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 Saddleback Lake in Hillsborough County, Florida**

Saddleback Lake

General Lake Description

Saddleback Lake (Figure Saddleback-1) is located in the Northwest Hillsborough Basin in Hillsborough County, Florida (Section 22, Township 27S, Range 18E). 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); a region of many lakes on a moderately thick plain of silty sand overlying Tampa Limestone. 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; an area of numerous neutral to slightly alkaline, low to moderate nutrient, clear-water lakes (Griffith *et al.* 1997).

The drainage area for the lake is 1.5 square miles (SWFWMD 1996). Inlets to the lake include shallow ditches from Crenshaw Lake to the north and Round Lake to the west (Figure Saddlback-2). A ditch along the southeast shore drains the lake into a wetland area north of Lake Zambito. There are no surface water withdrawals from the lake currently permitted by the District. There are, however, several permitted groundwater withdrawals in the area. Saddleback Lake has been intermittently augmented with water pumped from the Floridan Aquifer since the mid-1960s (Stewart and Hughes 1974, SWFMD Water Use Permit No. 2011435).

The "Gazetteer of Florida Lakes" (Florida Board of Conservation 1969, Shafer *et al.* 1986) lists the lake area as 33 acres. The 1956 United States Geological Survey (photorevised 1987) 1:24,000 Sulphur Springs, Fla. quadrangle map indicates a water level elevation of 54 ft above NGVD for the lake basin. This elevation corresponds to a lake surface area of 40.5 acres, based on a topographic map of the basin generated in support of minimum levels development (Figure Saddleback-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 Saddleback-1. Location of Saddleback Lake in Hillsborough County, Florida.

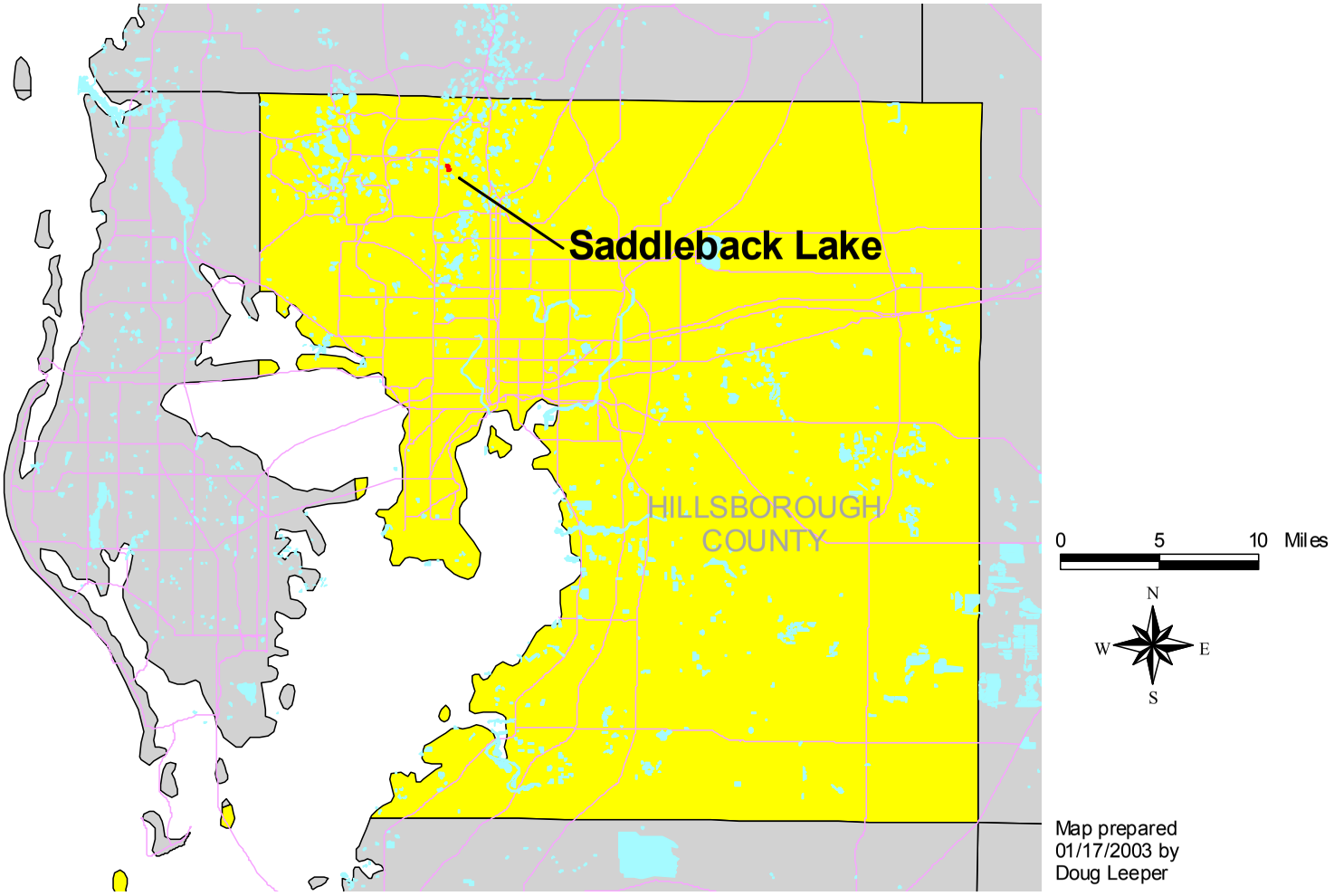


Figure Saddleback-2. Location of the District lake gauge, inlets, outlet and site where hydrologic indicators were measured at Saddleback Lake in Hillsborough County, Florida.

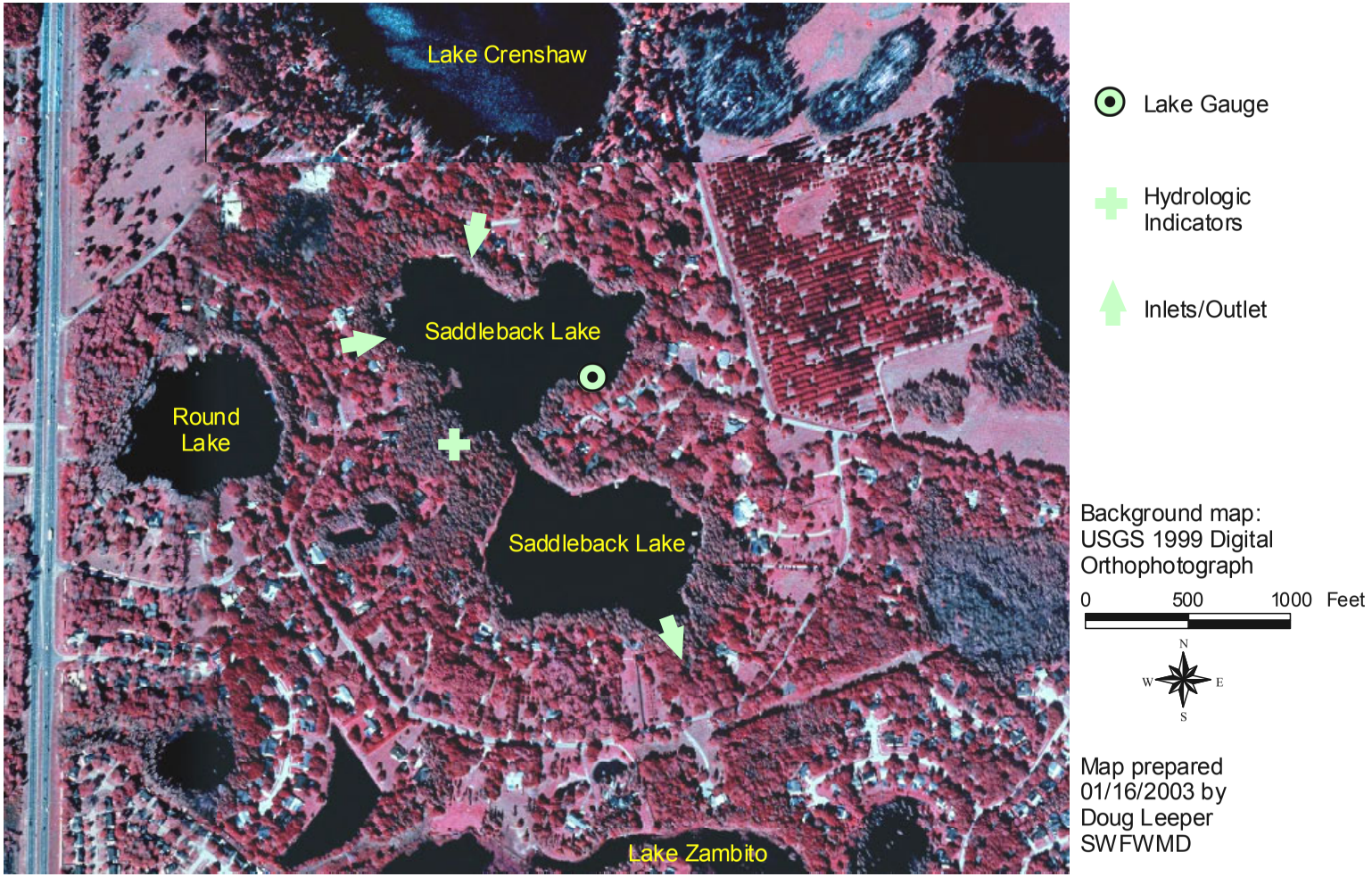
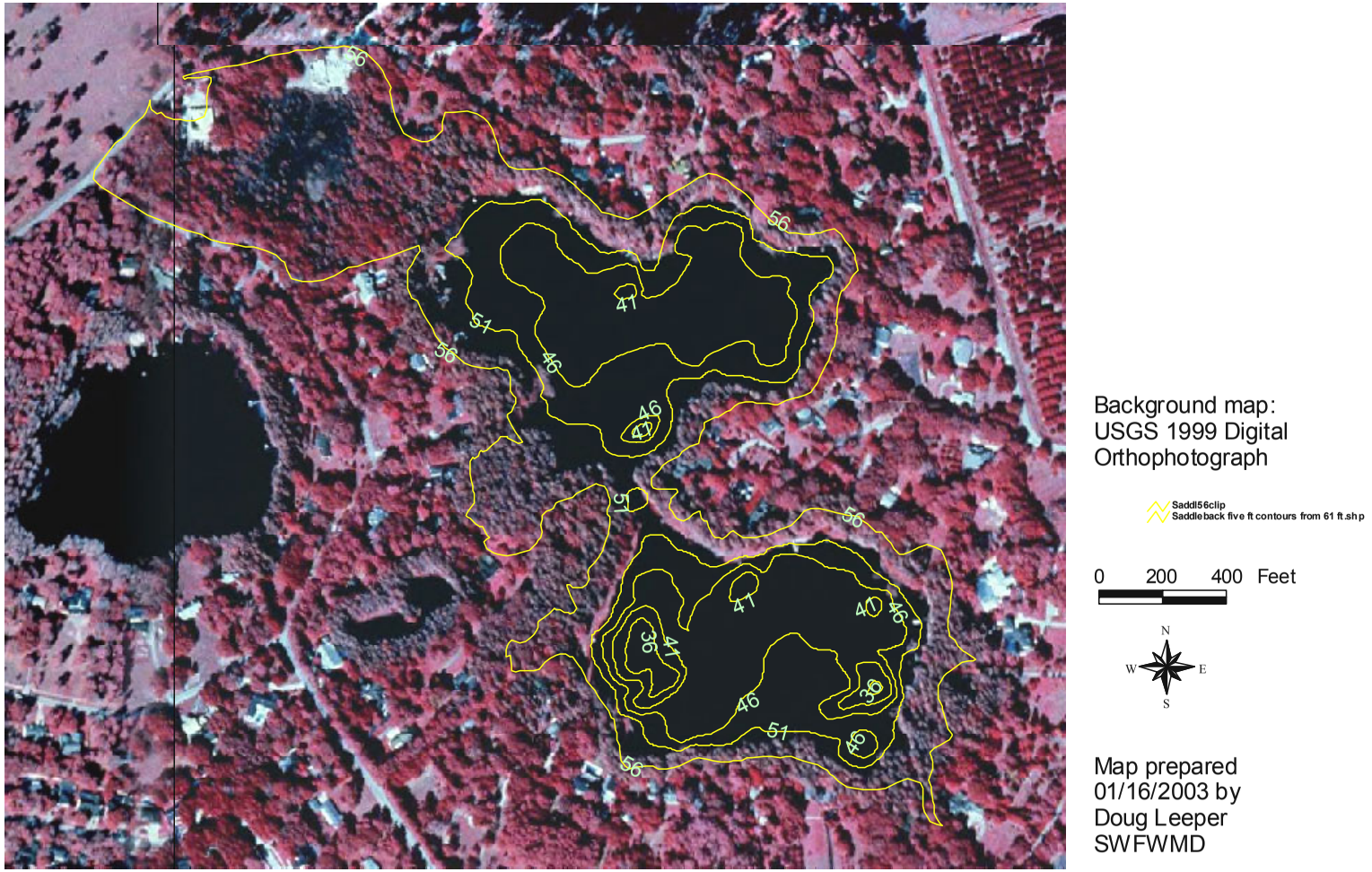


Figure Saddleback-3. Five-foot contours within the Saddleback Lake basin in Hillsborough County, Florida. Values shown are elevations, in feet, above the National Geodetic Vertical Datum of 1929.



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 Saddleback Lake in September 1980 (Table Saddleback-1). A Maximum Desirable Level of 54.75 ft above NGVD was also developed, but was not adopted by the Governing Board.

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

Level	Elevation (feet above NGVD)	Total Lake Area (acres)
Ten Year Flood Guidance Level	56.50	NA
High Level	55.50	53
Low Level	53.00	34
Extreme Low Level	52.00	28

NA = not available

Proposed Minimum and Guidance Levels

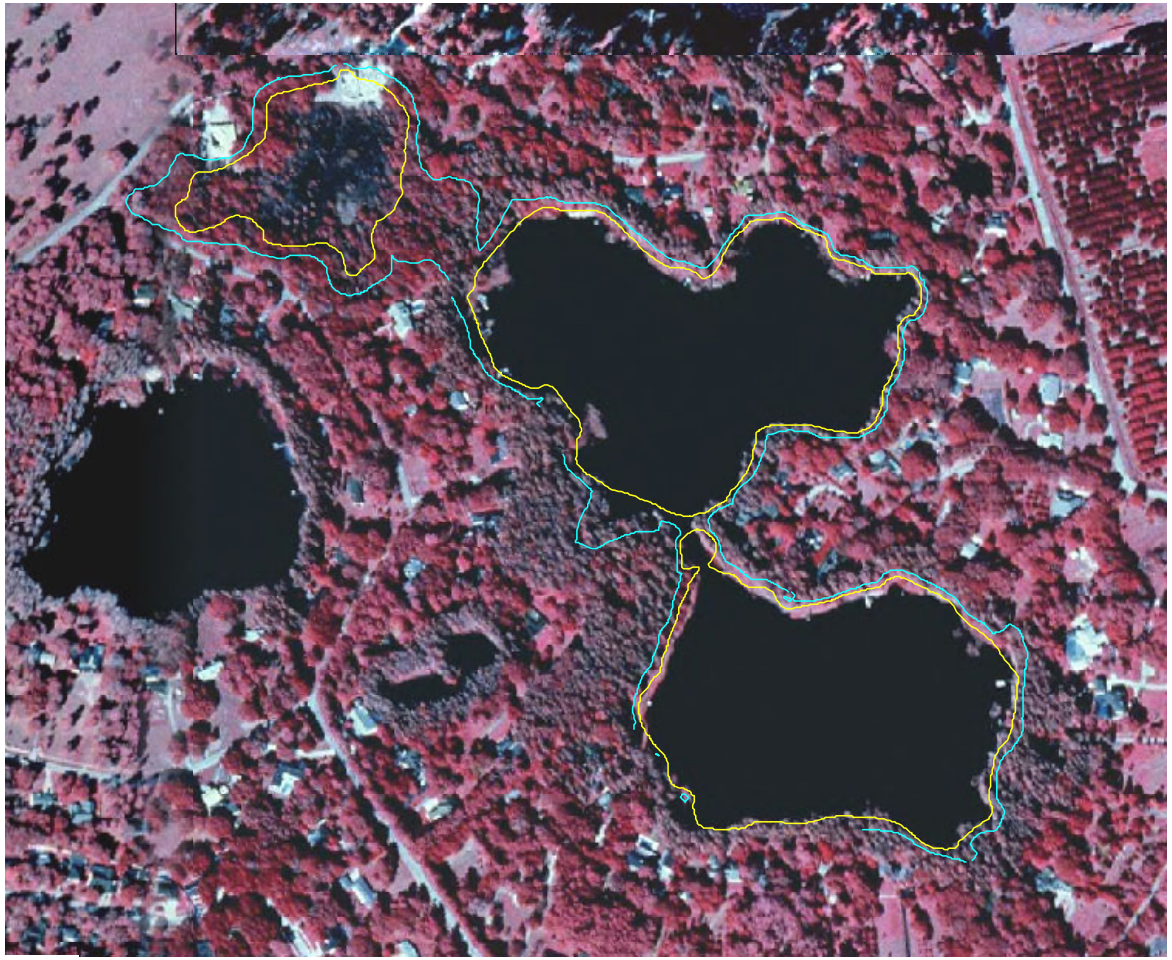
Proposed Minimum and Guidance Levels were developed for Saddleback Lake using the methodology for Category 2 Lakes described in current District rules (Chapter 40D-8, Florida Administrative Code; see also SWFWMD 1999). Proposed levels, along with lake surface area values for each level are listed in Table Saddleback-2. The locations of the proposed minimum levels within the lake basin are shown in Figure Saddleback-4.

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

Level	Elevation (feet above NGVD)	Total Lake Area (acres)
Ten Year Flood Guidance Level	56.34	NA
High Guidance Level	54.58	46
High Minimum Lake Level	54.58	46
Minimum Lake Level	53.58	37
Low Guidance Level	52.48	29

NA = not available

Figure Saddleback-4. Approximate location of the proposed Minimum Lake Level (yellow) and the proposed High Minimum Lake Level (blue) for Saddleback Lake in 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 Saddleback Lake (District Universal ID Number STA 144 144) from June 1971 through September 1985 and from November 1987 to the present date (Figure Saddleback-5). For the period of record from January 1974 through the present date, the hydrologic data are classified as Current data. Current data collected through January 2002 were used to calculate the Current P10, P50, and P90 (Table Saddleback-3).

The Normal Pool elevation was established using cypress trees within the swamp adjacent to the southwest shore of the north lake basin (Tables Saddleback-3 and Saddleback-4, Figure Saddleback-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 (Tables Saddleback-3 and Saddleback-5, Figure Saddleback-6). The 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 Normal Pool elevation, and the Current P10, the High Guidance Level was established at the Current P10 elevation of 54.58 ft above NGVD (Table Saddleback-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 Saddleback Lake using the methodology for open basin lakes described in current District Rules (Chapter 40D-8, Florida Administrative Code). The District used an existing hydrologic and hydraulic computer model of the Rocky Creek Watershed developed by Hillsborough County (Hillsborough County 1998). The Rocky Creek runoff hydrographs were computed using the NRCS Dimensionless Unit Hydrograph, 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 Rocky Creek 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. District staff modified the EXTRAN input data developed by Hillsborough County to include additional surveyed elements of the Saddleback Lake outlet conveyance system. The initial elevation of Saddleback Lake was set at the control point elevation of 53.9 ft above NGVD. The modified data set was then used to determine the 10-year flood level based on runoff hydrographs from the 10-year storm event.

The Ten Year Flood Guidance Level (56.34 ft above NGVD) was exceeded in September 1974 (see Figure Saddleback-5). The highest recorded surface elevation for

the lake, 56.48 ft above NGVD, was reported on September 25, 1974 and October 28, 1974.

Saddleback Lake contains abundant stands of aquatic macrophytes, including torpedograss (*Panicum repens*), American lotus (*Nelumbo lutea*), and southern naid (*Najas quadelupensis*). The southwest corner of the north basin of the lake is contiguous with a cypress-dominated (*Taxodium* sp.) wetland of more than 0.5 acres in size. Based on the presence of this wetland, Saddleback Lake may be 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 Saddleback Lake, this standard occurs at 54.13 ft above NGVD. Based on the relationship between the Cypress Standard and Historic P50 elevation, the proposed Minimum Lake Level was established at the Historic P50 elevation (53.58 ft above NGVD), and the proposed High Minimum Lake Level was established at the High Guidance Level (54.58 ft above NGVD). The proposed High Minimum Lake Level is 2.5 ft below the Low Floor Slab elevation.

For comparative purposes, minimum level standards used for establishing the Minimum Lake Level for lakes without fringing cypress wetlands were developed for Saddleback Lake (Table Saddleback-3, see Leeper *et al*. 2001 and Dierber and Wagner 2001 for the methodology employed). A Dock-Use Standard was established at 53.58 ft above NGVD, based on the Northern Tampa Bay area RLWR5090 (1.1 ft) and a Dock-End Sediment elevation of 50.48 ft, which was developed from measurement of 31 docks. A Species Richness Standard was established at 53.0 ft above NGVD, based on a 15% reduction in lake surface area from that at the Historic P50 elevation. An Aesthetic-Standard for the lake was established at the Low Guidance Level elevation of 52.48 ft above NGVD. A Basin Connectivity Standard was established at 51.1 ft above NGVD, based on use of powerboats in the lake, a critical high-spot elevation of 48 ft and the RLWR5090 for the northern Tampa Bay area. A Recreation/Ski Standard was not established, based on the size of the lake sub-basins.

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

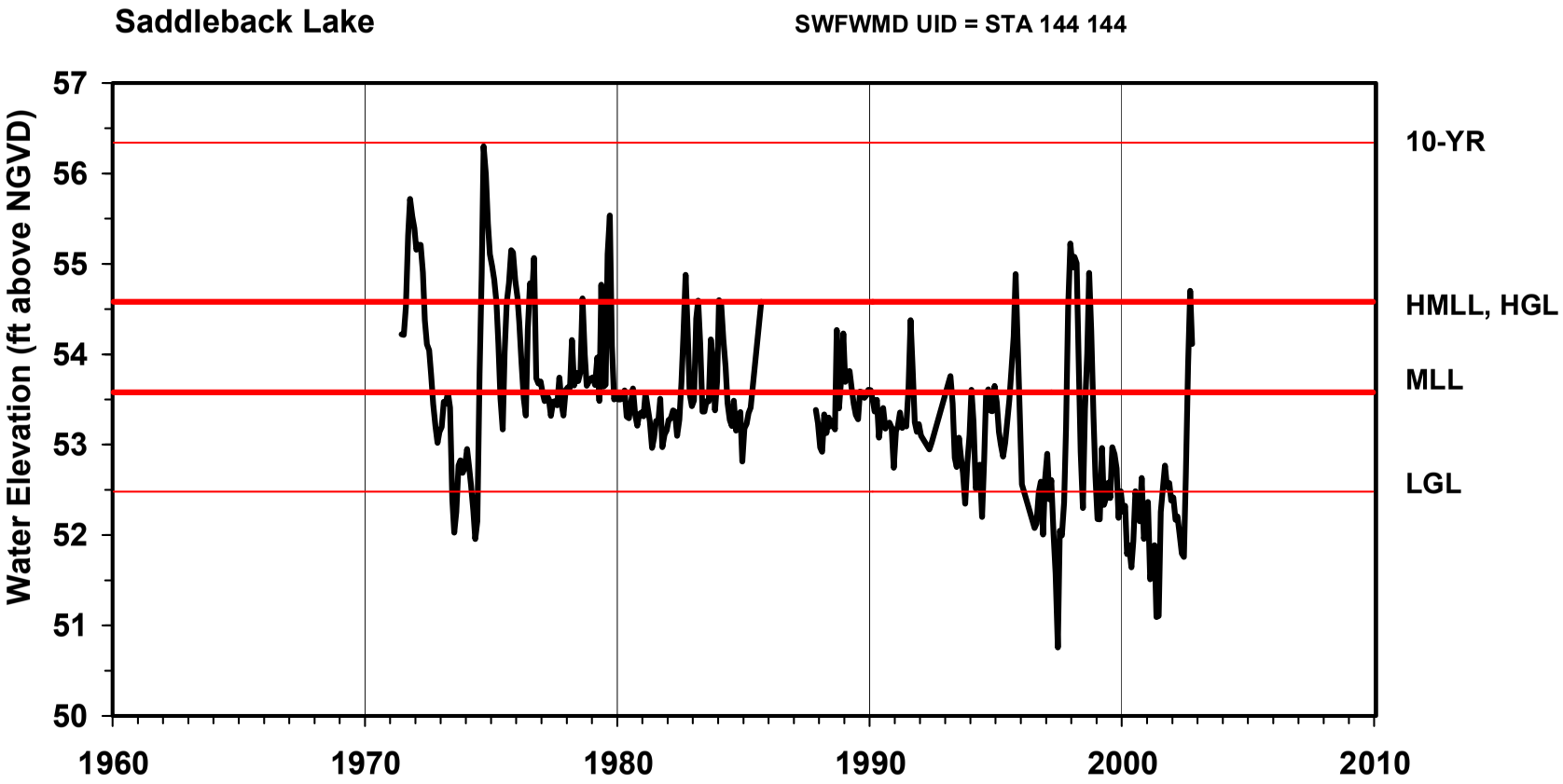


Table Saddleback-3. Elevation data and associated area values used for establishing minimum levels for Saddleback Lake in Hillsborough County, Florida.

Level or Feature	Elevation (feet above NGVD)	Total Lake Area (acres)
Current P10	54.58	46
Current P50	53.37	36
Current P90	52.27	29
Normal Pool	55.93	55
Low Floor Slab	57.06	NA
Low Other (slab for wooden gazebo)	56.26	NA
Low Road	57.1	NA
Control Point	53.9	39
High Guidance Level	54.58	46
Historic P50	53.58	37
Low Guidance Level	52.48	29
Cypress Standard	54.13	42
Dock-Use Standard [a]	53.58	37
Species Richness Standard [a]	53.0	34
Aesthetic Standard	52.48	29
Basin Connectivity Standard [a]	51.1	25

NA = not available

[a] = not applicable; used for developing minimum levels for Category 3 Lakes

Table Saddleback-4. Elevation data used for establishing the Normal Pool Elevation for Saddleback Lake in Hillsborough County, Florida. Data were collected on December 13, 2000. The lake surface elevation was 52.07 above NGVD.

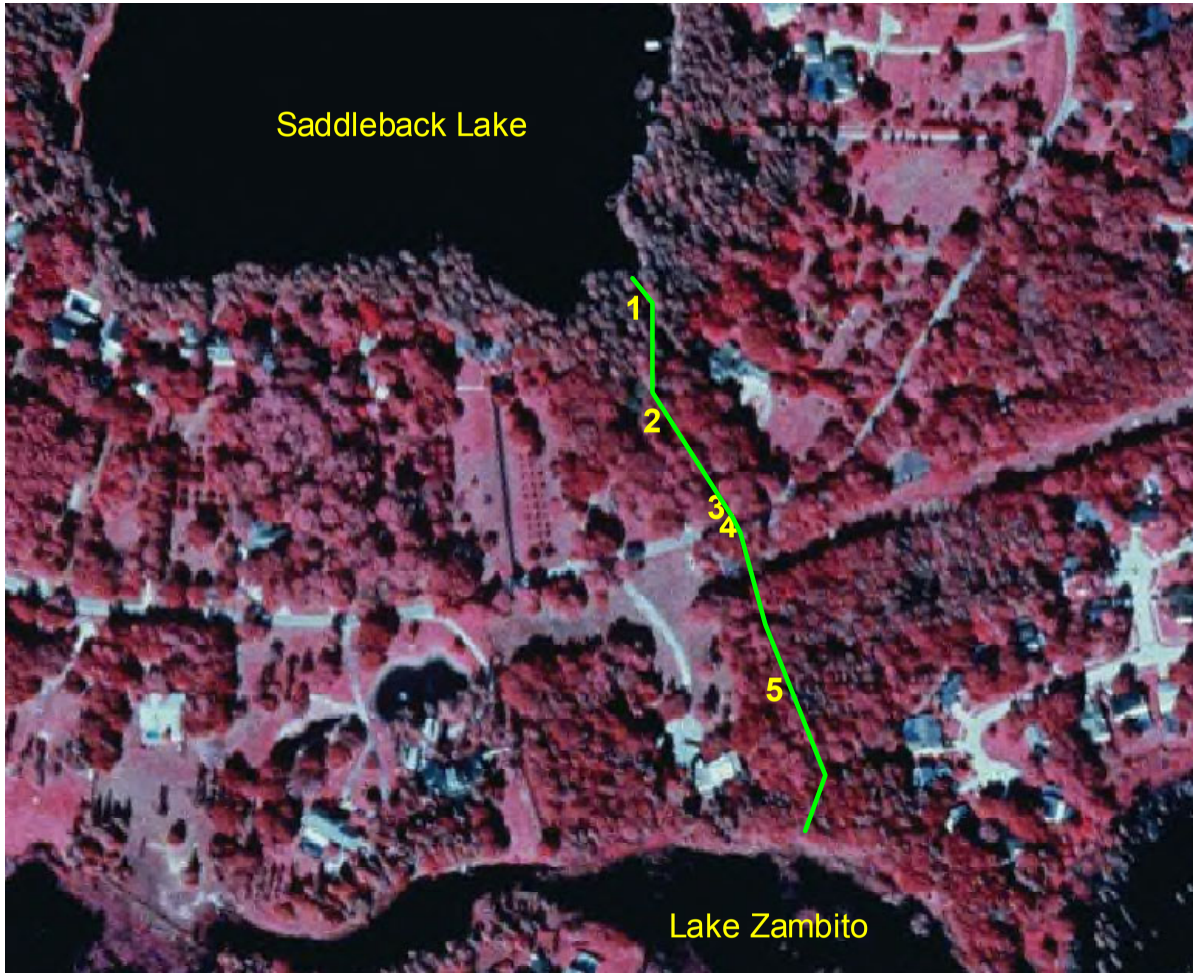
Hydrologic Indicator	Elevation (feet above NGVD)
Normal pool based on cypress buttress	55.87
Normal pool based on cypress buttress	56.05
Normal pool based on cypress buttress	55.93
Normal pool based on cypress buttress	56.21
Normal pool based on cypress buttress	56.41
Normal pool based on cypress buttress	55.9
Normal pool based on cypress buttress	55.99
Normal pool based on cypress buttress	55.74
Normal pool based on cypress buttress	55.92
Normal pool based on cypress buttress	55.45
N	**10**
Median	**55.93**
Mean	**55.95**
Standard Deviation	**0.24**

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

No.	Description	Elevation (feet above NGVD)
1	Invert of 48" notch in 13 ft wide sandbag structure; elevation of the top of the structure is 53.4 ft above NGVD	52.4
2	Open channel	NA
3	Control point; high spot in channel north of Berger Road	53.9
4	Invert at north ends of two 36" corrugated metal pipes running under Berger Road; invert elevations at south ends of pipes are 52.84 and 52.98 ft above NGVD	53.19
5	Open channel to Lake Zambito	NA

NA = not applicable

Figure Saddleback-6. Outlet conveyance system for Saddleback Lake in Hillsborough County, Florida. Numbered sites along the conveyance system are described in Table Saddleback-5.



Background map:
USGS 1999 Digital
Orthophotograph

0 200 400 Feet

N
W E
S

Map prepared
01/17/2003 by
Doug Leeper
SWFWMD

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

Arnold, D. 2001. Memorandum to Doug Leeper (Southwest Florida Water Management District), dated November 21, 2001. Subject: Response to your memo on issues concerning control point identification. Southwest Florida Water Management District, Brooksville, Florida.

Brooks, H.K. 1981. Physiographic divisions of Florida: map and guide. Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, Florida.

Coats, B. 2000. Radium conundrum. St. Petersburg Times, September 22, 2000. St. Petersburg, Florida.

Coats, B. 2002. Lake warning: please don't eat the mussels. St. Petersburg Times, December 13, 2002. St. Petersburg, Florida.

Cowell, B.C., Young, S.N., and Resico, C.H., Jr. 1973. Aquatic insect survey of Upper Tampa Bay Watershed Project and Brooker Creek Watershed. Department of Biology, University of South Florida, Tampa, Florida. Prepared for the Southwest Florida Water Management District, Brooksville, Florida.

Dierberg, F.E. and Wagner, K.J. 2001. A review of "A multiple-parameter approach for establishing minimum levels for Category 3 Lakes of the Southwest Florida Water Management District" June 2001 draft by D. Leeper, M. Kelly, A. Munson, and R. Gant. Prepared for the Southwest Florida Water Management District, Brooksville, Florida.

Dooris, P.M. 1978. *Hydrilla verticillata*: chemical factors in lakes affecting growth. Ph.D. dissertation. Department of Biology, University of South Florida, Tampa, Florida.

Dooris, P.M., Dooris, G.M., and Martin, D.F. 1982. Phytoplankton responses to ground water addition in central Florida lakes. Water Resources Bulletin 18: 335-337.

Dooris, P.M., and Martin, D.F. 1979. Ground-water induced changes in lake chemistry. Groundwater 17: 324-327.

Dooris, P.M, and Moresi, R.J. 1975. Evaluation of lake augmentation practices in northwest Hillsborough County, Florida. Southwest Florida Water Management District, Brooksville, Florida.

Florida Board of Conservation. 1969. Florida lakes, part III: gazetteer. Division of Water Resources, Tallahassee, Florida.

Florida Department of Agriculture and Consumer Services. 1938. Aerial photography of the Saddleback Lake area, dated November 21, 1938. Tallahassee, Florida.

Florida Lakewatch. 2001. Florida Lakewatch data report 2000. Department of Fisheries and Aquatic Sciences, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, Florida.

Griffith, G., Canfield, D., Jr., Horsburgh, C., Omernik, and J. Azevedo, S. 1997. Lake regions of Florida (map). United States Environmental Protection Agency, University of Florida Institute of Food and Agricultural Sciences, Florida Lakewatch, Florida Department of Environmental Protection, and the Florida Lake Management Society.

Hassell, A.L. 1994. A chemical and biochemical characterization of Lakes Cooper, Strawberry, Crystal, Hobbs, Starvation, and Saddleback in Hillsborough County (Florida). M.S. thesis. Department of Chemistry, University of South Florida, Tampa, Florida.

Hassell, A.L., Dooris, P.M., and Martin, D.M. 1979. Maucha diagrams and chemical analyses to diagnose changes in lake chemistry. Environmental Chemistry 60: 75-80.

Hazardous Substance and Waste Management Research, Inc. 2000. Human health risk assessment and preliminary ecological evaluation regarding potential exposure to radium-226 in several Central Florida lake ecosystems. Tallahassee, Florida. Prepared for the Southwest Florida Water Management District, Brooksville, Florida.

Hillsborough County 1998. Rocky/Brushy Creek area stormwater management master plan. Public Works Department/Engineering Division, Stormwater Management Section, Tampa, Florida.

Hillsborough County Watershed Atlas (web site: hillsborough.wateratlas.usf.edu) 2002. Developed by the Hillsborough County Public Works Department Stormwater Management Section, the University of South Florida Florida Center for Community Design and Research, and the Southwest Florida Water Management District, Tampa and Brooksville, Florida.

Hogg, W. 2002. Letter to Doug Leeper (Southwest Florida Water Management District), dated February 15, 2002. Subject: Comments on proposed methodology to establish minimum levels for Category 3 lakes. Tampa Bay Water, Clearwater, Florida.

Jones, K.C. 1878. Lake augmentation alternatives in Northwest Hillsborough Basin. Southwest Florida Water Management District, Brooksville, Florida.

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.

Leeper, D. 2001. Draft memorandum to Marty Kelly (Southwest Florida Water Management District), dated November 21, 2001. Subject: Staff response to written

comments on the District's proposed methods for developing minimum levels for Category 3 lakes. Southwest Florida Water Management District, Brooksville, Florida.

Leeper, D., Kelly, M., Munson, A. and Gant, R. 2001. A multiple-parameter approach for establishing minimum levels for Category 3 Lakes of the Southwest Florida Water Management District, June14, 2001 draft. Southwest Florida Water Management District, Brooksville, Florida.

Luter, T.H. 1998. Memorandum, dated May 7, 1980 to G. W. Kuhl: Augmentation of Lakes Byrd, Charles and Saddleback, Hillsborough County, Florida. Southwest Florida Water Management District, Brooksville, Florida.

Martin, D.F., Victor, D.M.,and Dooris, P.M. 1976. Effects of artificially introduced ground water on the chemical and biochemical characteristics of six Hillsborough County (Florida) lakes. Water Research Journal 10: 65-69.

Metz, P.A., and Sacks, L.A. 2002. Comparison of the hydrogeology and water quality of a ground-water augmented lake with two non-augmented lakes in northwest Hillsborough County, Florida. Water-Resource Investigations Report 02-4032. U.S. Geological Survey, Tallahassee, Florida, in cooperation with the Southwest Florida Water Management District, Brooksville, Florida.

Murphy, W.R., Jr., Evans, R.P., and Whalen, J.K. 1984. Flooding in northwestern Hillsborough and southern Pasco Counties, Florida, in 1979. Open-File Report 82-96. U.S. Geological Survey, Tallahassee, Florida.

Robertson, R.T. 1971. Water levels Northwest Hillsborough Basin. Southwest Florida Water Management District, Brooksville, Florida.

Shafer, M.D., Dickinson, R.E., Heaney, J.P., and Huber, W.C. 1986. Gazetteer of Florida lakes. Publication no. 96, Water Resources Research Center, University of Florida, Gainesville, Florida.

Southwest Florida Water Management District. 1973. Environmental assessment Upper Tampa Bay Watershed Hillsborough, Pasco and Pinellas Counties, Florida. Brooksville, Florida.

Southwest Florida Water Management District. 1981. An evaluation of lake regulatory stage levels on selected lakes in the Northwest Hillsborough Basin. Brooksville, Florida.

Southwest Florida Water Management District. 1989. Northwest Hillsborough Basin Northwest Re-Map II, aerial photography with contours. Sheet No. 22-27-18. Brooksville, Florida. Prepared by Kucera International Photogrammetric Consultants, Lakeland, Florida.

Southwest Florida Water Management District. 1996. Lake Levels Program lake data

sheets / 1977-1996, NW Hillsborough Basin – 14, Volume #1 – Lake H thru Z. Brooksville, Florida.

Southwest Florida Water Management District. 1999. Establishment of minimum levels for Category 1 and Category 2 lakes, *in* Northern Tampa Bay minimum flows and levels white papers: white papers supporting the establishment of minimum flows and levels for isolated cypress wetlands, Category 1 and 2 lakes, seawater intrusion, environmental aquifer levels, and Tampa Bypass Canal; peer-review final draft, March 19, 1999. Brooksville, Florida.

Southwest Florida Water Management District. 2002. Special purpose survey, Section 22, Township 27 South, Range 18 East, Hillsborough County; Northwest Hillsborough Basin, Minimum Flows & Levels, Lake Crenshaw, Saddleback & Round. Brooksville, Florida.

Stewart, J. W., and Hughes, G.H. 1974. Hydrologic consequences of using ground water to maintain lake levels affected by water wells near Tampa, Florida. United States Geological Survey, Southwest Florida Water Management District, and the Florida Department of Natural Resources, Tallahassee, Florida.

United States Geological Survey. 1956. Sulphur Springs quadrangle, Florida-Hillsborough Co., 7.5 minute series (topographic) map; Sulphur Springs, Fla., 28082-A4-TF-024, 1956, photorevised 1987, DMA 4540 III SW-Series V847. Department of Interior, Washington, D.C.

Voakes, R. F. 2001. Letter to Doug Leeper (Southwest Florida Water Management District), dated September 15, 2001. Subject: Comments on a Multiple-Parameter Approach for Establishing Minimum Levels for Category 3 Lakes of the Southwest Florida Water Management District. Public Utilities Department, City of St. Petersburg, Florida.

Young, S. 1979. Relationship between abundance of crustacean zooplankton and trophic state in fourteen central Florida lakes. M.S. Thesis. Department of Biology, University of South Florida, Tampa, Florida.