

April 23, 2004

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 Garden Lake in
Hillsborough County, Florida

Garden Lake

General Description

Garden Lake (Figure 1) is located in the Northwest Hillsborough Basin of the Southwest Florida Water Management District (SWFWMD or District) in Hillsborough County, Florida (Sections 17 and 18, Township 27S, Range 17E). White (1970) classified the area of west-central Florida containing Garden Lake as the Northern Gulf Coastal Lowlands physiographic region. Brooks (1981) characterized the area surrounding the lake as the Odessa Flats subdivision of the Tampa Plain in the Ocala Uplift Physiographic District, and described the subdivision as a poorly dissected low sandy plain overlying Tampa Limestone. As part of the Florida Department of Environmental Protection's Lake Bioassessment/Regionalization Initiative, the area has been identified as the Keystone Lakes region, and described as well-drained, sandy upland with numerous slightly acidic, clear-water lakes with low nutrient levels (Griffith *et al.* 1997).

Public roads (Garden Lake Circle and Boy Scout Road) encircle the lake, and the surrounding uplands are used for residential development, citrus production and livestock grazing (Figure 2). There are no public boat ramps or other public access sites along the shoreline.

The lake is located in the Brooker Creek Watershed. Inlets include a ditch along the northeast shore of the lake that is used to convey groundwater for augmentation of lake water levels. Augmentation of Garden Lake, along with two other nearby lakes, Sunset Lake and Lake Jackson, has been conducted by Pinellas Count Utilities since October 1976 (Biological Research Associates, Inc. 1982, 1996). Water used for augmenting the lakes is pumped from the Floridan aquifer at a site located just north of Tarpon Springs Road and east of Burrell Road. An outlet along the south shore of the lake provides for conveyance under Garden Lake Circle to a wetlands system. A second outlet, occurring

at a higher elevation is located along the southeast shore of the lake. There are no surface water withdrawals from the lake currently permitted by the District. There are, however, numerous permitted groundwater withdrawals in the area, including major withdrawals associated with the Eldridge-Wilde Wellfield facility, which has been in operation since 1956.

Garden Lake is shown on the 1974 United States Geological Survey 1:24,000 Elfers quadrangle map, but an elevation for the lake surface is not provided. The "Gazetteer of Florida Lakes" (Florida Board of Conservation 1969) includes Garden Lake as "Unnamed Lake – Thomas Lake" and lists the lake area at 13 acres at an elevation of 30 ft above mean sea level. A topographic map of the basin generated in support of minimum levels development (Figure 3) indicates that the lake would extend over 11 acres if the water surface were at 30 ft above NGVD. Data used for production of the topographic map were obtained from field surveys and aerial photography maps containing one-foot contour lines prepared using photogrammetric methods.

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

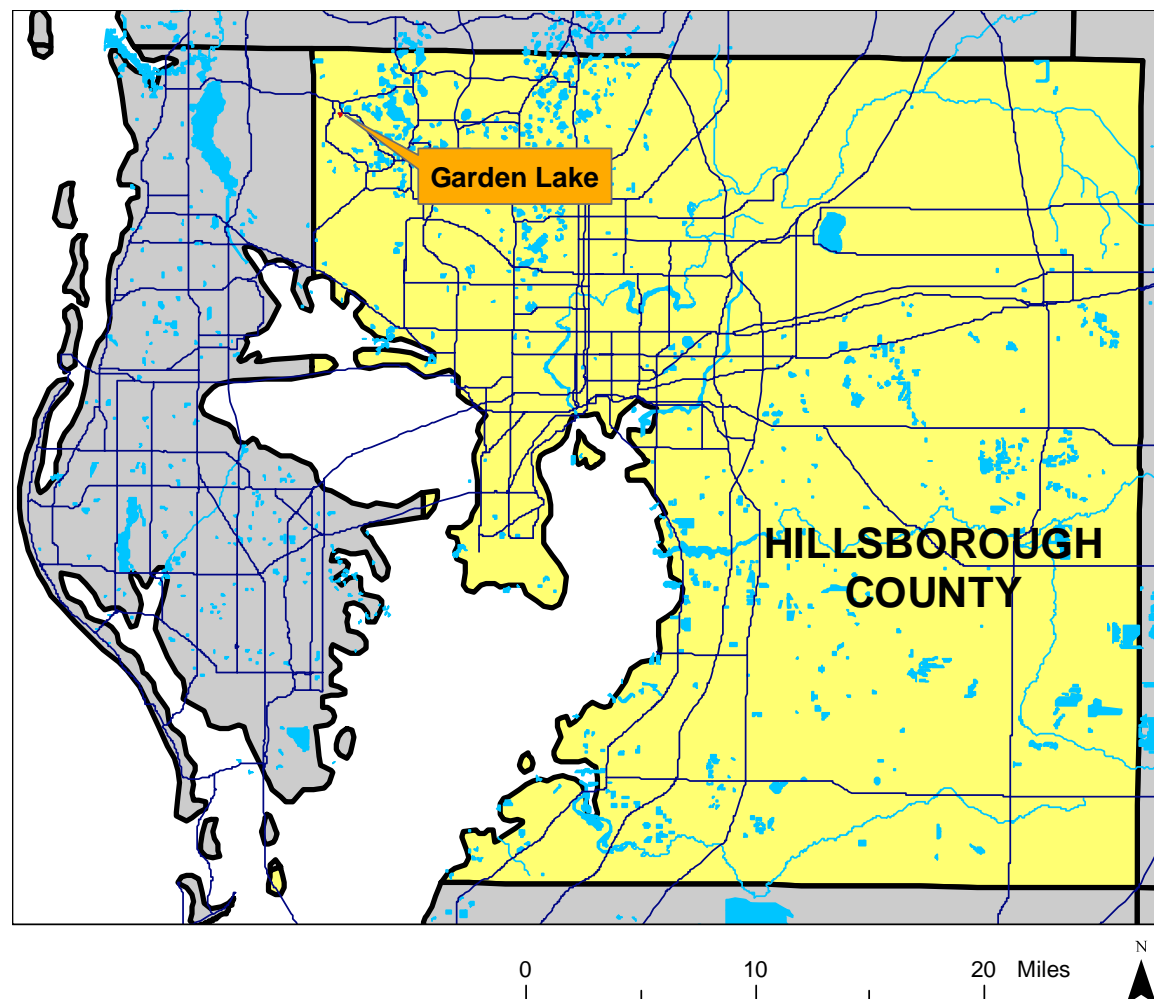
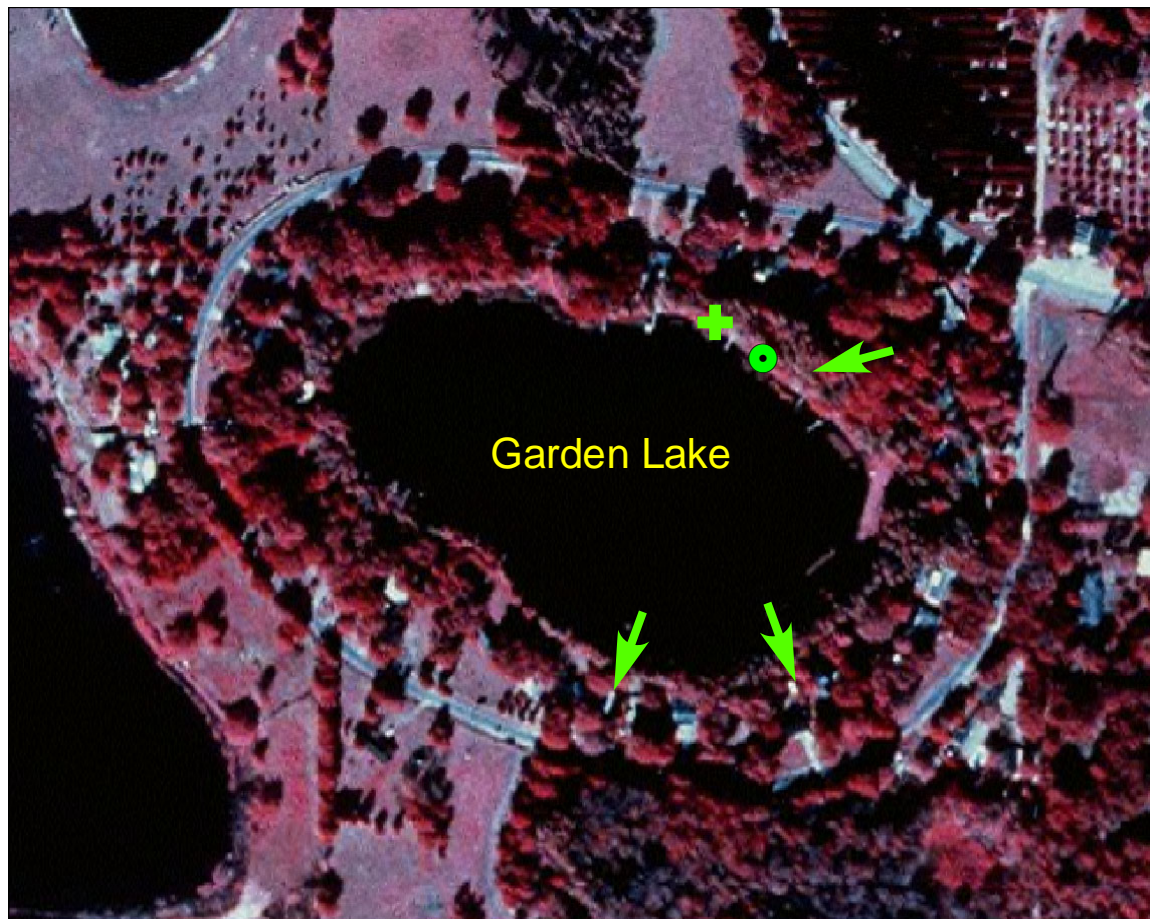





Figure 2. Location of District lake-level gauge, inlet, outlets and site where hydrologic indicators were measured at Garden Lake in Hillsborough County, Florida.



-  Lake gauge
-  Inlets/Outlets
-  Hydrologic Indicators

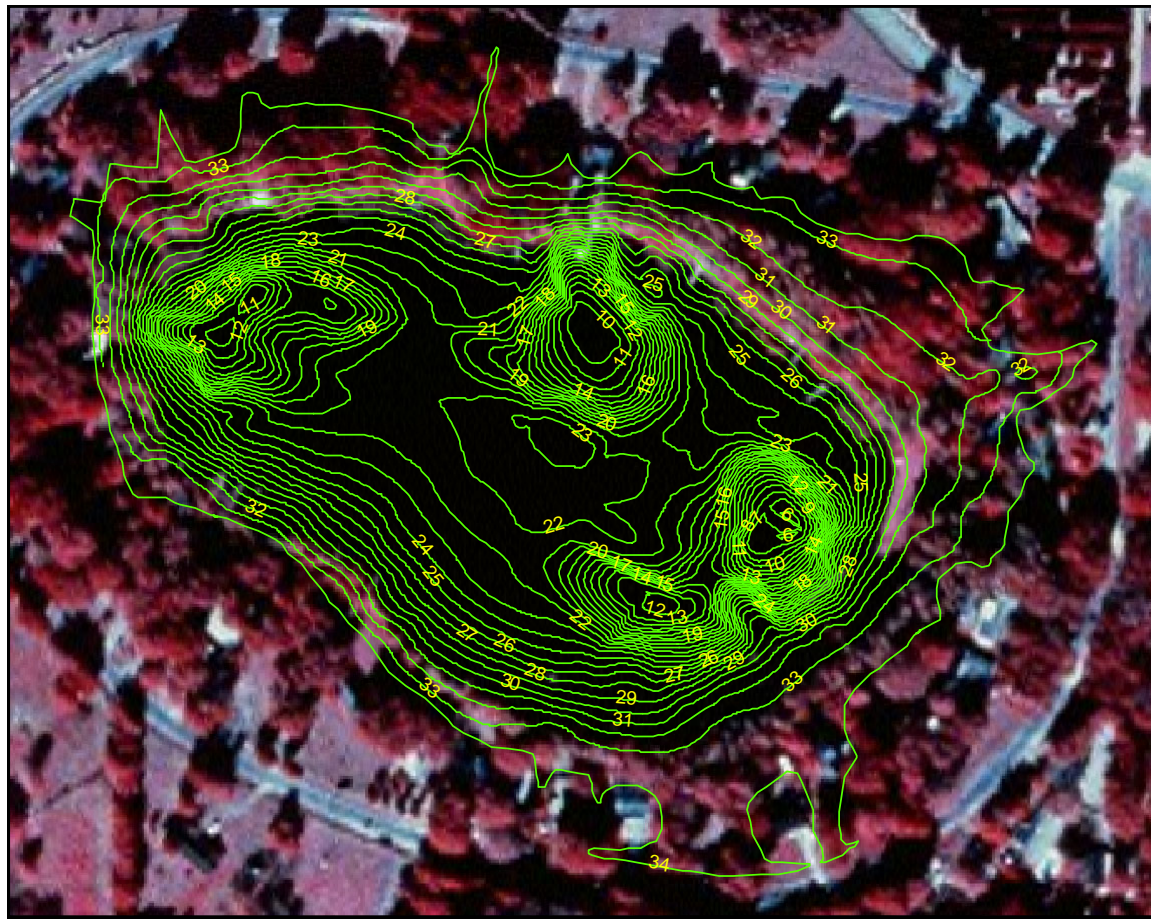
0 250 500 Feet

Aerial photography from 1999 USGS
Digital Orthophotograph.

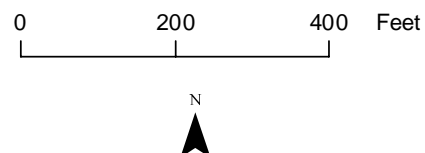
Map prepared August 25, 2003



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



Map prepared August 25, 2003 using 1999 USGS digital orthophotography, one-foot contour data from 1989 SWFWMD aerial photography maps (Sheet Nos. 17-27-17 and 18-27-17), and elevation data collected by Hillsborough County Stormwater Section staff on July 26, 1999.



Previously Adopted Lake Management Levels

Based on work conducted in the 1970s (see SWFWMD 1996), the District Governing Board adopted management levels (currently referred to as Guidance Levels) for Garden Lake in September 1980 (Table 1). A Maximum Desirable Level of 31.00 ft above NGVD was also developed, but was not adopted by the Governing Board.

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

Level	Elevation (feet above NGVD)	Lake Area (acres)
Ten Year Flood Guidance Level	35.00	NA
High Level	32.00	13.5
Low Level	29.00	10.4
Extreme Low Level	26.50	8.8

NA = not available

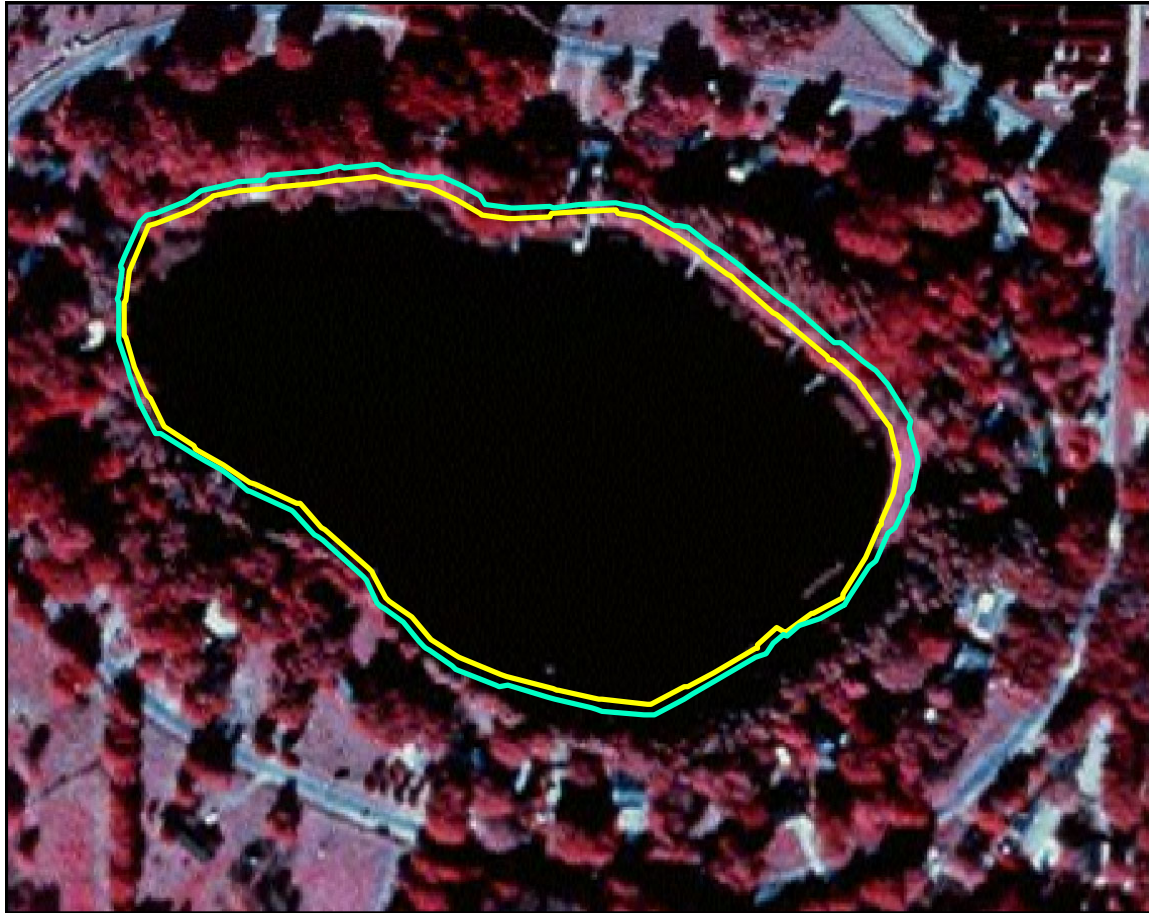
Proposed Minimum and Guidance Levels

Proposed Minimum and Guidance Levels were developed for Garden Lake using the methodology for Category 3 Lakes described in current District rules (Chapter 40D-8, Florida Administrative Code). Proposed levels, along with lake surface area values for each level are listed in Table 2. Locations of the proposed minimum levels within the lake basin are shown in Figure 4.

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

Level	Elevation (feet above NGVD)	Lake Area (acres)
Ten Year Flood Guidance Level	33.9	17.5
High Guidance Level	31.5	12.8
High Minimum Lake Level	30.5	11.6
Minimum Lake Level	29.5	10.7
Low Guidance Level	29.4	10.6

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



Map prepared August 25, 2003 using 1999 USGS digital orthophotography, one-foot contour data from 1989 SWFWMD aerial photography maps (Sheet Nos. 17-27-17 and 18-27-17), and elevation data collected by Hillsborough County Stormwater Section staff on July 26, 1999.

0 200 400 Feet



garden_min_levels

Contour

- 29.5 ft above NGVD
- 30.5 ft above NGVD

Summary of Data and Analyses Supporting Recommended Minimum and Guidance Levels

Hydrologic data are available from the District Water Management Database for Garden Lake (District Universal ID Number STA 219 219) from May 1977 through the present date (Figure 5, see Figure 2 for current location of the SWFWMD lake-level gauge). The hydrologic data record is not continuous; *i.e.*, there are some months during the period of record when water level data were not recorded. Monthly mean water surface elevations, along with proposed guidance and minimum levels are graphed in Figure 6. Historic hydrologic data are not available. For the entire period of record, the hydrologic data are classified as Current data. Current data collected through January 2003 were used to calculate the Current P10, P50, and P90 (Table 3).

The Normal Pool elevation was established at 32.2 ft above NGVD based on elevations associated with the buttressing of cypress (*Taxodium* sp.) trees along the north shore of the lake (Table 4, Figure 2). The low floor slab elevation, extent of structural alteration and the control point elevation were determined using available one-foot contour interval aerial maps and field survey data collected in July 2003 (Table 3). The control point elevation was established at 31.5 ft above NGVD, based on the ground elevation in a ditch south of a culvert located under Garden Lake Circle (Figure 7). The Normal Pool elevation is higher than the control point elevation so the lake is considered to be Structurally Altered.

Based on the relative elevations of the control point, the Normal Pool and the Current P10, the High Guidance Level was established at the Control Point elevation of 31.5 ft above NGVD (Table 3). The Historic P50 and Low Guidance Level were established at 30.5 and 29.4 ft above NGVD, respectively, using the High Guidance Level and the Northern Tampa Bay Region RLWR50 (1.0 ft) and RLWR90 (2.1 ft) statistics (see SWFWMD 1999 for a discussion of the reference lake water regime statistics).

The Ten Year Flood Guidance Level for Garden Lake was established at 33.9 ft above NGVD using the methodology for open basin lakes described in current District Rules (Chapter 40D-8, Florida Administrative Code). For the analysis, Hillsborough County's modified version of the Environmental Protection Agency's Stormwater Management Model (SWMM), version 4.31C (Hillsborough County 2000) 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 stage data, the lake surface last exceeded the Ten Year Flood Guidance Level in the late 1980s. The highest surface elevation for Garden Lake included in the District water management database, 33.74 ft above NGVD, occurred on September 23, 1988. The low of record, 24.05 ft above NGVD, occurred on July 26, 1977

Garden Lake contains diverse stands of aquatic macrophytes and other hydrophytes, including southern naiad (*Najas guadelupensis*), torpedograss (*Panicum repens*), pennywort (*Hydrocotyle umbellata*), muskgrass (*Chara* sp.), hydrilla (*Hydrilla verticillata*), and primrose willow (*Ludwigia* sp.). The lake is not contiguous with a

cypress-dominated wetland greater than 0.5 acre in size, so it is classified as a Category 3 Lake for the purpose of minimum levels development.

Dock-Use, Aesthetics, Species Richness, and Basin Connectivity Standards were evaluated for minimum levels development (Table 3). The Dock-Use Standard was established at 29.5 ft above NGVD, based on the elevation of sediments at the end of 90% of the 10 docks at the lake (26.4 ft above NGVD, Table 5), a clearance value of two-feet based on use of powerboats in the lake, and the Reference Lake Water Regime 5090 for the northern Tampa Bay area (1.1 ft). The Aesthetic-Standard for the lake was established at the Low Guidance Level elevation of 29.4 ft above NGVD. The Species Richness Standard was established at 28.2 ft above NGVD, based on limiting reduction in lake surface area to less than a 15% decrease in the area at the Historic P50 elevation. The Connectivity Standard was established at 25.1 ft above NGVD, based on the elevation that ensures connectivity among the three major sub-basins of the lake (22 ft), a two-foot clearance value for use of powerboats on the lake, and the northern Tampa Bay area Reference Lake Water Regime 5090 (1.1 ft). Mixing and Recreation/Ski Standards were not developed, based on the small size and morphology of the lake basin. 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 8).

All appropriate standards for Garden Lake are lower than the Historic P50 elevation. The Dock-Use Standard, the most conservative (*i.e.*, the highest) of the standards was used to establish the Minimum Lake Level at 29.5 ft above NGVD. The proposed High Minimum Lake Level was established at 30.5 ft above NGVD, an elevation corresponding to the Minimum Lake Level plus the Reference Lake Water Regime 50 for the northern Tampa Bay area (1.0 ft). The proposed High Minimum Lake Level is 4.5 ft below the Low Floor Slab elevation, 4.4 ft below the lowest spot in the roads located in the immediate lake basin, and 3.4 ft below a carport located on a lakeshore residential lot.

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

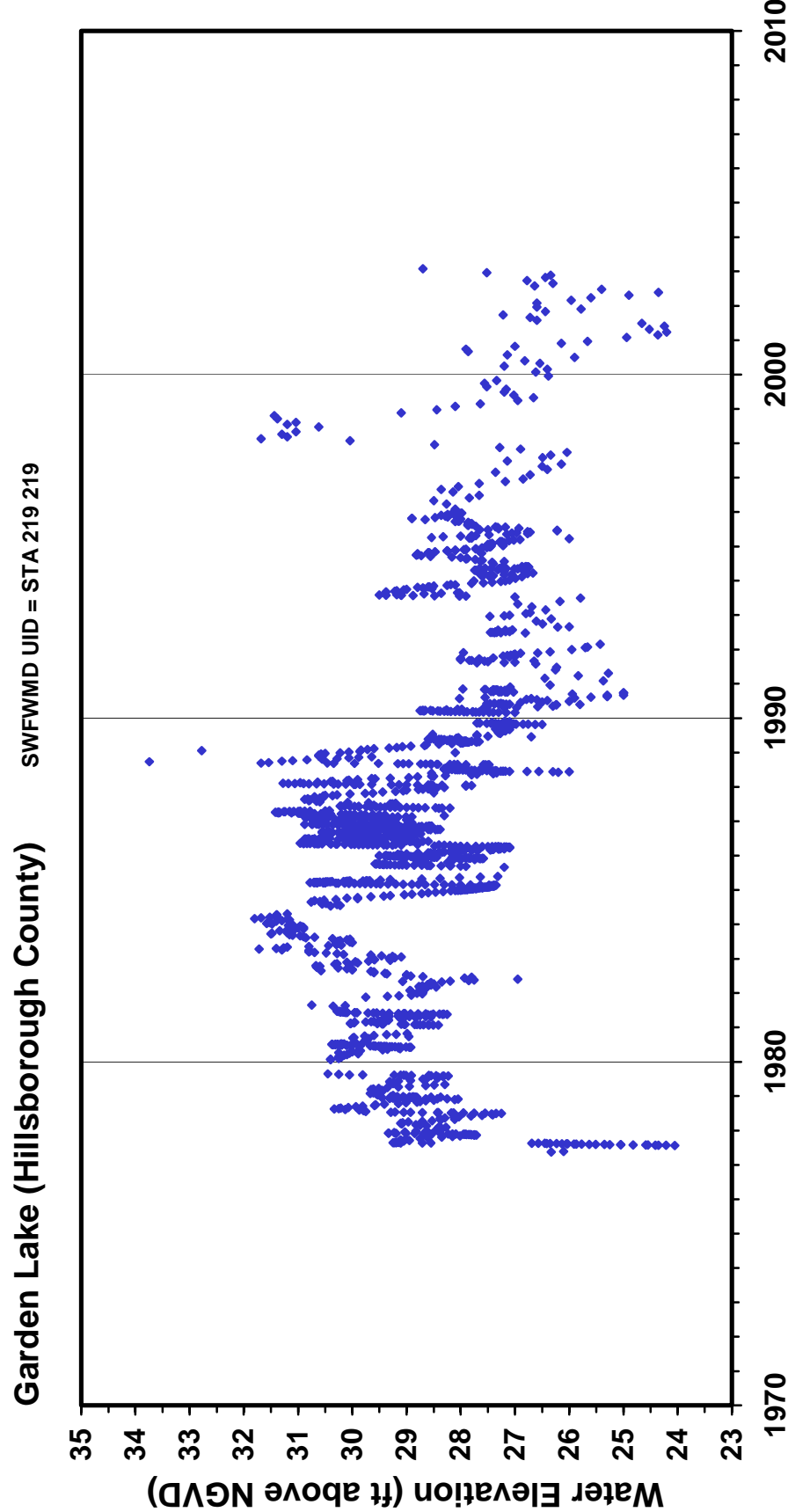


Figure 6. Mean monthly surface water elevation through January 2003, and proposed guidance and minimum levels for Garden Lake in Hillsborough County, Florida. Proposed levels include the Ten Year Flood Guidance Level (10-YR), High Guidance Level (HGL), Low Guidance Level (LGL), High Minimum Lake Level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

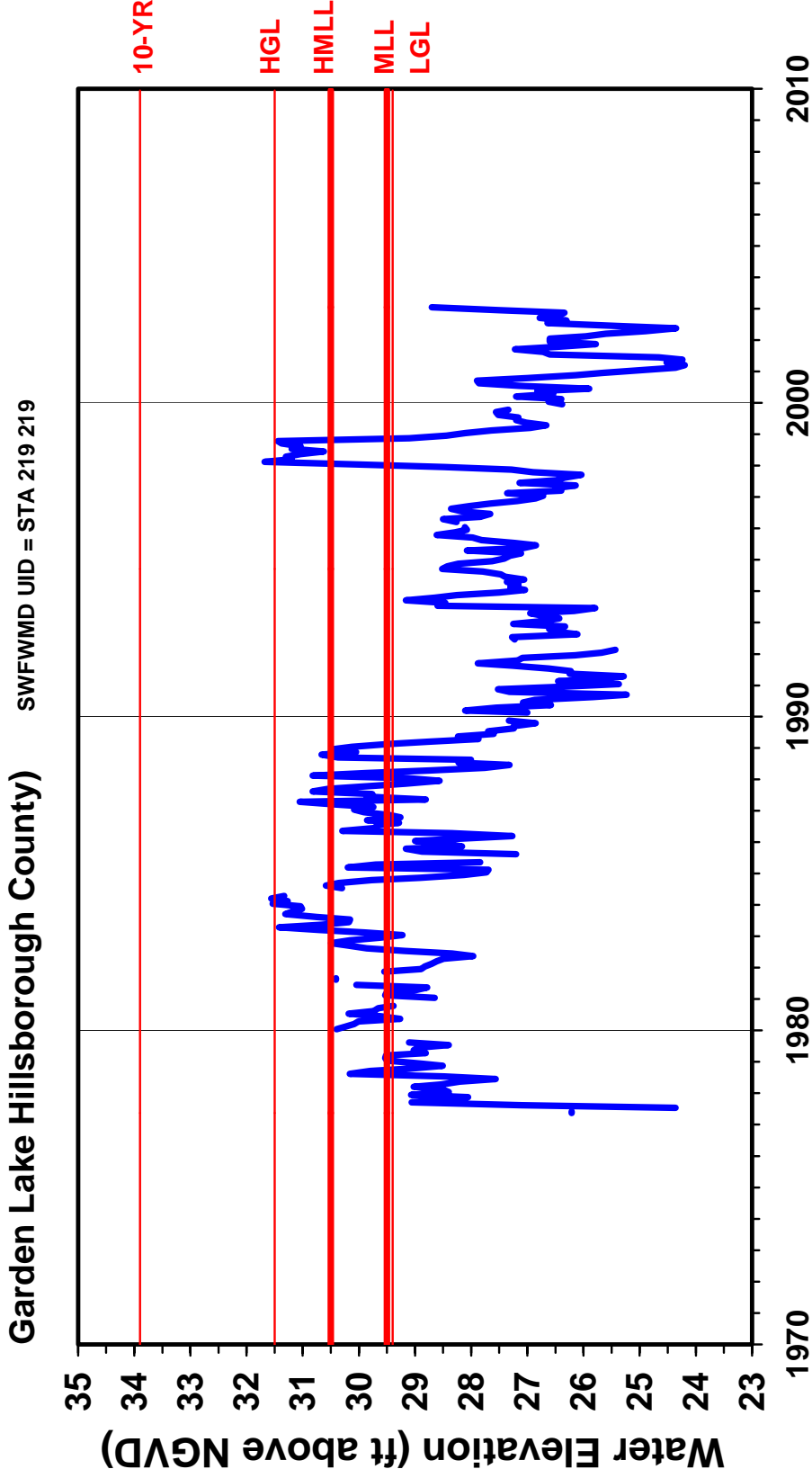


Table 3. Elevation data and associated area values used for establishing minimum levels for Garden Lake in Hillsborough County, Florida.

Level or Feature	Elevation (feet above NGVD)	Lake Area (acres)
Current P10	30.42	11.5
Current P50	28.10	9.8
Current P90	26.15	8.6
Normal Pool	32.2	13.8
Low Floor Slab	34.98	NA
Low Other (carport)	33.85	17.5
Low Road	34.88	NA
Control Point	31.5	12.8
High Guidance Level	31.5	12.8
Historic P50	30.5	11.6
Low Guidance Level	29.4	10.6
Dock-Use Standard	29.5	10.7
Aesthetic Standard	29.4	10.6
Species Richness Standard	28.2	9.9
Connectivity Standard	25.1	8.0
Recreation/Ski Standard	NA	NA
Mixing Standard	NA	NA

NA = not available/not applicable

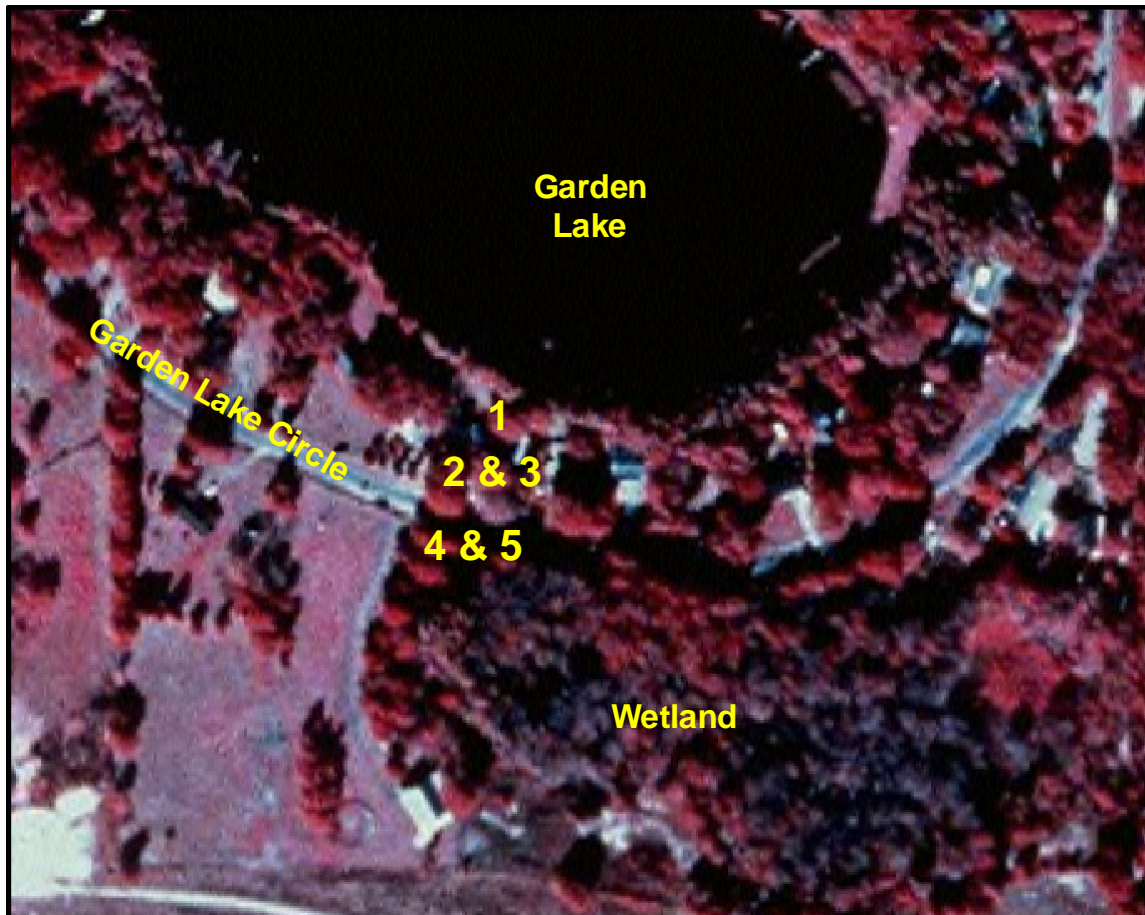
Table 4. Elevation data used for establishing the Normal Pool Elevation for Garden Lake in Hillsborough County, Florida. Data were collected on October 01, 2002 by SWFWMD staff.

Hydrologic Indicator	Elevation (feet above NGVD)
Normal pool based on cypress buttress	31.83
Normal pool based on cypress buttress	31.98
Normal pool based on cypress buttress	32.17
Normal pool based on cypress buttress	32.22
Normal pool based on cypress buttress	32.62
Normal pool based on cypress buttress	32.74
Normal pool based on cypress buttress	32.90
N	7
Median	32.2
Mean	32.4
Standard Deviation	0.4

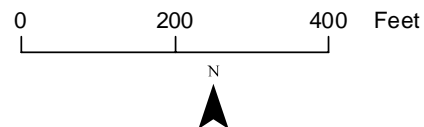
Table 5. Summary statistics for elevations associated with docks (n=10) at Garden Lake in Hillsborough County, Florida, based on data collected by SWFWMD staff on September 12, 2002. Percentiles (P10, P50, P90) represent elevations exceeded by 10, 50 and 90 percent of the docks.

Statistic	Elevation of Sediments at Dock Ends (feet above NGVD)	Elevation of Dock Platform (feet above NGVD)
Mean	25.5 (0.8)	32.3 (1.3)
P10	26.4	33.4
P50	25.7	32.5
P90	24.5	30.5
Maximum	26.42	33.7
Minimum	24.2	29.8

Figure 7. Outlet conveyance system for Garden Lake in Hillsborough County, Florida.

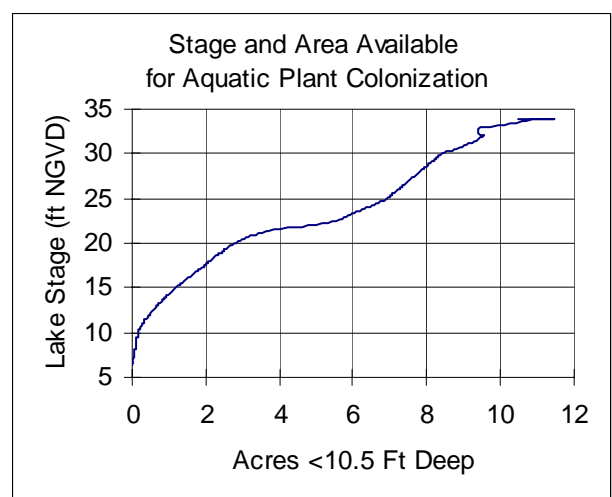
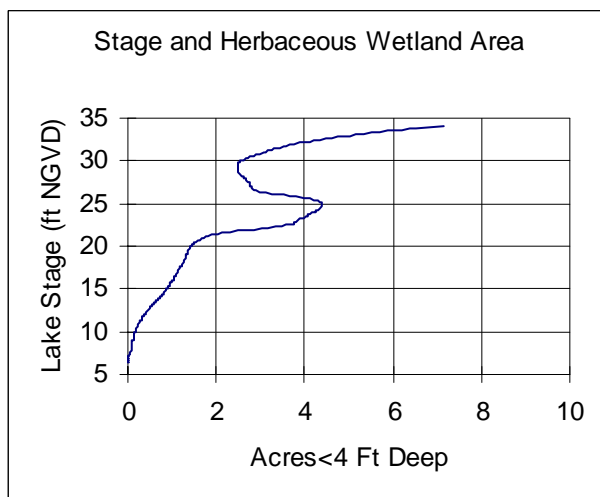
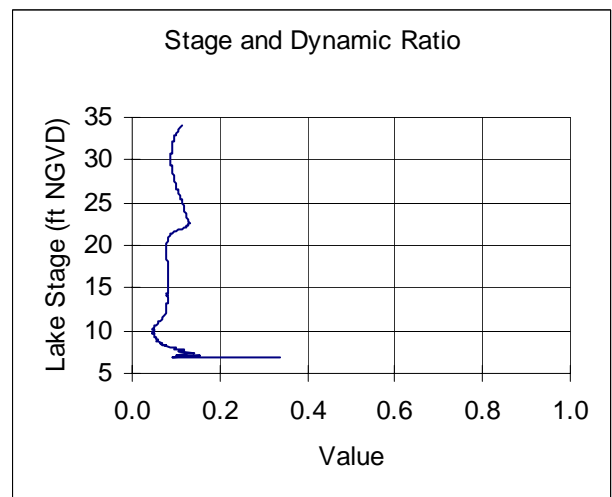
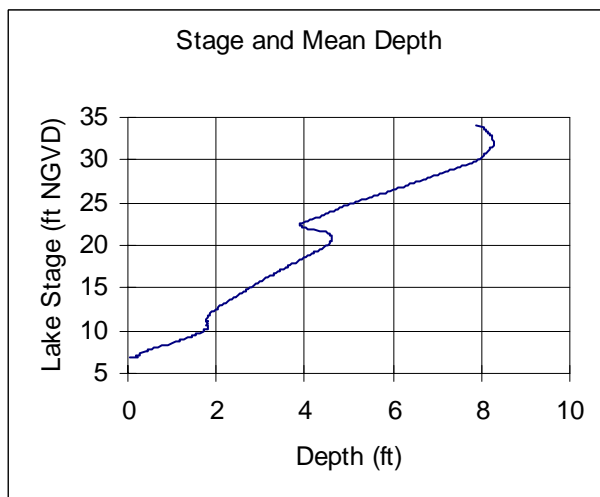
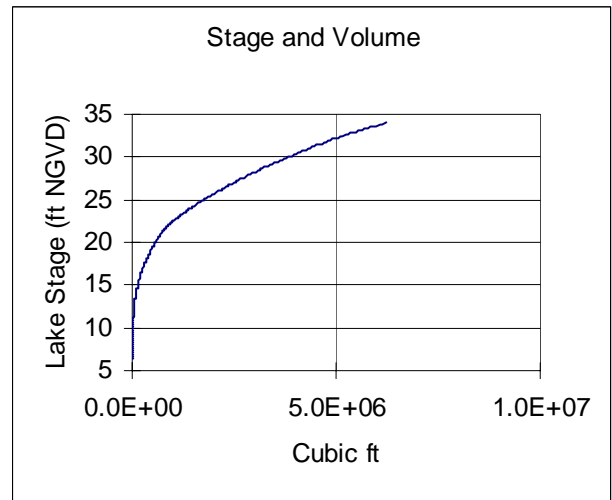
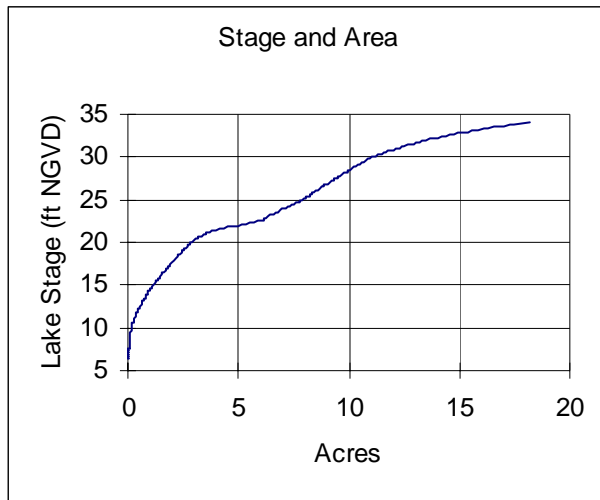


Map prepared August 25 2003 using 1999 USGS digital orthophotography.



Site	Description	Elevation (feet above NGVD)
1	Ground elevation in center of ditch.	31.4
2	Ground elevation in ditch just north of pipe identified as Site No. 3.	31.3
3	North invert of 48 inch diameter, 40.4 ft long corrugated metal pipe running under Garden Lake Circle.	30.45
4	South invert of 48 inch diameter, 40.4 ft long corrugated metal pipe running under Garden Lake Circle.	30.08
5	Control point; ground elevation in ditch just south of pipe identified as Site No. 4. Ditch drains to a cypress wetland.	31.5

Figure 8. Surface area, volume, mean depth, dynamic ratio (basin slope), potential herbaceous wetland area and area available for aquatic macrophyte colonization versus lake stage for Garden Lake in Hillsborough County, Florida.



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