

November 7, 2003

MEMORANDUM

TO: File

**FROM: Doug Leeper, Senior Environmental Scientist
Resource Conservation and Development Department
Southwest Florida Water Management District**

**SUBJECT: Proposed minimum and guidance levels for Spring Lake in
Hernando County, Florida**

Spring Lake

General Description

Spring Lake (Figure 1) is located in the Withlacoochee River Basin in Hernando County, Florida (Sections 10 and 15, Township 23S, Range 20E). The area surrounding the lake is categorized as the Dade City Hills subdivision of the Ocala Uplift Physiographic District (Brooks 1981). The subdivision is a "spectacular ridge of high hills dissected from Upper Miocene sand and silty sand". As part of the Florida Department of Environmental Protection's Lake Bioassessment/Regionalization Initiative, the area has been identified as the Southern Brooksville Ridge lake region. The region is an area of thick sand hills overlying limestone, with slightly colored, mostly neutral to alkaline (some are acidic), mesotrophic or meso-eutrophic lakes (Griffith *et al.* 1997).

The drainage area for Spring Lake is 0.3 square miles (Florida Board of Conservation 1969). The lake has no distinct inlets. Water can drain from the basin through a set of culverts along the lake's eastern shore (Figure 2). A road encircles the lake and uplands in the immediate lake basin are planted in citrus or used as pastures. There are no surface water withdrawals from the lake currently permitted by the District. There are, however, a few permitted groundwater withdrawals in the area.

The "Gazetteer of Florida Lakes" (Florida Board of Conservation 1969, Shafer *et al.* 1986) lists the lake area as 58 acres at an elevation of 186 ft above the National Geodetic Vertical Datum of 1929 (NGVD). The 1954 (photorevised 1988) United States Geological Survey 1:24,000 Spring Lake Fla. quadrangle map shows a surface water elevation of 186 ft above NGVD for the lake. Based on a topographic map of the basin generated in support of minimum levels development (Figure 3), the lake covers an area of 64 acres when the surface level is at 185 ft above NGVD. Data used for production of the topographic map were obtained from field surveys conducted in May

2002 and 1:200 aerial photograph maps containing one-foot contour lines prepared using photogrammetric methods.

Figure 1. Location of Spring Lake in Hernando County, Florida.

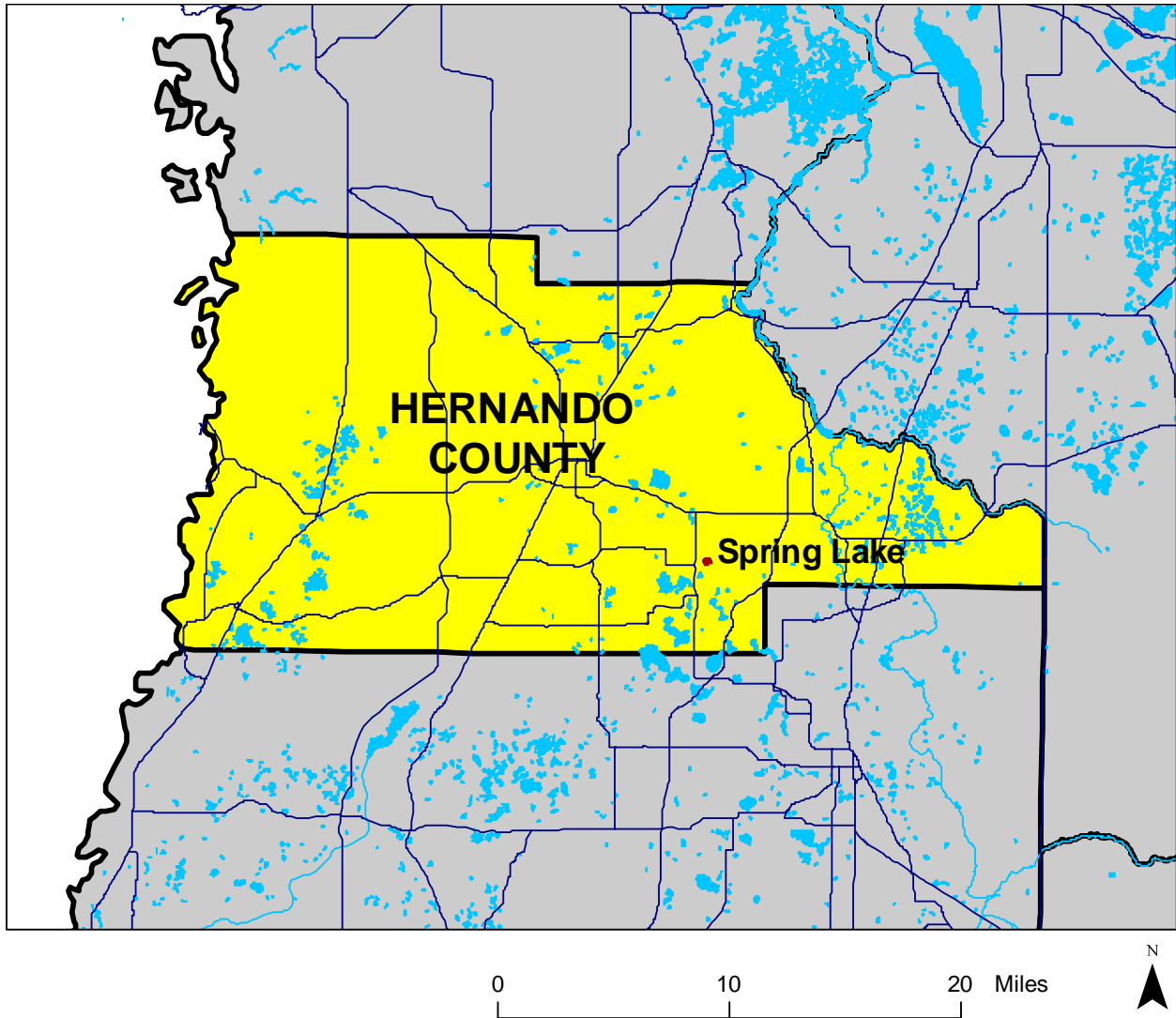


Figure 2. Location of District lake-level gauge and outlet at Spring Lake in Hernando County, Florida.



 Lake gauge

 Outlet

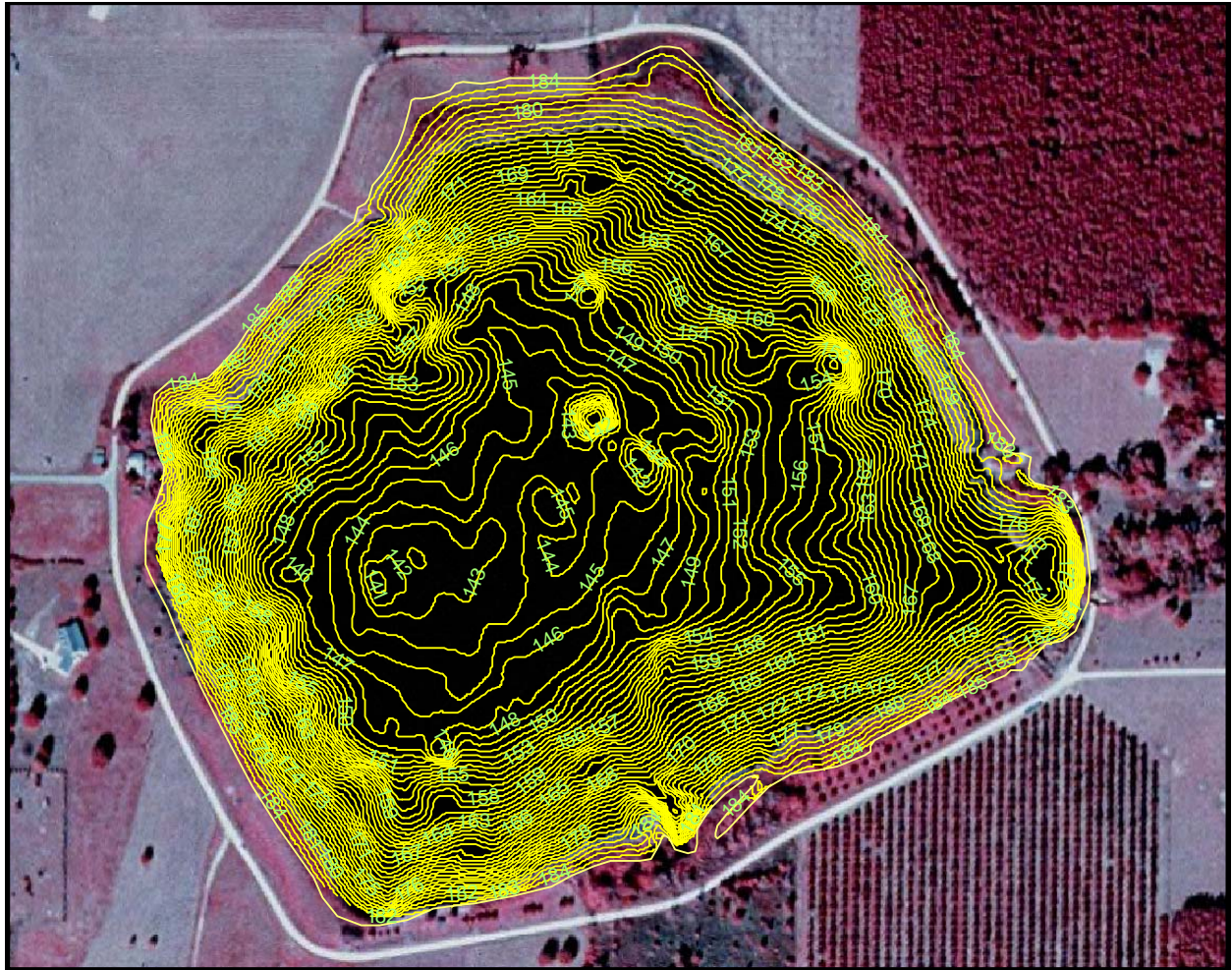
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Aerial photography from 1999 USGS
Digital Orthophotograph.

Map prepared September 23, 2003



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



Map prepared June 11, 2003 using 1999 USGS digital orthophotography, elevation data from 1987 SWFWMD aerial photography with contours maps (Sheet Nos. 10-23-20 and 15-23-20), and elevation data collected on May 6, 2002 by SWFWMD Staff.

0 250 500 750 Feet



Previously Adopted Lake Management Levels

Based on work conducted in the 1980s (see SWFWMD 1996), the District Governing Board adopted management levels (currently referred to as Guidance Levels) for Spring Lake in February 1986 (Table 1). A Maximum Desirable Level of 183.25 ft above NGVD was also developed, but was not adopted by the Governing Board.

Table 1. Adopted guidance levels and associated surface areas for Spring Lake in Hernando County, Florida.

Level	Elevation (feet above NGVD)	Total Lake Area (acres)
Ten Year Flood Guidance Level	185.02	64
High Level	184.25	63
Low Level	181.25	59
Extreme Low Level	178.25	54

Proposed Minimum and Guidance Levels

Proposed Minimum and Guidance Levels were developed for Spring Lake using the methodology for Category 3 Lakes described 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 2. Contour lines corresponding the proposed minimum level elevations are shown within the basin in Figure 4.

Table 2. Proposed minimum levels, guidance levels and associated surface areas for Spring Lake in Hernando County, Florida.

Level	Elevation (feet above NGVD)	Lake Area (acres)
Ten Year Flood Guidance Level	183.3	62
High Guidance Level	181.6	59
High Minimum Lake Level	180.1	57
Minimum Lake Level	179.0	55
Low Guidance Level	179.0	55

Figure 4. Approximate location of the proposed Minimum Lake Level (yellow) and proposed High Minimum Lake Level (blue) for Spring Lake in Hernando County, Florida. Elevations of contours are in feet above the National Geodetic Vertical Datum of 1929.



Map prepared September 22, 2003 using 1999 USGS digital orthophotography, elevation data from 1987 SWFWMD aerial photography with contours maps (Sheet Nos. 10-23-20 and 15-23-20), and elevation data collected on May 6, 2002 by SWFWMD Staff.

0 250 500 750 Feet



Legend

Contour

— 179.0 ft above NGVD

— 180.1 ft above NGVD

Summary of Data and Analyses Supporting Recommended Minimum and Guidance Levels

Hydrologic data are available for Spring Lake (District Universal ID Number STA 175 175) from February 1965 through June 1966, for a few dates in the 1980s, and from June 1990 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 period of record from October 1988 through the present date, the hydrologic data are classified as Historic data. Data collected prior to this time are not suitable for classification as Historic data, because the outlet invert was raised in August or September 1988 following failure of the then existing structure. Historic data collected through January 2003 were used to calculate the Historic P10, P50, and P90 (Table 3).

The Category 3 Lake Normal Pool elevation was established at 185 ft above NGVD based on the elevation estimates for citrus trees derived from review of aerial photography with contours maps Table 4). The low floor slab elevation, extent of structural alteration and control point elevation (181.0 ft above NGVD) were determined using available one-foot contour interval aerial maps and field survey data (Table 3, Figure 7). The Category 3 Lake Normal Pool elevation is above the control point, so the lake is 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 181.6 ft above NGVD (Table 3). The Historic P50 (180.5 ft above NGVD) and Low Guidance Level (179.0 ft above NGVD) were determined using the Historic P50 and Historic P90 elevations.

The Ten Year Flood Guidance Level for Spring Lake was established at 183.3 ft NGVD using the methodology for open basin lakes described in current District Rules (Chapter 40D-8, Florida Administrative Code). A hydrologic and hydraulic computer model "NETWORK", developed by the SWFWMD, was used. The Spring Lake hydrographs were computed using the NRCS Dimensionless Unit Hydrograph, a 256 shape factor, an 11.0 inch rainfall depth, and a 120 hour rainfall duration. The initial elevation of Spring Lake was set at the outlet control point elevation of 181.00.

The Ten Year Flood Guidance Level has been exceeded a few times during the period for which lake stage data are available (see Figure 6). The highest surface elevation for Spring Lake included in the District Water Management Database, 183.57 ft above NGVD, occurred on October 10, 1984. The low of record, 174.85 ft above NGVD, occurred on June 8, 1965.

Spring Lake contains extensive, diverse stands of aquatic macrophytes and other hydrophytes, including cattail (*Typha* sp.), panic grass (*Panicum* sp.), pennywort (*Hydrocotyle umbellata*), arrowhead (*Sagittaria* sp.) and wax myrtle (*Myrica cerifera*). The lake is not, however, contiguous with cypress-dominated wetlands of 0.5 or more acres in size, so it is classified as a Category 3 Lake for the purpose of minimum levels

development.

Aesthetics, Species Richness and Recreation/Ski Standards were evaluated for minimum levels development (Table 3). The Aesthetic-Standard for the lake was established at the Low Guidance Level elevation of 179.0 ft above NGVD. The Species Richness Standard was established at 174.2 ft above NGVD, based on a 15% reduction in lake surface area from that at the Historic P50 elevation. The Recreation/Ski Standard was established at 159.5 ft above NGVD, based on a critical ski elevation of 158 ft above NGVD and the difference between the Historic P50 and Historic P90 (1.5 ft). A Dock-Use Standard was not established for the lake since only floating docks were observed during a site visit in May 2002. Based on basin morphology, Basin Connectivity and Mixing Standards were not established. Review of changes in potential herbaceous wetland area associated with change in lake stage, and potential change in area available for aquatic macrophyte colonization did not indicate that use of any of the identified standards would be inappropriate for minimum levels development (Figure 7).

All appropriate standards for Spring Lake occur at elevation lower than the Historic P50 elevation. The Aesthetics Standard, the most conservative (*i.e.*, the highest) of the standards, was used to establish the proposed Minimum Lake Level at 179.0 ft above NGVD. The proposed High Minimum Lake Level was established at 180.1 ft above NGVD, an elevation corresponding to the Minimum Lake Level plus the difference between the Historic P10 and the Historic P50 (1.1 ft). The proposed High Minimum Lake Level is 14.2 ft below the Low Floor Slab elevation and 8.4 ft below the low spot in the road that encircles the lake.

Figure 5. Surface water elevation at Spring Lake in Hernando County, Florida. Data through January 2003 are shown.

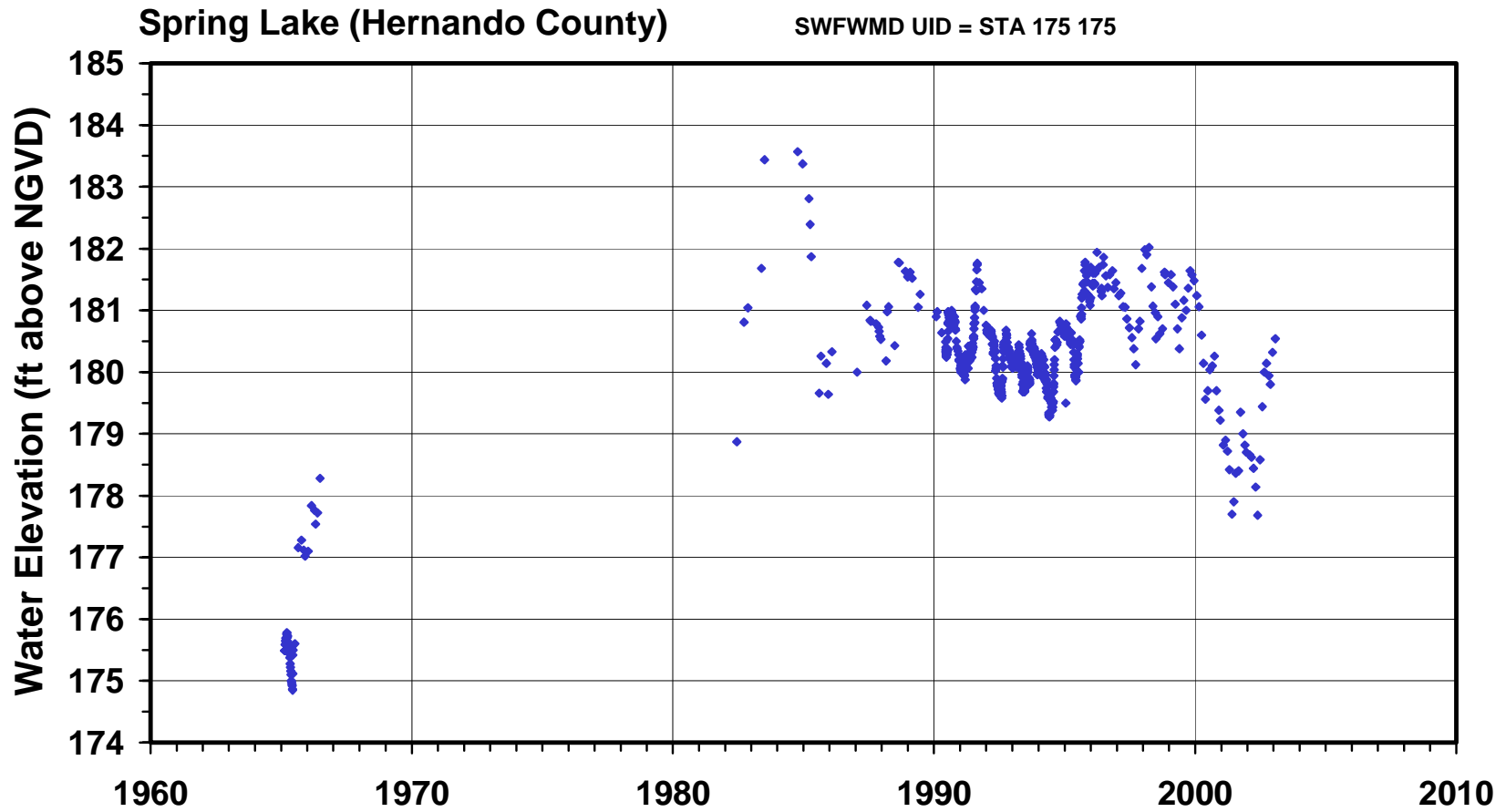


Figure 6. Mean monthly surface water elevation, and proposed guidance and minimum levels for Spring Lake in Hernando County, Florida. Proposed levels include the Ten Year Flood Guidance Level (10-YR), High Guidance Level (HGL), Low Guidance Level (LGL), High Minimum Lake Level (HMLL), and Minimum Lake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

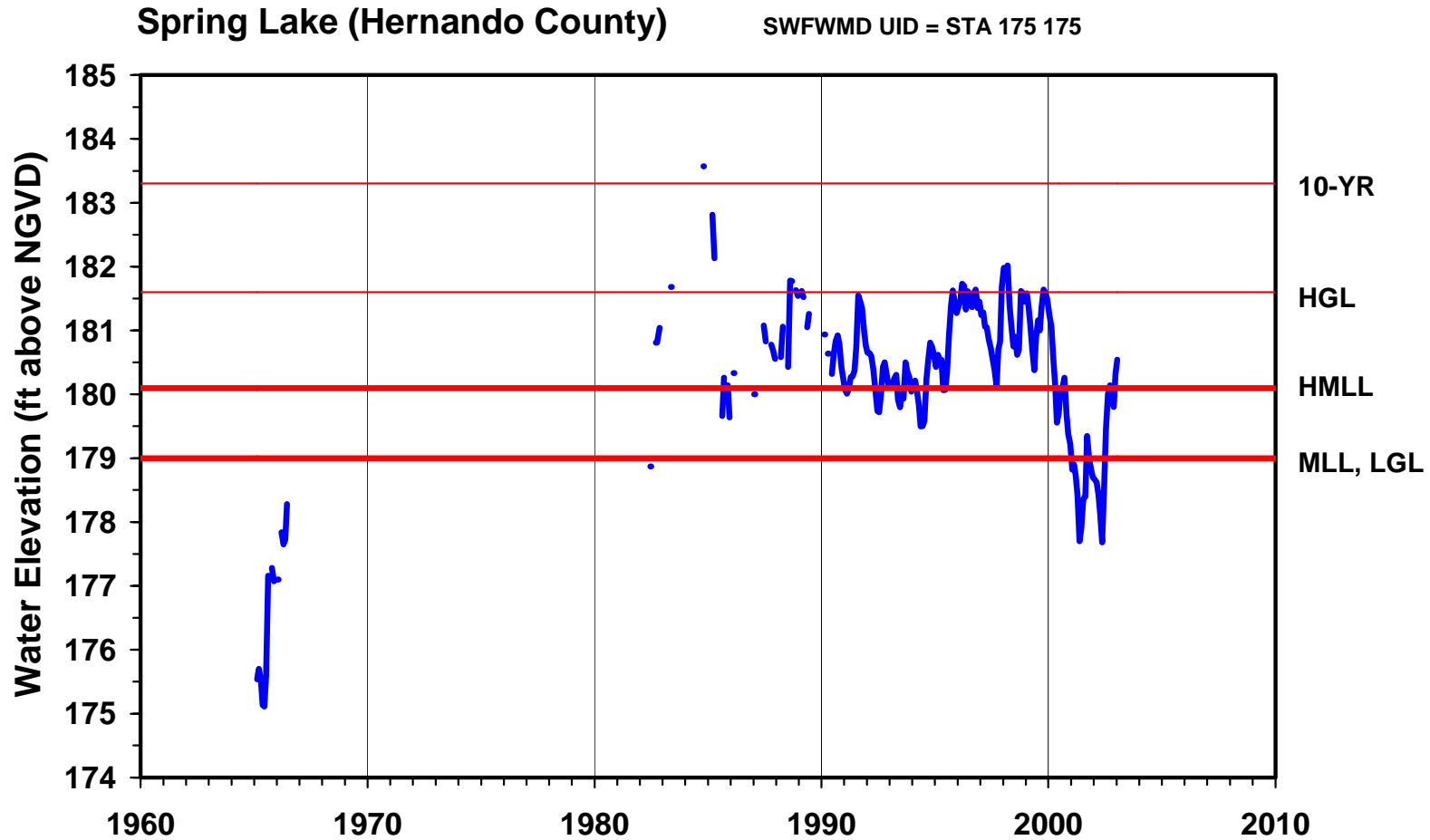


Table 3. Elevation data and associated area values used for establishing minimum levels for Spring Lake in Hernando County, Florida.

Level or Feature	Elevation (feet above NGVD)	Lake Area (acres)
Historic P10	181.58	59
Historic P50	180.53	57
Historic P90	178.99	55
Category 3 Lake Normal Pool	185	64
Low Floor Slab	194.28	NA
Low Road	188.52	NA
Control Point	181.00	58
High Guidance Level	181.6	59
Historic P50	180.5	57
Low Guidance Level	179.0	55
Aesthetic Standard	179.0	55
Species Richness Standard	174.2	49
Recreation/Ski Standard	159.5	30
Basin Connectivity Standard	NA	NA
Dock-Use Standard	NA	NA
Mixing Standard	NA	NA

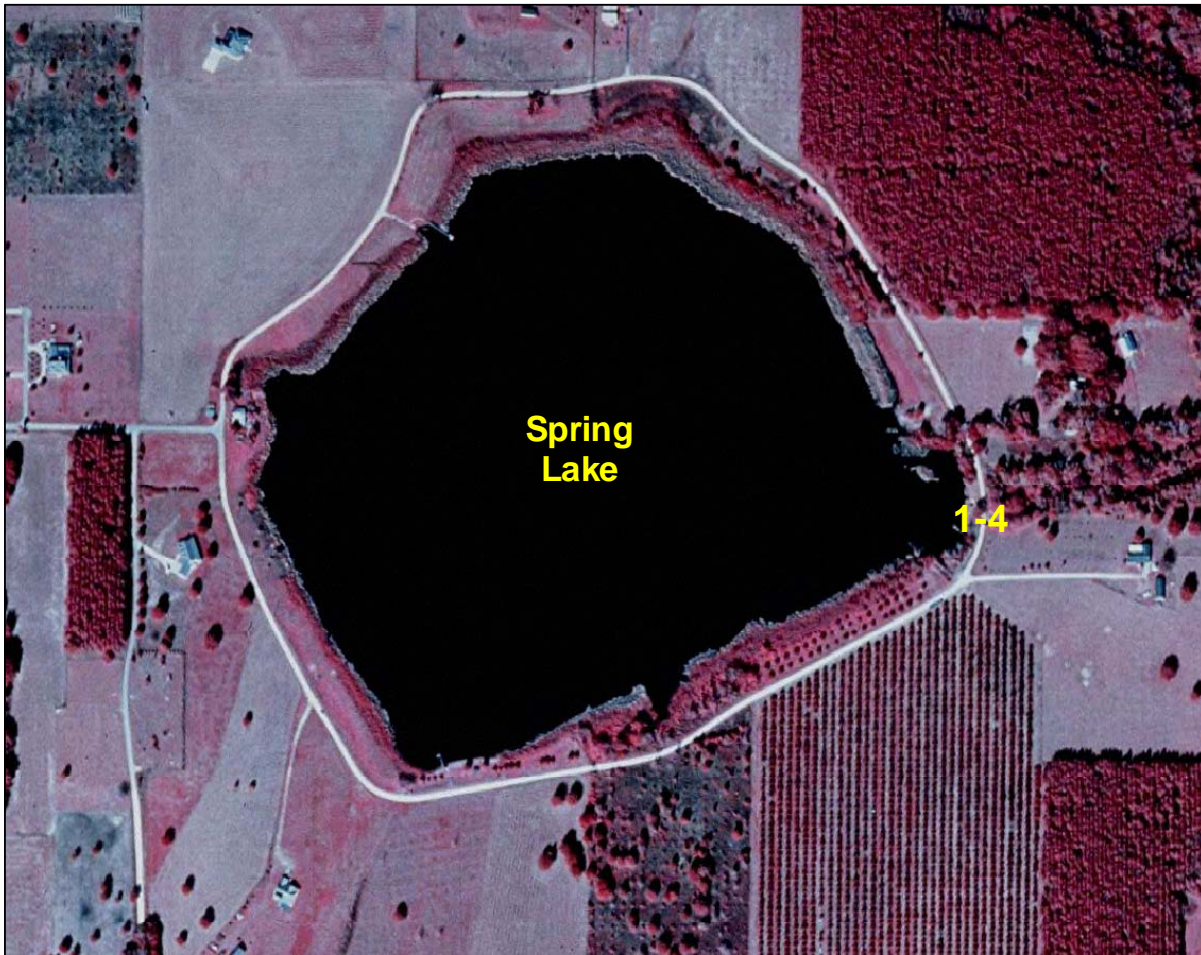
NA = not available/applicable

Table 4. Elevation data used for establishing the Category 3 Lake Normal Pool Elevation for Spring Lake in Hernando County, Florida. Data base on review of SWFWMD aerial photography with one-foot contours and field observations conducted by SWFWMD staff in May 2002.

Hydrologic Indicator	Elevation (feet above NGVD)
Base of citrus trees	~185
N	NA
Median	NA
Mean	NA
Standard Deviation	NA

NA = not applicable

Figure 7. Outlet conveyance system for Spring Lake in Hernando County, Florida.



Aerial photography from 1999 USGS
Digital Orthophotograph.

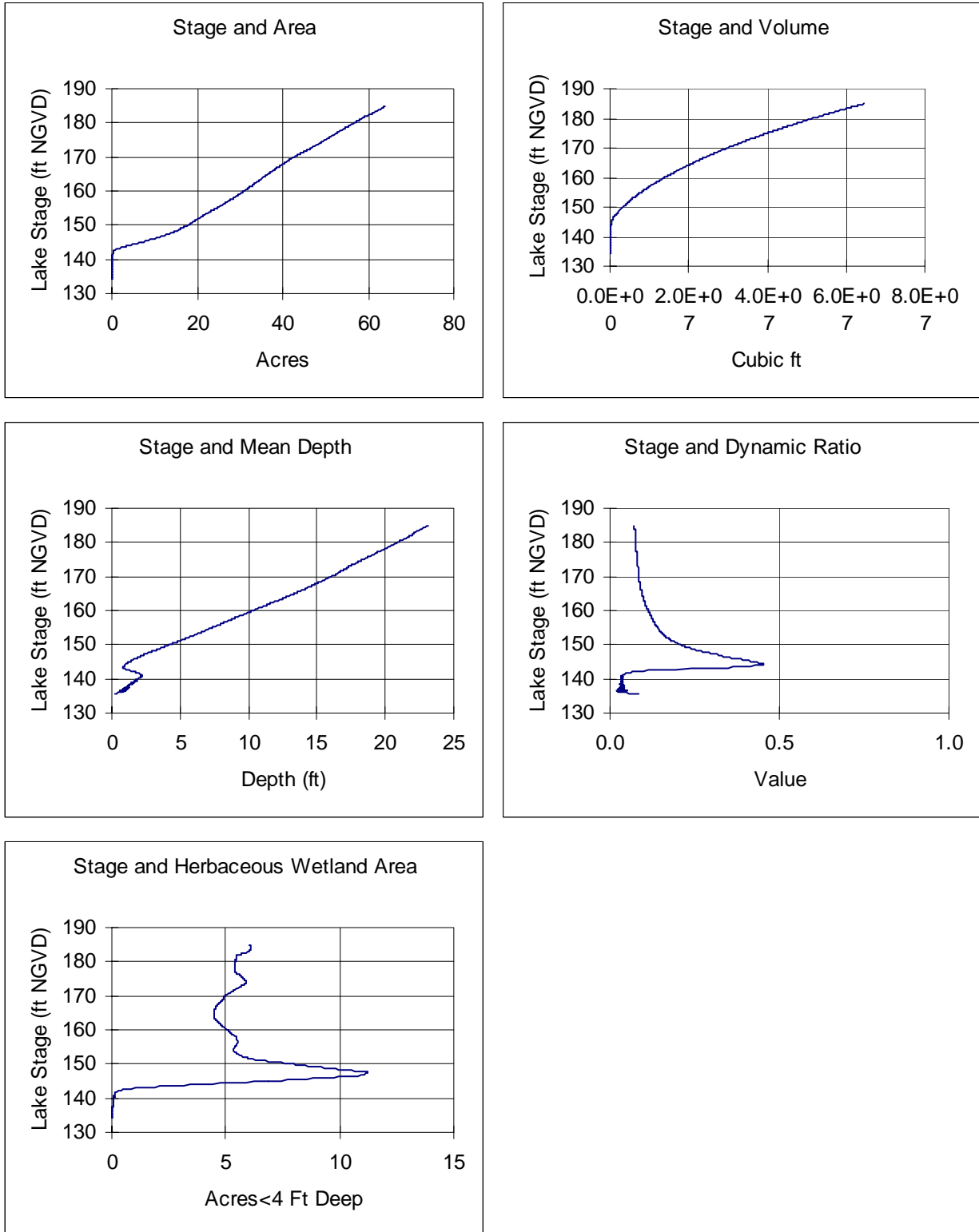
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Map prepared June 10, 2003

Site	Description	Elevation (feet above NGVD)
1	Control point; invert at west end of 64-ft long, 36-inch diameter corrugated metal pipe	181.00
2	Invert at east end of 64-ft long, 36-inch diameter corrugated metal pipe	179.52
3	Invert at west end of 100-ft long, 24-inch diameter corrugated metal pipe	181.80
4	Invert at east end of 100-ft long, 24-inch diameter corrugated metal pipe	179.36

Figure 8. Surface area, volume, mean depth, dynamic ratio, potential herbaceous wetland area, and area available for macrophyte colonization versus lake stage for Spring Lake in Hernando County, Florida.



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

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