August 27, 2004

MEMORANDUM

TO: **File**

FROM: **Adam Munson, Environmental Scientist**
Resource Conservation and Development Department
Southwest Florida Water Management District

SUBJECT: **Proposed minimum and guidance levels for Green Lake in Pasco County, Florida**

Green Lake

General Description

Green Lake is located in Pasco County, Florida (Sections 9, 10, 15 and 16, Township 25S, Range 18E) in the Coastal Rivers Basin of the Southwest Florida Water Management District (Figure 1). The area surrounding the lake is categorized as the Land-O-Lakes subdivision of the Tampa Plain in the Ocala Uplift Physiographic District (Brooks 1981). The region is characterized as a plain with many small lakes overlying moderately thick limestone with karst features. As part of the Florida Department of Environmental Protection's Lake Bioassessment/Regionalization Initiative, the area has been identified as the Land-O-Lakes lake region, and described as an area of neutral to slightly alkaline, low to moderate nutrient, clear-water lakes interspersed in sandy uplands (Griffith *et al.* 1997).

There are no major inflows to Green Lake. Outlets to a large wetland area east of the lake occur along the northern and eastern lakeshores (Figure 2). The lake may also discharge to the north through a culvert under State Road 52. Residential development covers approximately 70% of the shoreline. Two canals have been dredged in areas along the north shore. There are no surface water withdrawals from the lake currently permitted by the District.

The "Gazetteer of Florida Lakes" (Florida Board of Conservation 1969, Shafer *et al.* 1986) lists the lake area as 26 acres and the surface elevation at 74 ft above the National Geodetic Vertical Datum of 1929 (NGVD). The 1954 United States Geological Survey 1:24,000 Fivay, Fla. and the 1954 (phorорevised 1988) quadrangle maps show a surface water elevation of 74 ft above NGVD. Based on a topographic map of the basin generated in support of minimum levels development (Figure 3), the lake covers an area of 108 acres when the water surface is at 74 ft above NGVD. Data used for production of the topographic map were obtained from field surveys conducted in August 2002 and one-foot contours developed from contour data prepared using photogrammetric methods.

Figure 1. Location of Green Lake in Pasco County, Florida.

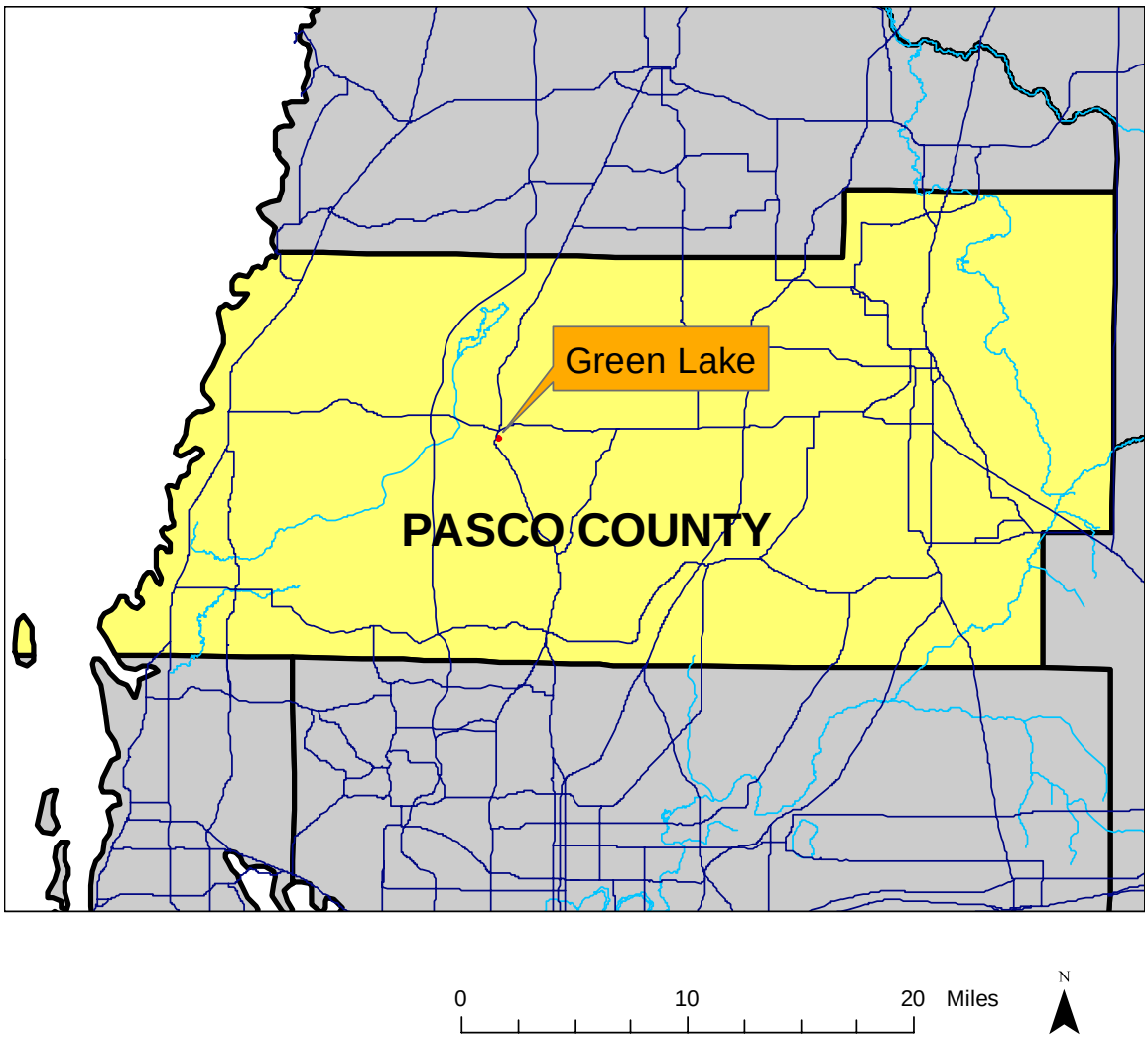
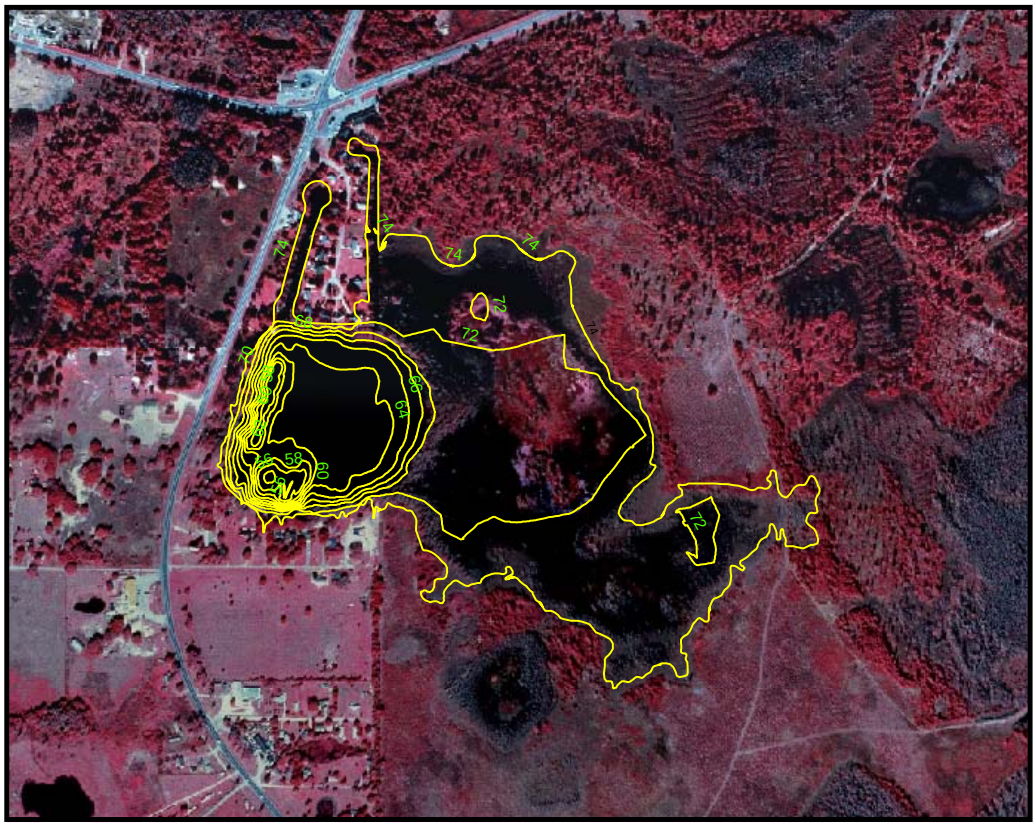


Figure 2. Location of District lake-level gauge, outlets, and site where hydrologic indicators were measured at Green Lake in Pasco County, Florida.

Figure 3. Two-foot contours within the Green Lake basin in Pasco County, Florida. Values shown are elevations, in feet above the National Geodetic Vertical Datum of 1929.



Map prepared September 4, 2003 using 1999 USGS digital orthophotography, elevation data from 1977 SWFWMD aerial photography with contours maps (Sheet Nos. 9-25-18, 10-25-18, 15-25-18 and 16-25-18), and elevation data collected on August 15, 2002 by SWFWMD staff.

0 500 1,000 1,500 2,000 Feet

N

Previously Adopted Lake Management Levels

Management levels have not previously been adopted for Green Lake.

Proposed Minimum and Guidance Levels

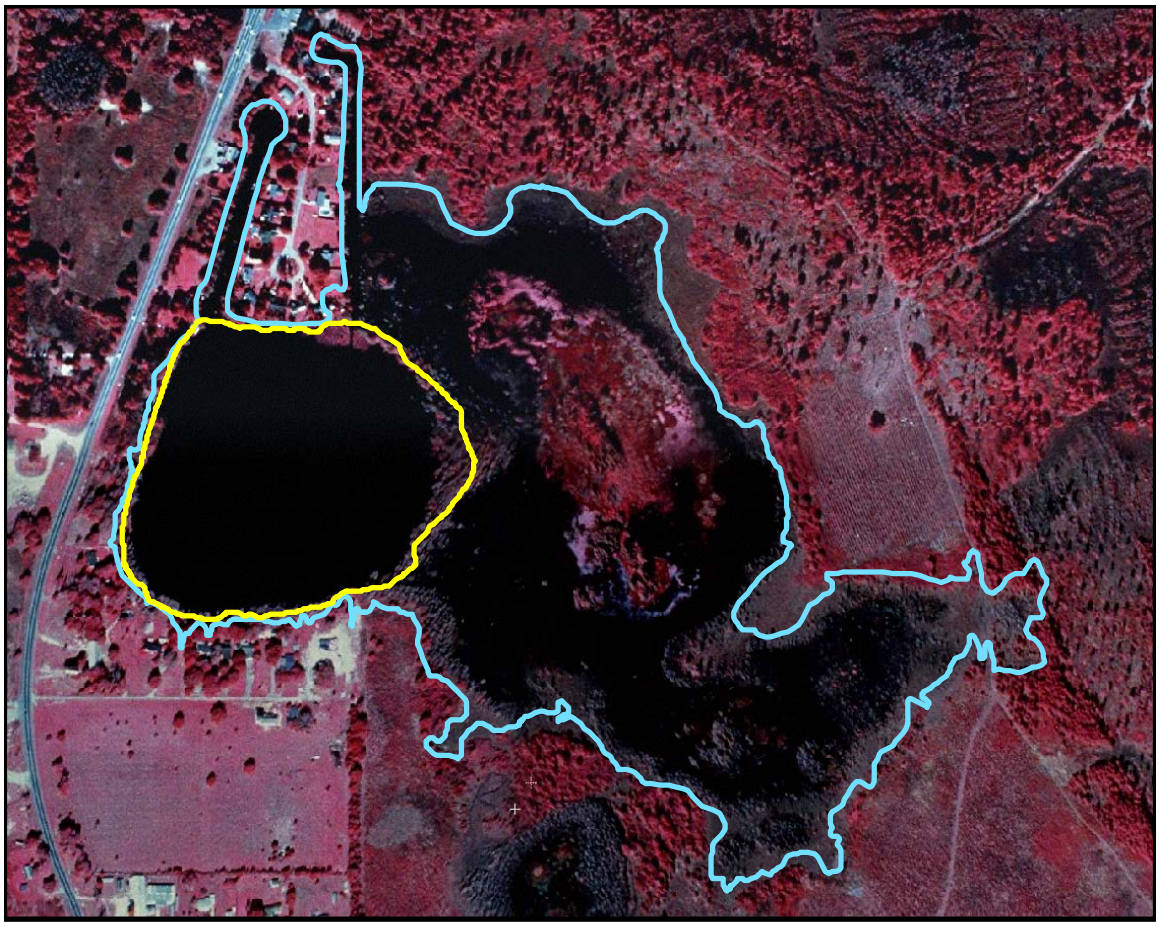
Proposed Minimum and Guidance Levels were developed for Green Lake using the methodology for Category 1 and 2 Lakes described in SWFWMD (1999) and current District Rules (Chapter 40-D8, Florida Administrative Code). Additional lake-level information was developed using methods outlined in Leeper *et al.* (2001), in accordance with modifications outlined by Dierberg and Wagner (2001). Proposed levels, along with lake surface area values for each level are listed in Table 1. Locations of the proposed minimum levels within the lake basin are shown in Figure 4.

Table 1. Proposed minimum levels, guidance levels and associated surface areas for Green Lake in Pasco County, Florida.

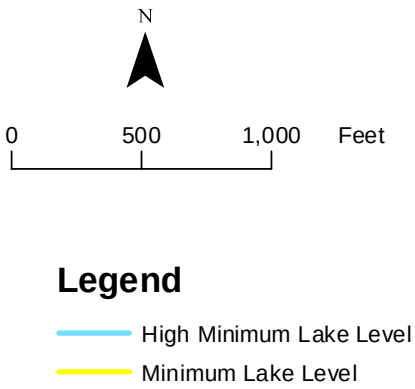
Level	Elevation (feet above NGVD)	Lake Area (acres)
Ten Year Flood Guidance Level	75.5	NA
High Guidance Level	74.4	NA
High Minimum Lake Level	74.2	NA
Minimum Lake Level	71.9	27
Low Guidance Level	70.0	24

NA = not available

Figure 4. Approximate location of the proposed Minimum Lake Level (yellow) and proposed High Minimum Lake Level (blue) for Green Lake in Pasco County, Florida. Elevations of contours are in feet above the National Geodetic Vertical Datum of 1929. Contour shown for the High Minimum Lake Level is 74.0 ft above NGVD; actual elevation of the level is 74.2 ft above NGVD.



Map prepared August 25, 2004 using 1999 USGS digital orthophotography, elevation data from 1977 SWFWMD aerial photography with contours maps (Sheet Nos. 9-25-18, 10-25-18, 15-25-18 and 16-25-18), and elevation data collected on August 15, 2002 by SWFWMD staff.



Summary of Data and Analyses Supporting Recommended Minimum and Guidance Levels

Hydrologic data are available for Green Lake (District Universal ID Numbers STA 305 305) for several dates in the first half of the 1980s, and from December 1993 to the present date (Figure 5, see Figure 2 for current location of the SWFWMD lake-level gauge). Monthly mean water surface elevations, along with proposed guidance and minimum levels are shown in Figure 6. For the entire period of record, the hydrologic data are classified as Historic data. Historic data collected through February 2003 were used to calculate the Historic P10, P50, and P90 (Table 2).

The Normal Pool elevation was established at 74.2 ft above NGVD based on the elevation of cypress buttresses on trees along the south shore of the lake (Table 3). The low floor slab elevation, extent of structural alteration and control point elevation were determined using available one-foot contour interval aerial maps and field survey data (Table 2, Figure 7). The Normal Pool elevation is below the control point elevation (74,3 ft above NGVD), so the lake is not considered to be Structurally Altered.

Based on the availability of Historic hydrologic data for the lake basin, the High Guidance Level was established at the Historic P10 elevation of 74.4 ft above NGVD (Table 2). The Historic P50 and Low Guidance Levels (72.1 and 70.0 ft above NGVD, respectively) were determined using the Historic P50 and Historic P90 elevations.

The Ten Year Flood Guidance Level for Green Lake was established at 75.5 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 NETWORK flood routing model was used. Model input was based on a ten-year storm event with a 120-hour duration and an 11.3-inch rainfall depth. Based on available lake stage data, the Ten Year Flood Guidance Level was last exceeded in the winter of 1998 (see Figures 5 and 6). The highest surface elevation for the lake included in the District Water Management Database, 75.64 ft above NGVD, occurred on January 7, 1998. The low of record, 67.88 ft above NGVD, occurred on June 26, 2001.

Green Lake contains diverse stands of aquatic macrophytes and other hydrophytes, including cattail (*Typha* sp.), spatterdock (*Nuphar luteum*), eelgrass (*Vallisneria* sp.), arrowhead (*Sagittaria lancifolia*), pickerelweed (*Pontederia cordata*), fragrant water lily (*Nymphaea odorata*), torpedo grass (*Panicum repens*), water primrose (*Ludwigia* sp.), and alligator weed (*Alternanthera philoxeroides*). The eastern portion of the lake is contiguous with cypress-dominated wetlands of 0.5 or more acres in size, so the lake is classified as a Category 1 or 2 Lake for the purpose of minimum levels development. Because the Historic P50 elevation is more than 1.8 feet below the Normal Pool elevation, the lake is classified as a Category 2 Lake. Note that herein, for discussion purposes, the elevation 1.8 ft below the Normal Pool elevation is identified as the Cypress Standard. For Green Lake, this standard is established at 72.4 ft above NGVD. Based on the relationship between the Cypress Standard and the Historic P50 elevation, the proposed Minimum Lake Level was established at the Historic P50 elevation (72.1 ft

above NGVD). The proposed High Minimum Lake Level was established at 74.4 ft above NGVD, an elevation corresponding the High Guidance Level and the Historic P10. The proposed High Minimum Lake Level is 1.1 ft below the low spot on the roads encircling the lake, but only 0.8 ft below the floor slab of the lowest residential dwelling along the lakeshore.

Based on the difference between the proposed High Minimum Lake Level and the lowest floor slab elevation, a revised, proposed High Minimum Lake Level was established at 74.2 ft above NGVD, one foot below the lowest floor slab. The revised, proposed Minimum Lake Level was established at 71.9 ft above NGVD, an elevation corresponding to the revised, proposed High Minimum Lake Level minus the difference between the Historic P10 and Historic P50 elevations.

For comparative purposes, minimum level standards used for establishing Minimum Lake Level for lakes without fringing cypress wetlands (see Leeper *et al.* 2001) were developed for Green Lake (Table 2). The Dock-Use Standard was established at 74.9 ft above NGVD, based on the elevation of sediments at the end of 90% of the 19 docks at the lake (70.8 ft above NGVD, Table 5), a clearance value of 2 ft based on use of powerboats in the lake, and the difference between the Historic P50 and Historic P90 elevations (2.1 ft). The Aesthetic-Standard for the lake was established at the Low Guidance Level elevation of 70.0 ft above NGVD. The Species Richness Standard was established at 72.0 ft above NGVD, based on limiting change in lake surface area to less than a 15% reduction from the area at the Historic P50 elevation. The Recreation/Ski Standard was established at 73.1 ft above NGVD, based on the elevation at which the lake could contain an area suitable for safe skiing (71.0 ft above NGVD) and the difference between the Historic P50 and Historic P90 (2.1 ft). Based on basin morphology, a Mixing Standard for preventing potential resuspension of sediments and a Basin Connectivity Standard were not established. Review of changes in potential herbaceous wetland area associated with change in lake stage did not indicate that use of any of the identified standards would be inappropriate for minimum levels development (Figure 8).

Figure 5. Surface water elevation at Green Lake in Pasco County, Florida. Data through February 2003 are shown.

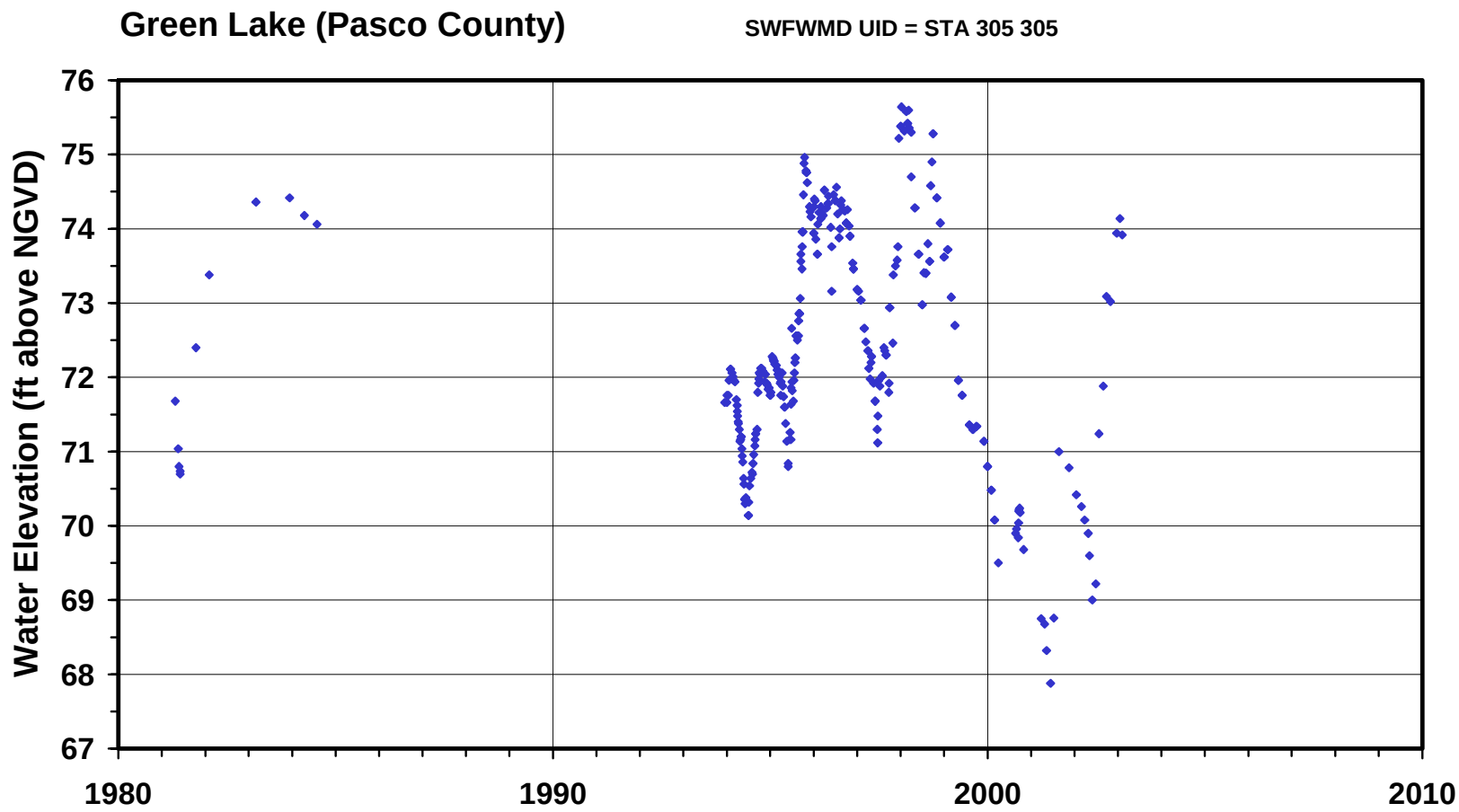


Figure 6. Mean monthly surface water elevation through February 2003, and proposed guidance and minimum levels for Green Lake in Pasco County, Florida. Proposed levels include the Ten Year Flood Guidance Level (10-YR), High Guidance Level (HGL), Low Guidance Level (LGL), High Minimum Lake Level (HMLL), and Minimum Lake Level (MLL).

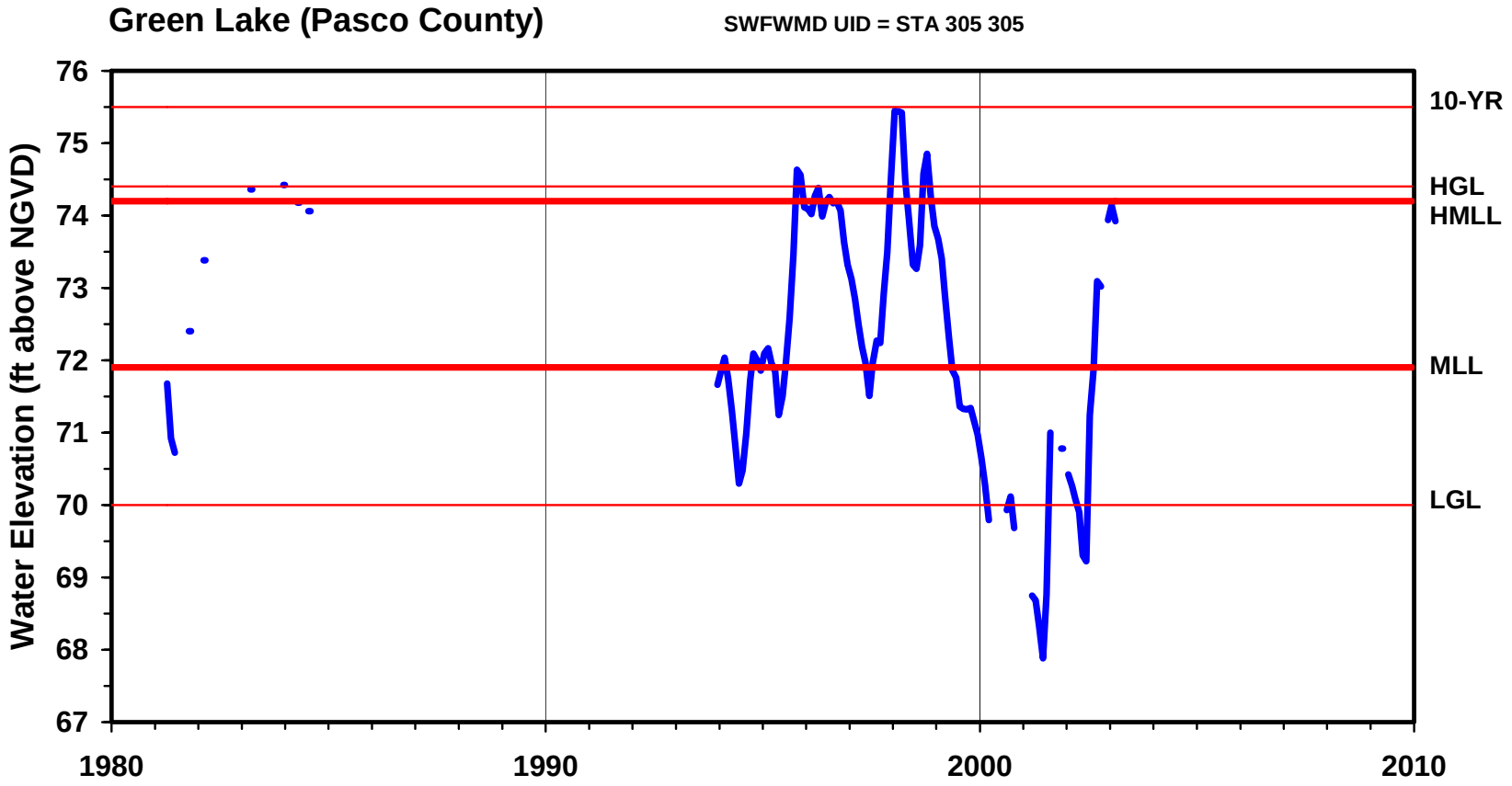


Table 2. Elevation data and associated area values used for establishing minimum levels for Green Lake in Pasco County, Florida.

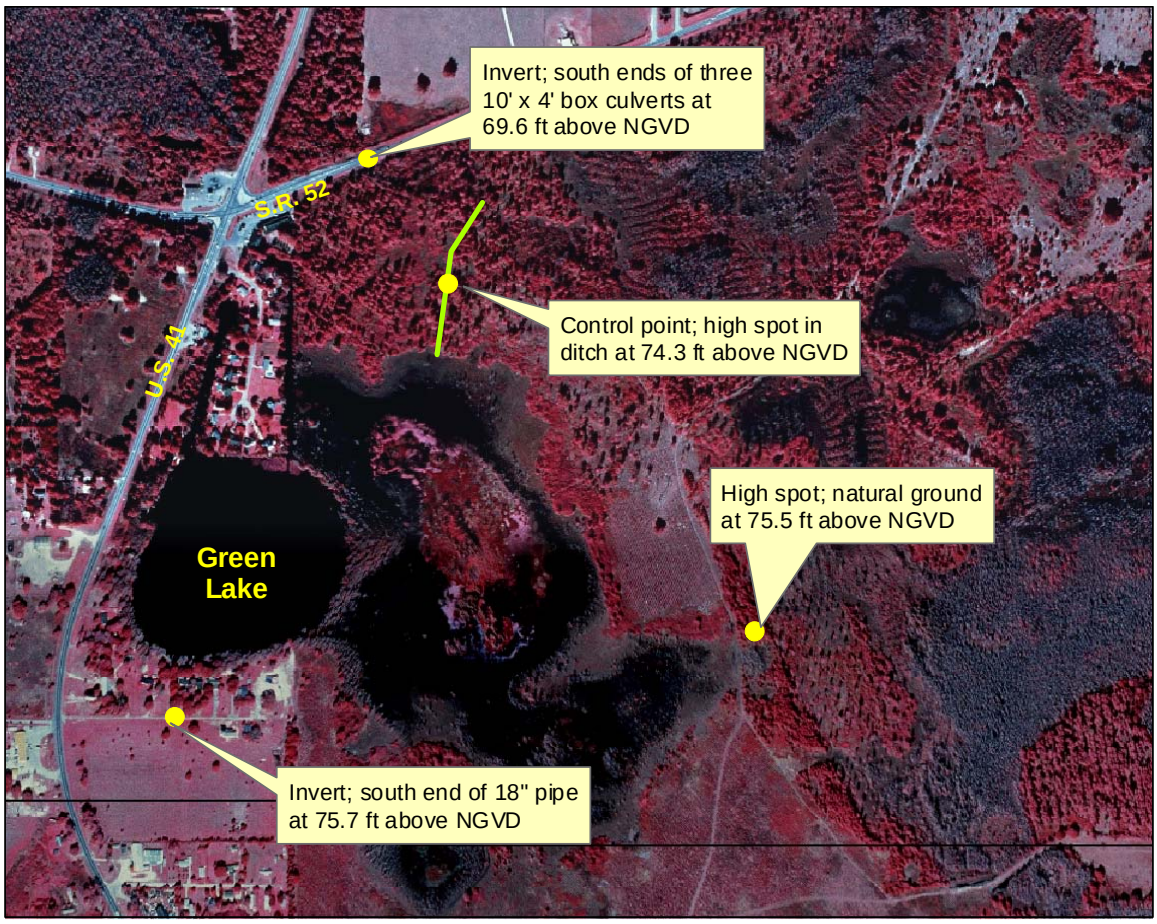
Level or Feature	Elevation (feet above NGVD)	Lake Area (acres)
Historic P10	74.37	NA
Historic P50	72.13	56
Historic P90	70.04	24
Normal Pool	74.2	NA
Low Floor Slab – 11030 Lakeshore Drive	75.2	NA
Low Road – South end of Lakeshore Drive, north shore	75.5	NA
Low Other - concrete slab for frame shed behind 11031 Lakeshore Drive, north shore	74.6	NA
Low Other - ground shot under pole barn, west shore	75.7	NA
Low Other – Patio behind residence at 11030 Lakeshore Drive	75.1	NA
Control Point	74.3	108
High Guidance Level	74.4	NA
Historic P50	72.1	56
Low Guidance Level	70.0	24
Cypress Standard	72.4	62
*Dock-Use Standard	74.9	NA
*Recreation/Ski Standard	73.1	92
*Species Richness Standard	72.0	54
*Aesthetic Standard	70.0	24
*Connectivity Standard	NA	NA
*Mixing Standard	NA	NA

NA = not applicable/not available
* = Established for comparative purposes only; not used for development of minimum levels

Table 3. Elevation data used for establishing the Normal Pool Elevation for Green Lake in Pasco County, Florida. Data were collected in August 2002 by SWFWMD staff.

Hydrologic Indicator	Elevation (feet above NGVD)
Cypress buttress inflection point	73.44
Cypress buttress inflection point	73.78
Cypress buttress inflection point	74.09
Cypress buttress inflection point	74.14
Cypress buttress inflection point	74.14
Cypress buttress inflection point	74.2
Cypress buttress inflection point	74.24
Cypress buttress inflection point	74.29
Cypress buttress inflection point	74.54
Cypress buttress inflection point	74.83
Cypress buttress inflection point	74.99
N	**11**
Median	**74.2**
Mean	**74.2**
Standard Deviation	**0.4**

Figure 7. Outlet conveyance system for Green Lake in Pasco County, Florida.



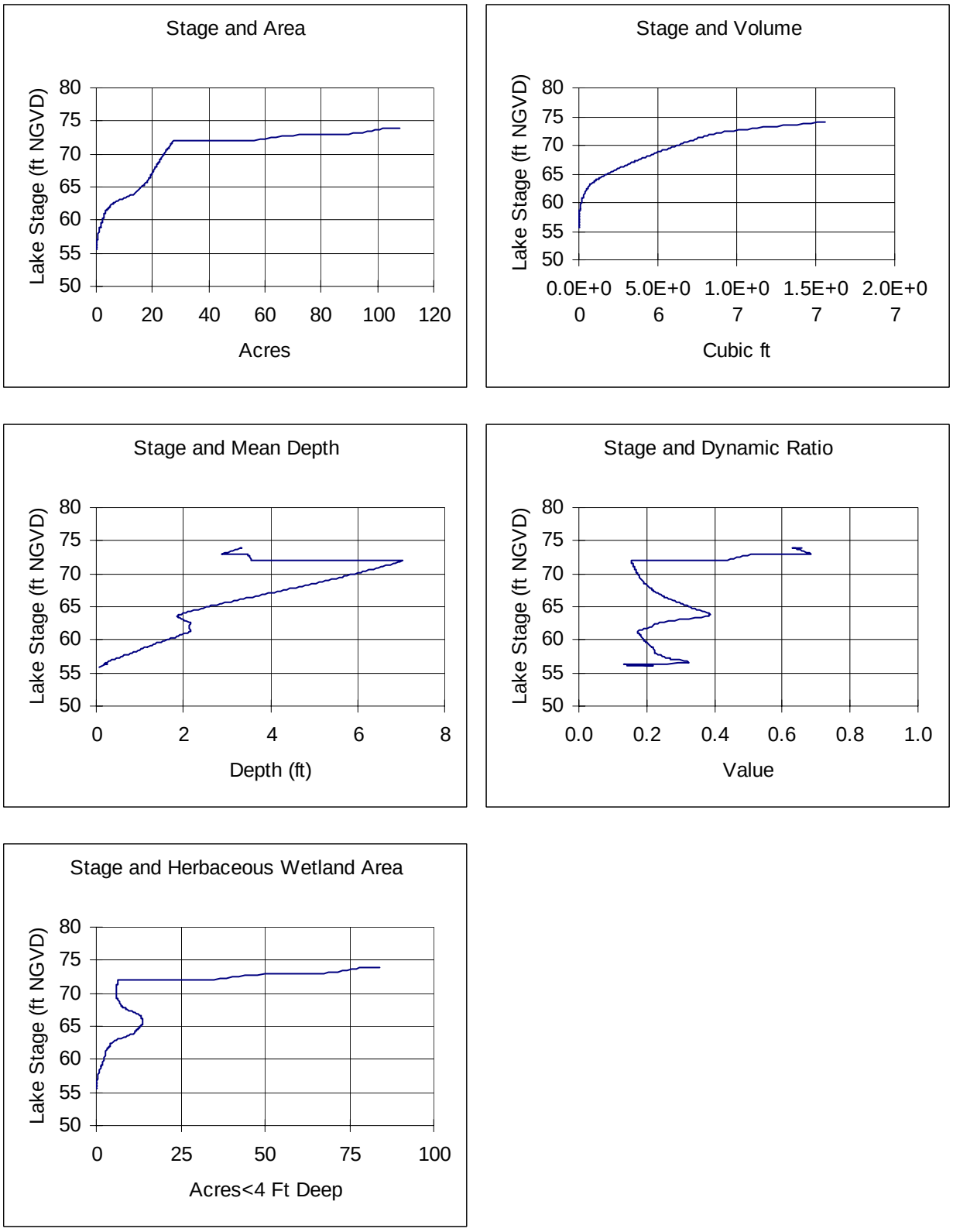
Aerial photography from 1999 USGS Digital Orhtophotograph.

Map prepared June 23, 2004.

Table 5. Summary statistics for elevations associated with docks (n=19) at Green Lake in Pasco County, Florida, based on data collected by SWFWMD staff on September 25, 2002. Percentiles (P10, P50, P90) represent elevations exceeded by 10, 50 and 90 percent of the docks.

Statistic	Elevation of Sediments at Dock Ends (feet above NGVD)	Elevation of Dock Platform (feet above NGVD)
Mean (SD)	69.8 (1.0)	75.5 (1.0)
P10	70.8	76.5
P50	69.9	75.4
P90	68.9	74.7
Maximum	71.4	77.5
Minimum	67.6	72.9

Figure 8. Surface area, volume, mean depth, dynamic ratio (basin slope), and potential versus lake stage for Green Lake in Pasco County, Florida.



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