

February 2, 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 Lake Dan in
Hillsborough County, Florida

Lake Dan

General Description

Lake Dan (Figure 1) is located in the Northwest Hillsborough Basin of the Southwest Florida Water Management District (SWFWMD or District) in Hillsborough County, Florida (Section 6, Township 27 South, Range 17 East). White (1970) classified the area of west-central Florida containing Lake Jackson 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 access to the shoreline is not available. Uplands surrounding Lake Dan are used for cattle grazing (Figure 2). The lake is located in the Eldridge-Wilde Wellfield, a Tampa Bay Water public water supply production facility that has been in service since 1956. Approximately half of the lake shoreline has been cleared of woody vegetation (Figure 2). Although much of the forested wetland contiguous with the lake has been destroyed, an intact cypress-dominated wetland remains along the southwest lakeshore.

Lake Dan is located in the Anclote River Watershed. The lake has a drainage area of 0.6 square miles (Florida Board of Conservation 1969). Inlets include a ditch along the southeastern lakeshore that carries groundwater pumped from the Floridan aquifer for augmentation of the lake, and two ditches that connect the lake to cypress wetlands to the north (Figure 2). An outlet along the west shore of the lake drains to a wetland system. 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 operation of the Eldridge-Wilde Wellfield.

The 1974 United States Geological Survey 1:24,000 Elfers quadrangle map does not include an elevation for the lake surface. The "Gazetteer of Florida Lakes" (Florida Board of Conservation 1969, Shafer *et al.* 1986) lists the lake area as 35 acres at an elevation of 33 ft above the National Geodetic Vertical Datum of 1929 (NGVD). A topographic map of the basin generated in support of minimum levels development (Figure 3) indicates that the lake extends over 72 acres when the water surface is at 33 ft above NGVD. At this elevation, the inundated area would include the wetland contiguous with the southwest corner of the lake. 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 Lake Dan in Hillsborough County, Florida.

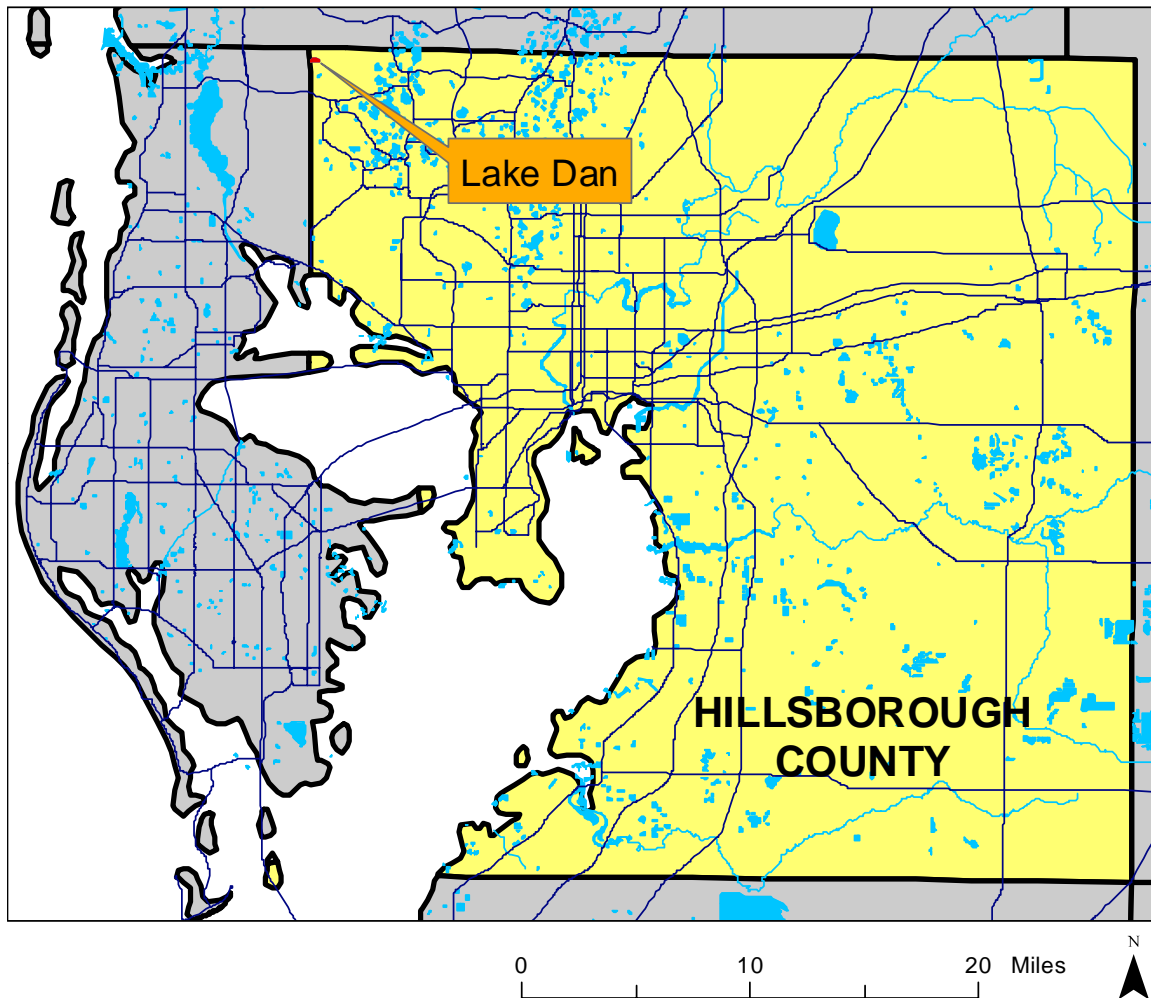
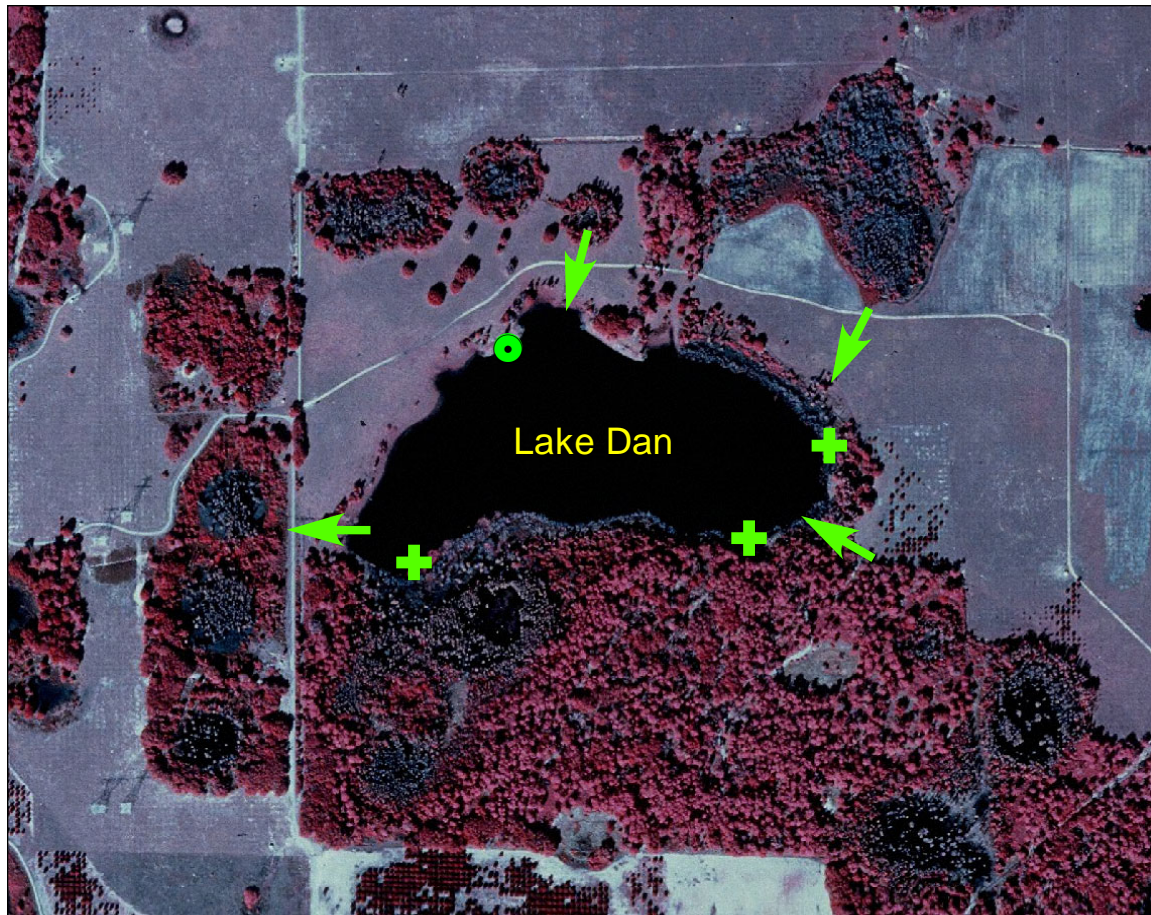





Figure 2. Location of District lake-level gauge, inlets, outlet and sites where hydrologic indicators were measured at Lake Dan in Hillsborough County, Florida.



-  Lake gauge
-  Inlets/Outlets
-  Hydrologic Indicators

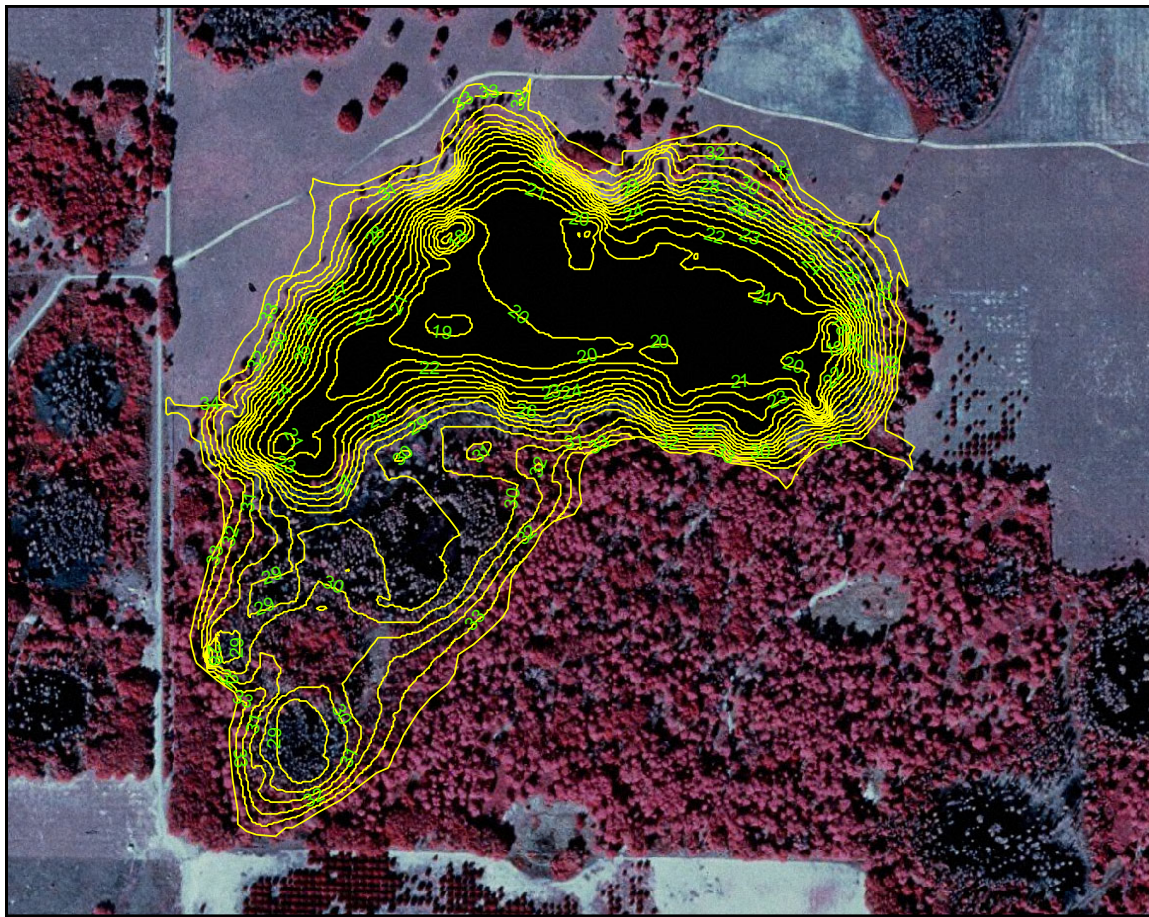
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Aerial photography from 1999 USGS
Digital Orthophotograph.

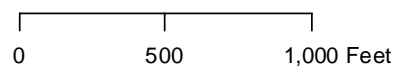
Map prepared February 2, 2004



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



Map prepared July 22, 2003 using 1999 USGS digital orthophotography, elevation data from 1989 SWFWMD aerial photography with contours maps (West Half, Sheet No. 6-27-18), and elevation data collected on April 17, 2003 by SWFWMD staff.



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 Lake Dan in September 1980 (Table 1). A Maximum Desirable Level of 30.00 ft above NGVD was also developed, but was not adopted by the Governing Board.

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

Level	Elevation (feet above NGVD)	Lake Area (acres)
Ten Year Flood Guidance Level	35.00	NA
High Level	32.00	66
Low Level	28.00	37
Extreme Low Level	25.00	30

NA = not available

Proposed Minimum and Guidance Levels

Proposed Minimum and Guidance Levels were developed for Lake Dan 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 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 Lake Dan in Hillsborough County, Florida.

Level	Elevation (feet above NGVD)	Lake Area (acres)
Ten Year Flood Guidance Level	34.9	NA
High Guidance Level	32.5	69
High Minimum Lake Level	31.9	65
Minimum Lake Level	30.9	58
Low Guidance Level	30.4	55

NA = not available

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



Map prepared July 22, 2003 using 1999 USGS digital orthophotography, elevation data from 1989 SWFWMD aerial photography with contours maps (West Half, Sheet No. 6-27-18), and elevation data collected on April 17, 2003 by SWFWMD staff.

0 500 1,000 Feet



Legend

dan_minimum_levels

Contour

— Minimum Lake Level 30.9 ft

— High Minimum Lake Level 31.9 ft

Summary of Data and Analyses Supporting Recommended Minimum and Guidance Levels

Hydrologic data are available from the District Water Management Database for Lake Dan (District Universal ID Number STA 297 297) from March 1980 through the present date (Figure 5, see Figure 2 for current location of the SWFWMD lake-level gauge). Note that 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 data are not available. For the period of record from March 1980 through the present, 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 32.7 ft above NGVD based on elevations associated with the buttressing of cypress (*Taxodium* sp.) trees along the east and southwest shores of the lake and the base of saw palmetto (*Serenoa repens*) shrubs along the south shore (Table 4, Figure 2). The 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 32.5 ft above NGVD, based on the ground elevation in a ditch between two culverts along the west shore of the lake (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 relationship between the control point elevation, the Normal Pool elevation and the Current P10, the High Guidance Level was established at the Control Point elevation of 32.5 ft above NGVD (Table 3). The Historic P50 and Low Guidance Level were established at 31.5 and 30.4 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 was established at 34.9 ft above NGVD for Lake Dan using the methodology for open basin lakes described in current District Rules (Chapter 40D-8, Florida Administrative Code). For the analysis, the ICPR flood routing model (Streamline Technologies, Inc. 2002) was used. Model input was based on a ten-year storm event with a 120-hour duration and an 11.3-inch rainfall depth. The Ten Year Flood Guidance Level has not been exceeded during the period for which lake stage data are available (see Figures 5 and 6). The highest surface elevation for Lake Dan included in the District water management database, 34.38 ft above NGVD, occurred on March 4, 1998. The low of record, 22.09 ft above NGVD, occurred on February 9, 1990. Data included in SWFWMD (1996) indicate that the lake stage may have been as low as 19 ft above NGVD in the early 1970s.

Lake Dan contains diverse stands of aquatic macrophytes and other hydrophytes, including southern naid (*Najas guadelupensis*), torpedograss (*Panicum repens*), spatterdock (*Nuphar luteum*), maidencaine (*Panicum hemitomum*), pennywort (*Hydrocotyle umbellata*), primrose willow (*Ludwigia* sp.), buttonbush (*Cephalanthus occidentalis*), and willow (*Salix* sp.). The lake is also contiguous with a cypress-dominated wetland greater than 0.5 acre in size, so it is classified as a Category 1 or 2 Lake for the purpose of minimum levels development. Because the Historic P50 elevation is less than 1.8 feet below the Normal Pool elevation, the lake is classified as a Category 1 Lake. Note that herein, for discussion purposes, the elevation 1.8 ft below the Normal Pool elevation is identified as the Cypress Standard. For Lake Dan this standard is established at 30.9 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 Cypress Standard elevation (30.9 ft above NGVD). The proposed High Minimum Lake Level was established at 31.9 ft above NGVD, an elevation corresponding the Minimum Lake Level plus the RLWR50 statistic (1.0 ft) for the Northern Tampa Bay area. The proposed High Minimum Lake Level is 2.5 ft below the low spot in a nearby paved site access road, and 2.1 ft below a low spot in a dirt access road that runs along the north shore of the lake.

For comparative purposes, minimum level standards used for establishing Minimum Lake Level for lakes without fringing cypress wetlands were developed for Lake Dan (Table 3). The Aesthetic Standard for the lake would be established at the Low Guidance Level elevation of 30.4 ft above NGVD. The Species Richness Standard would be established at 30.3 ft above NGVD, based on limiting reduction in lake surface area to less than a 15% decrease in the lake area at the Historic P50 elevation. The Basin Connectivity Standard would be established at 24.1 ft above NGVD, based on a critical high-spot elevation of 22 ft above NGVD, one foot clearance for movement of biota and use of non-powerboats on the lake, and the Northern Tampa Bay area RLWR5090 (1.1 ft). Based on dynamic ratio values (see Bachmann *et al.* 2000), a Mixing Standard for preventing potential resuspension of sediments would be established at an elevation of 21.3 ft above NGVD (Figure 8). Development of a Dock-Use Standard would not be appropriate for the basin, as there are currently no docks along the lakeshore. Powerboats are not used on Lake Dan, so development of a Recreation/Ski Standard would also not be appropriate. 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 Lake Dan in Hillsborough County, Florida. Data through January 2003 are shown.

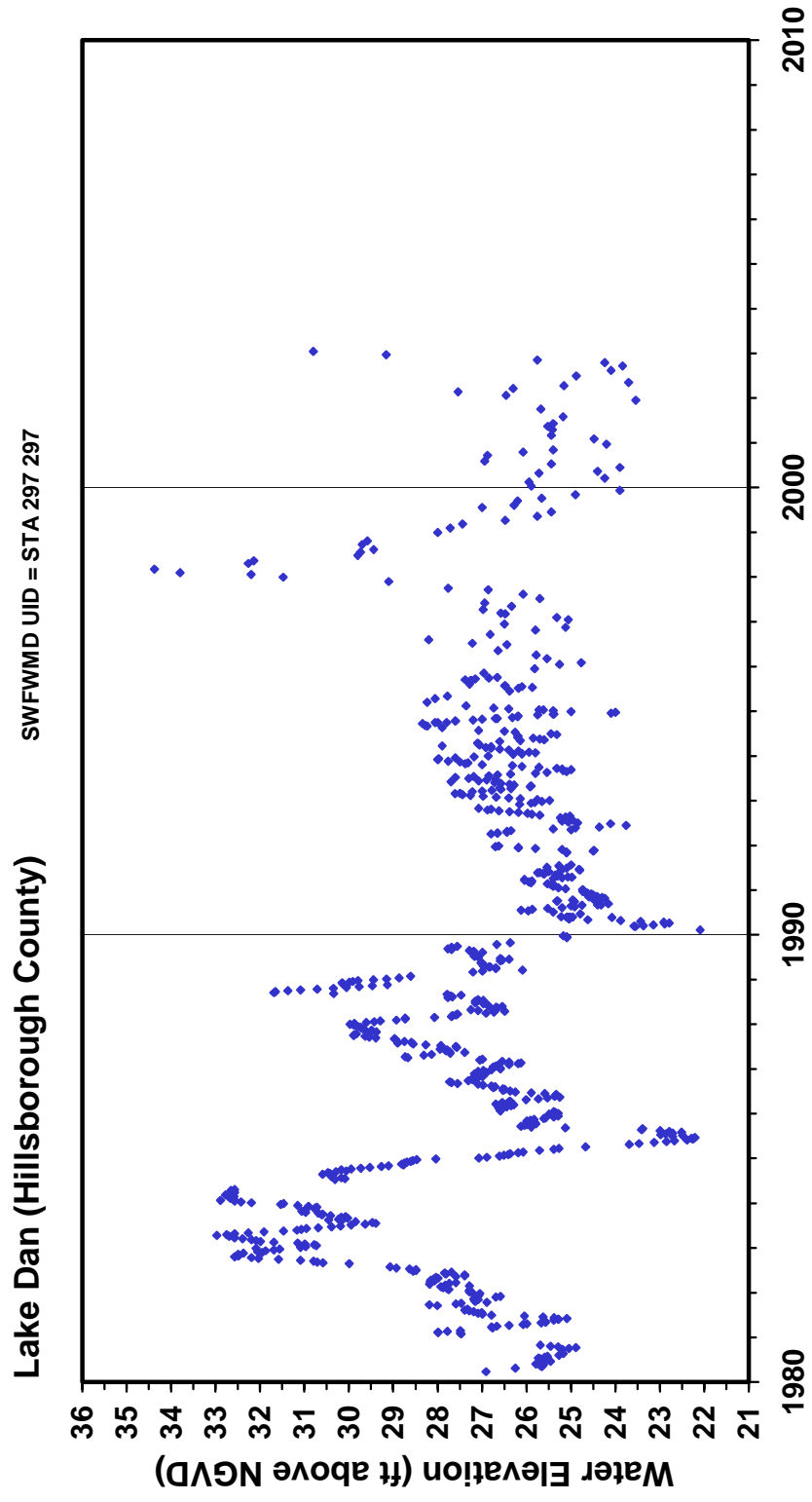


Figure 6. Mean monthly surface water elevation through January 2003, and proposed guidance and minimum levels for Lake Dan in Hillsborough County, Florida. Proposed levels include the Ten Year Flood Guidance Level (10-YR), High Guidance Level (HGL), Low Guidance Level (LGL), High Minimum Lake Level (HMLL),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

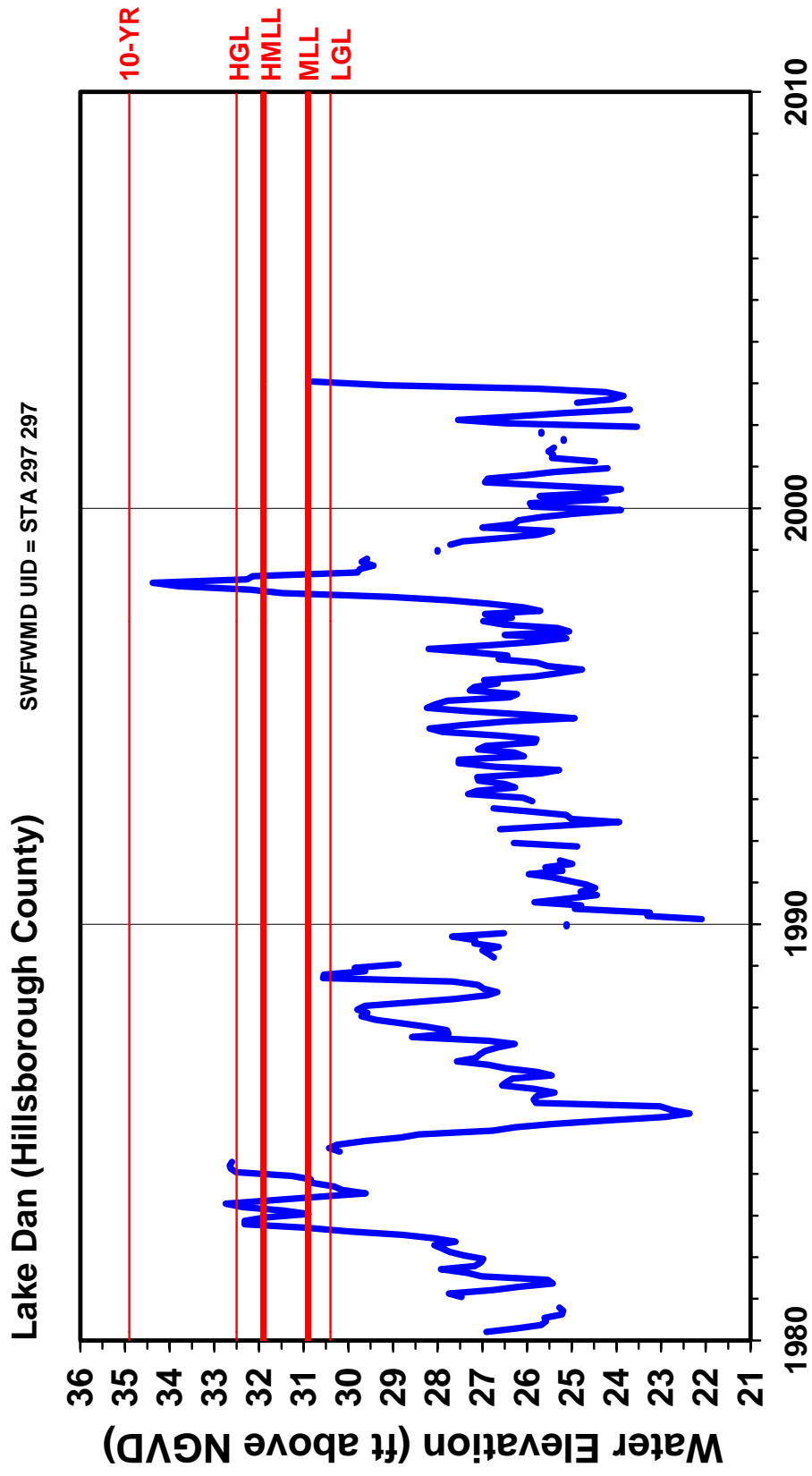


Table 3. Elevation data and associated area values used for establishing minimum levels for Lake Dan in Hillsborough County, Florida.

Level or Feature	Elevation (feet above NGVD)	Lake Area (acres)
Current P10	30.52	56
Current P50	26.66	34
Current P90	24.83	29
Normal Pool	32.7	70
Low Floor Slab	NA	NA
Low Other (dirt ranch road)	34.0	77
Low Road	34.42	NA
Control Point	32.5	69
High Guidance Level	32.5	69
Historic P50	31.5	63
Low Guidance Level	30.4	55
Cypress Standard	30.9	58
*Aesthetic Standard	30.4	55
*Species Richness Standard	30.3	54
*Connectivity Standard	24.1	27
*Mixing Standard	21.3	17

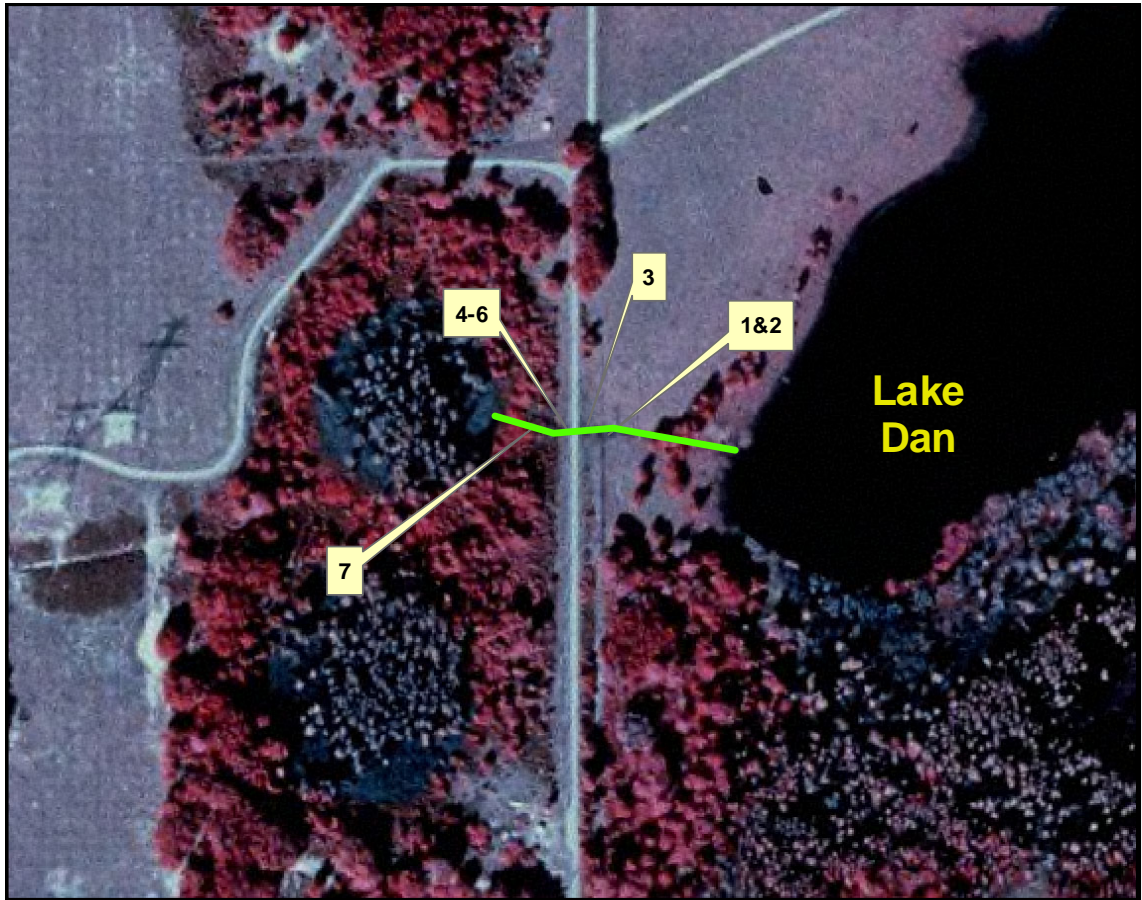
NA = not available/not applicable

*= Established for comparative purposed only; not used for minimum levels development

Table 4. Elevation data used for establishing the Normal Pool Elevation for Lake Dan in Hillsborough County, Florida. Data were collected by SWFWMD staff on September 24, 2002 and April 17, 2003.

Hydrologic Indicator	Elevation (feet above NGVD)
Normal pool based on cypress buttress	27.87
Normal pool based on cypress buttress	32.26
Normal pool based on cypress buttress	32.39
Normal pool based on cypress buttress	32.67
Normal pool based on cypress buttress	33.21
Normal pool based on cypress buttress	33.31
Base of saw palmetto	32.39
Base of saw palmetto	32.45
Base of saw palmetto	32.5
Base of saw palmetto	32.67
Base of saw palmetto	32.77
Base of saw palmetto	32.94
Base of saw palmetto	33.07
Base of saw palmetto	32.39
N	13
Median	32.7
Mean	32.4
Standard Deviation	1.4

Figure 7. Outlet conveyance system for Lake Dan in Hillsborough County, Florida. Ditched flow path is indicated by green line.



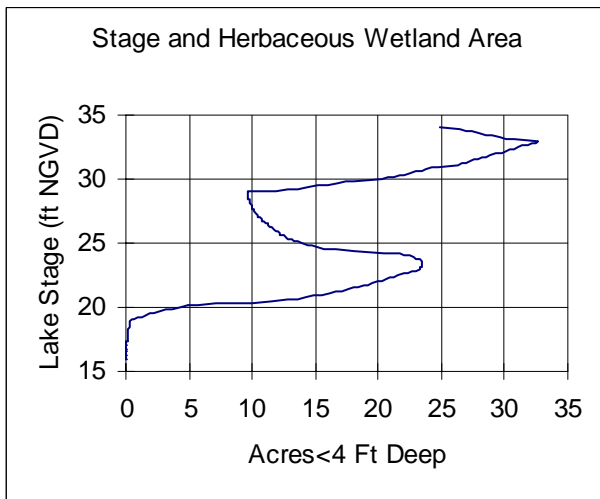
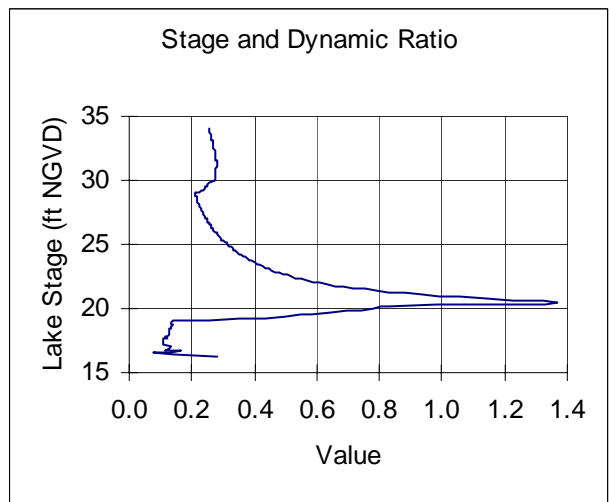
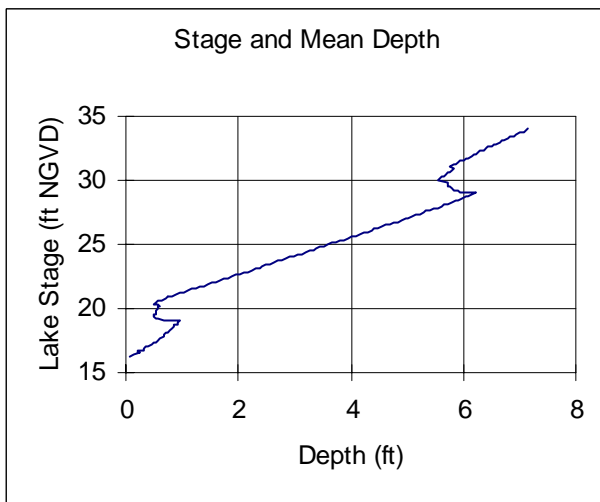
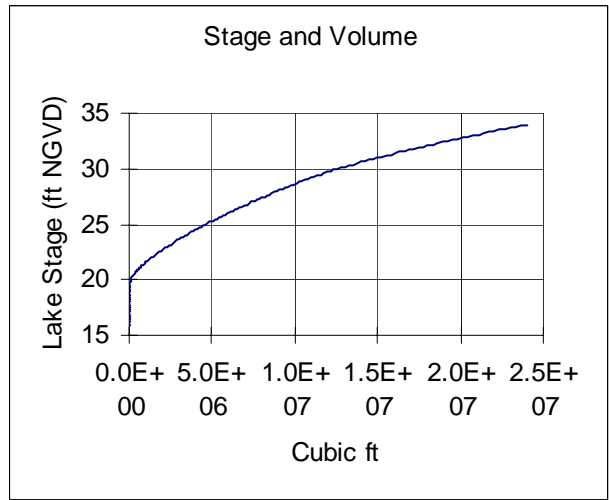
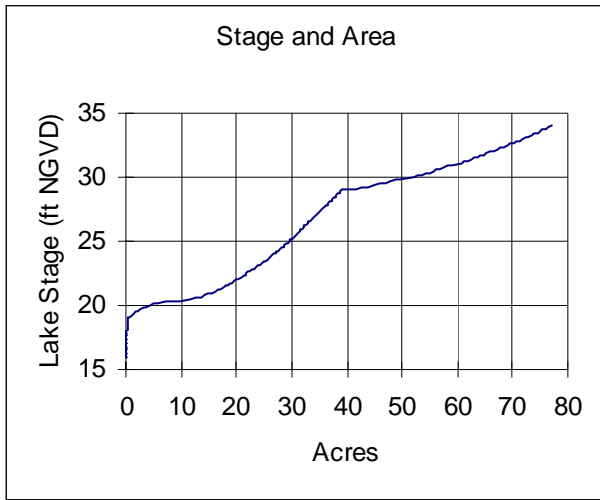
Map prepared February 2, 2004 using 1999 USGS digital orthophotography.

0 200 400 600 Feet



Site	Description	Elevation (feet above NGVD)
1	Invert at east end of 13-ft long, 24 inch diameter reinforced concrete pipe	31.81
2	Invert at west end of 13-ft long, 24 inch diameter reinforced concrete pipe	31.67
3	Control point; ground shot in ditch centerline	32.5
4	Invert at east end of 20-ft long, 24 inch diameter corrugated metal pipe	31.44
5	Invert at west end of 20-ft long, 24 inch diameter corrugated metal pipe	31.47
6	Ground shot in ditch centerline at west end of 20-ft long, 24 inch diameter corrugated metal pipe	32.2
7	Ground shot in ditch centerline, 50 feet west end of 20-ft long, 24 inch diameter corrugated metal pipe	30.1

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



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