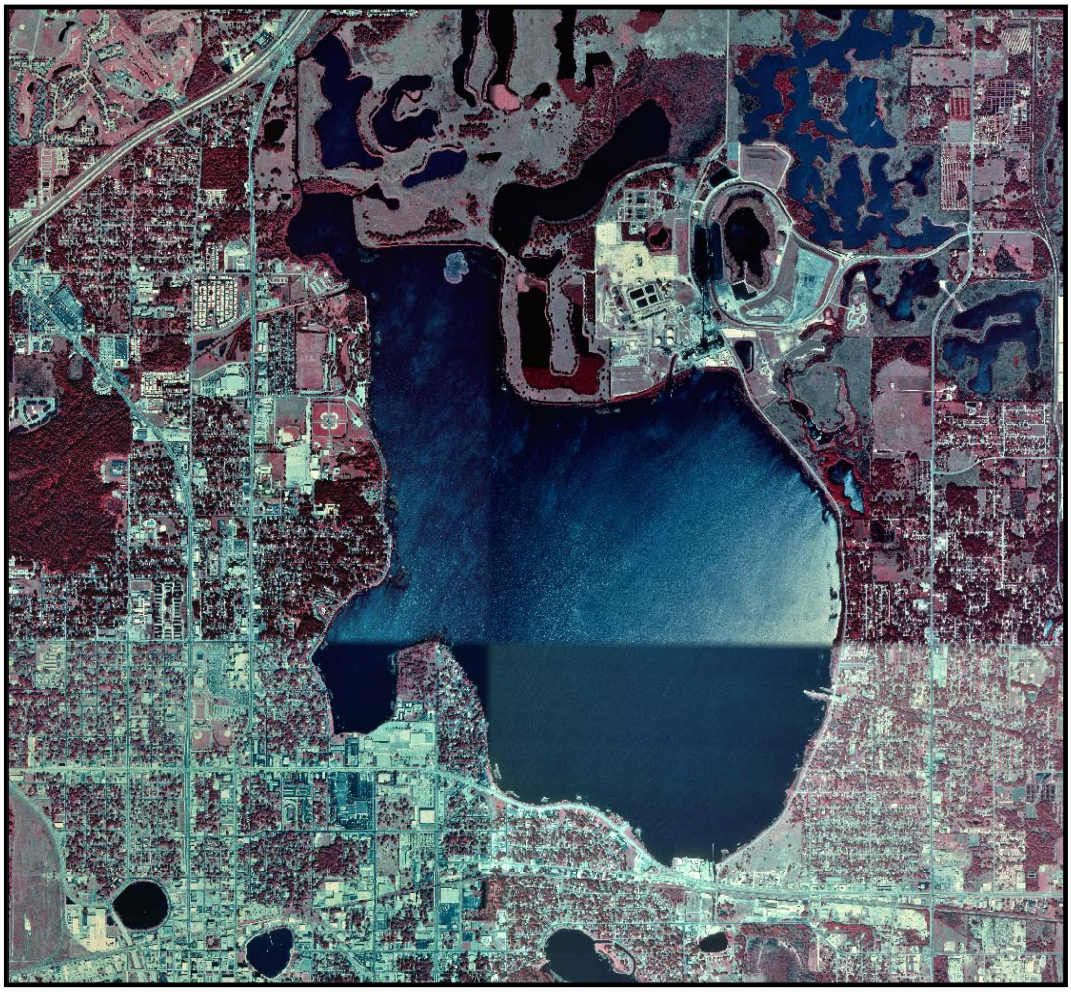
Minimum and Guidance Levels for Lake Parker in Polk County, Florida



April 2005 Draft

Ecologic Evaluation Section
Resource Conservation and Development Department

Southwest Florida
Water Management District

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Brooksville, Florida

Proposed Minimum and Guidance Levels for Lake Parker

State law (Section 373.042, Florida Statutes; hereafter F. S.) directs the Department of Environmental Protection or the water management districts to establish minimum flows and levels for lakes, wetlands, rivers and aquifers. As currently defined by statute, the minimum level of an aquifer or surface water body is "the level of groundwater in the aquifer and the level of surface water at which further withdrawals would be significantly harmful to the water resources of the area". Adoption of a minimum water level does not necessarily protect a water body from significant harm; however, protection, recovery or regulatory compliance can be gauged once a standard has been established.

Minimum flows and levels are to be established based upon the best available information and shall be developed with consideration of "…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 caveat that these considerations shall not allow significant harm caused by withdrawals (Section 373.0421, F. S.). Additional guidance for the establishment of minimum flows and levels is provided in the Florida Water Resources Implementation Rule (Chapter 62-40.473, Florida Administrative Code; hereafter F.A.C.), which requires that "consideration shall be given to the protection of water resources, natural seasonal fluctuations in water flows, and environmental values associated with coastal, estuarine, aquatic and wetland 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; j) and navigation."

To address this legislative mandate within its jurisdictional boundaries, the Southwest Florida Water Management District (District or SWFWMD) has developed specific methodologies for establishing minimum flows and levels for lakes, wetlands, rivers and aquifers, and adopted them into it Water Levels and Rates of Flow Rule (Chapter 40D-8, F.A.C.). For lakes, methodologies have been developed for establishing Minimum Levels for systems with fringing cypress-dominated wetlands 0.5 acres or greater in size (Category 1 or 2 lakes), and for those without fringing cypress wetlands 0.5 acres or greater in size (Category 3 lakes). Lakes with fringing cypress wetlands where water levels currently rise to an elevation expected to fully maintain the integrity of the wetlands are classified as Category 1 lakes. Lakes with fringing cypress wetlands that have been structurally altered such that lake water levels do not rise to former levels are classified as Category 2 lakes. Lakes without fringing cypress wetlands 0.5 acres or greater in size are classified as Category 3 lakes. Chapter 40D-8, F.A.C. also provides for the establishment of Guidance Levels, which serve as advisory information for the District, lake shore residents and local governments, or to aid in the management or

control of adjustable water level structures. Typically two Minimum Levels and three Guidance Levels are established for lakes, and upon adoption by the District Governing Board, are incorporated into Chapter 40D-8, F.A.C. The levels, which are expressed as elevations in feet above the National Geodetic Vertical Datum of 1929 (NGVD), are described below.

The **Ten Year Flood Guidance Level** is provided as an advisory guideline for lake shore development. It is the level of flooding expected on a frequency of not less than the ten year recurring interval, or on a frequency of not greater than a ten percent probability of occurrence in any given year.

The **High Guidance Level** is provided as an advisory guideline for construction of lake shore development, water dependent structures, and operation of water management structures. The High Guidance Level is the elevation that a lake's water levels are expected to equal or exceed ten percent of the time (P90) on a long-term basis.

The **High Minimum Lake Level** is the elevation that a lake's water levels are required to equal or exceed ten percent of the time (P10) on a long-term basis.

The **Minimum Lake Level** is the elevation that a lake's water levels are required to equal or exceed fifty percent of the time (P50) on a long-term basis.

The **Low Guidance Level** is provided as an advisory guideline for water dependent structures, information for lake shore residents and operation of water management structures. The Low Guidance Level is the elevation that a lake's water levels are expected to equal or exceed ninety percent of the time (P90) on a long-term basis.

In accordance with Chapter 40D-8, F.A.C., proposed Minimum and Guidance Levels were developed for Lake Parker (Table 1), a Category 3 lake located in Polk County, Florida. The levels were established using best available information, including field data that were obtained specifically for the purpose of Minimum Levels development.

Table 1. Proposed Minimum and Guidance Levels for Lake Parker.

Minimum and Guidance Levels	Elevation (feet above NGVD)
Ten Year Flood Guidance Level	131.8
High Guidance Level	130.6
High Minimum Lake Level	130.6
Minimum Lake Level	129.6
Low Guidance Level	129.0

Data and Analyses Supporting Proposed Minimum and Guidance Levels for Lake Parker

Lake Setting and Description

Lake Parker is located in Polk County, Florida (Sections 31 and 32, Township 27 South, Range 24 East and Sections 4, 5, 6, 7, 8, 9, 16 and 17, Township 28S, Range 24E), in the Peace River Basin of the Southwest Florida Water Management District (Figure 1). White (1970) classified the area of central Florida containing Lake Parker as the Polk Upland physiographic region. Brooks (1981) characterized the area surrounding the lake as the Bartow Embayment subdivision of the Central Lake Physiographic District, and described the subdivision as a large erosional basin partially backfilled with the phosphatic sand of the Bone Valley Formation of the Pliocene age. As part of the Florida Department of Environmental Protection's Lake Bioassessment/Regionalization Initiative, the area has been identified as the Lakeland/Bone Valley Upland region, and described as sand hills of the Lakeland Ridge, and the more poorly drained flatwoods areas of parts of the Bone Valley Uplands and Bartow Embayment. All of these areas are covered by phosphatic sand or clayey sand from the Miocene-Pliocene Bone Valley Member of the Peace River Formation. The lakes in this region have high phosphorus, nitrogen, and chlorophyll *a* values (Griffith *et al.* 1997).

Lake Parker lies in the Saddle Creek sub-basin of the Peace River watershed and has a drainage area of 23.6 square miles (Foose 1981). Inflows to the lake occur from Lake Gibson located to the north, a wetland system to the west, urban development within the southwest drainage basin, and Lake Bonny to the south. The lake discharges to the east through a District water control structure within a canal that flows to Saddle Creek (Figure 2). Surface water withdrawals from Lake Parker occur in association with the operation of the City of Lakeland's two power plants located on the north and south shores of the lake. There are also a number of permitted groundwater withdrawals in the surrounding area.

The 1944 and 1975 (photorevised 1987) United States Geological Survey 1:24,000 Lakeland, Fla. quadrangle maps indicate an elevation of 128 and 130 ft above NGVD, respectively for Lake Parker. The "Gazetteer of Florida Lakes" (Florida Board of Conservation 1969, Shafer *et al.* 1986) lists the lake elevation at 128 ft above NGVD with a surface area of 2,272 acres at this elevation. A topographic map of the lake basin generated in support of minimum levels development (Figure 3) indicates that the lake extends over 2,058 acres at an elevation of 128 ft above NGVD.

Medium and high-density residential/urban development dominates the eastern, southern and western areas surrounding Lake Parker (Figure 2). Former phosphate mine lands north of the lake have been reclaimed to improved pastures and open water features. Public boat ramps are located at Lake Parker Park on the northwestern shore and at Sertoma Park on the southern shore of the lake. As a result of urbanization and past phosphate mining, the majority of the lake shoreline area has been altered.

Wetland and aquatic vegetation observed along the shoreline and within the lake basin include primrose willow (*Ludwigia sp.*), cattail (*Typha sp.*), giant bulrush (*Scirpus californicus*), Egyptian paspalidium (*Paspalidium geminatum*), para grass (*Brachiaria mutica*), pennywort (*Hydrocotyle umbellata*), spatterdock (*Nuphar luteum*), pickerelweed (*Pontederia cordata*), water milfoil (*Myriophyllum aquaticum*), red maple (*Acer rubrum)*, Carolina willow (*Salix caroliniana*), wax myrtle (*Myrica cerifera*), and Brazilian pepper (*Schinus terebinthifolius*).

Figure 1. Location of Lake Parker in Polk County, Florida.

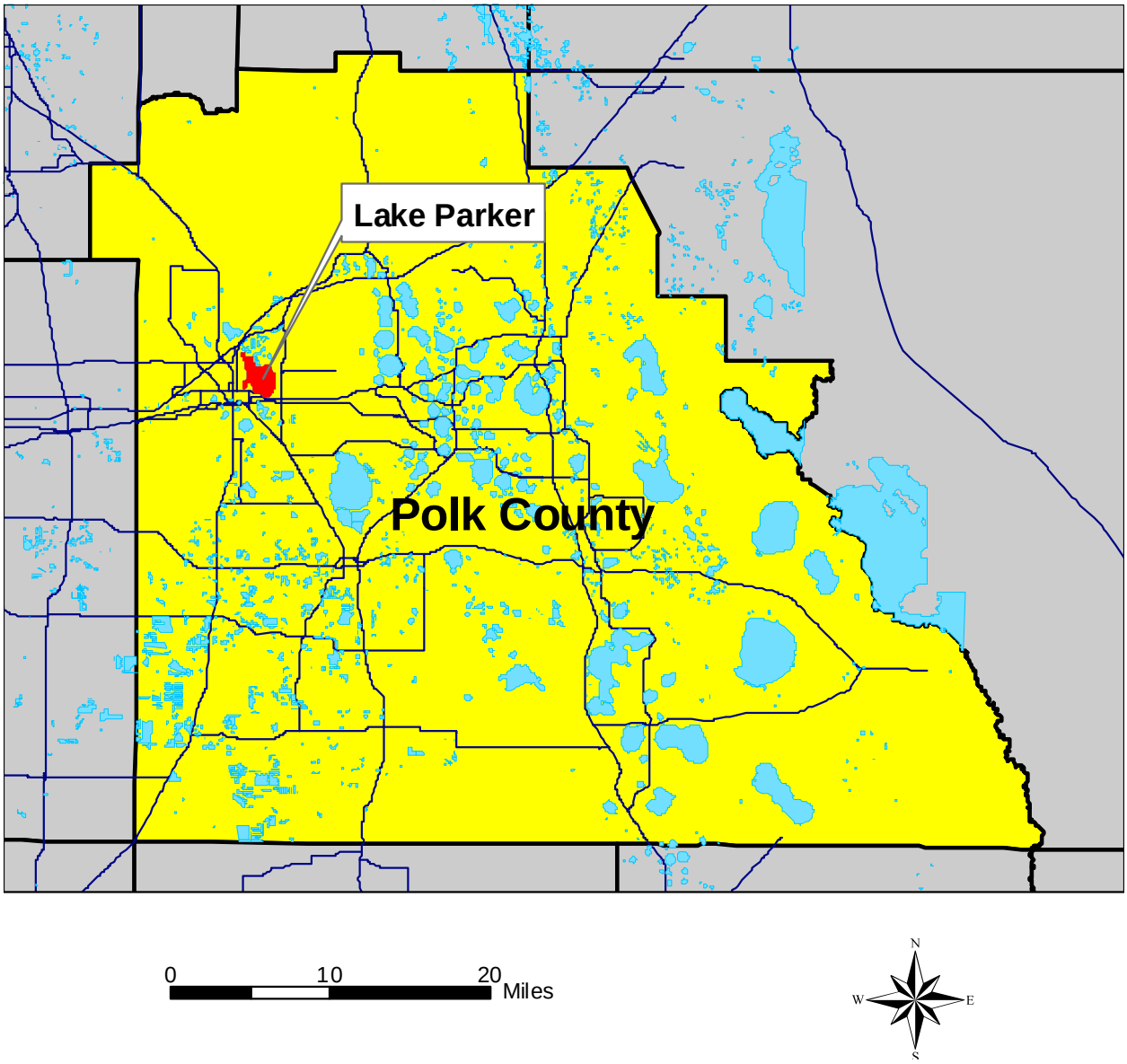
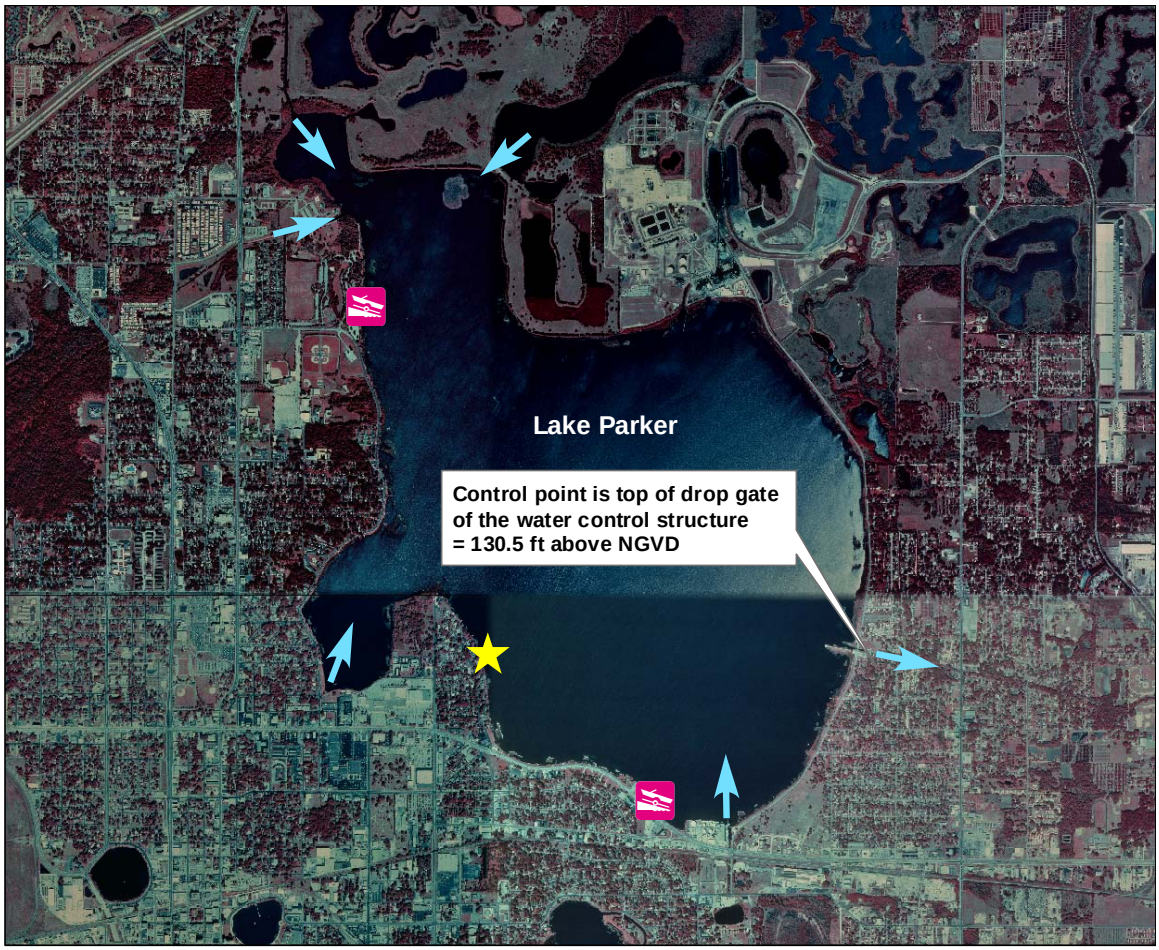


Figure 2. Location of lake water level gauge, boat ramps/parks, inlets, outlet, and control point for Lake Parker.



Legend

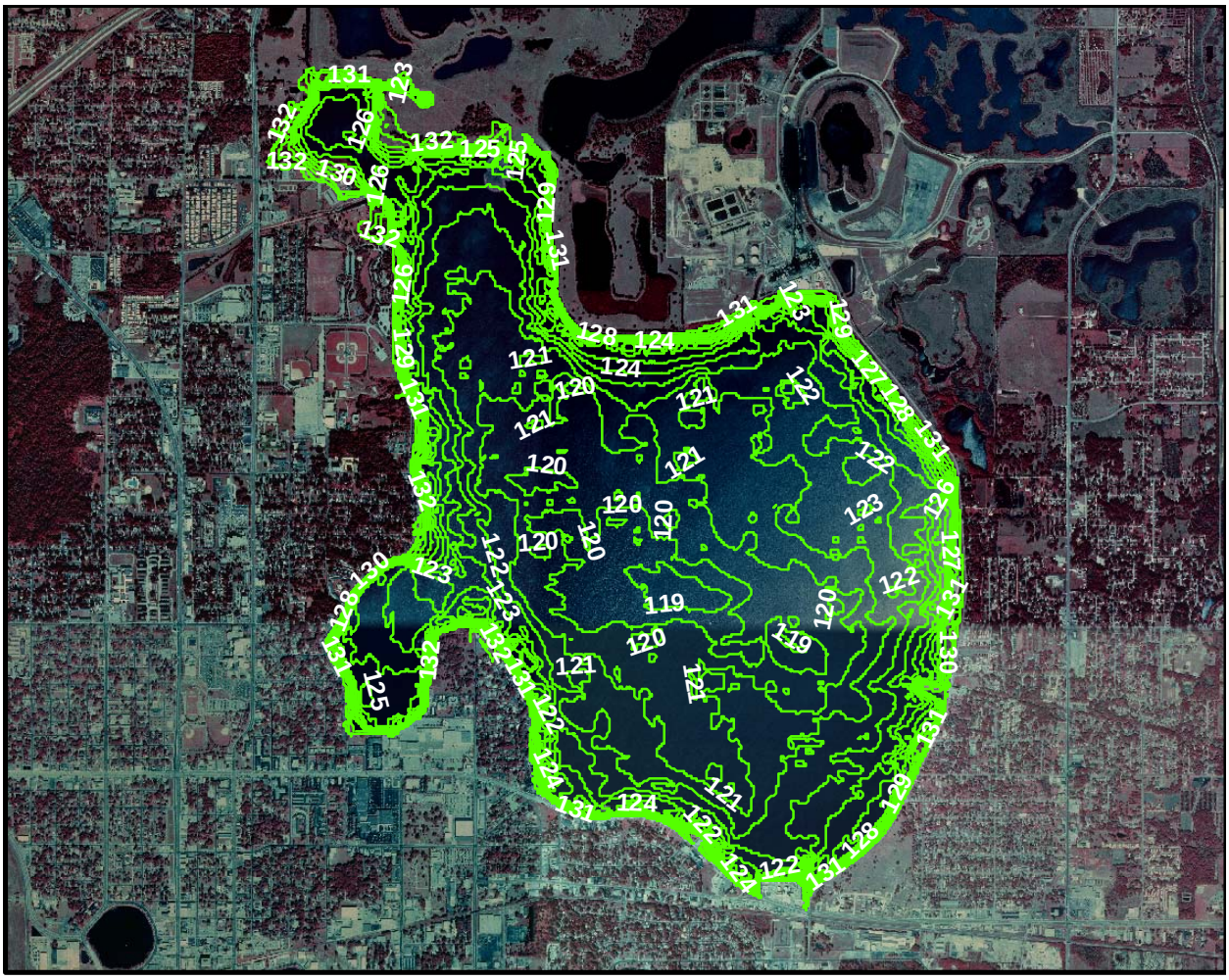
- Boat ramp/park
- Staff gauge
- Inlets, outlet

N
W E
S

0 0.5 1 2 Miles

Aerial photography from 1999 USGS Digital Orthophotography.

Figure 3. One foot contours within the Lake Parker basin. Values shown are elevations in feet above the National Geodetic Vertical Datum of 1929.



Map prepared using 1999 USGS digital orthophotography, elevation data from 1989 SWFWMD aerial photography with contours maps (Sheet Nos. 31 and 32-27-24, and 4, 5, 6, 7, 8, 9, 16, and 17-28-24), and elevation data collected on March 9, March 30, and May 6, 2004 by SWFWMD staff.

0 2,000 4,000 8,000
Feet

N
W E
S

Currently Adopted Lake Guidance Levels

The District has a long history of water resource protection through the establishment of lake management levels. With the development of the Lake Levels Program in the mid-1970s, the District began an initiative for establishing lake management levels based on hydrologic, biological, physical and cultural aspects of lake ecosystems. By 1996, management levels for nearly 400 lakes had been established.

Based on work conducted in the 1970s (see SWFWMD 1996), the District Governing Board adopted Guidance Levels for Lake Parker in September 1981 (Table 2). A Maximum Desirable Level of 130.75 ft above NGVD was also developed, but was not adopted. The adopted Guidance Levels and Maximum Desirable Level were developed using a methodology that differs from the current District approach for establishing Minimum and Guidance Levels. The levels do not, therefore, necessarily correspond with levels developed using current methodologies. Minimum and Guidance Levels established during minimum levels development shall replace current Guidance Levels shown in Table 2 upon adoption by the District's Governing Board into Chapter 40D-8, F.A.C.

Annually since 1991, a list of stressed lakes has been developed to support the District's consumptive water use permitting program. As described in Chapter 40D-2, F.A.C., Consumptive Use of Water, "a stressed condition for a lake is defined to be chronic fluctuation below the normal range of lake level fluctuations". For lakes with adopted Guidance Levels, chronic fluctuation below the Low Level is considered a stressed condition. For lakes without adopted levels, determination of stressed condition is determined on a case-by-case basis. Lake Parker is not included on the current Stressed Lakes List (Gant *et al.* 2005), nor has it been classified as a stressed lake in the past.

Table 2. Adopted Guidance Levels and associated surface areas for Lake Parker.

Management Levels	Elevation (feet above NGVD)	Lake Area (acres)
Ten Year Flood Guidance Level	131.60	2,209
High Level	131.00	2,184
Low Level	128.75	2,091
Extreme Low Level	127.50	2,038

Development of Minimum and Guidance Levels

Proposed Minimum and Guidance Levels for Lake Parker were developed using the methodology for Category 3 lakes described in Chapter 40D-8, F.A.C. and best available information in accordance with Section 373.042, F.S. Additional information gathered through field evaluations were also used. The levels and additional

information are listed in Table 3, along with surface areas for each elevation. Detailed descriptions of the development and use of these data are provided in subsequent sections of this report.

Table 3. Proposed Minimum and Guidance Levels, Historic P50, lake stage percentiles, control point elevation, and significant change standards for Lake Parker.

Levels	Elevation (feet above NGVD)	Lake Area (acres)
Lake Stage Percentiles		
Historic P10	130.57	2,167
Historic P50	129.60	2,123
Historic P90	128.95	2,099
Current P10	130.81	2,175
Current P50	130.25	2,150
Current P90	128.94	2,095
Other Levels		
Normal Pool	NA	NA
Control Point	130.5	2,162
Guidance Levels and Historic P50		
Ten Year Flood Guidance Level	131.8	2,217
High Guidance Level	130.6	2,167
Historic P50	129.6	2,123
Low Guidance Level	129.0	2,099
Significant Change Standards		
Dock-Use Standard	130.7	2,171
Basin Connectivity Standard	129.3	2,111
Aesthetics Standard	129.0	2,099
Recreation/Ski Standard	125.7	1,889
Species Richness Standard	125.2	1,805
Lake Mixing Standard	NA	NA
Minimum Levels		
High Minimum Lake Level	130.6	2,167
Minimum Lake Level	129.6	2,123

NA = not available/not applicable

Lake Stage Data and Percentiles

Lake stage data, *i.e*., surface water elevation data for Lake Parker (District Universal ID Number STA 467 468) were obtained from the District Water Management Data Base. The period of record for the data extends from May 1949 through the present date (Figure 4, see Figure 2 for current location of the SWFWMD lake water level gauge). The highest surface water elevation for Lake Parker recorded in the District Water Management Data Base, 131.89 ft above NGVD, occurred on June 22, 1982. The low of record, 126.86 ft above NGVD, occurred on June 25, 2001. Based on available lake stage data, monthly mean lake surface elevations were calculated and graphed (Figure 5).

For the purpose of minimum levels determination, lake stage data are categorized as "Historic" for periods when there were no measurable impacts due to water withdrawals, and impacts due to structural alterations were similar to existing conditions. Lake stage data are categorized as "Current" for periods when there were measurable, stable impacts due to water withdrawals, and impacts due to structural alterations were stable. Historic lake stage data are available for Lake Parker from May 1949 through December 1965 (Ellison 2002). Lake stage data from January 1966 through the present date are classified as Current data.

Monthly mean lake surface elevations from May 1949 through December 1962 were used to calculate the **Historic P10, P50, and P90** lake stage exceedance percentiles. The Historic P10 elevation, the elevation the lake water surface equaled or exceeded ten percent of the time during the Historic period, was **130.57 ft above NGVD**. The Historic P50 elevation, the elevation the lake water surface equaled or exceeded fifty percent of the time during the Historic period, was **129.60 ft above NGVD**. The Historic P90 elevation, the elevation the lake water surface equaled or exceeded 90 percent of the time during the Historic period, was **128.95 ft above NGVD**. Monthly mean lake surface elevations from January 1963 to December 2003 were used to calculate the Current P10, P50, and P90 lake stage exceedance percentiles. The Current P10 elevation, the elevation the lake water surface equaled or exceeded ten percent of the time during the Current period, was 130.81 ft above NGVD. The Current P50 elevation, the elevation the lake water surface equaled or exceeded fifty percent of the time during the Current period, was 130.25 ft above NGVD. The Current P90 elevation, the elevation the lake water surface equaled or exceeded 90 percent of the time during the Current period, was 128.94 ft above NGVD.

Normal Pool and Control Point Elevations

The **Normal Pool** elevation, a reference elevation used for development of minimum lake and wetland levels, is established based on the elevation of Hydrologic Indicators of sustained inundation, including biological and physical features. Because there are no appropriate biological or physical features within the lake shore area that could be used to determine an elevation of sustained inundation, development of the Normal Pool elevation is **not appropriate**. In 1970, the Florida Department of Natural

Resources identified the ordinary high water line for Lake Parker at 131.4 ft above mean sea level (Bishop 1970). More recently, the Department of Environmental Protection has identified a safe upland line for the lake at an elevation of 130.5 ft above NGVD (Malloy 2005).

The **Control Point** elevation is defined as the highest stable point along the outlet profile of a surface water conveyance system (*e.g.*, structure, ditch, culvert, or pipe) that principally controls lake water level fluctuations. For Lake Parker, the Control Point was established at **130.5 ft above NGVD**, the elevation of the top of the drop gate of the water control structure located near the east shore of the lake (Figure 2).

Proposed Guidance Levels and the Historic P50

The **Ten Year Flood Guidance Level** is provided as an advisory guideline for lake shore development. It is the level of flooding expected on a frequency of not less than the ten year recurring interval, or on a frequency of not greater than a ten percent probability of occurrence in any given year. The Ten Year Flood Guidance Level was established for Lake Parker at **131.8 ft above NGVD** using the methodology for open basin lakes described in current District Rules (Chapter 40D-8, Florida Administrative Code). For the analysis, the long-term gauging record for Lake Parker was used to assess flooding potential. Because of the replacement of the water control structure at a higher elevation, flood frequency elevation estimates were based on a probability analysis of annual peak stages recorded between 1976 and 2003. Various frequency distributions and probability plots were compared to establish the best estimate of flood frequency elevations. Based on available lake stage data, the Ten Year Flood Guidance Level has been exceeded numerous times during the past 55 years (Figures 4).

The **High Guidance Level** is provided as an advisory guideline for construction of lake shore development, water dependent structures, and operation of water management structures. The High Guidance Level is the elevation that a lake's water levels are expected to equal or exceed ten percent of the time (Historic P10) on a long-term basis and is established using Historic or Current data, the Control Point, or the Normal Pool elevation. Because Historic data are available for Lake Parker, the High Guidance Level was established at **130.6 ft above NGVD**, the Historic P10.

The **Historic P50** elevation is the elevation that a lake's water levels are expected to equal or exceed fifty percent of the time on a long-term basis. It is derived to support development of minimum lake levels, and is established using Historic or Current data and, in some cases, reference lake water regime statistics. Because Historic data are available for Lake Parker, the Historic P50 was established at **129.6 ft above NGVD**.

The **Low Guidance Level** is provided as an advisory guideline for water dependent structures, information for lake shore residents and operation of water management structures. The Low Guidance Level is the elevation that a lake's water levels are expected to equal or exceed ninety percent of the time (Historic P90) on a long-term

basis and is established using Historic or Current data and, in some cases, reference lake water regime statistics and the High Guidance Level. Because Historic data are available for Lake Parker, the Low Guidance Level was established at **129.0 ft above NGVD**, the Historic P90.

Lake Categorization

Lakes are classified as Category 1, 2, or 3 for the purpose of Minimum Levels development. Those with fringing cypress wetlands greater that 0.5 acres in size where water levels currently rise to an elevation expected to fully maintain the integrity of the wetlands (*i.e*., the Historic P50 is equal to or higher than an elevation 1.8 ft below the Normal Pool elevation) are classified as Category 1 Lakes. Lakes with fringing wetlands greater than 0.5 acres in size that have been structurally altered such that the Historic P50 elevation is more than 1.8 ft below the Normal Pool elevation, are classified as Category 2 Lakes. Lakes without fringing cypress wetlands or with cypress wetlands less than 0.5 acres in size, are classified as Category 3 Lakes. Because Lake Parker does not have fringing cypress wetlands, it is classified as a **Category 3** lake.

Significant Change Standards and Other Information for Consideration

Lake-specific significant change standards and other available information are developed for establishing Minimum Levels. The standards are used to identify thresholds for preventing significant harm to cultural and natural system values associated with lakes in accordance with guidance provided in the Florida Water Resources Implementation Rule (Chapter 62-40.473, F.A.C.). Other information taken into consideration includes potential changes in the coverage of herbaceous wetland vegetation and aquatic plants.

For Category 3 lakes, six significant change standards are developed, including a Species Richness Standard, an Aesthetics Standard, a Lake Mixing Standard, a Recreation/Ski Standard, a Dock-Use Standard, and a Basin Connectivity Standard. Potential changes in the coverage of herbaceous wetland vegetation and aquatic plants associated with use of standards for development of Minimum Levels for Category 3 lakes is also taken into consideration. Since Lake Parker is a Category 3 lake, the applicable significant change standards were developed (Table 3) and evaluated with respect to potential changes in plant cover.

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 clearance value for boat mooring, and use of Historic lake stage data or region-specific reference lake water regime statistics. Because Historic data are available for Lake Parker, the Dock-use Standard was established at **130.7 ft above NGVD** by adding a clearance value of 2 ft to the difference between the Historic P50 and Historic P90 (0.7 ft), and the elevation of

sediments at the end of 90 percent of the 34 docks (128.0 ft) that were observed at the lake in March 2004.

Table 4. Summary statistics for elevations associated with docks (n = 34) at Lake Parker. Percentiles (P10 and P90) represent elevations exceeded by 10 and 90 percent of the docks.

Statistic	Elevation of Sediments at Waterward End of Docks (feet above NGVD)	Elevation of Dock Platforms (feet above NGVD)
Mean (SD)	126.6 (1.7)	132.3 (0.8)
P10	128.0	133.4
P90	125.6	131.3
Maximum	128.5	133.6
Minimum	118.4	130.8

The **Basin Connectivity Standard** is developed to protect surface water connections between lake basins or among sub-basins within lake basins to allow for movement of aquatic biota, such as fish, and support recreational uses. The standard is based on the elevation of lake sediments at a critical high spot between lake basins or lake sub-basins, clearance values for movement of aquatic biota or powerboats and other watercraft, and use of Historic lake stage data or region-specific reference lake water regime statistics. Because Historic data are available for Lake Parker, the Basin Connectivity Standard was established at **129.3 ft above NGVD**, based on the sum of the critical high spot elevation (126.6 ft above NGVD), the clearance value for power boats and movement of biota (2 ft), and the difference between the Historic P50 and Historic P90 (0.7 ft).

The **Aesthetics Standard** is developed to protect aesthetic values associated with the inundation of lake basins. The standard is intended to limit potential change in aesthetic values associated with the median lake stage from diminishing below the values associated with the lake when it is staged at the Low Guidance Level. The Aesthetic Standard is established at the Low Guidance Level, which is **129.0 ft above NGVD**.

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 (the Ski elevation) within the basin that can contain a five-foot deep ski corridor delineated as a circular area with a radius of 418 ft, or a rectangular area 200 ft in width and 2,000 ft in length, and use of Historic lake stage data or region-specific reference lake water regime statistics. Because Historic data are available for Lake Parker, the Recreation/Ski Standard was established at **125.7 ft above NGVD**, based on the sum of the Ski elevation (125 ft above NGVD), and the difference between the Historic P50 and Historic P90 (0.7 ft).

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 Florida lakes, 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 Species Richness Standard was established at **125.2 ft above NGVD**.

The **Lake Mixing Standard** is developed to prevent significant changes in patterns of wind-driven mixing of the lake water column and sediment resuspension. The standard is established at the highest elevation at or below the Historic P50 elevation where the dynamic ratio (see Bachmann *et al*. 2000) shifts from a value of <0.8 to a value >0.8, or from a value >0.8 to a value <0.8. The Lake Mixing Standard was established at 118.6 ft above NGVD, the elevation at which the dynamic ratio shifts from a value >0.8 to a value <0.8. Because Lake Parker would only be 2 acres in size at this elevation (0.09 percent of the lake surface area at the Historic P50), the Lake Mixing Standard is **not applicable** for use in establishing the Minimum Lake Level. Monthly water column profiles of temperature, pH, dissolved oxygen, and conductivity, collected at five sites within the lake basin from May 2003 through April 2004 by Lakeland Electric, indicate that the lake does not stratify.

Herbaceous Wetland Information is taken into consideration to determine the elevation at which change in lake stage would result in substantial change in potential wetland area within the lake basin (*i.e*., basin area with a water depth less than or equal to four feet). For Lake Parker, the potential wetland area available at the elevations of the applicable significant change standards was compared with the potential area available at the Historic P50. Based on this comparison, there would not be a significant increase or decrease in the area of herbaceous wetland vegetation at the elevations of the applicable significant change standards in relation to the area at the Historic P50 (Figure 6).

Submersed Aquatic Macrophyte Information is taken into consideration to determine the elevation at which change in lake stage would result in substantial change in the area available for colonization by submersed aquatic plants. For Lake Parker, the potential area available for submersed aquatic plant colonization at the elevations of the applicable significant change standards were compared with the potential area available at the Historic P50. Based on this comparison, there would not be a significant increase or decrease in the area of submersed aquatic plant vegetation at the elevations of the applicable significant change standards in relation to the area at the Historic P50 (Figure 6).

Proposed Minimum Levels

The High Minimum Lake Level and the Minimum Lake Level are developed using lake-specific significant change standards, lake categorization, and other available information including substantial changes in the coverage of herbaceous wetland

vegetation and aquatic macrophytes; elevations associated with residential dwellings, roads or other structures; frequent submergence of dock platforms; faunal surveys; aerial photographs; typical uses of lakes (*e.g.,* recreation, aesthetics, navigation, and irrigation); surrounding land-uses; socio-economic effects; and public health, safety and welfare matters.

The **Minimum Lake Level** is the elevation that a lake's water levels are required to equal or exceed fifty percent of the time on a long-term basis. The Minimum Lake Level for Category 3 Lakes is established at the elevation corresponding to the most conservative significant change standard, *i.e*., the standard with the highest elevation, except where that elevation is above the Historic P50 elevation, in which case, the Minimum Lake Level is established at the Historic P50 elevation. Because the most conservative of the appropriate standards (the Dock-Use Standard) is above the Historic P50, the Minimum Lake Level for Lake Parker was established at the Historic P50, **129.6 ft above NGVD**. The water level equaled or exceeded fifty percent of the time (P50) has been above the Minimum Lake Level for Lake Parker over the last five long-term (10-year) periods (Table 5).

Table 5. Comparisons between the Minimum Lake Level for Lake Parker and water surface elevations equaled or exceeded fifty percent of the time (P50) over the last five 10-year periods.

10-year Period			MLL Equaled or Exceeded ?	Feet P50 is above (+) or below (-) MLL
January 1994	through	December 2003	Yes	+0.8
January 1993	through	December 2002	Yes	+0.7
January 1992	through	December 2001	Yes	+0.7
January 1991	through	December 2000	Yes	+0.8
January 1990	through	December 1999	Yes	+0.8

The **High Minimum Lake Level** is the elevation that a lake's water levels are required to equal or exceed ten percent of the time on a long-term basis. Because Lake Parker is a Category 3 lake and Historic data are available, the High Minimum Lake Level was established at **130.6 ft above NGVD** by adding the difference between the Historic P10 and Historic P50 (1.0 ft) to the Minimum Lake Level. The water level equaled or exceeded ten percent of the time (P10) has been above the High Minimum Lake Level for Lake Parker over the last five long-term (10-year) periods (Table 6).

Table 6. Comparisons between the High Minimum Lake Level for Lake Parker and water surface elevations equaled or exceeded ten percent of the time (P10) over the last five 10-year periods.

10-year Period			HMLL Equaled or Exceeded ?	Feet P10 is above (+) or below (-) HMLL
January 1994	through	December 2003	Yes	+0.2
January 1993	through	December 2002	Yes	+0.2
January 1992	through	December 2001	Yes	+0.2
January 1991	through	December 2000	Yes	+0.2
January 1990	through	December 1999	Yes	+0.2

Comparison of the High Minimum Lake Level with Lake Basin Features

The elevations of various man-made features within the immediate Lake Parker basin were determined to evaluate the potential for flooding when the lake surface is at the proposed High Minimum Lake Level. Based on review of available one-foot contour interval aerial maps for the region and field survey data, the proposed High Minimum Lake Level is 1.6 ft below the slab of the lowest residential dwelling, 3.8 ft below a pool, 1.3 ft below the low spot on a paved park trail, 3.1 ft below the lowest spot on the roads that encircle the lake, 3.2 ft below the top of the boat ramp at Lake Parker Park, and 2.2 ft below the top of the boat ramp at Sertoma Park (Table 7).

Table 7. Elevations of lake basin features surrounding Lake Parker.

Lake Basin Features	Elevation (feet above NGVD)
Low Floor Slab (house)	132.2
Low Other (pool)	134.4
Low Other (paved park trail)	131.9
Low Road (Lake Parker Drive)	133.7
Top of Boat Ramp at Lake Parker Park	133.8
Top of Boat Ramp at Sertoma Park	132.8

Figure 4. Surface water elevations through December 2003 for Lake Parker.

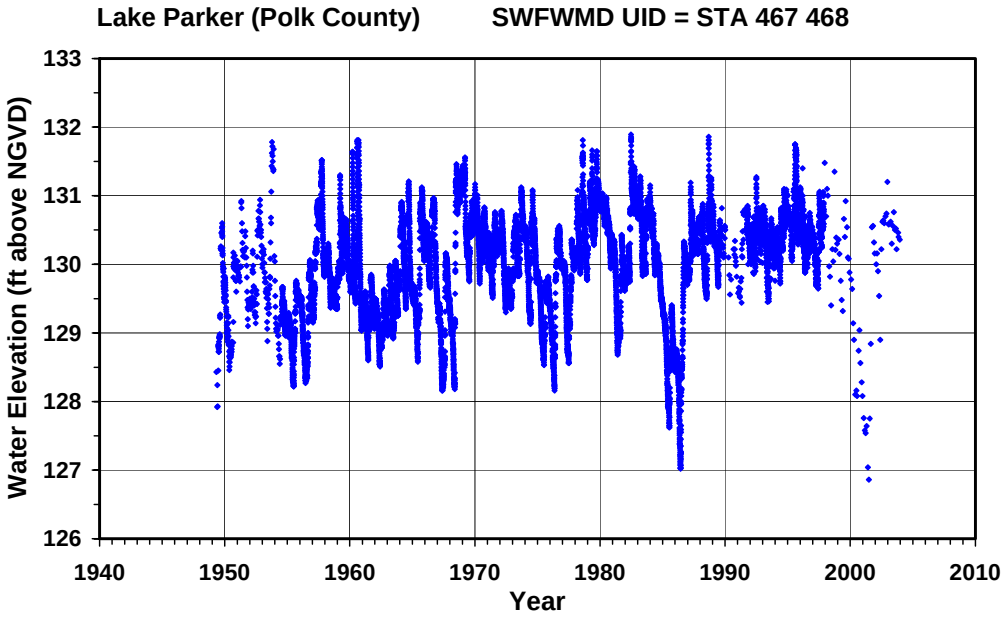


Figure 5. Mean monthly surface water elevations through December 2003, and proposed Guidance and Minimum Levels for Lake Parker. Proposed levels include the Ten-Year Flood Guidance Level (10-YR), High Guidance Level (HGL), Low Guidance Level (LGL), High Minimum Lake Level (HMLL), and Minimum Lake Level (MLL).

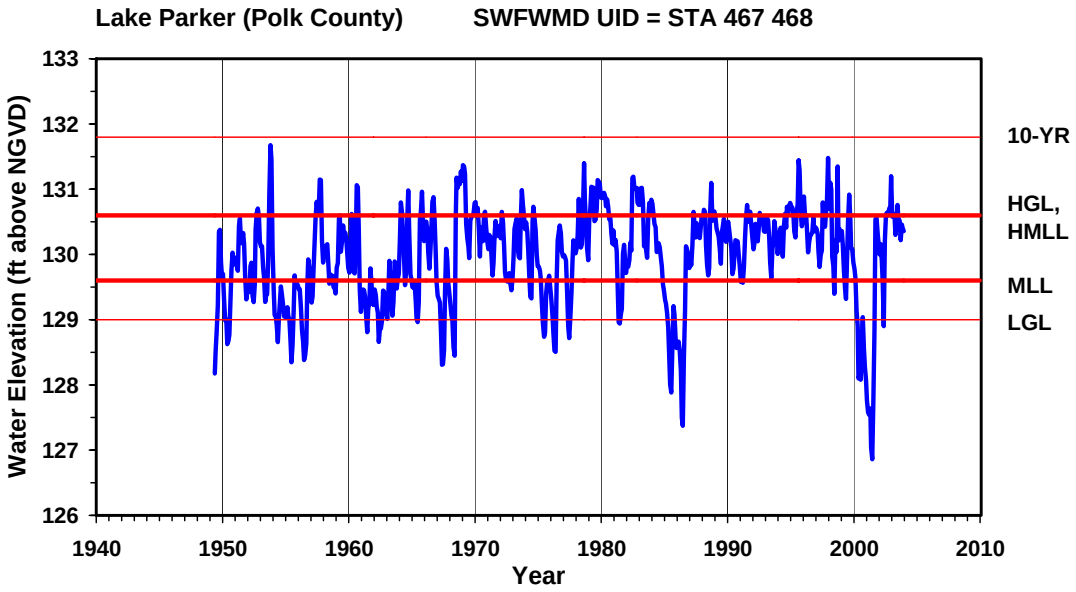


Figure 6. Surface area, volume, mean depth, dynamic ratio (basin slope), potential herbaceous wetland area, and potential aquatic macrophyte colonization area versus lake stage for Lake Parker.

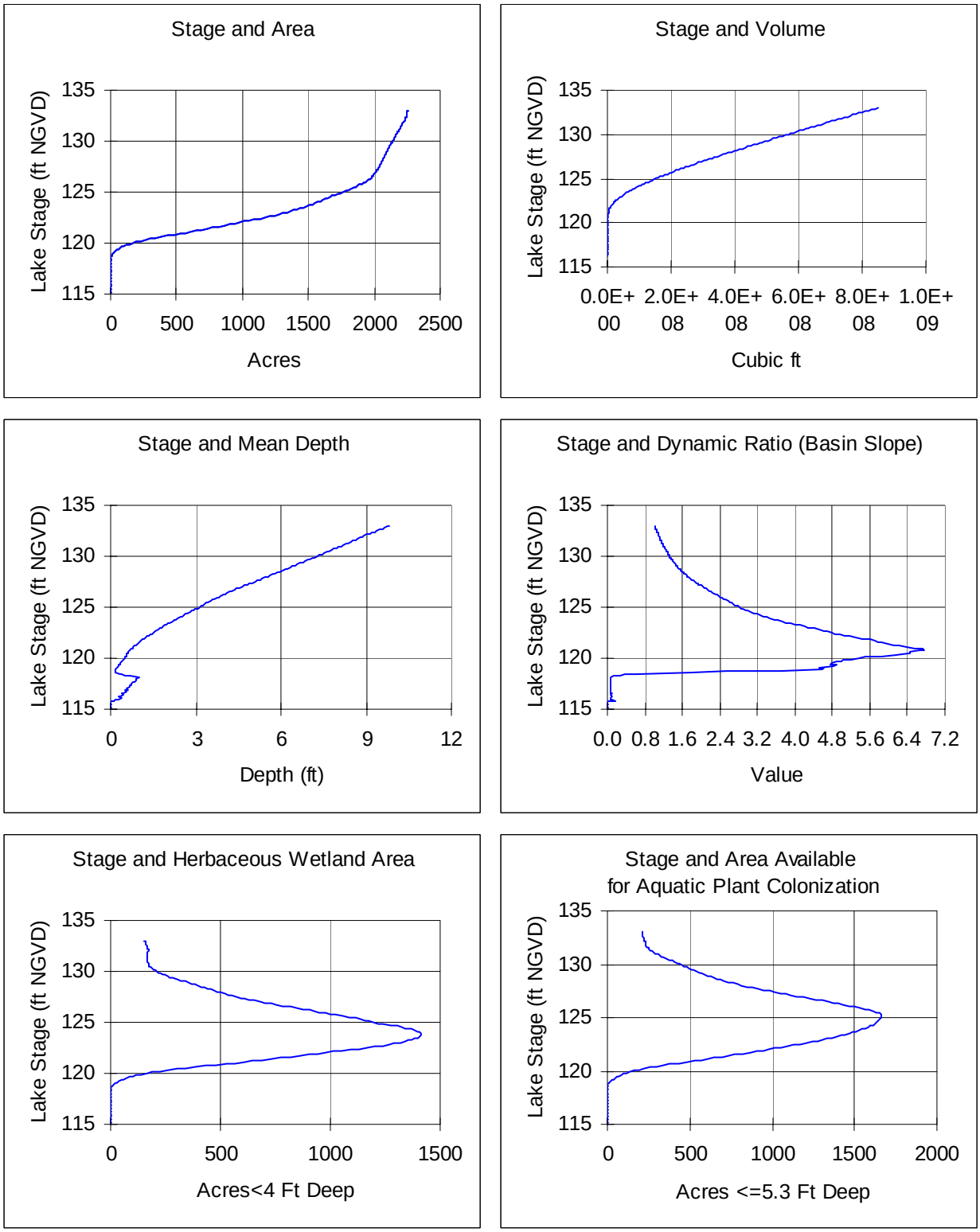
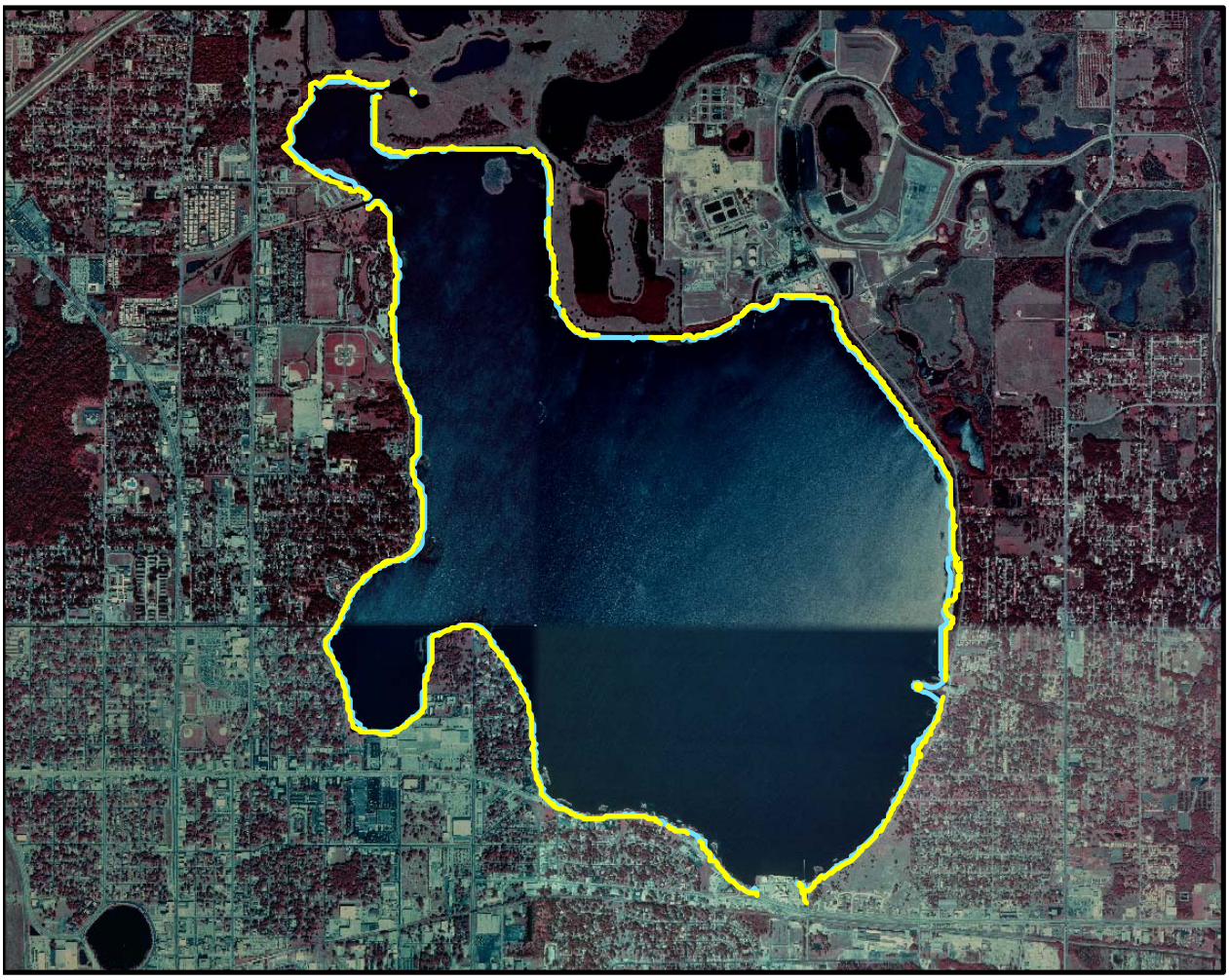


Figure 7. Approximate location of the proposed Minimum Lake Level (MLL) and High Minimum Lake Level (HMLL) for Lake Parker.



Legend

Parker Minimum Levels

129.6 above NGVD = MLL

130.6 above NGVD = HMLL

Map prepared using 1999 USGS digital orthophotography, elevation data from 1989 SWFWMD aerial photography with contours maps (Sheet Nos. 31 and 32-27-24, and 4, 5, 6, 7, 8, 9, 16, and 17-28-24), and elevation data collected on March 9, March 30, and May 6, 2004 by SWFWMD staff.

0 2,000 4,000 8,000 Feet

Documents Cited and Reviewed for Development of Proposed Minimum and Guidance Levels

Abrahms Aerial Survey Corporation of Florida. 1978. Aerial photography with contours. Peace River Basin, Lake Parker, Sheet Nos.: 4, 5, 6, 9, and 16-28-24. St. Petersburg, Florida. Prepared for the Southwest Florida Water Management District, Brooksville, Florida.

Abrahms Aerial Survey Corporation of Florida. 1983. Aerial photography with contours. Peace River Basin, Lake Parker, Sheet Nos.: 7, 8, and 17-28-24. St. Petersburg, Florida. Prepared for the Southwest Florida Water Management District, Brooksville, Florida.

Arnold, D. 2004. Memorandum – FY 2004 lakes 10-yr flood elevations. Southwest Florida Water Management District, Brooksville Florida.

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: 281-291.

Bishop, E. W. 1970. Letter to Mrs. Emily Black re: ordinary high water line for Lake Parker. Florida Department of Natural Resources, Tallahassee, Florida.

Blatchley, W. S. 1932. In days agone. The Nature Publishing Company, Indianapolis, Indiana.

Brenner, M., T. J. Whitmore, et. al. 1993. Paleolinmological methods for defining target conditions in lake restoration: Florida case studies. Lake and Reservoir Management 7: 209-2127.

Brenner, M., C. L. Schelske, et al. 1997. Radium-226 stratigraphy in Florida lake sediments as an indicator of human disturbance. Verhandlugen Internationale Vereinigung fur theoretische und Angewandle Limnologie 26: 809-813.

Brooks, H. K. 1981. Physiographic divisions of Florida: map and guide. Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, Florida.

Carrick, H. J. and C. L. Shelske. 1997. Have we overlooked the importance of small phytoplankton in productive waters. Limnology and Oceanography 42: 1613-1621.

Deevey, E. S., M. W. Binford, et. al. 1986. Sedimentary record of accelerated nutrient loading in Florida lakes. Hydrobiologia 143: 49-53.

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" June 2001 draft by D. Leeper, M. Kelly, A. Munson, and R. Gant. Prepared for the Southwest Florida Water Management District, Brooksville, Florida.

Ellison, D. 2002. Draft report: Establishment of a reference lake water regime for the Highlands Ridge area of Polk and Highlands Counties. Hydrologic Evaluation Section, Southwest Florida Water Management District, Brooksville, Florida.

Florida Board of Conservation. 1969. Florida lakes, part III: gazetteer. Division of Water Resources, Tallahassee, Florida.

Foose, D. W. 1981. Drainage areas of selected surface-water sites in Florida. United States Geological Survey, Open-file report 81-482. Tallahassee, Florida.

Fowler, E.D., Taylor, A.E., Knobel, E.W., Phillips, S.W., Lesh, F.R., Gray, A.L., Sweet, A.T., Edwards, M.J., Smith, H.M., Devereux, R.E., Hasty, A.H., and Wildermuth, R. 1927. Soil survey of Polk County, Florida. Series 1927, No. 39. U.S. Department of Agriculture, Washington, D.C.

Gant, R., Hood, J. and Toole, D. 2005. Memorandum to Ralph Kerr, John Parker, Michael Balser and Scott Laidlow, dated January 31, 2005. Subject: 2005 Stressed Lakes. Southwest Florida Water Management District, Brooksville, Florida.

Griffith, G. E., D. E. Canfield Jr., C. A. Horsburgh, J. M. Omernik, and S. H. Azevedo. 1997. Lake regions of Florida (map). United States Environmental Protection Agency, University of Florida Institute of Food and Agricultural Sciences, Florida Lakewatch, Florida Department of Environmental Protection, and the Florida Lake Management Society, Gainesville and Tallahassee, Florida.

Henderson, S.E. and Lopez, M.A. 1989. Trend analysis of Lake Parker stage and relation to various hydrologic factors, 1950-86, Lakeland, Florida. Water Resources Investigations Report 89-4037. U.S. Geological Survey, Tallahassee, Florida.

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, June14, 2001 draft. Southwest Florida Water Management District, Brooksville, Florida.

Malloy, R. 2005. E-mail to Doug Leeper, dated March 21, 2005. Subject: lake safe upland lines. Florida Department of Environmental Protection, Bureau of Surveying and Mapping, Tallahassee, Florida.

Moxley, D. J. and F. H. Langford. 1982. Beneficial effects of *Hydrilla* on two eutrophic lakes in central Florida. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 36: 280-286.

Polk County. 2001. Web site: Polk County Lake Atlas. Developed by: Polk County, Florida Center for Community Design + Research, and the University of South Florida. Florida Center for Community Design + Research, School of Architecture and Community Design, University of South Florida, Tampa, Florida.

Ralph L. Woolpert Company. 1979. Aerial photography with contours. Green Swamp Basin, Lake Parker North, Sheet Nos. 31 E & W, and 32-27-24. Prepared for the Southwest Florida Water Management District, Brooksville, Florida.

Romie, K. 2000. Water chemistry of lakes in the Southwest Florida Water Management District. Southwest Florida Water Management District, Brooksville, Florida.

Shafer, M. D., Dickinson, R. E., Heaney, J. P., and Huber, W. C. 1986. Gazetteer of Florida lakes. Publication no. 96, Water Resources Research Center, University of Florida, Gainesville, Florida.

Southwest Florida Water Management District. 1991. Public facilities report, water control structures and facilities, Lake Parker Structure. Brooksville, Florida.

Southwest Florida Water Management District. 1992. Flood-stage frequency relationships for selected lakes within the Southwest Florida Water Management District. September 1991, updated November 1992. Brooksville, Florida.

Southwest Florida Water Management District. 1993. Lake Parker diagnostic feasibility study. Brooksville, Florida.

Southwest Florida Water Management District. 1996. Lake Levels Program lake data sheets / 1977-1996, Peace River Basin – 20, Volume #2 – Lakes I thru Z. Brooksville, Florida.

Southwest Florida Water Management District. 1999. Establishment of minimum levels for Category 1 and Category 2 lakes, *in* Northern Tampa Bay minimum flows and levels white papers: white papers supporting the establishment of minimum flows and levels for isolated cypress wetlands, Category 1 and 2 lakes, seawater intrusion, environmental aquifer levels, and Tampa Bypass Canal; peer-review final draft, March 19, 1999. Brooksville, Florida.

Southwest Florida Water Management District. 2001. Structure profile on the District water control facility Parker, water control structure, Peace River Basin (20), Polk County, June 14, 2001. Brooksville, Florida.

Southwest Florida Water Management District. 2004a. Survey Section Field Book 20/251, pages 29-76. Brooksville, Florida.

Southwest Florida Water Management District. 2004b. Survey Section Field Book 20/252, pages 1-21. Brooksville, Florida.

Southwest Florida Water Management District. 2005. Special Purpose Survey: Peace River Basin, Lake Parker, minimum flows and levels. Drawing No. 20-999-004. Brooksville, Florida.

United States Geological Survey. 1944. Lakeland quadrangle, Florida, 7.5 minute series (topographic) map; Polk Co., Fla., N2800-W8152.5/7.5, 1944, AMS 4440 II NW-Series V847. Department of Interior, Washington, D.C.

United States Geological Survey. 1949. Lakeland quadrangle, Florida, 7.5 minute series (topographic) map; Polk Co., Fla., N2752.5-W8145/7.5, 1949, Photorevised 1972, AMS 4639 IV NE Series V847. Department of Interior, Washington, D.C.

United States Geological Survey. 1975. Lakeland quadrangle, Florida, 7.5 minute series (topographic) map; Polk Co., Fla., 28081-A8-TF-024, 1975, DMA 4640 III SW-Series V847. Department of Interior, Washington, D.C.

Westgate, J. T. 1977. Memorandum to Jay Ahern, Staff Attorney: Lake Parker Water Levels. Southwest Florida Water Management District, Brooksville, Florida.

White, W. A. 1970. The geomorphology of the Florida peninsula. Geological Bulletin, No. 51. Bureau of Geology, Florida Department of Natural Resources, Tallahassee, Florida.