

February 4, 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 Fairy Lake in
Hillsborough County, Florida**

Fairy Lake

General Lake Description

Fairy Lake (*a.k.a.* Lake Maurine) is located in the Northwest Hillsborough Basin in Hillsborough County, Florida (Section 34, Township 27S, Range 17E) (Figure Fairy-1). The area surrounding the lake is categorized as the Lake Tarpon Basin subdivision of the Tampa Plain in the Ocala Uplift Physiographic District (Brooks 1981); an erosional basin partially filled with Late Pleistocene sediments 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; an area of numerous slightly acidic, low nutrient, and mostly clear-water lakes (Griffith *et al.* 1997).

The lake receives inflow through culverts from two small pond to the east and discharges through a series of culverts along the western shore (Figure Fairy-2). There are no surface water withdrawals from the lake currently permitted by the District. There are, however, several permitted groundwater withdrawals in the lake vicinity.

The "Gazetteer of Florida Lakes" (Florida Board of Conservation 1969, Shafer *et al.* 1986) lists the lake area as 52 acres. The 1956 United States Geological Survey (photorevised 1987) 1:24,000 Citrus Park, Fla. quadrangle map indicates a water level elevation of 31 ft, NGVD. This elevation corresponds to a lake surface area of 51 acres, based on a topographic map of the basin generated in support of minimum levels development (Figure Fairy-3). Data used for production of the topographic map were obtained from field surveys and 1:200 aerial photograph maps containing one-foot contour lines prepared using photogrammetric methods.

Figure Fairy-1. Location of Fairy Lake in Hillsborough County, Florida.

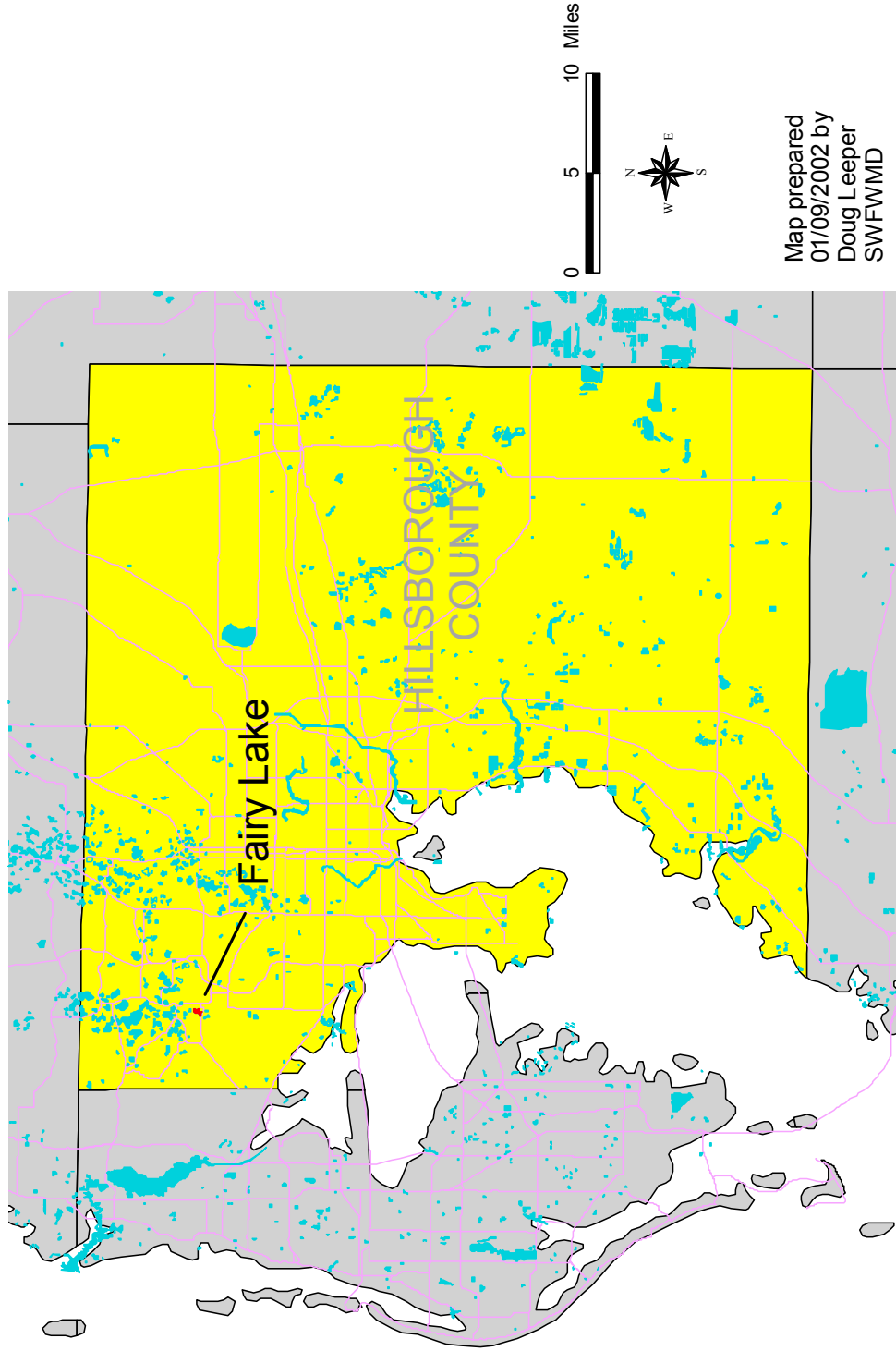


Figure Fairy-2. Location of District lake gauge, inlets, outlet and site where hydrologic indicators were measured at Fairy Lake in Hillsborough County, Florida.

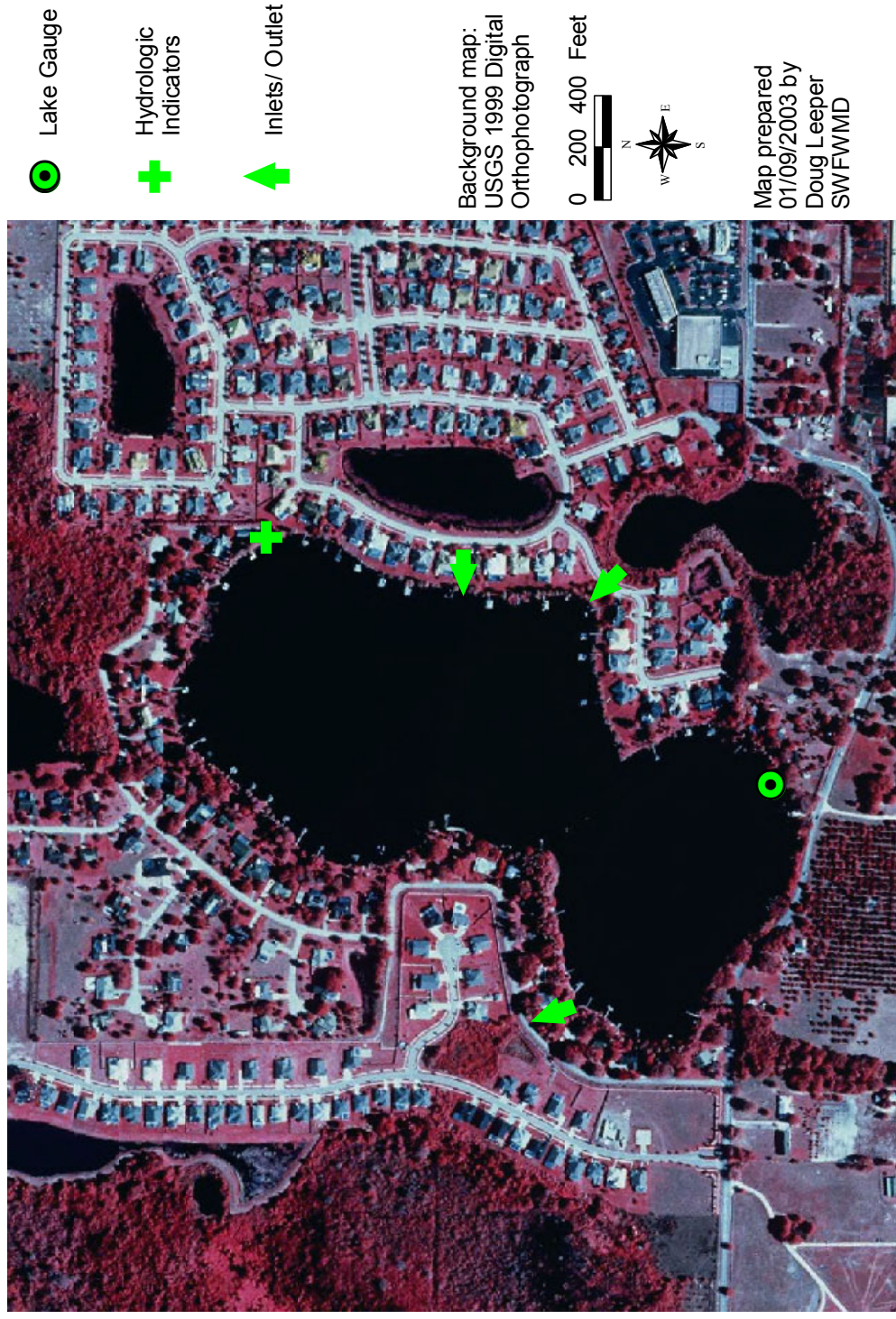


Figure Fairy-3. Five-foot contours within the Fairy Lake basin in Hillsborough County, Florida. Values shown are elevations, in feet, above the National Geodetic Vertical Datum of 1929.



Previously Adopted Lake Management Levels

Based on work conducted in 1977 (see SWFWMD 1996), the District Governing Board adopted management levels (currently referred to as Guidance Levels) for Fairy Lake in September 1980 (Table Fairy-1). A Maximum Desirable Level of 34.00 ft above NGVD was also developed, but was not adopted by the Governing Board.

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

Level	Elevation (feet above NGVD)	Total Lake Area (acres)
Ten Year Flood Guidance Level	36.00	60
High Level	34.75	58
Low Level	32.00	53
Extreme Low Level	29.50	48

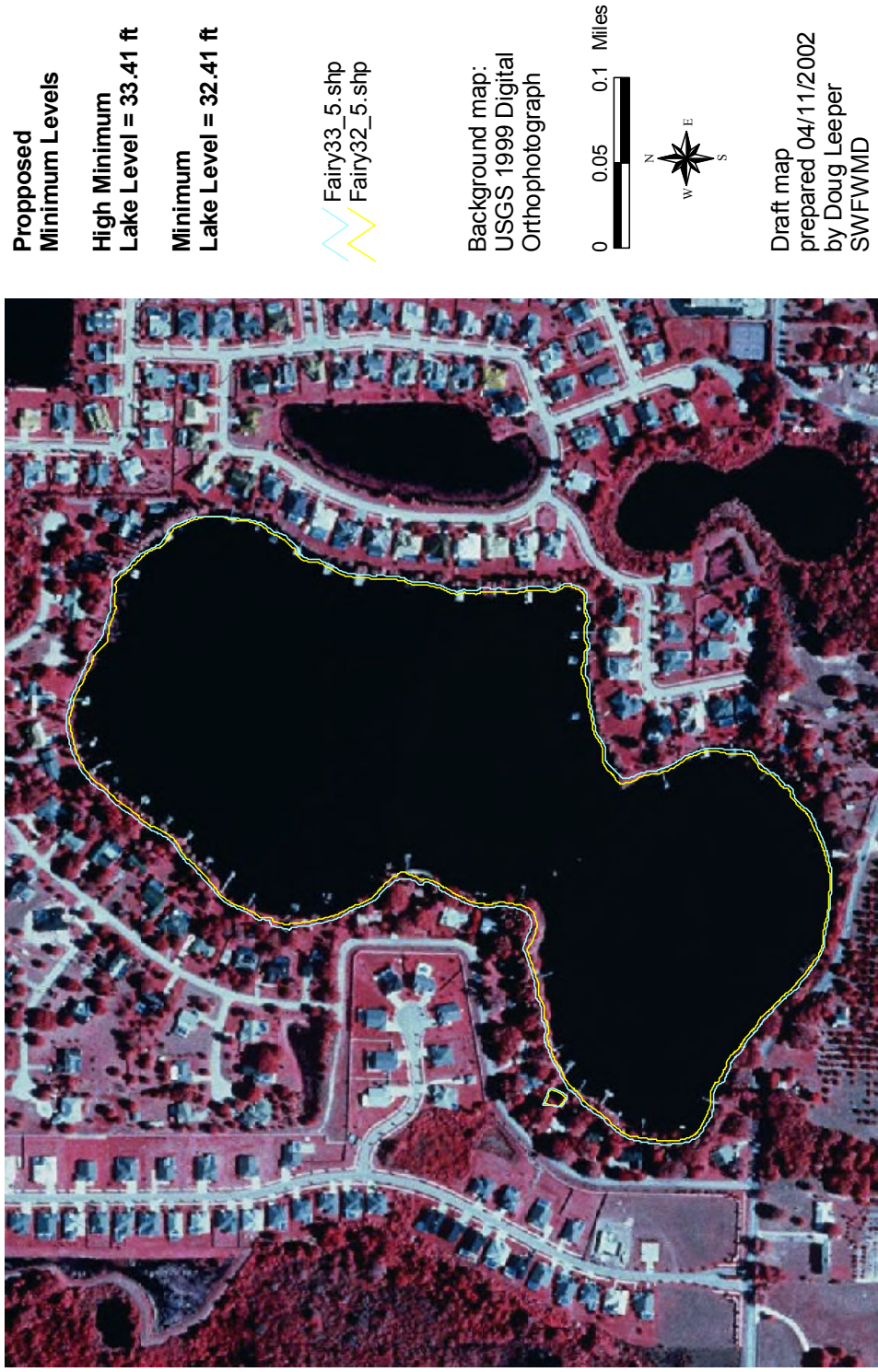
Proposed Minimum and Guidance Levels

Proposed Minimum and Guidance Levels were developed for Fairy 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 Fairy-2. The locations of the proposed minimum levels within the lake basin are shown in Figure Fairy-4.

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

Level	Elevation (feet above NGVD)	Total Lake Area (acres)
Ten Year Flood Guidance Level	34.51	57
High Guidance Level	33.41	55
High Minimum Lake Level	33.41	55
Minimum Lake Level	32.41	53
Low Guidance Level	31.31	51

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



Summary of Data and Analyses Supporting Recommended Minimum and Guidance Levels

Hydrologic data are available for Fairy Lake (District Universal ID Number STA 250 250) for a few dates from the 1970s and 1980s and for the period from February 1990 through the present date (Figure Fairy-5). For the entire period of record, the hydrologic data are classified as Current data. Data collected through December 2001 were used to calculate the Current P10, P50, and P90 (Table Fairy-3).

The Category 3 Lake Normal Pool elevation (Table Fairy-3) was established at 35.49 ft above NGVD, based on buttressing of large cypress trees along the northeastern shore of the lake (Table Fairy-4). 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 (Tables Fairy-3 and Fairy-5, Figure Fairy-6). The Category 3 Lake Normal Pool elevation is above the control point, so the lake is considered to be Structurally Altered.

Based on the relationship between the control point elevation, the Category 3 Lake Normal Pool elevation and the Current P10, the High Guidance Level was established at the Current P10 elevation (Table Fairy-3). The Historic P50 and Low Guidance Level were determined 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 for Fairy Lake using the methodology for open basin lakes described in current District Rules (Chapter 40D-8, Florida Administrative Code). The District used the flood information from an existing study of the Double Branch Watershed developed by Ayres Associates for Hillsborough County (Ayres 1998). The methodology used by Ayres for determining flood stages of lakes in the Double Branch Watershed was consistent with the District's methodology. The Double Branch runoff hydrographs were computed using the NRCS Dimensionless Unit Hydrograph method, a 256-shape factor, a 10.0-inch rainfall depth based on NRCS TP-49, and a 72-hour rainfall distribution developed by the South Florida Water Management District. The Double Branch conveyance system was simulated with the Hillsborough County modified version of EXTRAN, and the hydrodynamic routing component of the Environmental Protection Agency's Stormwater Management Model (SWMM) v.4.31. Fairy Lake's initial elevation was set at the control point elevation of 32.19 feet above NGVD. The Ten Year Flood Guidance Level (34.51 ft above NGVD) has not been exceeded during the period for which lake stage data are available (see Figure Fairy-5). The highest recorded surface elevation for the lake, 34.62ft above NGVD, occurred on December 17, 1997.

Fairy Lake is not contiguous with any cypress-dominated wetlands of 0.5 or more acres in size and is therefore classified as a Category 3 Lake for the purpose of minimum levels development. Aquatic macrophytes, including cattail (*Typha* sp.), torpedoglass

(*Panicum repens*), water pennywort (*Hydrocotyle umbellata*) and spatterdock (*Nuphar luteum*) occur throughout the basin.

Dock-Use, Aesthetics, Basin Connectivity, Species Richness, and Recreation/Ski Standards were evaluated for minimum levels development. A Dock-Use Standard for Fairy Lake was established at 32.54 ft above NGVD, based on the Northern Tampa Bay area RLWR5090 (1.1 ft) and a Dock-End Sediment elevation of 29.44 ft, developed from measurement of 45 docks. The Recreation/Ski Standard was established at 32.1 ft, based on a critical ski elevation of 31.0 ft and the Northern Tampa Bay area RLWR5090. An Aesthetic-Standard for the lake was established at the Low Guidance Level elevation of 31.31 ft above NGVD. A Basin Connectivity Standard was established at 30.60 ft above NGVD, based on use of powerboats in the lake, a critical high-spot elevation of 27.5 ft and the RLWR5090 for the northern Tampa Bay area. A Species Richness Standard was established at 28.64 ft above NGVD, based on a 15% reduction in lake surface area from that at the Historic P50 elevation. Review of the dynamic ratio for lake stages bounded by the Current P10 and Current P90 elevations and the High and Low Guidance Levels did not indicate that potential changes in basin susceptibility to wind-induced sediment resuspension would be of concern for minimum levels development (Figure Fairy-7). 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 Fairy-7).

The Dock-Use Standard, the most conservative of the appropriate standards, exceeded the Historic P50 elevation, so the Historic P50 elevation was substituted for this standard and used to establish the proposed Minimum Lake Level at 32.41 ft above NGVD. The proposed High Minimum Lake Level was established at 33.41 ft above NGVD, an elevation corresponding to the Minimum Lake Level plus the RLWR50 (1.0 ft) for the northern Tampa Bay area. The proposed High Minimum Lake Level is equivalent to the High Guidance Level and is 3.8 ft below the Low Floor Slab elevation.

Figure Fairy-5. Mean monthly surface water elevation, and proposed guidance and minimum levels for Fairy Lake, 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 (MLL).

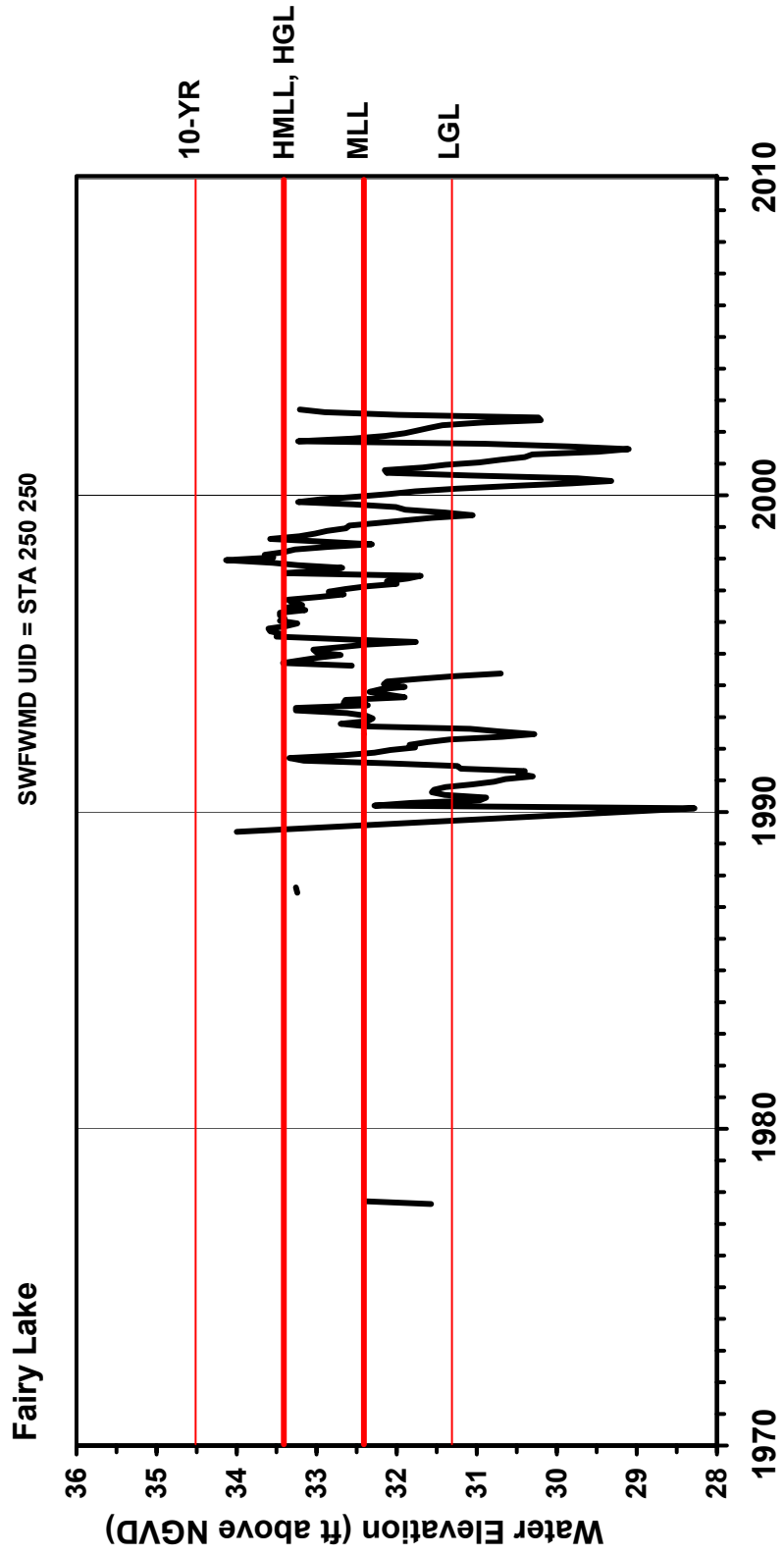


Table Fairy-3. Elevation data and associated area values used for establishing minimum levels for Fairy Lake, Hillsborough County, Florida.

Level or Feature	Elevation (feet above NGVD)	Total Lake Area (acres)
Current P10	33.41	55
Current P50	32.31	53
Current P90	30.60	50
Category 3 Lake Normal Pool	35.49	59
Low Floor Slab	37.19	NA
Low Road	36.58	NA
Control Point	32.19	53
High Guidance Level	33.41	55
Historic P50	32.41	53
Low Guidance Level	31.31	51
Dock-Use Standard	32.54	54
Recreation/Ski Standard	32.10	53
Aesthetic Standard	31.31	51
Basin Connectivity Standard	30.60	50
Species Richness Standard	28.64	46

NA = not applicable

Table Fairy-4. Elevation data used for establishing the Category 3 Lake Normal Pool Elevation for Fairy Lake, Hillsborough County, Florida. Data were collected on August 11, 1999; water level elevation was 31.91 ft above NGVD.

Hydrologic Indicator	Elevation (ft above NGVD)
Normal pool based on cypress buttress	35.56
Normal pool based on cypress buttress	34.67
Normal pool based on cypress buttress	34.67
Normal pool based on cypress buttress	35.70
Normal pool based on cypress buttress	35.70
Normal pool based on cypress buttress	35.42
N	6
Median	35.49
Mean	35.29
Standard Deviation	0.49

Table Fairy-5. Summary of structural alteration / control point elevation information for Fairy Lake, Hillsborough County, Florida. Numbers correspond to those shown in Figures Fairy-6.

No.	Description	Elevation (feet above NGVD)
1	Invert at south end of 24" reinforced concrete pipe	31.44
2	Top of wooden flashboard installed at the end of No. 1 above	31.94
3	Control point; invert at north end of 24" reinforced concrete pipe entering box culvert	32.19
4	Invert at northwest end of 15" reinforced concrete pipe	31.51

Figure Fairy-6. Outlet conveyance system for Fairy Lake in Hillsborough County, Florida. Numbered sites are described in table Fairy-5.



Background map:
USGS 1999 Digital
Orthophotograph

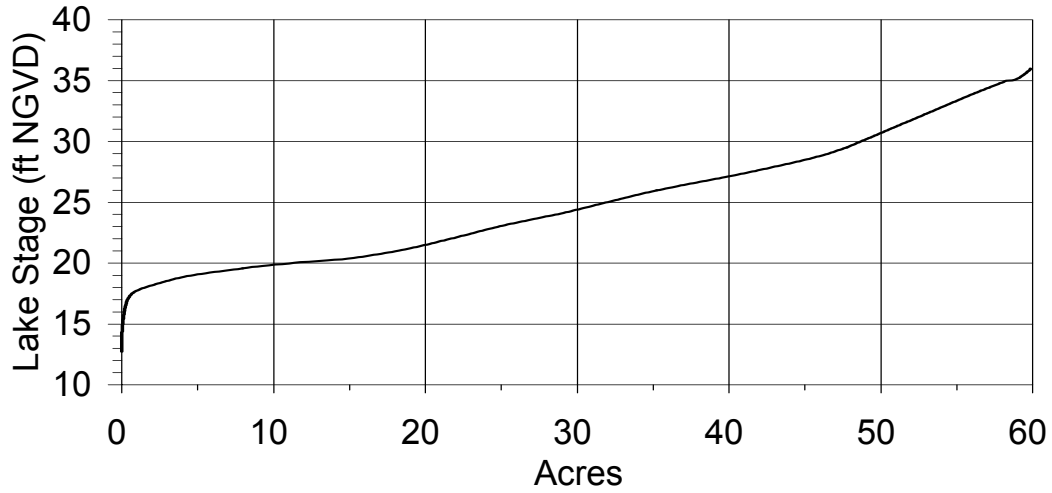
0 50 100 150 Feet



Map prepared
01/09/2003 by
Doug Leeper
SWFWMD

Figure Fairy-7. Surface area, volume, potential herbaceous wetland area, and dynamic ratio versus lake stage for Fairy Lake in Hillsborough County, Florida.

Stage and Area



Stage and Volume

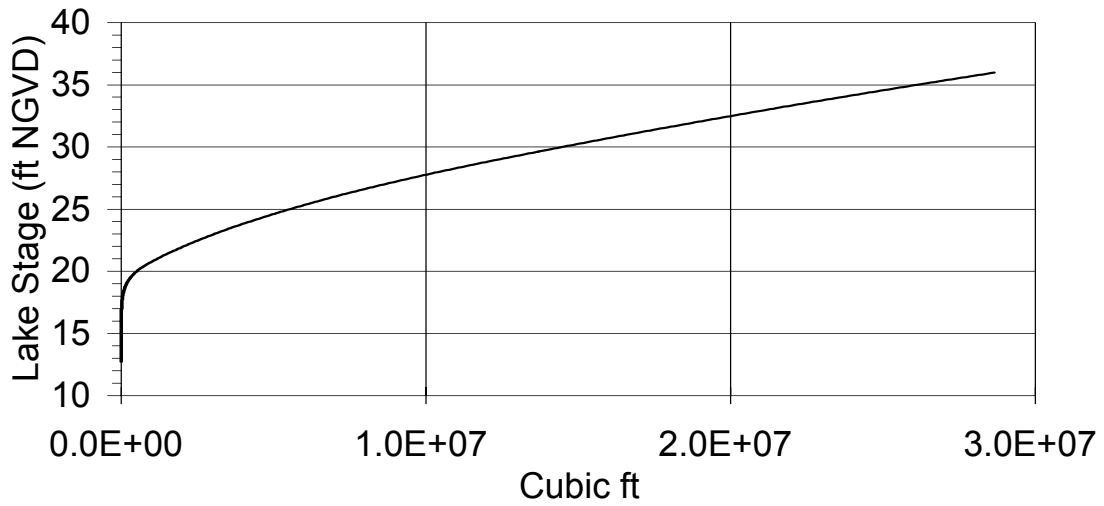
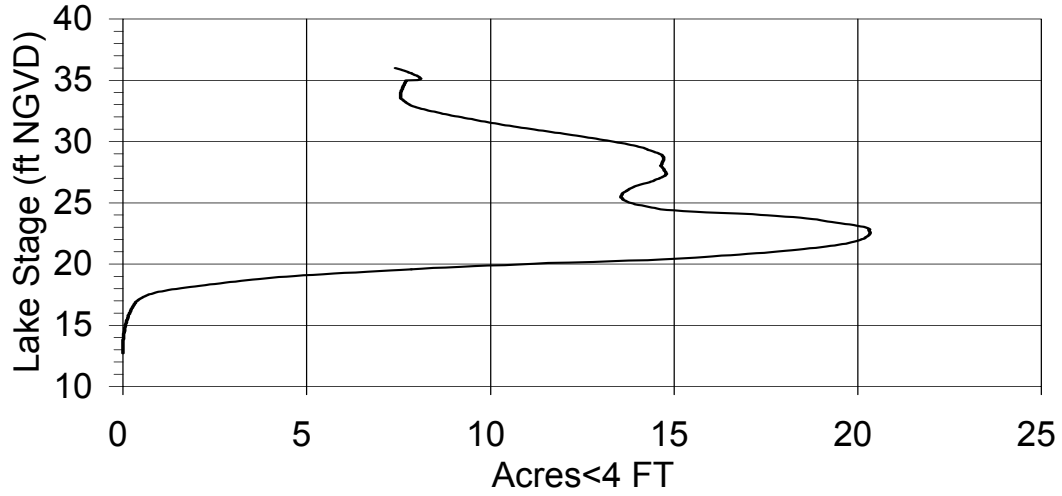


Figure Fairy-7 (continued).

Stage and Herbaceous Wetland Area



Stage and Area Available for Aquatic Plant Colonization

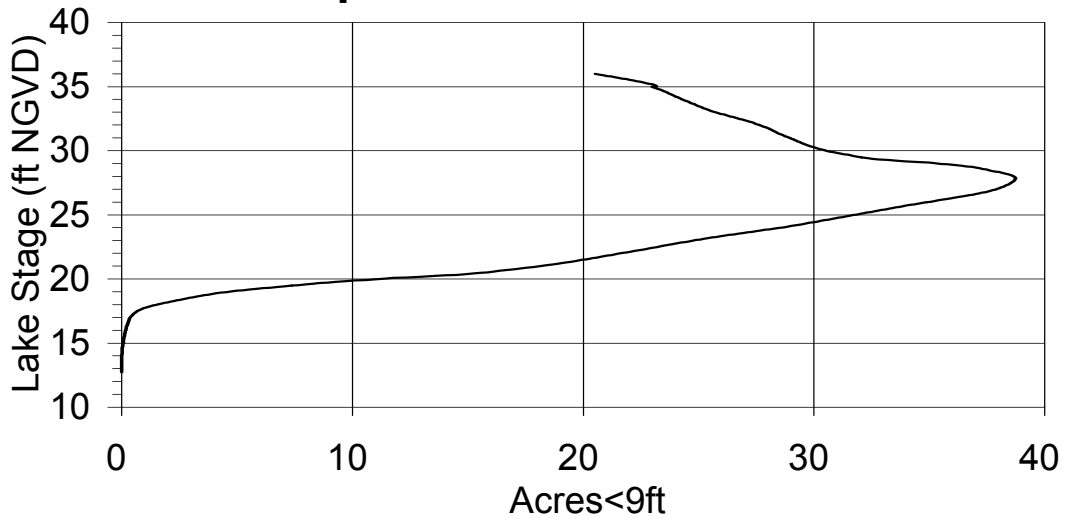
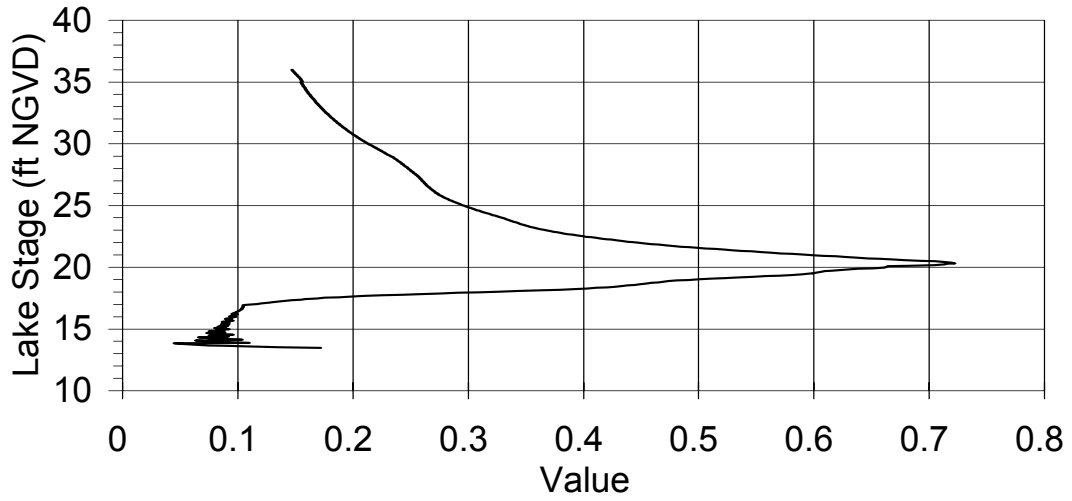


Figure Fairy-7 (continued).

Stage and Dynamic Ratio



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Leeper, D. 2001. Memorandum to Dave Arnold (Southwest Florida Water Management District), dated November 13, 2001. Subject: Issues concerning identification of the control point elevation. Southwest Florida Water Management District, Brooksville, Florida.

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