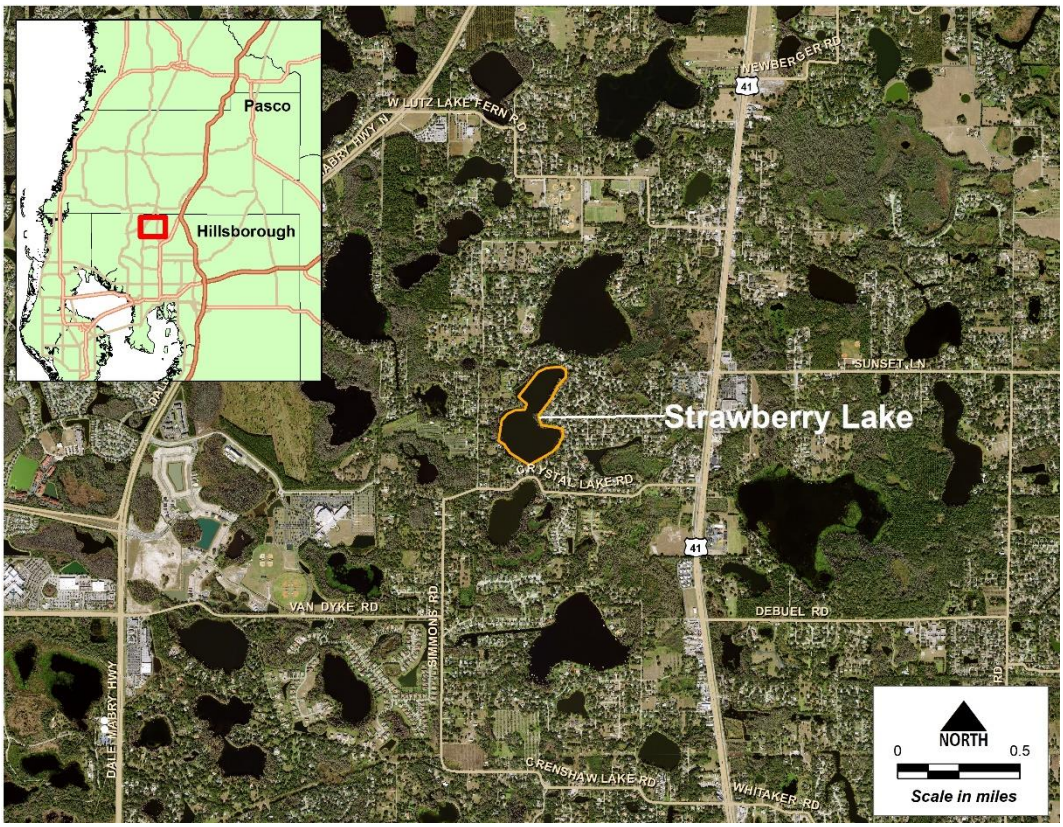

Figure 31. Location of Strawberry Lake in Hillsborough County, Florida.

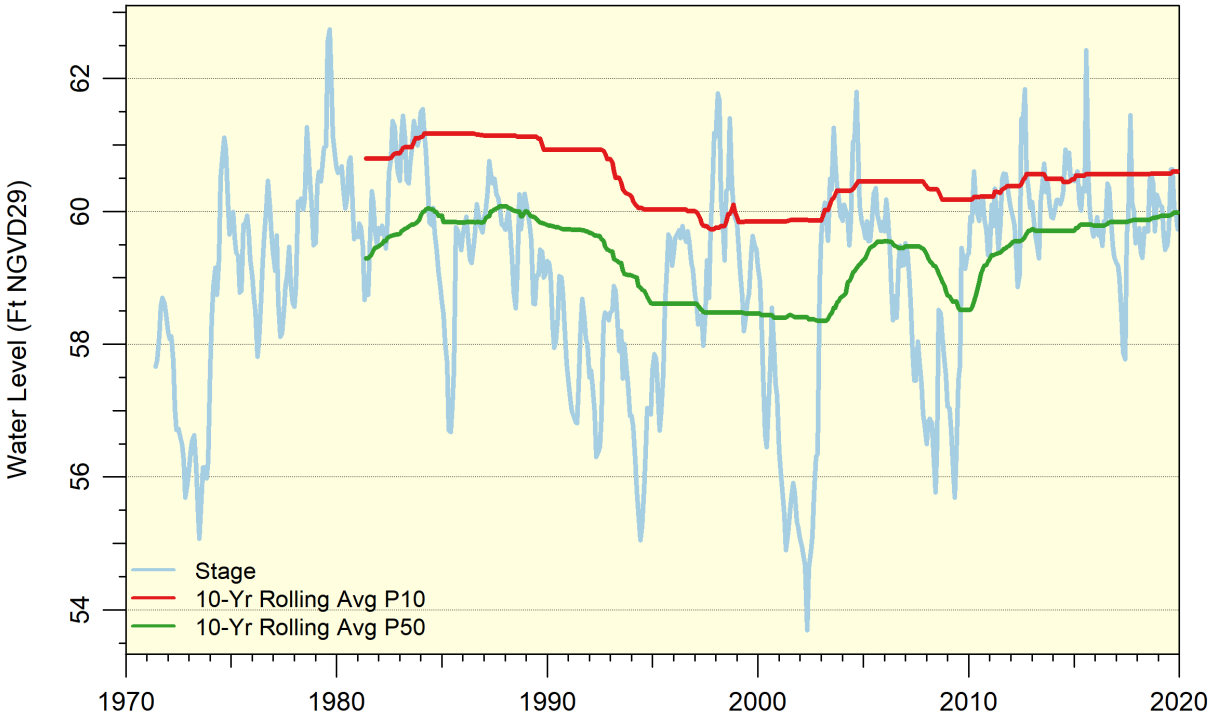

Figure 32. Hydrograph and rolling 10-year P10 and P50 for Strawberry Lake.

Sunset Lake

Sunset Lake is located in Hillsborough County (Figure 33). A description of the lake and its hydrogeologic setting is available in Carr and Hancock (2017). As described in Carr and Hancock (2017), water level data for the lake span from 1972 to present and currently continue to be collected on a monthly basis by the District (Figure 34).

Carr and Hancock (2017) developed significant change standards and Historic percentiles for Sunset Lake. The standards are assessed to identify possible thresholds in the P50 for preventing significant harm to natural system values associated with lakes in accordance with guidance provided in the Florida Water Resource Implementation Rule (62-40.473, F.A.C.). Other information taken into consideration in the development of minimum levels includes potential changes in the coverage of herbaceous wetland vegetation and aquatic plants, flooding of residential dwellings and infrastructure, and the health, safety and welfare of the public. Based on these factors, the most appropriate elevation for use as the MLL corresponds to the Wetland Offset Standard, which represents the most appropriate standard below the Historic P50, where the Historic P50 is the median water level estimated to occur in the total absence of withdrawals. The HMLL is then calculated by adding the difference between the Historic P10 and Historic P50 to the MLL. No revisions to guidance levels occurred.

Using the status assessment process described in Basso et al. (2020), to assess status for Sunset Lake, the P10 and P50 from 2010-2019 observed stage data are compared to, respectively, the HMLL and MLL (Table 19). Based on the 2010-2019 observed stage data, both the HMLL and MLL are considered met for Sunset Lake.

Table 19. Minimum levels and initial status assessment for Sunset Lake.

Percentile	Minimum Levels (ft NGVD29)	Status Stage Data (2010-2019) (ft NGVD29)	Status (ft)
P10	32.8	33.7	+0.9
P50	31.5	32.8	+1.3

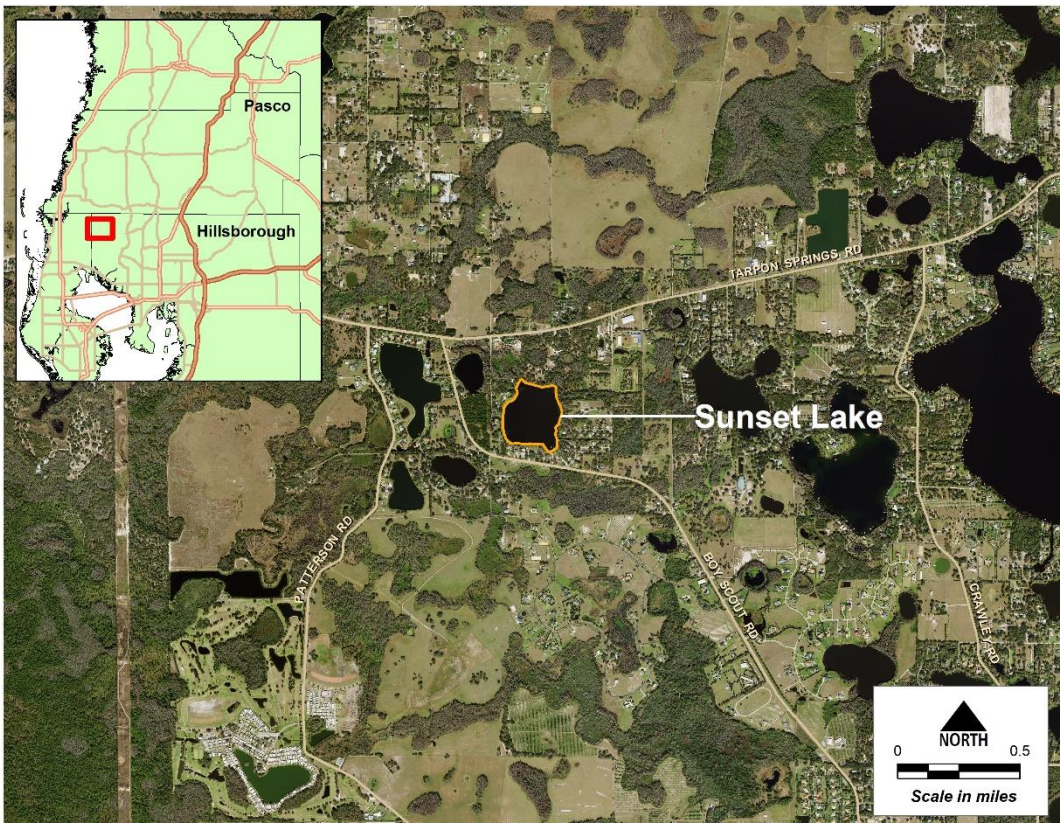

Figure 33. Location of Sunset Lake in Hillsborough County, Florida.

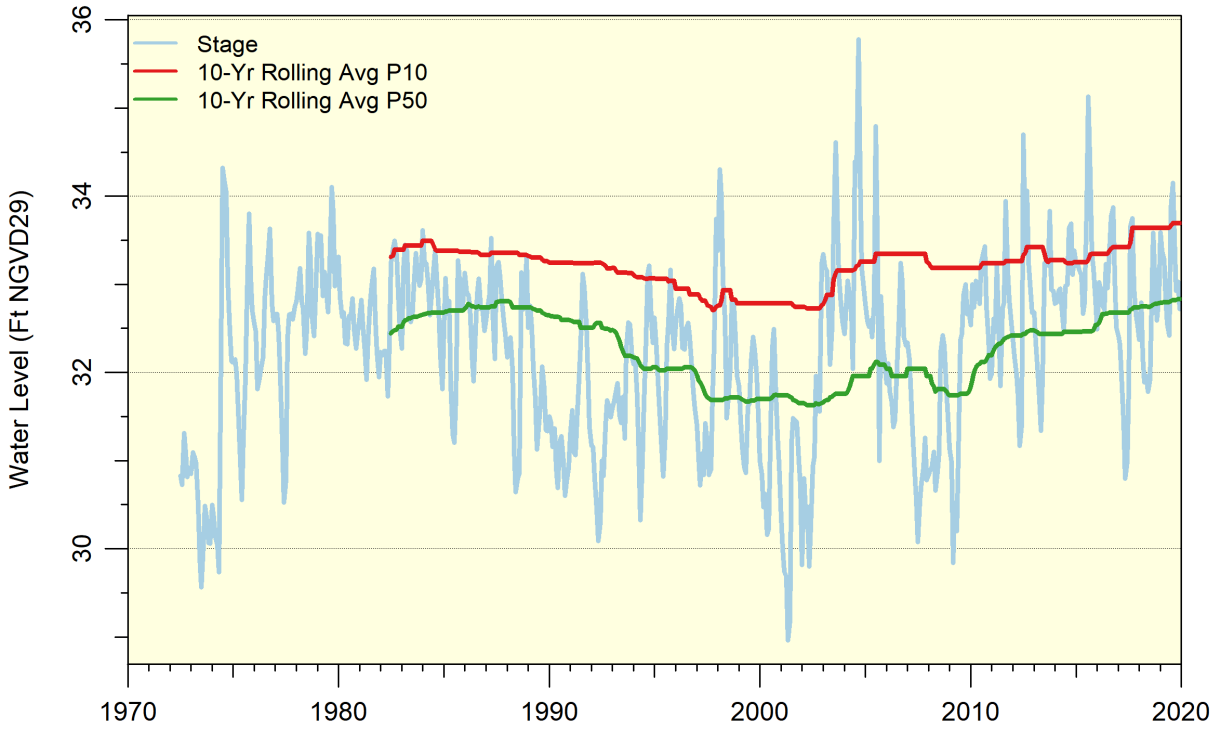

Figure 34. Hydrograph and rolling 10-year P10 and P50 for Sunset Lake.

Lake Taylor

Lake Taylor is located in Hillsborough County (Figure 35). A description of the lake and its hydrogeologic setting is available in SWFWMD (2004a). As described in SWFWMD (2004a), water level data for the lake span from 1971 to present and currently continue to be collected on a monthly basis by the District (Figure 36).

SWFWMD (2004a) developed significant change standards and Historic percentiles for Lake Taylor. The standards are assessed to identify possible thresholds in the P50 for preventing significant harm to natural system values associated with lakes in accordance with guidance provided in the Florida Water Resource Implementation Rule (62-40.473, F.A.C.). Other information taken into consideration in the development of minimum levels includes potential changes in the coverage of herbaceous wetland vegetation and aquatic plants, flooding of residential dwellings and infrastructure, and the health, safety and welfare of the public. Based on these factors, the most appropriate elevation for use as the MLL corresponds to the Dock-Use Standard, which represents the most appropriate standard below the Historic P50, where the Historic P50 is the median water level estimated to occur in the total absence of withdrawals. The HMLL is then calculated by adding the P10-P50 Reference Lake Water Regime (RLWR50) value of 1.0 feet to the MLL (SWFWMD, 1999a). No revisions to guidance levels occurred.

Using the status assessment process described in Basso et al. (2020), to assess status for Lake Taylor, the P10 and P50 from 2010-2019 observed stage data are compared to, respectively, the HMLL and MLL (Table 20). Based on the 2010-2019 observed stage data, both the HMLL and MLL are considered met for Lake Taylor.

Table 20. Minimum levels and initial status assessment for Lake Taylor.

Percentile	Minimum Levels (ft NGVD29)	Status Stage Data (2010-2019) (ft NGVD29)	Status (ft)
P10	37.6	39.1	+1.5
P50	36.6	38.2	+1.6

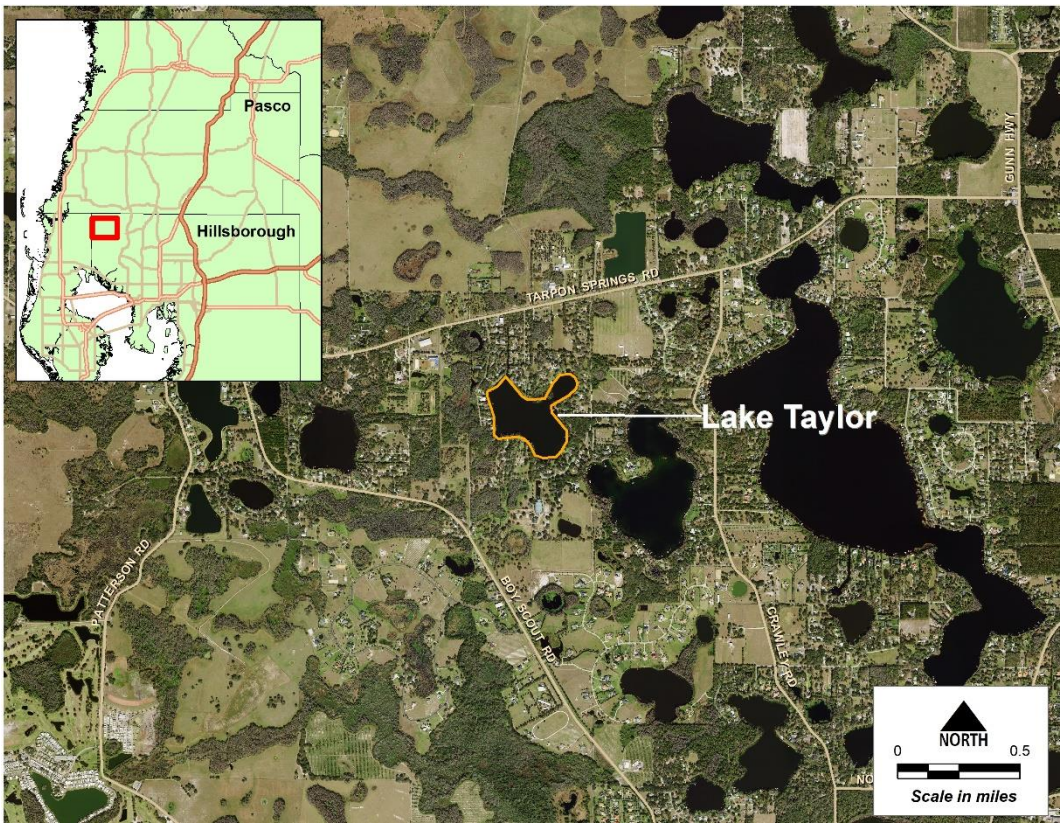

Figure 35. Location of Lake Taylor in Hillsborough County, Florida.

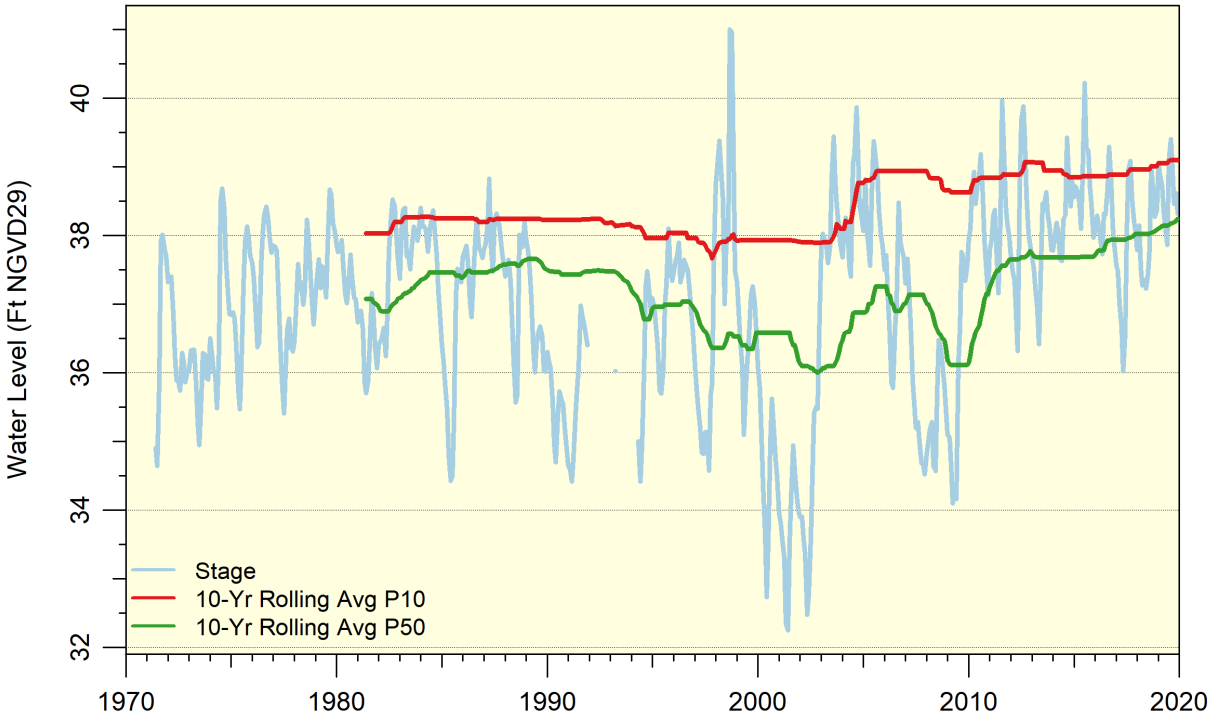

Figure 36. Hydrograph and rolling 10-year P10 and P50 for Lake Taylor.

Lake Wimauma

Lake Wimauma is located in Hillsborough County (Figure 37). A description of the lake and its hydrogeologic setting is available in Kolasa et al. (2012b). As described in Kolasa et al. (2012b), water level data for the lake span from 1973 to present and currently continue to be collected on a monthly basis by the District (Figure 38).

Kolasa et al. (2012b) developed significant change standards and Historic percentiles for Lake Wimauma. The standards are assessed to identify possible thresholds in the P50 for preventing significant harm to natural system values associated with lakes in accordance with guidance provided in the Florida Water Resource Implementation Rule (62-40.473, F.A.C.). Other information taken into consideration in the development of minimum levels includes potential changes in the coverage of herbaceous wetland vegetation and aquatic plants, flooding of residential dwellings and infrastructure, and the health, safety and welfare of the public. Based on these factors, the most appropriate elevation for use as the MLL corresponds to the Wetland Offset Standard, which represents the most appropriate standard below the Historic P50, where the Historic P50 is the median water level estimated to occur in the total absence of withdrawals. The HMLL is then calculated by adding the difference between the P10 and P50 from 2019-2019 observed stage data. No revisions to guidance levels occurred.

Based on evaluation of groundwater and lake stage data, as well as the lake's location within a confined hydrogeologic setting, the lake's period-of-record data can be considered Historic (Kolasa et al., 2012b; Basso, 2019). To assess status for Lake Wimauma, the P10 and P50 from 2010-2019 observed stage data are compared to, respectively, the HMLL and MLL (Table 21). Based on the 2010-2019 observed stage data, both the HMLL and MLL are considered met for Lake Wimauma.

Table 21. Minimum levels and initial status assessment for Lake Wimauma.

Percentile	Minimum Levels (ft NGVD29)	Status Stage Data (2010-2019) (ft NGVD29)	Status (ft)
P10	81.0	82.0	+1.0
P50	78.4	79.4	+1.0

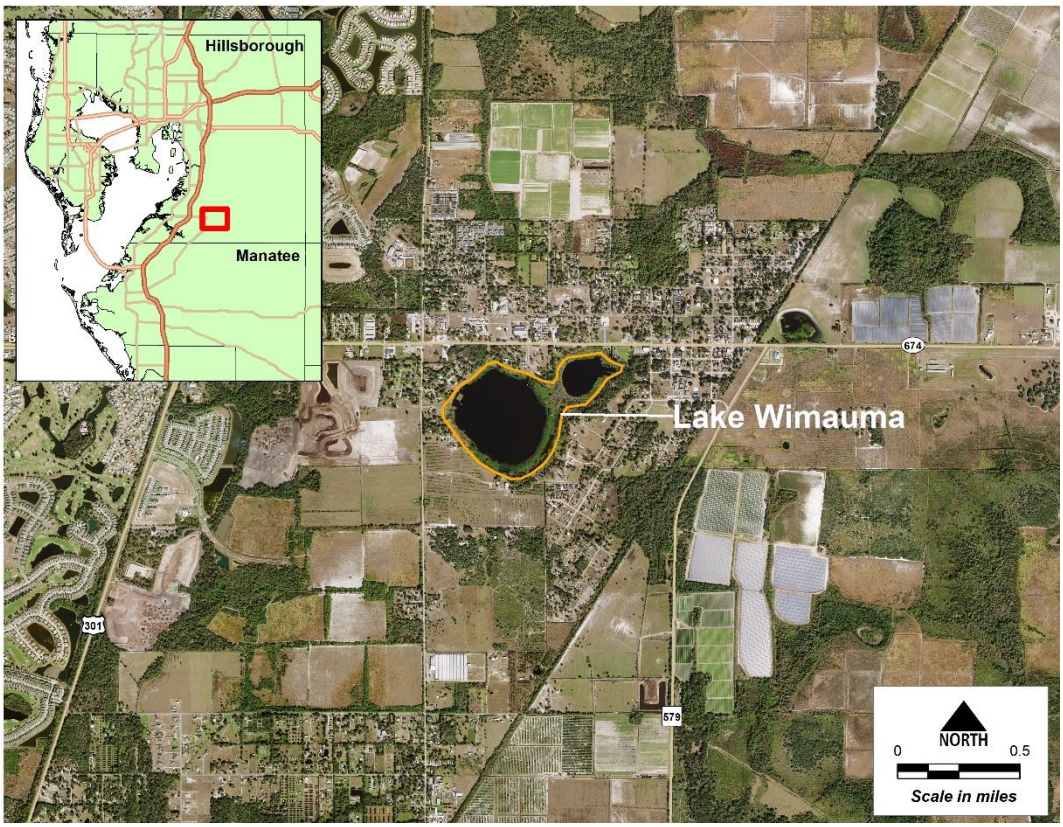

Figure 37. Location of Lake Wimauma in Hillsborough County, Florida.

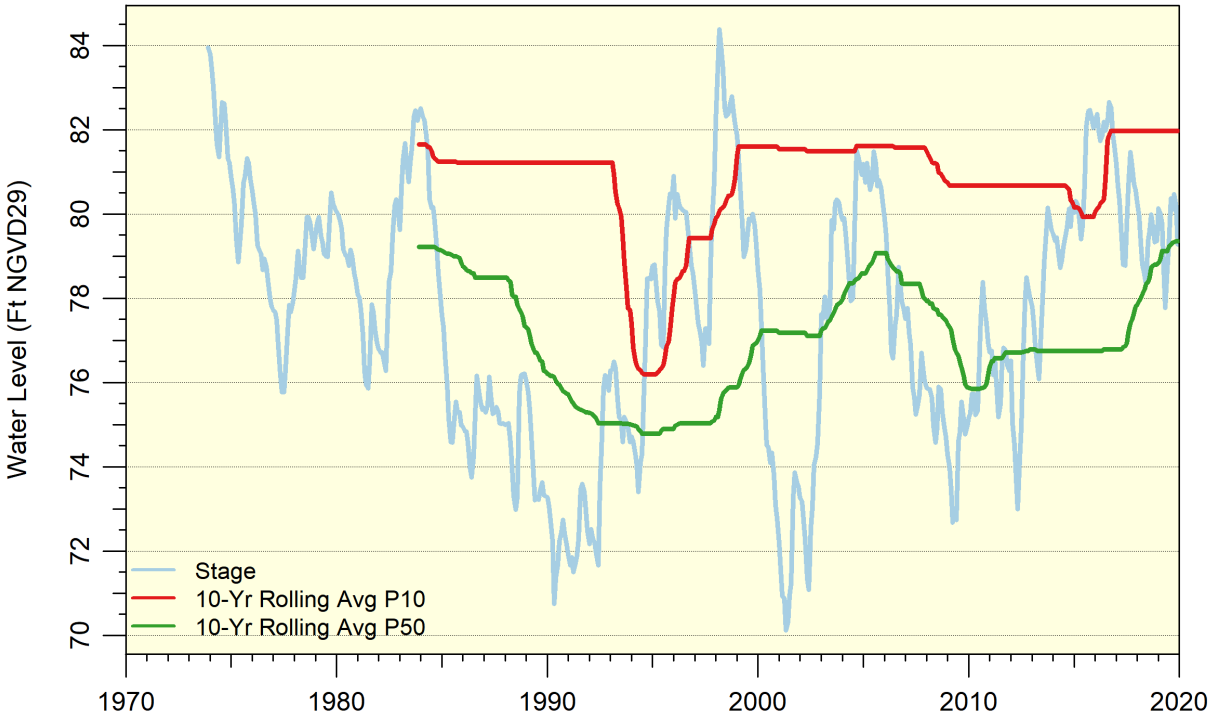

Figure 38. Hydrograph and rolling 10-year P10 and P50 for Lake Wimauma.

Pasco County

Clear Lake

Clear Lake is located in Pasco County (Figure 39). A description of the lake and its hydrogeologic setting is available in Leeper et al. (2004). As described in Leeper et al. (2004), water level data for the lake span from 1965 to present and currently continue to be collected on a twice weekly basis by the District (Figure 40).

Leeper et al. (2004) developed significant change standards and Historic percentiles for Clear Lake. Additionally, the Wetland Offset Standard elevation was calculated based on the methodology described in Hancock (2007). The standards are assessed to identify possible thresholds in the P50 for preventing significant harm to natural system values associated with lakes in accordance with guidance provided in the Florida Water Resource Implementation Rule (62-40.473, F.A.C.). Other information taken into consideration in the development of minimum levels includes potential changes in the coverage of herbaceous wetland vegetation and aquatic plants, flooding of residential dwellings and infrastructure, and the health, safety and welfare of the public. Based on these factors, the most appropriate elevation for use as the MLL corresponds to the Wetland Offset Standard, which represents the most appropriate standard below the Historic P50, where the Historic P50 is the median water level estimated to occur in the total absence of withdrawals. The HMLL is then calculated by adding the difference between the Historic P10 and Historic P50 to the MLL. No revisions to guidance levels occurred.

Clear Lake is located within the perched hydrogeologic setting of the Brooksville Ridge and has no permitted surface withdrawals, so its period-of-record data can be considered Historic (Leeper et al., 2004; Basso, 2019). To assess status for Clear Lake, the P10 and P50 from period-of-record observed stage data are compared to, respectively, the HMLL and MLL (Table 22). Based on the period-of-record observed stage data, both the HMLL and MLL are considered met for Clear Lake.

Table 22. Minimum levels and initial status assessment for Clear Lake.

Percentile	Minimum Levels (ft NGVD29)	Status Stage Data (1965-2019) (ft NGVD29)	Status (ft)
P10	126.2	127.1	+0.9
P50	124.9	125.9	+1.0

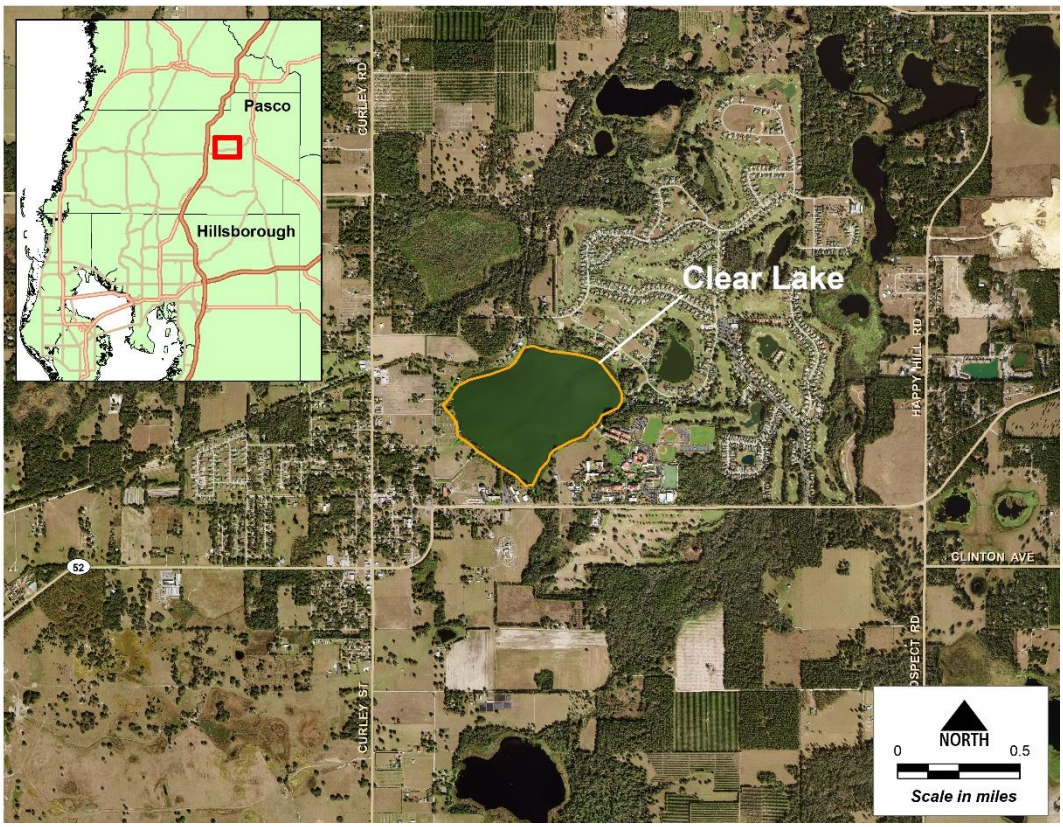

Figure 39. Location of Clear Lake in Pasco County, Florida.

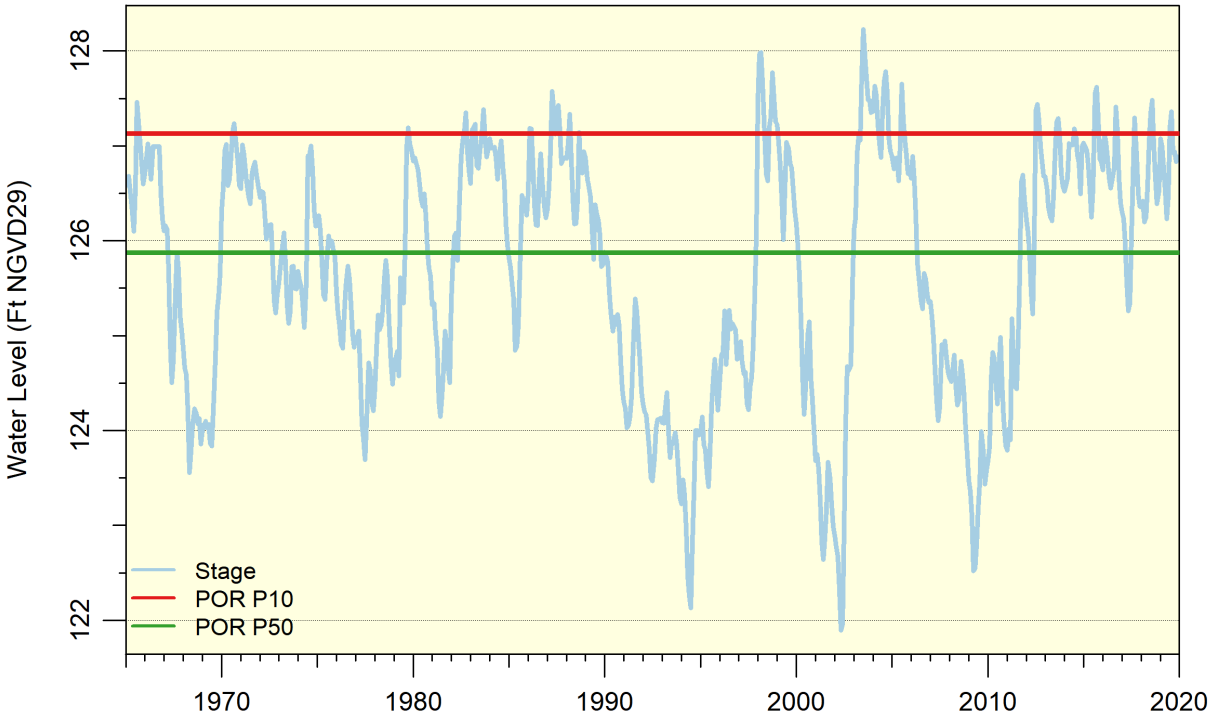

Figure 40. Hydrograph and period-of-record P10 and P50 for Clear Lake.

Hancock Lake

Hancock Lake is located in Pasco County (Figure 41Figure 17). A description of the lake and its hydrogeologic setting is available in Leeper (2003b). As described in Leeper (2003b), water level data for the lake span from 1978 to present and currently continue to be collected on a monthly basis by the District (Figure 42).

Leeper (2003b) developed significant change standards and Historic percentiles for Hancock Lake. Additionally, the Wetland Offset Standard elevation was calculated based on the methodology described in Hancock (2007). The standards are assessed to identify possible thresholds in the P50 for preventing significant harm to natural system values associated with lakes in accordance with guidance provided in the Florida Water Resource Implementation Rule (62-40.473, F.A.C.). Other information taken into consideration in the development of minimum levels includes potential changes in the coverage of herbaceous wetland vegetation and aquatic plants, flooding of residential dwellings and infrastructure, and the health, safety and welfare of the public. Based on these factors, the most appropriate elevation for use as the MLL corresponds to the Wetland Offset Standard, which represents the most appropriate standard below the Historic P50, where the Historic P50 is the median water level estimated to occur in the total absence of withdrawals. The HMLL is then calculated by adding the difference between the Historic P10 and Historic P50 to the MLL. No revisions to guidance levels occurred.

Lake Hancock is located within the perched hydrogeologic setting of the Brooksville Ridge and has no permitted surface withdrawals, so its period-of-record data can be considered Historic (Leeper, 2003b; Basso, 2019). To assess status for Hancock Lake, the P10 and P50 from period-of-record observed stage data are compared to, respectively, the HMLL and MLL (Table 23). Based on the period-of-record observed stage data, both the HMLL and MLL are considered met for Hancock Lake.

Table 23. Minimum levels and initial status assessment for Hancock Lake.

Percentile	Minimum Levels (ft NGVD29)	Status Stage Data (1978-2019) (ft NGVD29)	Status (ft)
P10	101.7	102.6	+0.9
P50	99.4	100.2	+0.8

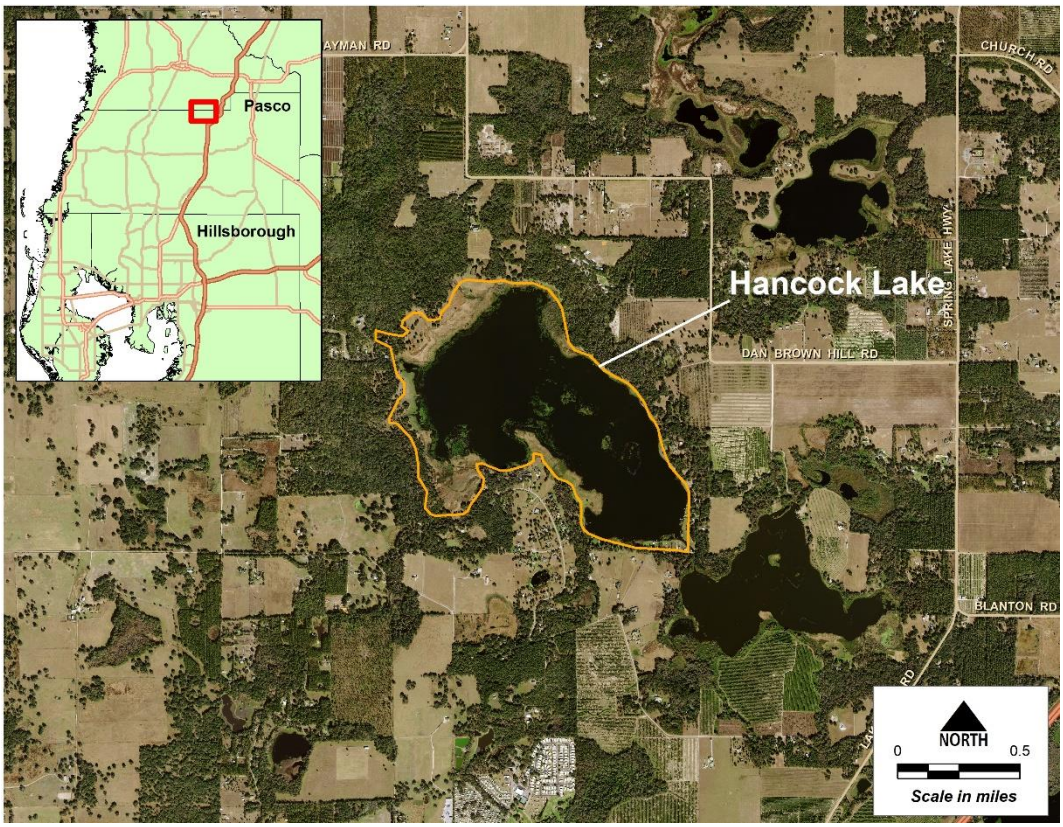

Figure 41. Location of Hancock Lake in Pasco County, Florida.

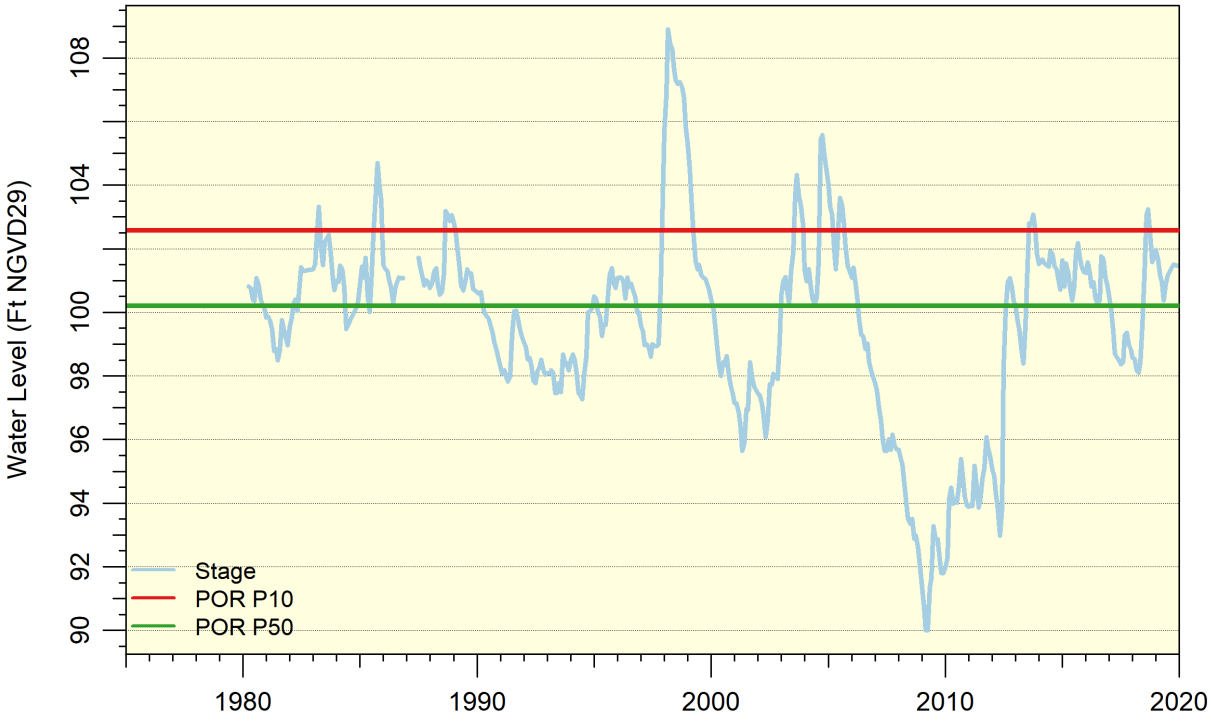

Figure 42. Hydrograph and period-of-record P10 and P50 for Hancock Lake.

Hernando County

Hunters Lake

Hunters Lake is located in Hernando County (Figure 43). A description of the lake and its hydrogeologic setting is available in SWFWMD (2005b). As described in SWFWMD (2005b), water level data for the lake span from 1965 to present and currently continue to be collected on a monthly basis by the District (Figure 44).

SWFWMD (2005b) developed significant change standards and Historic percentiles for Hunters Lake. The standards are assessed to identify possible thresholds in the P50 for preventing significant harm to natural system values associated with lakes in accordance with guidance provided in the Florida Water Resource Implementation Rule (62-40.473, F.A.C.). Other information taken into consideration in the development of minimum levels includes potential changes in the coverage of herbaceous wetland vegetation and aquatic plants, flooding of residential dwellings and infrastructure, and the health, safety and welfare of the public. Based on these factors, the most appropriate elevation for use as the MLL corresponds to the Recreation/Ski Standard, which represents the most appropriate standard below the Historic P50, where the Historic P50 is the median water level estimated to occur in the total absence of withdrawals. The HMLL is then calculated by adding the difference between the Historic P10 and Historic P50 to the MLL. No revisions to guidance levels occurred.

Based on evaluation of groundwater and lake stage data, the lake's period-of-record data was considered Historic based on a 2005 assessment (Basso, 2005; SWFWMD, 2005b; Basso and Ellison, 2010). As groundwater withdrawals in the lake's vicinity have generally held constant or decreased relative to 2005 levels, the lake's stage data can continue to be considered Historic. To assess status for Hunters Lake, the P10 and P50 from period-of-record observed stage data are compared to, respectively, the HMLL and MLL (Table 24). Based on the period-of-record observed stage data, both the HMLL and MLL are considered met for Hunters Lake.

Table 24. Minimum levels and initial status assessment for Hunters Lake.

Percentile	Minimum Levels (ft NGVD29)	Status Stage Data (1965-2019) (ft NGVD29)	Status (ft)
P10	18.6	19.2	+0.6
P50	16.4	16.8	+0.4

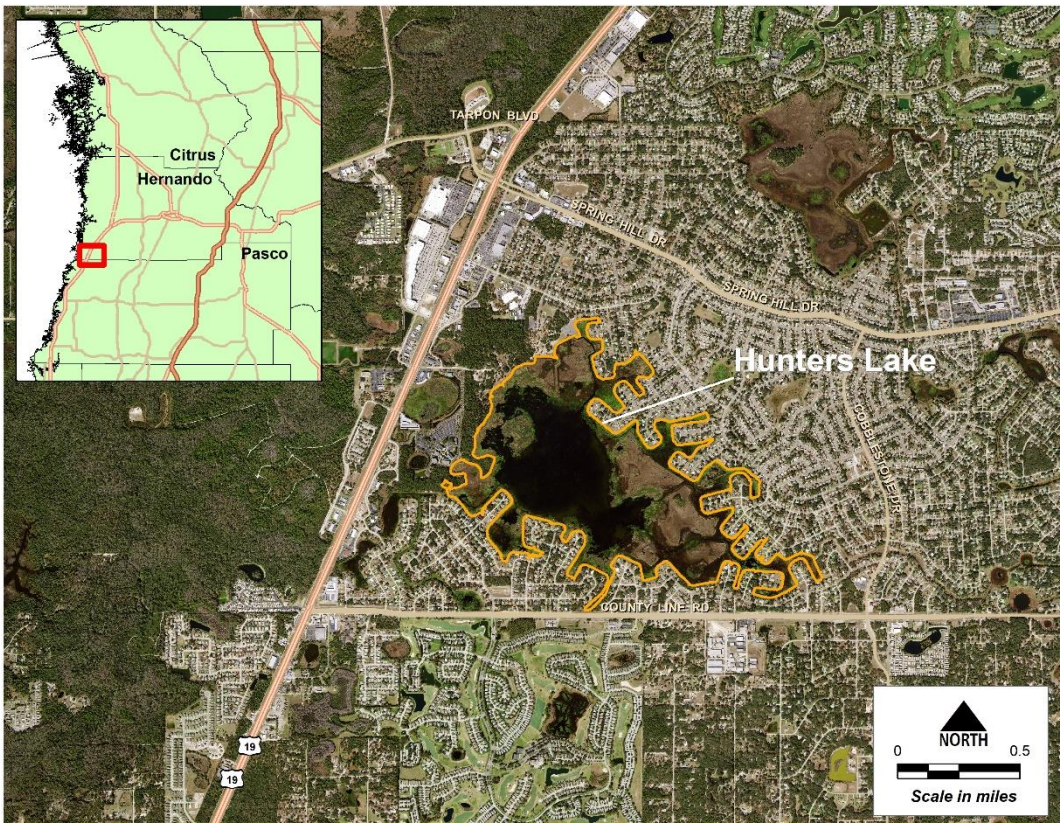

Figure 43. Location of Hunters Lake in Hernando County, Florida.

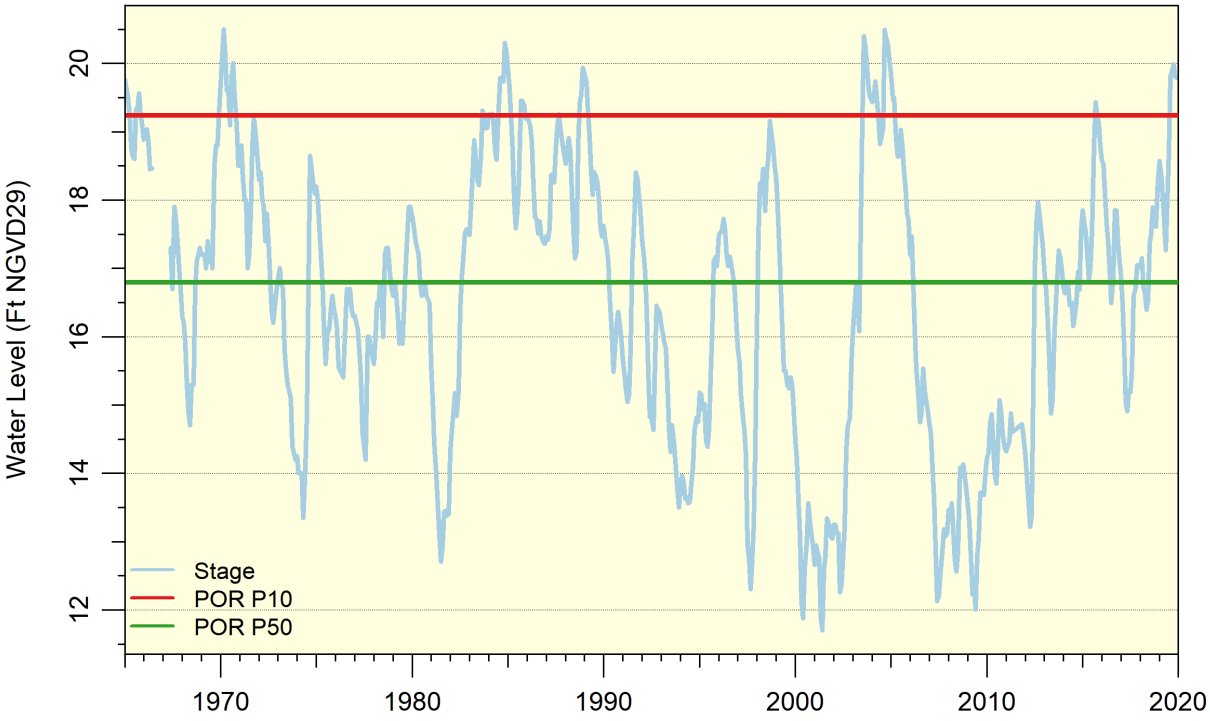

Figure 44. Hydrograph and period-of-record P10 and P50 for Hunters Lake.

Lake Lindsey

Lake Lindsey is located in Hernando County (Figure 45). A description of the lake and its hydrogeologic setting is available in Leeper (2004b). As described in Leeper (2004b), water level data for the lake span from 1965 to present and currently continue to be collected on a twice weekly basis by the District (Figure 46).

Leeper (2004b) developed significant change standards and Historic percentiles for Lake Lindsey. Additionally, the Wetland Offset Standard elevation was calculated based on the methodology described in Hancock (2007). The standards are assessed to identify possible thresholds in the P50 for preventing significant harm to natural system values associated with lakes in accordance with guidance provided in the Florida Water Resource Implementation Rule (62-40.473, F.A.C.). Other information taken into consideration in the development of minimum levels includes potential changes in the coverage of herbaceous wetland vegetation and aquatic plants, flooding of residential dwellings and infrastructure, and the health, safety and welfare of the public. Based on these factors, the most appropriate elevation for use as the MLL corresponds to the Wetland Offset Standard, which represents the most appropriate standard below the Historic P50, where the Historic P50 is the median water level estimated to occur in the total absence of withdrawals. The HMLL is then calculated by adding the difference between the Historic P10 and Historic P50 to the MLL. No revisions to guidance levels occurred.

Lake Lindsey is located within the perched hydrogeologic setting of the Brooksville Ridge and has no permitted surface withdrawals, so its period-of-record data can be considered Historic (Leeper, 2004b; Basso, 2019). To assess status for Lake Lindsey, the P10 and P50 from period-of-record observed stage data are compared to, respectively, the HMLL and MLL (Table 25). Based on the period-of-record observed stage data, both the HMLL and MLL are considered met for Lake Lindsey.

Table 25. Minimum levels and initial status assessment for Lake Lindsey.

Percentile	Minimum Levels (ft NGVD29)	Status Stage Data (1965-2019) (ft NGVD29)	Status (ft)
P10	67.6	68.2	+0.6
P50	65.3	65.5	+0.2

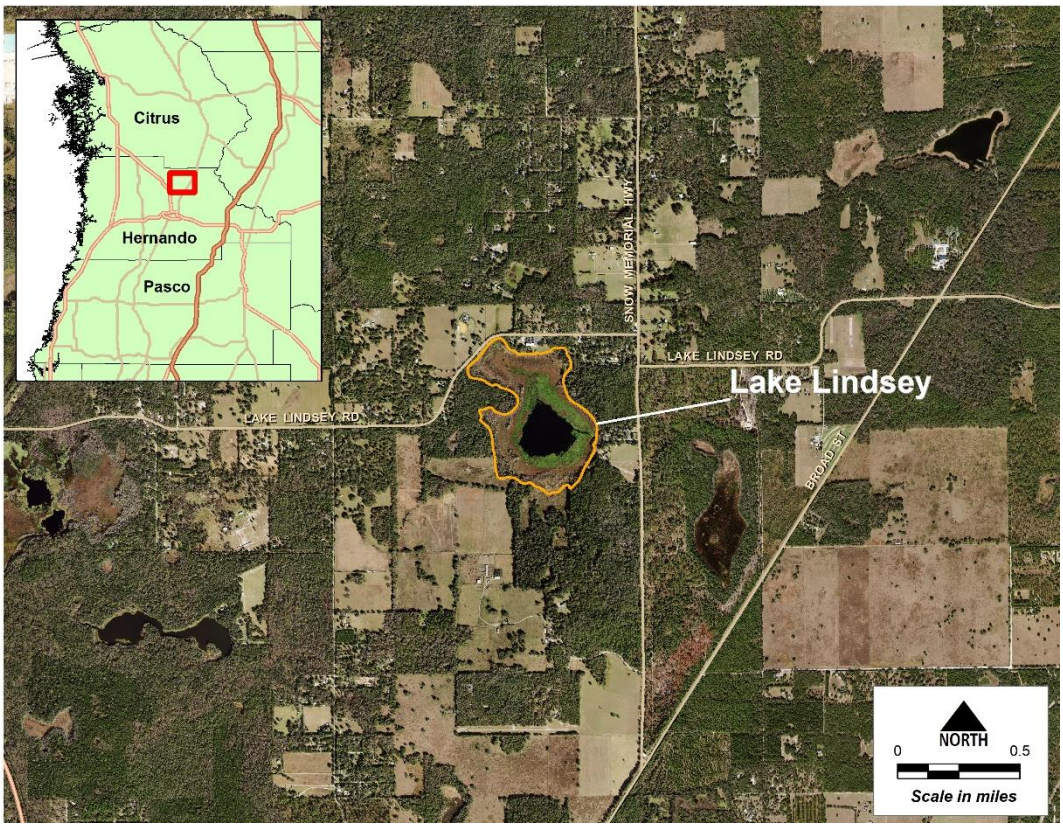

Figure 45. Location of Lake Lindsey in Hernando County, Florida.

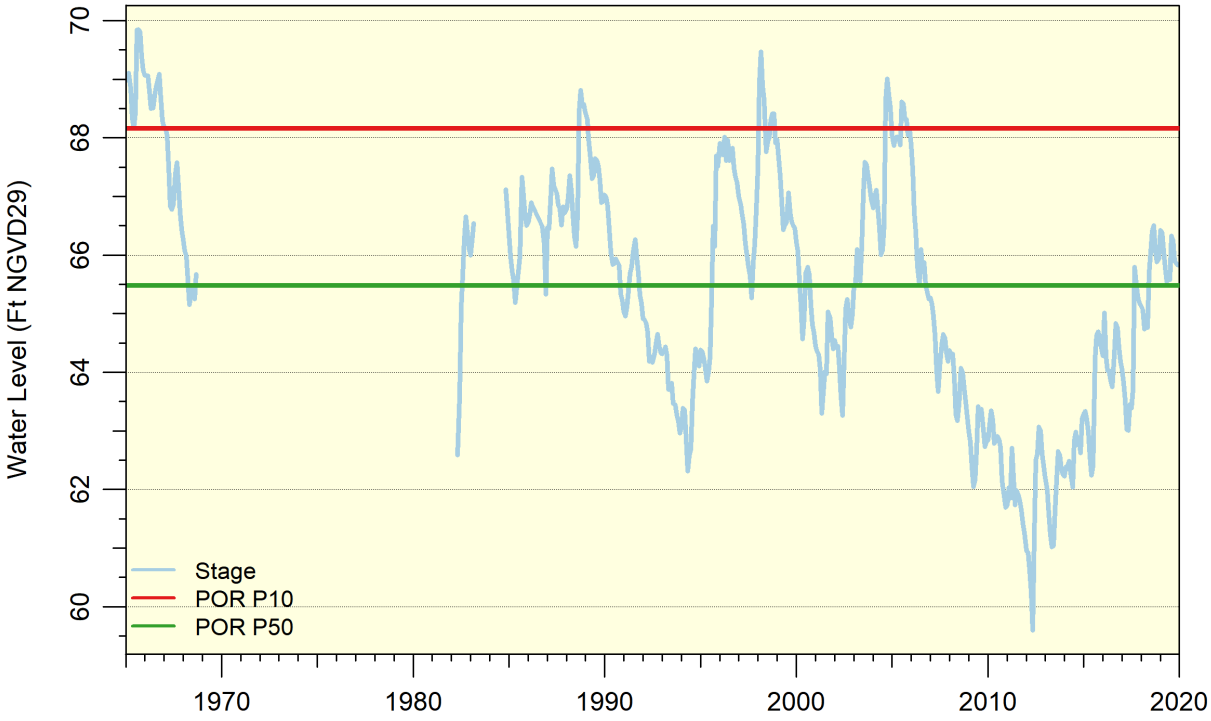

Figure 46. Hydrograph and period-of-record P10 and P50 for Lake Lindsey.

Mountain Lake

Mountain Lake is located in Hernando County (Figure 47). A description of the lake and its hydrogeologic setting is available in Leeper (2004c). As described in Leeper (2004c), water level data for the lake span from 1984 to present and currently continue to be collected on a monthly basis by the District (Figure 48).

Leeper (2004c) developed significant change standards and Historic percentiles for Mountain Lake. Additionally, the Wetland Offset Standard elevation was calculated based on the methodology described in Hancock (2007). The standards are assessed to identify possible thresholds in the P50 for preventing significant harm to natural system values associated with lakes in accordance with guidance provided in the Florida Water Resource Implementation Rule (62-40.473, F.A.C.). Other information taken into consideration in the development of minimum levels includes potential changes in the coverage of herbaceous wetland vegetation and aquatic plants, flooding of residential dwellings and infrastructure, and the health, safety and welfare of the public. Based on these factors, the most appropriate elevation for use as the MLL corresponds to the Wetland Offset Standard, which represents the most appropriate standard below the Historic P50, where the Historic P50 is the median water level estimated to occur in the total absence of withdrawals. The HMLL is then calculated by adding the difference between the Historic P10 and Historic P50 to the MLL. No revisions to guidance levels occurred.

Mountain Lake is located within the perched hydrogeologic setting of the Brooksville Ridge and has no permitted surface withdrawals, so its period-of-record data can be considered Historic (Leeper, 2004c; Basso, 2019). To assess status for Mountain Lake, the P10 and P50 from period-of-record observed stage data are compared to, respectively, the HMLL and MLL (Table 26). Based on the period-of-record observed stage data, both the HMLL and MLL are considered met for Mountain Lake.

Table 26. Minimum levels and initial status assessment for Mountain Lake.

Percentile	Minimum Levels (ft NGVD29)	Status Stage Data (1984-2019) (ft NGVD29)	Status (ft)
P10	102.0	102.8	+0.8
P50	98.7	100.0	+1.3

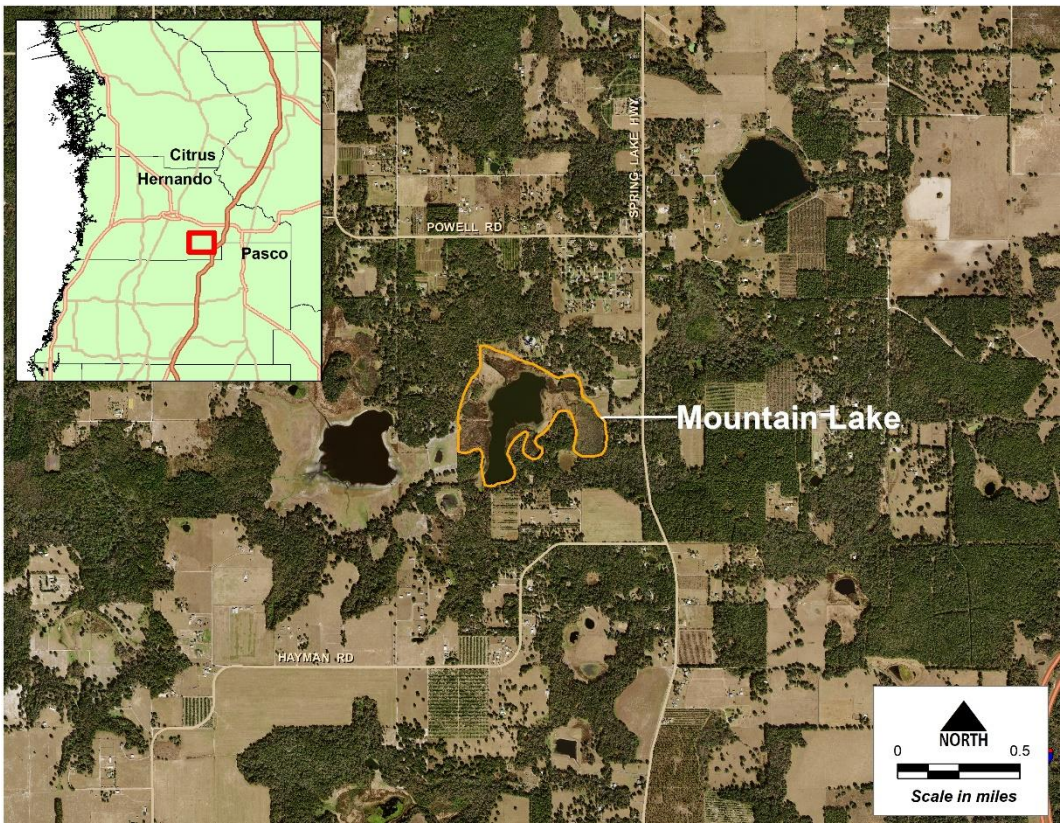

Figure 47. Location of Mountain Lake in Hernando County, Florida.

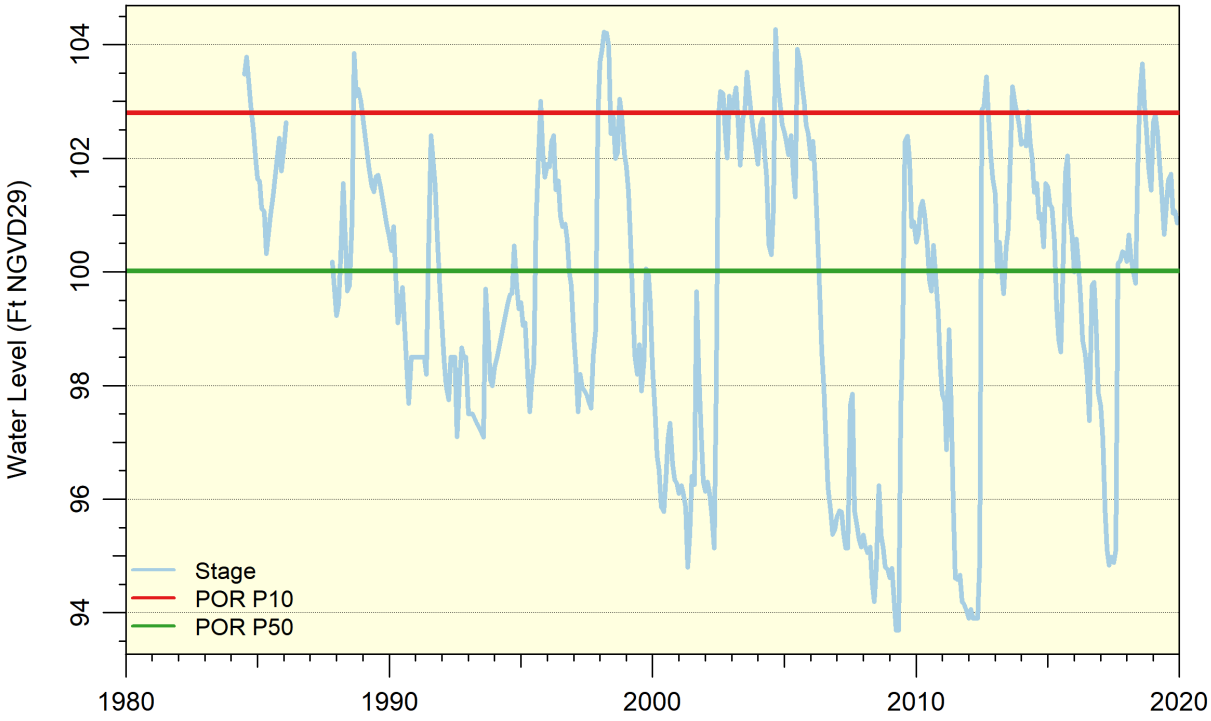

Figure 48. Hydrograph and period-of-record P10 and P50 for Mountain Lake.

Neff Lake

Neff Lake is located in Hernando County (Figure 49). A description of the lake and its hydrogeologic setting is available in Munson (2004). As described in Munson (2004), water level data for the lake span from 1965 to present and currently continue to be collected on a monthly basis by the District (Figure 50).

Munson (2004) developed significant change standards and Historic percentiles for Neff Lake. Additionally, the Wetland Offset Standard elevation was calculated based on the methodology described in Hancock (2007). The standards are assessed to identify possible thresholds in the P50 for preventing significant harm to natural system values associated with lakes in accordance with guidance provided in the Florida Water Resource Implementation Rule (62-40.473, F.A.C.). Other information taken into consideration in the development of minimum levels includes potential changes in the coverage of herbaceous wetland vegetation and aquatic plants, flooding of residential dwellings and infrastructure, and the health, safety and welfare of the public. Based on these factors, the most appropriate elevation for use as the MLL corresponds to the Wetland Offset Standard, which represents the most appropriate standard below the Historic P50, where the Historic P50 is the median water level estimated to occur in the total absence of withdrawals. The HMLL is then calculated by adding the difference between the P10 and P50 calculated from period-of-record observed stage data. No revisions to guidance levels occurred.

Neff Lake is located within the perched hydrogeologic setting of the Brooksville Ridge and has no permitted surface withdrawals, and while the lake frequently experiences karst activity, based on evaluation of groundwater and lake stage data, its period-of-record data can be considered Historic (Munson, 2004; Basso, 2019). To assess status for Neff Lake, the P10 and P50 from period-of-record observed stage data are compared to, respectively, the HMLL and MLL (Table 27). Based on the period-of-record observed stage data, both the HMLL and MLL are considered met for Neff Lake.

Table 27. Minimum levels and initial status assessment for Neff Lake.

Percentile	Minimum Levels (ft NGVD29)	Status Stage Data (1965-2019) (ft NGVD29)	Status (ft)
P10	100.7	101.6	+0.9
P50	93.7	94.6	+0.9

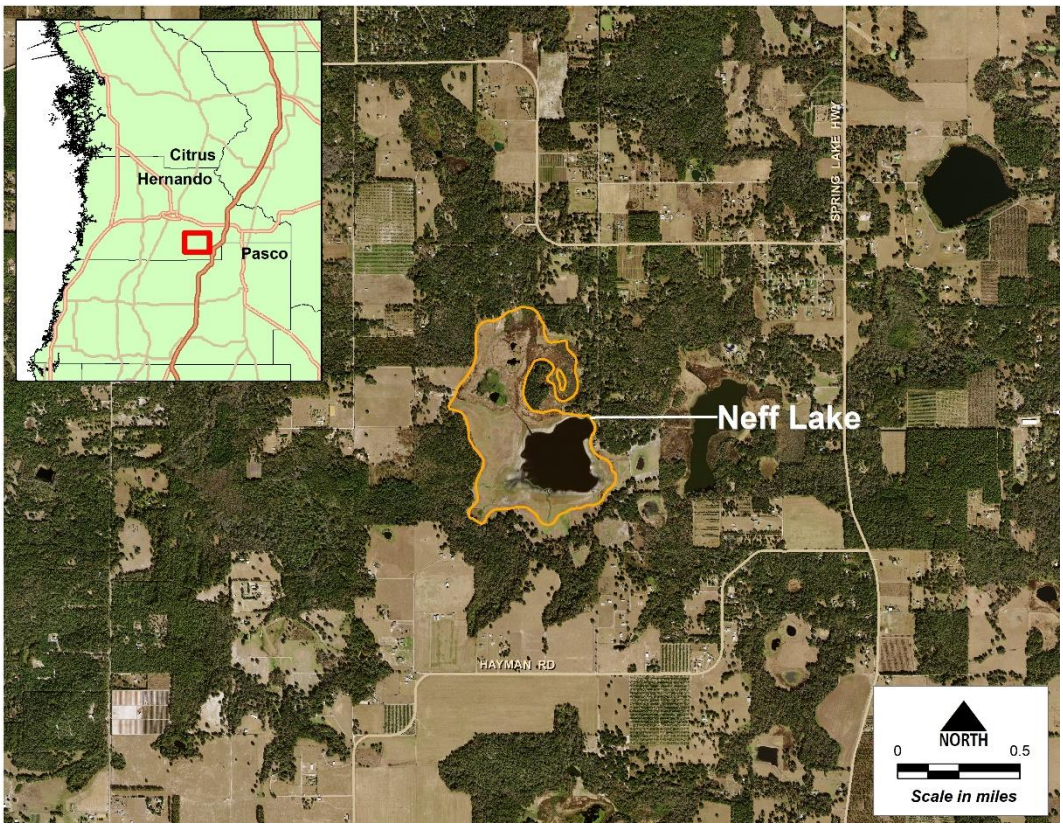

Figure 49. Location of Neff Lake in Hernando County, Florida.

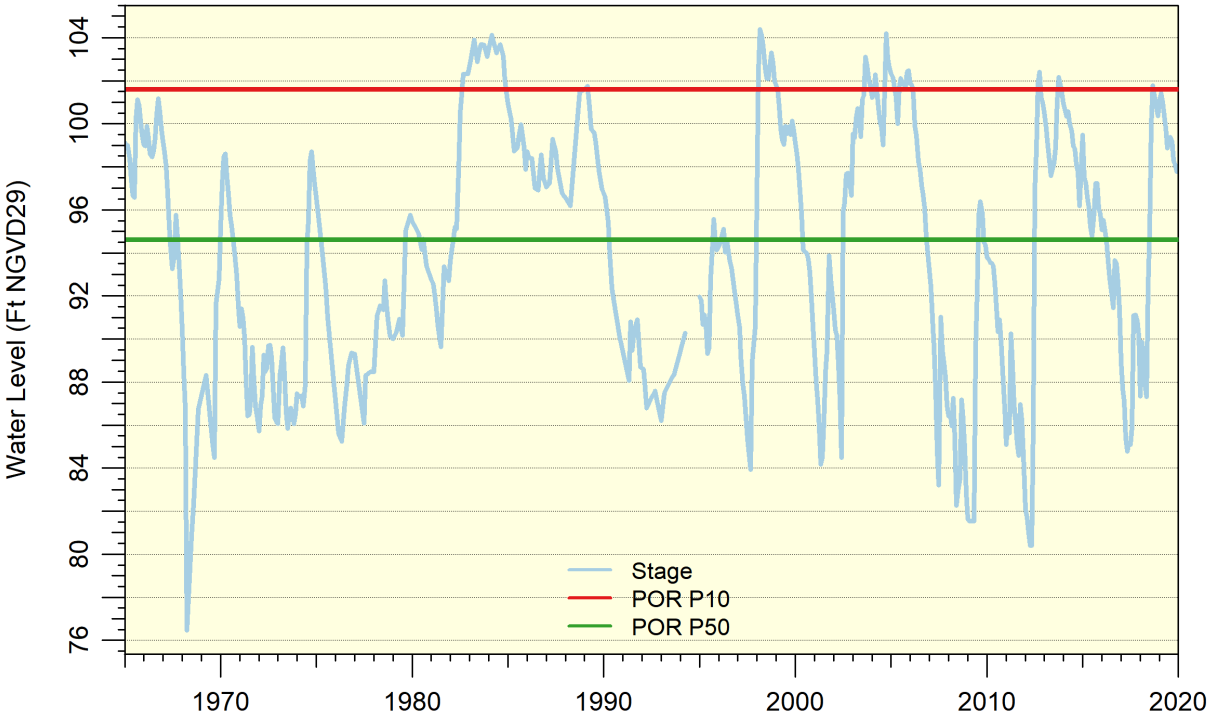

Figure 50. Hydrograph and period-of-record P10 and P50 for Neff Lake.

Polk County

Lake Parker

Lake Parker is located in Polk County (Figure 51). A description of the lake and its hydrogeologic setting is available in SWFWMD (2005b). As described in SWFWMD (2005b), water level data for the lake span from 1949 to present and currently continue to be collected on a daily basis by the District (Figure 52).

SWFWMD (2005b) developed significant change standards and Historic percentiles for Lake Parker. The standards are assessed to identify possible thresholds in the P50 for preventing significant harm to natural system values associated with lakes in accordance with guidance provided in the Florida Water Resource Implementation Rule (62-40.473, F.A.C.). Other information taken into consideration in the development of minimum levels includes potential changes in the coverage of herbaceous wetland vegetation and aquatic plants, flooding of residential dwellings and infrastructure, and the health, safety and welfare of the public. Based on these factors, the most appropriate elevation for use as the MLL corresponds to the Basin Connectivity Standard, which represents the most appropriate standard below the Historic P50, where the Historic P50 is the median water level estimated to occur in the total absence of withdrawals. The HMLL is then calculated by adding the difference between the Historic P10 and Historic P50 to the MLL. No revisions to guidance levels occurred.

According to CFWI (2020), Lake Parker is located in an area “with sufficient confinement between the lake and the UFA” such that it has “no significant Floridan aquifer connection” and is thus “not sensitive to impacts from Floridan aquifer withdrawals”. To assess status for Lake Parker, the P10 and P50 from 2010-2019 observed stage data are compared to, respectively, the HMLL and MLL (Table 28). Based on the 2010-2019 observed stage data, both the HMLL and MLL are considered met for Lake Parker.

Table 28. Minimum levels and initial status assessment for Lake Parker.

Percentile	Minimum Levels (ft NGVD29)	Status Stage Data (2010-2019) (ft NGVD29)	Status (ft)
P10	130.3	130.8	+0.5
P50	129.3	130.4	+1.1

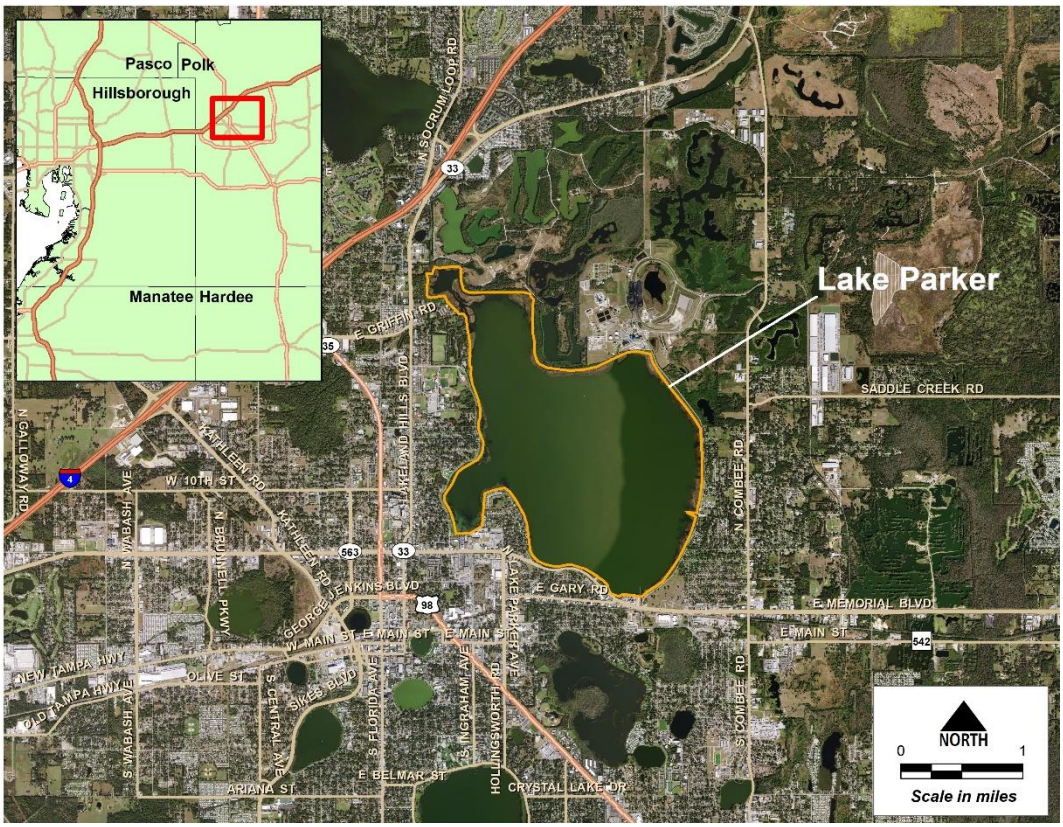

Figure 51. Location of Lake Parker in Polk County, Florida.

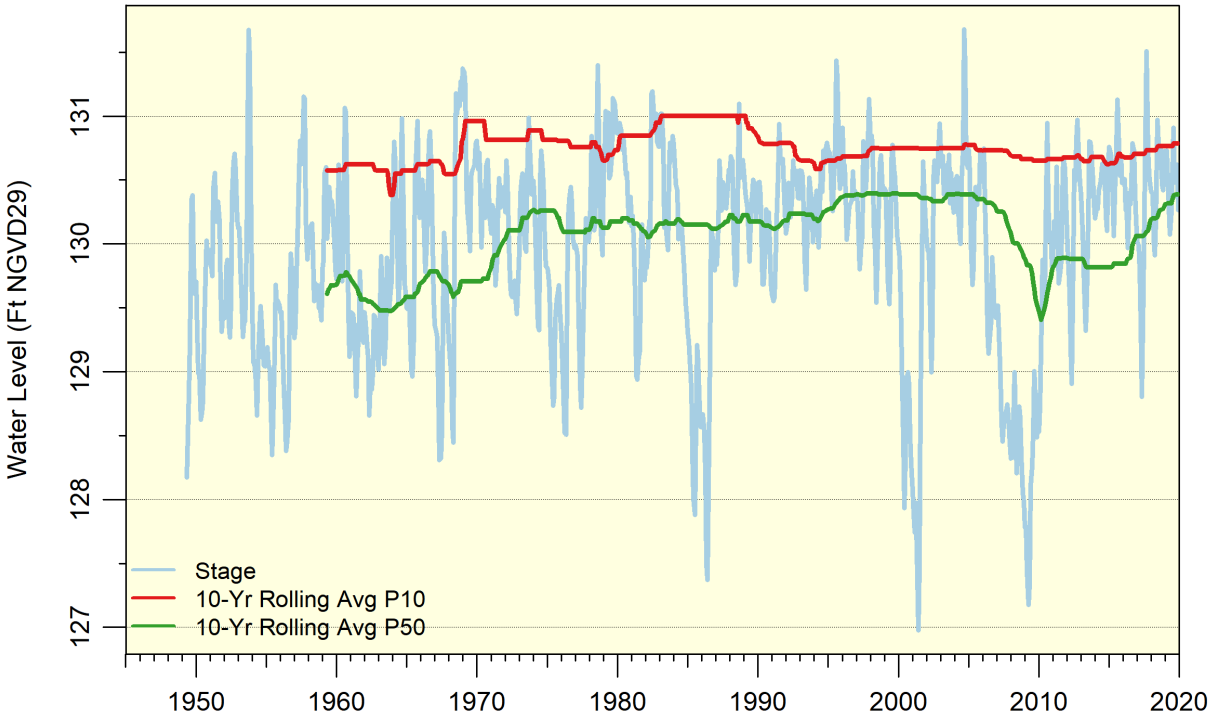

Figure 52. Hydrograph and rolling 10-year P10 and P50 for Lake Parker.

References

Bachmann, R. W., Hoyer, M. V., and Canfield, D. E., Jr. (2000). The potential for wave disturbance in shallow Florida lakes. Lake and Reservoir Management, 16(4):281-291.

Basso, R. (2005). Groundwater withdrawal impacts to Hunters Lake and Weeki Wachee Prairie. Southwest Florida Water Management District, Brooksville, FL.

Basso, R. and Ellison, E. (2010). Current groundwater withdrawal impacts to Hunters Lake/Weekiwachee Prairie and an evaluation of compliance with its Minimum Lake Level. Southwest Florida Water Management District, Brooksville, FL.

Basso, R. (2019). Hydrogeologic Provinces within West-Central Florida. Southwest Florida Water Management District, Brooksville, FL.

Basso, R., LeMond, L., Leeper, D., Cameron, C., Qi, J., and Weinstein, D. (2020). Northern Tampa Bay Lake and Wetland MFL Status Assessment (draft). Southwest Florida Water Management District, Brooksville, FL.

Bedient, P., Brinson, M., Dierberg, F., Gorelick, S., Jenkins, K., Ross, D., Wagner, K., and Stephenson, D. (1999). Report of the Scientific Peer Review Panel on the data, theories, and methodologies supporting the Minimum Flows and Levels Rule for northern Tampa Bay Area, Florida. Prepared for the Southwest Florida Water Management District, the Environmental Confederation of Southwest Florida, Polk County, and Tampa Bay Water. Southwest Florida Water Management District, Brooksville, FL.

Caffrey, A.J., Hoyer, M.V. and Canfield, D.E., Jr. (2006). Factors affecting the maximum depth of colonization by submersed aquatic macrophytes in Florida lakes. University of Florida Institute of Food and Agricultural Sciences Department of Fisheries and Aquatic Sciences. Gainesville, Florida. Prepared for the Southwest Florida Water Management District, Brooksville, FL.

Caffrey, A.J., Hoyer, M.V. and Canfield, D.E., Jr. (2007). Factors affecting the maximum depth of colonization by submersed aquatic macrophytes in Florida lakes. Lake and Reservoir Management, 23(3):287-297

Campbell, D. and Hancock, M.C. (2017). Revised Minimum and Guidance Levels Based on Reevaluation of Levels Adopted for Lake Merrywater in Hillsborough County, Florida. Southwest Florida Water Management District, Brooksville, FL.

Campbell, D.E. and Cameron, C.R. (2020). Revised Minimum and Guidance Levels Based on Reevaluation of Adopted Levels for Halfmoon Lake in Hillsborough County, Florida (draft). Southwest Florida Water Management District, Brooksville, FL.

Carr, D.W., Leeper, D.A., and Rochow, T.F. (2006). Comparison of Six Biologic Indicators of Hydrology and the Landward Extent of Hydric Soils. Wetlands, 26:1012–1019.

Carr, D.W. and Rochow, T.F. (2004). Comparison of six biological indicators of hydrology in isolated Taxodium acsendens domes (draft). Southwest Florida Water Management District, Brooksville, FL.

Carr, D., Hancock, M., Patterson, J., Leeper, D., and Kolasa, K. (2015a). Minimum and Guidance Levels for Crystal Lake in Hillsborough County, Florida. Southwest Florida Water Management District, Brooksville, FL.

Carr, D., Kolasa, K., McBride, T., Hancock, M., Ellison, D., and Patterson, J. (2015b). Minimum and Guidance Levels for Bird Lake in Hillsborough County, Florida. Southwest Florida Water Management District, Brooksville, FL.

Carr, D. and Hancock, M. (2017). Revised Minimum and Guidance Levels for Sunset Lake in Hillsborough County, Florida. Southwest Florida Water Management District, Brooksville, FL.

Carr, D.W., Hurst, M.K., Cameron, C.R., and Hancock, M.C. (2018a). Revised Minimum and Guidance Levels Based on Reevaluation of Levels Adopted for Brant Lake in Hillsborough County, Florida. Southwest Florida Water Management District, Brooksville, FL.

Carr, D.W., Cameron, C.R., and Hancock, M. (2018b). Revised Minimum and Guidance Levels Based on Reevaluation of Levels Adopted for Dosson and Sunshine Lakes in Hillsborough County, Florida. Southwest Florida Water Management District, Brooksville, FL.

Central Florida Water Initiative (CFWI). (2020). Regional Water Supply Plan 2020: A comprehensive plan for Orange, Osceola, Polk, Seminole, and southern Lake counties.

Dierberg, F.E. and Wagner, K.J. (2001). A review of “A multiple-parameter approach for establishing minimum levels for Category 3 Lakes of the Southwest Florida Water Management District" Jun” (2001 draft by D. Leeper, M. Kelly, A. Munson, and R. Gant. Prepared for the Southwest Florida Water Management District, Brooksville, FL.

Emery, S., Martin, D., Sumpter, D., Bowman, R., and Paul, R. (2009). Lake surface area and bird species richness: analysis for minimum flows and levels rule review. University of South Florida Institute for Environmental Studies. Tampa, Florida. Prepared for the Southwest Florida Water Management District. Brooksville, FL.

Flannery, M.S., Peebles, E.B., and Montgomery, R.T. (2002). A percent-of-flow approach for Managing reductions in freshwater flows from unimpounded rivers to southwest Florida estuaries. Estuaries, 25(6):1318-1332.

Hancock, M. (2006). A proposed interim method for determining minimum levels in isolated wetlands (draft). Southwest Florida Water Management District, Brooksville, FL.

Hancock, M. (2007). Recent development in MFL establishment and assessment (draft). Southwest Florida Water Management District, Brooksville, FL.

Hancock, M.C., Leeper, D.A., Barcelo, M.D., and Kelly, M.H. (2010). Minimum flows and levels development, compliance, and reporting in the Southwest Florida Water Management District. Southwest Florida Water Management District, Brooksville, FL.

Hurst, M., Sealy, S., and Hancock, M. (2019). Revised Minimum and Guidance Levels Based on Reevaluation of Levels Adopted for Sapphire Lake in Hillsborough County, Florida. Southwest Florida Water Management District, Brooksville, FL.

Kolasa, K., Leeper, D., Ellison, D., and Said, A. (2012b). Minimum and Guidance Levels for Lake Wimauma in Hillsborough County, Florida. Southwest Florida Water Management District, Brooksville, FL.

Kolasa, K., Ellison, D., and Basso, R. (2015). Minimum and Guidance Levels for Lake Hanna in Hillsborough County, Florida. Southwest Florida Water Management District, Brooksville, FL.

Leeper, D., Kelly, M., Munson, A., and Gant, R. (2001). A multiple-parameter approach for establishing minimum levels for Category 3 Lakes of the Southwest Florida Water Management District. Southwest Florida Water Management District, Brooksville, Florida.

Leeper, D. (2003a). Proposed minimum and guidance levels for Fairy Lake in Hillsborough County, Florida. Southwest Florida Water Management District, Brooksville, FL.

Leeper, D. (2003b). Proposed minimum and guidance levels for Hancock Lake in Pasco and Hernando Counties, Florida. Southwest Florida Water Management District, Brooksville, FL.

Leeper, D. (2003c). Proposed minimum and guidance levels for Lakes Helen, Ellen and Barbara in Hillsborough County, Florida. Southwest Florida Water Management District, Brooksville, FL.

Leeper, D. (2004a). Proposed minimum and guidance levels for Lake Jackson in Hillsborough County, Florida. Southwest Florida Water Management District, Brooksville, FL.

Leeper, D. (2004b). Proposed minimum and guidance levels for Lake Lindsey in Hernando County, Florida. Southwest Florida Water Management District, Brooksville, FL.

Leeper, D. (2004c). Proposed minimum and guidance levels for Mountain Lake in Hernando County, Florida. Southwest Florida Water Management District, Brooksville, FL.

Leeper, D. (2004d). Proposed minimum and guidance levels for Strawberry (North Crystal) Lake in Hillsborough County, Florida. Southwest Florida Water Management District, Brooksville, FL.

Leeper, D., Munson, A., Henningsen, L., and Gant, R. (2004). Proposed minimum and guidance levels for Clear Lake in Pasco County, Florida. Southwest Florida Water Management District, Brooksville, FL.

Mace, J. (2009). Minimum levels reevaluation: Gore Lake Flagler County, Florida. Technical Publication SJ2009003. St. Johns River Water Management District, Palatka, Florida.

Munson, A. (2004). Proposed minimum and guidance levels for Neff Lake in Hernando County, Florida. Southwest Florida Water Management District, Brooksville, FL.

Neubauer, C.P., Hall, G.B., Lowe, E.F., Robison, C.P., Hupalo, R.B., and Keenan, L.W. (2008). Minimum flows and levels method of the St. Johns River Water Management District, Florida, USA. Environmental Management 42: 1101-1114.

Poff N.L., B. Richter, A.H. Arthington, S.E. Bunn, R.J. Naiman, E. Kendy, M. Acreman, C. Apse, B.P. Bledsoe, M. Freeman, J. Henriksen, R.B. Jacobson, J. Kennen, D.M. Merritt, J. O'Keeffe, J.D. Olden, K. Rogers, R.E. Tharme, and A. Warner. (2010). The Ecological Limits of Hydrologic Alteration (ELOHA): a new framework for developing regional environmental flow standards. Freshwater Biology, 55(1):147-170.

Poff, N.L. and Zimmerman, K.H. (2010). Ecological responses to altered flow regimes: a literature review to inform science and management of environmental flows. Freshwater Biology, 55(1):194-205.

Postel, S. and Richter, B. (2003). Rivers for life: Managing water for people and nature. Island Press. Washington, DC.

South Florida Water Management District (SFWMD). (2000). Minimum flows and levels for Lake Okeechobee, the Everglades and the Biscayne aquifer (draft). South Florida Water Management District, West Palm Beach, Florida.

South Florida Water Management District (SFWMD). (2006). Technical Documentation to Support Development of Minimum Levels for Lake Istokpoga, South Florida Water Management District, West Palm Beach, Florida.

Southwest Florida Water Management District (SWFWMD). (1999a). Northern Tampa Bay Minimum Flows and Levels: Whiter Papers Supporting the Establishment of Minimum Levels for Category 1 and 2 Lakes. Southwest Florida Water Management District, Brooksville, FL.

Southwest Florida Water Management District (SWFWMD). (1999b). Northern Tampa Bay Minimum Flows and Levels: Whiter Papers Supporting the Establishment of Minimum Levels for Isolated Cypress Wetlands. Southwest Florida Water Management District, Brooksville, FL.

Southwest Florida Water Management District (SWFWMD). (2004). Minimum and Guidance Levels for Lake Taylor in Hillsborough County, Florida. Southwest Florida Water Management District, Brooksville, FL.

Southwest Florida Water Management District (SWFWMD). (2005a). Minimum and Guidance Levels for Hunters Lake in Hernando County, Florida. Southwest Florida Water Management District, Brooksville, FL.

Southwest Florida Water Management District (SWFWMD). (2005b). Minimum and Guidance Levels for Lake Parker in Polk County, Florida. Southwest Florida Water Management District, Brooksville, FL.

Suwannee River Water Management District (SRWMD). (2004). Development of Madison Blue Spring-based MFL: Technical Report. Suwannee River Water Management District, Live Oak, Florida.

Suwannee River Water Management District (SRWMD). (2005). Technical Report: MFL Establishment for the Lower Suwannee River and Estuary, Little Fanning, Fanning and Manatee Springs. Suwannee River Water Management District, Live Oak, Florida.

Swindasz, J., Hancock, M.C., Carr, D., Hurst, M., and Campbell, D. (2017). Revised Minimum and Guidance Levels Based on Reevaluation of Levels Adopted for Lake Juanita in Hillsborough County, Florida. Southwest Florida Water Management District, Brooksville, FL.

Swindasz, J., McBride, T., and Hancock, M.C. (2018). Revised Minimum and Guidance Levels for Saddleback Lake in Hillsborough County, Florida. Southwest Florida Water Management District, Brooksville, FL.

Uranowski, C., Hancock, M., and Leeper, D. (2015). Adopted Minimum and Guidance Levels for Lake Hobbs in Hillsborough County, Florida. Southwest Florida Water Management District, Brooksville, FL.

Venning, T.J. and Smith, S.C. (2020). Revised Minimum and Guidance Levels Based on Reevaluation of Adopted Levels for Cypress Lake in Hillsborough County, Florida (draft). Southwest Florida Water Management District, Brooksville, FL.

Wagner, K.J. and Dierberg, F.E.. (2006). A Review of a Multiple-Parameter Approach for Establishing Minimum Levels for Category 3 Lakes of the Southwest Florida Water Management District. Southwest Florida Water Management District, Brooksville, FL.

Wantzen, K.M., Rothhaupt, K.O., Morti, M. Cantonati, M.G. Toth, L.G. and Fisher, P. (editors). (2008). Ecological effects of water-level fluctuations in lakes. Development in Hydrobiology, Volume 204. Springer Netherlands.