

**April 27, 2004**

**MEMORANDUM**

**TO: File**

**FROM: Adam Munson, Environmental Scientist III  
Resource Conservation and Development Department  
Southwest Florida Water Management District**

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

## **Neff Lake**

### ***General Description***

Neff Lake (Figure 1) is located in the Withlacoochee River Basin in Hernando County, Florida (Sections 17, 20 and 21, 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 has been described as a "spectacular ridge of high hills dissected from Upper Miocene sand and silty sand" (Brooks 1981). 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, and described as 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).

Although the lake basin (Figure 2) has been highly modified, little of the lake shoreline has been cleared for residential development. There is a private boat ramp located just north of the gage site on the eastern shore.

The drainage area for Neff Lake is 5.1 square miles (SWFWMD 1996). The lake receives inflow from Mountain Lake located to the east through a ditch and culvert system. This system initiates along the west shore of Mountain Lake and drains to Neff Lake when the stage of Mountain Lake exceeds 102.54 ft above the National Geodetic Vertical Datum of 1929 (NGVD). Neff Lake does not have a surface outlet. However, significant drainage from the basin has occurred periodically to underlying aquifers through a sink system located along the northeast shore of the main lake basin (in the vicinity of the District's water level gauge). There are no surface water withdrawals from the lake currently permitted by the District. There are, however, several 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 226 acres and an elevation of 101 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 also indicates a 101 ft-NGVD surface water elevation for the lake. The 101 ft elevation listed in the "Gazetteer of Florida Lakes" corresponds to a lake surface area of 234 acres, based on a topographic map of the basin generated in support of minimum levels development (Figure 3). Data used for production of the topographic map were obtained from field surveys conducted on February 20, 2003 and 1:200 aerial photograph maps containing one-foot contour lines prepared using photogrammetric methods.

**Figure 1. Location of Neff Lake in Hernando County, Florida.**

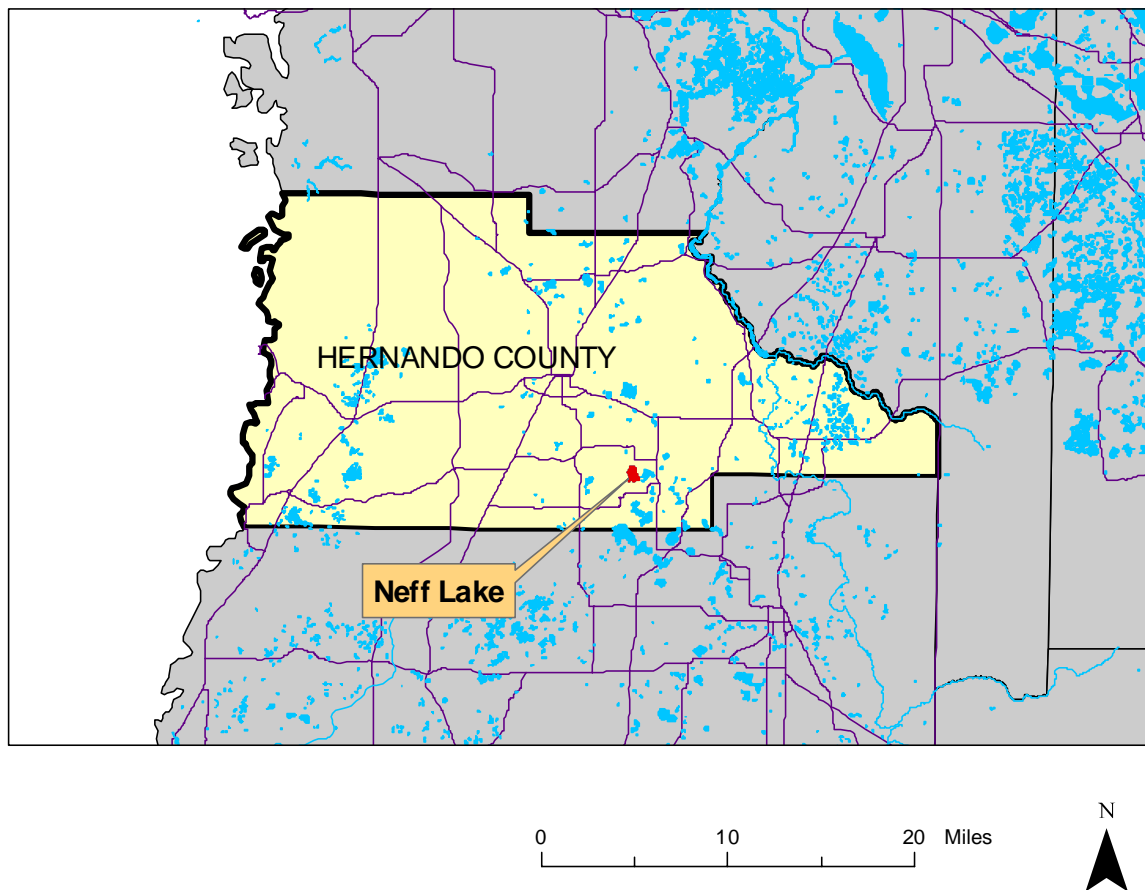
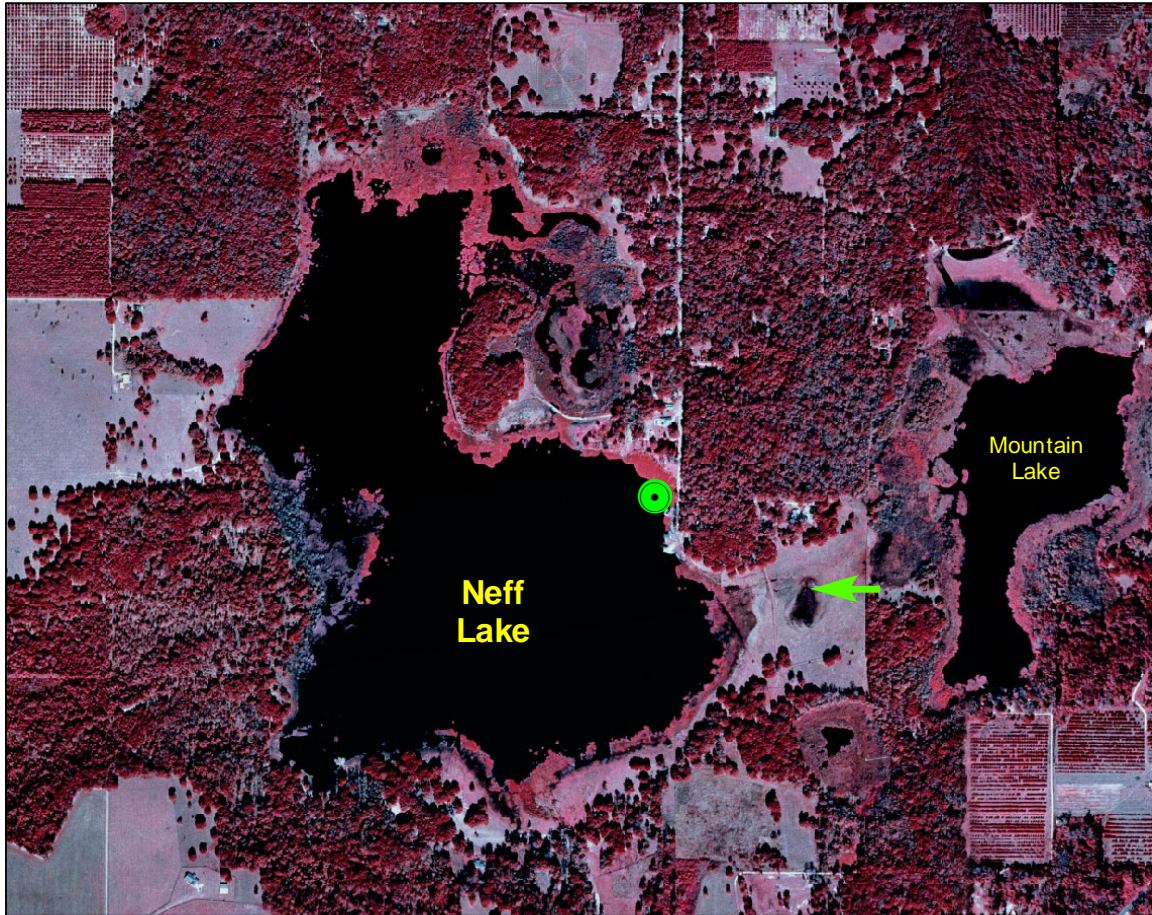




Figure 2. Location of District lake-level gauge and inlet at Neff Lake in Hernando County, Florida.



 Lake gauge

 Inlet

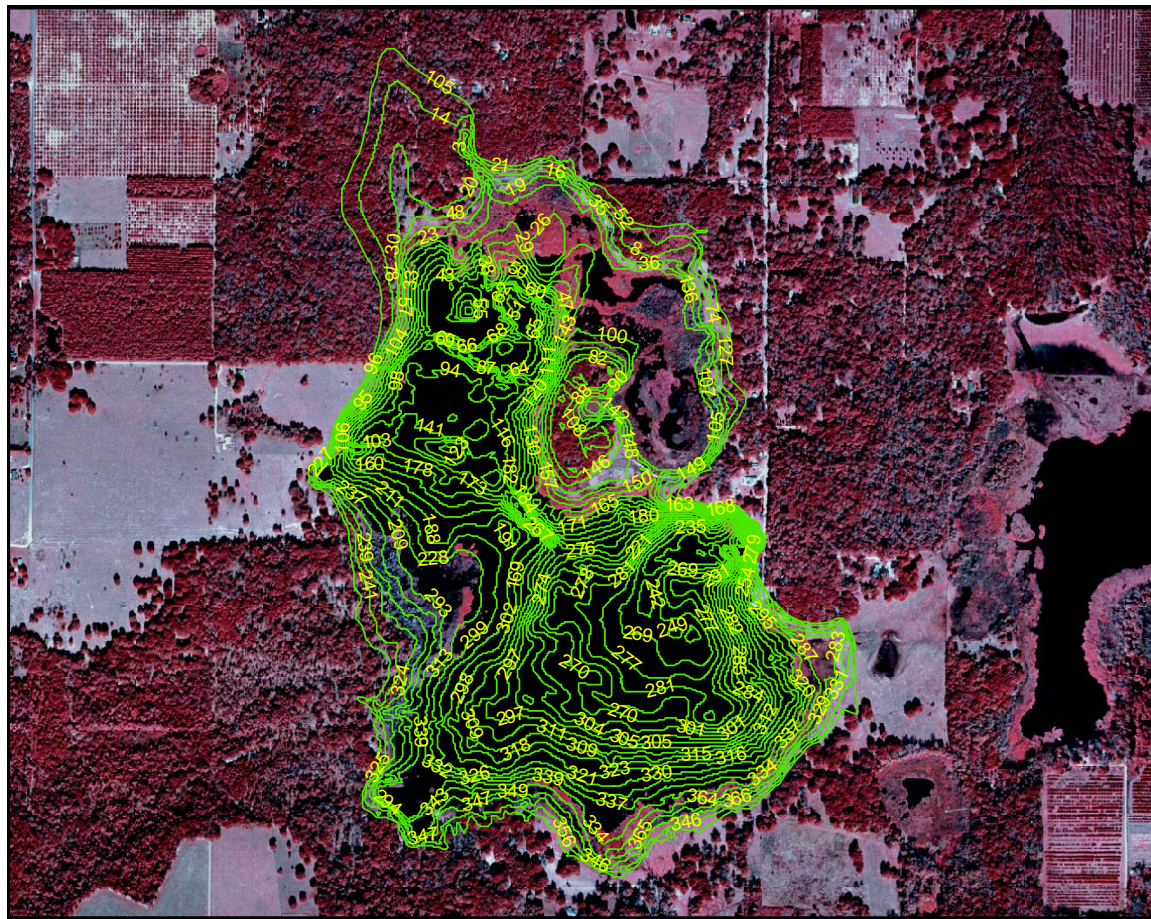
0 1,000 2,000 Feet



Aerial photograph from 1999 USGS  
Digital Orthophotography.

Map prepared March 8, 2004.

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



Map prepared March 8, 2004 using 1999 USGS digital orthophotography, elevation data from 1987 SWFWMD aerial photography with contours maps (Sheet nos. 20-23-20 and 17-23-20) and spot elevation data collected on February 20, 2003 by SWFWMD Staff.

0 1,000 2,000 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 Neff Lake on July 12, 1985 (Table 1). A Maximum Desirable Level of 102.50 ft above NGVD was also developed, but was not adopted by the Governing Board.

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

<b>Level</b>	<b>Elevation (feet above NGVD)</b>	<b>Total Lake Area (acres)</b>
Ten Year Flood Guidance Level	104.40	309
High Level	103.00	271
Low Level	100.00	188
Extreme Low Level	98.00	153

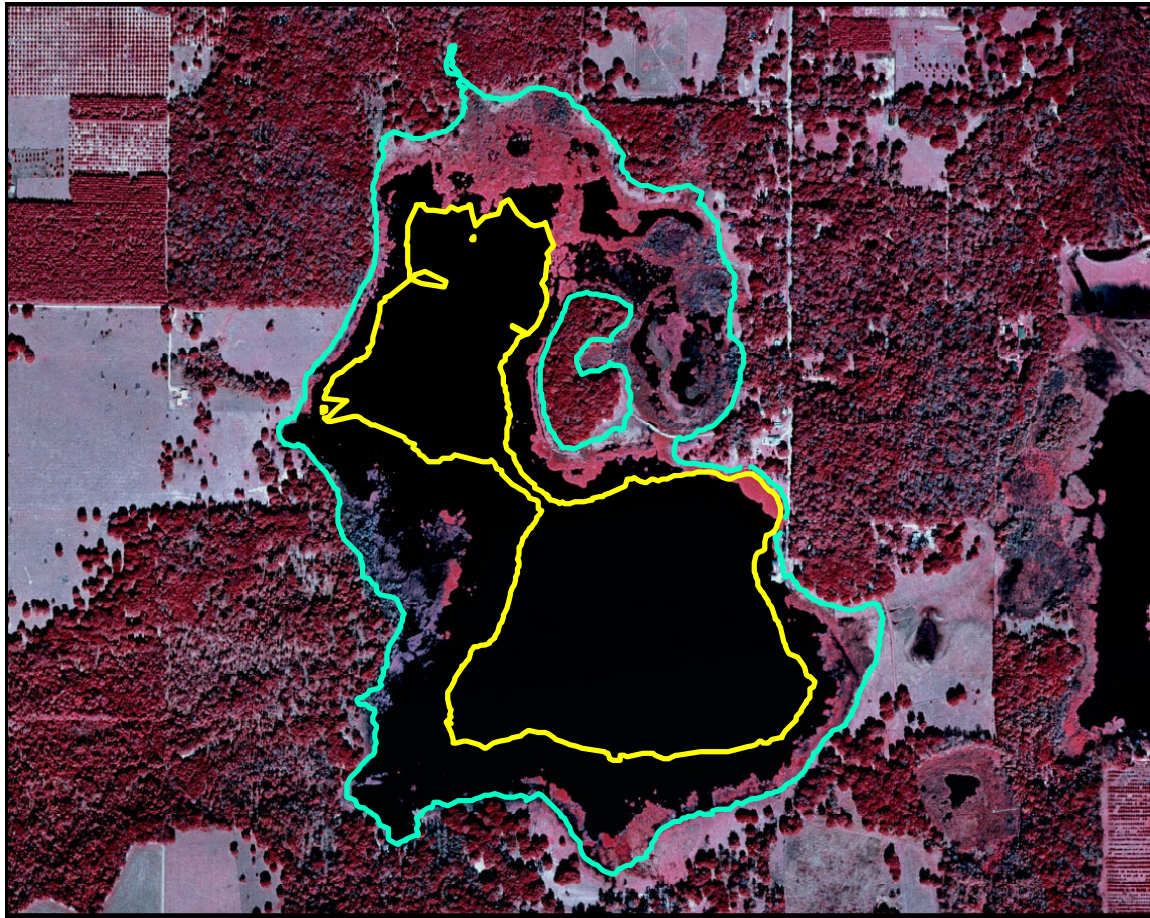
### ***Proposed Minimum and Guidance Levels***

Proposed Minimum and Guidance Levels were developed for Neff Lake using the methodology for Category 3 Lakes described current District rules (Chapter 40-D8, 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 Neff Lake in Hernando County, Florida.**

<b>Level</b>	<b>Elevation (feet above NGVD)</b>	<b>Lake Area (acres)</b>
Ten Year Flood Guidance Level	104.1	302
High Guidance Level	102.2	255
High Minimum Lake Level	102.2	255
Minimum Lake Level	94.5	105
Low Guidance Level	87.4	31

**Figure 4. Approximate location of the proposed Minimum Lake Level (yellow line) at 94.5 ft above NGVD and proposed High Minimum Lake Level (blue line) at 102.5 ft above NGVD for Neff Lake in Hernando County, Florida.**



Map prepared March 8, 2004 using 1999 USGS digital orthophotography, elevation data from 1987 SWFWMD aerial photography with contours maps (Sheet nos. 20-23-20 and 17-23-20) and spot elevation data collected on February 20, 2003 by SWFWMD Staff.

0 1,000 2,000 Feet



## **Summary of Data and Analyses Supporting Recommended Minimum and Guidance Levels**

A discontinuous record of hydrologic data is available for Neff Lake (District Universal ID Number STA 82 82) from October 1970 to July 1990, and from January 1995 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 entire period of record, the hydrologic data are classified as Historic data. Historic data collected through February 2003 were used to calculate the Historic P10, P50, and P90 (Table 3).

The Normal Pool elevation was established at 110 ft above NGVD based on elevations associated with the distribution of saw palmetto (*Serenoa repens*) and live oak (*Quercus virginiana*) in the lake basin (Table 4). The low floor slab and low road elevations were determined using available one-foot contour interval aerial maps and field survey data (Table 3). Neff Lake does not have an outlet. When the water surface in the basin exceeds 102.54 ft above NGVD, the lake may be connected to Mountain Lake to the east (Figure 7). However, since Mountain Lake does not have another outlet, Neff Lake is classified as a closed basin lake and a control point elevation was not established.

Based on the availability of Historic hydrologic data for Neff Lake, the High Guidance Level was established at the Historic P10 elevation of 102.2 ft above NGVD (Table 3). The Historic P50 and Low Guidance Level were established at 94.5 and 87.4 ft above NGVD, respectively, using the Historic P50 and Historic P90 elevations.

The Ten Year Flood Guidance Level for Neff Lake was established at 104.1 ft NGVD using the methodology for closed basin lakes described in current District Rules (Chapter 40D-8, Florida Administrative Code). In accordance with the closed-basin methodology, the 10-year flood level was based on frequency analysis of available lake stage data and stage values derived from a HSPF (Hydrologic Simulation Program Fortran) continuous simulation model. Inputs to the model included standard watershed parameters (basin size, slope, infiltration rate, ground water recession rate, etc.) and rainfall records from the Brooksville National Weather Service site for the period from 1950 through 2003.

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 Neff Lake included in the District Water Management Database, 104.39 ft above NGVD, occurred on March 11, 1998. The low of record, 70.12 ft above NGVD, occurred on June 18, 1971.

Neff Lake is not contiguous with 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 Alligator weed (*Alternanthera philoxeroides*), torpedograss (*Panicum repens*), water fern (*Salvinia* sp.), water

hyacinth (*Eichhornia crassipes*), *Lemna sp.*, *Azolla sp.*, and willow (*Salix sp.*) occur throughout the basin.

Basin Connectivity, Recreation/Ski, Species Richness, Aesthetics and Mixing Standards were evaluated for minimum levels development (Table 3). The Basin connectivity standard was established at 101.3 ft above NGVD, by determining the elevation required to maintain connectivity between the two major sub-basins (92.3 ft above NGVD), adding 2-ft for power boat clearance, and then adding the difference between the Historic P50 and the Historic P90 (7.0 ft) to assure at least 2 ft of clearance 50 % of the time. The Recreation/Ski Standard was established at 99.0 ft above NGVD, based on the elevation at which the lake could contain a safe skiing area (92 ft above NGVD) and the difference between the Historic P50 and Historic P90. The Species Richness Standard was established at 93.4 ft above NGVD, based on limiting change in lake surface area to less than a 15% reduction from the area at the Historic P50 elevation. The Aesthetic-Standard for the lake was established at the Low Guidance Level elevation of 87.4 ft above NGVD. Based on potential resuspension of sediments, the Mixing Standard was not applicable to this lake. The Dock-Use Standard was not established due to the absence of docks on Neff Lake.

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). However, because the Recreation/Ski Standard exceeds the Historic P50 elevation, the standard was not considered appropriate for minimum levels development.

The Basin Connectivity Standard, the highest of the appropriate standards, is greater than the Historic P50 elevation, so the Historic P50 was used to establish the proposed Minimum Lake Level at 94.5 ft above NGVD. The proposed High Minimum Lake Level was established at 102.2 ft above NGVD, an elevation corresponding to the Minimum Lake Level plus the difference between the Historic P50 and the Historic P10 (7.7 ft). The proposed High Minimum Lake Level is 6.1 ft below the Low Floor Slab elevation for Neff Lake and 7.4 ft below the Low Floor Slab for Mountain Lake. It is also 2.2 ft below the Low Road elevation for Neff Lake. When compared to elevations of other structures, the proposed High Minimum Lake Level is 3.5 ft below the floor slab elevation of a restroom/laundry building on Neff Lake, but is 3.8 ft above the floor slab of a first floor garage under a house on Neff Lake. The garage of this house has been inundated a number of times in the past for extended periods of time.

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

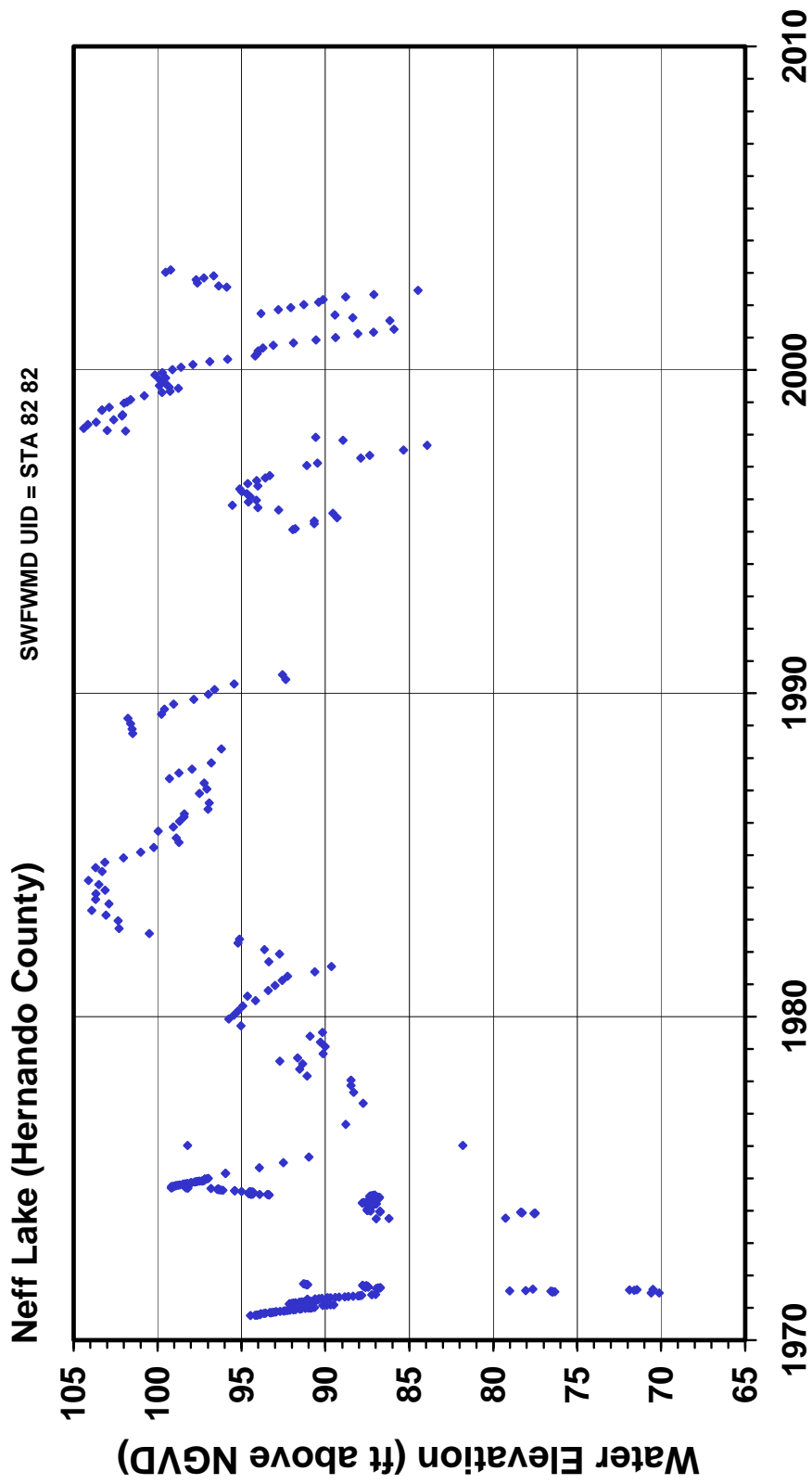
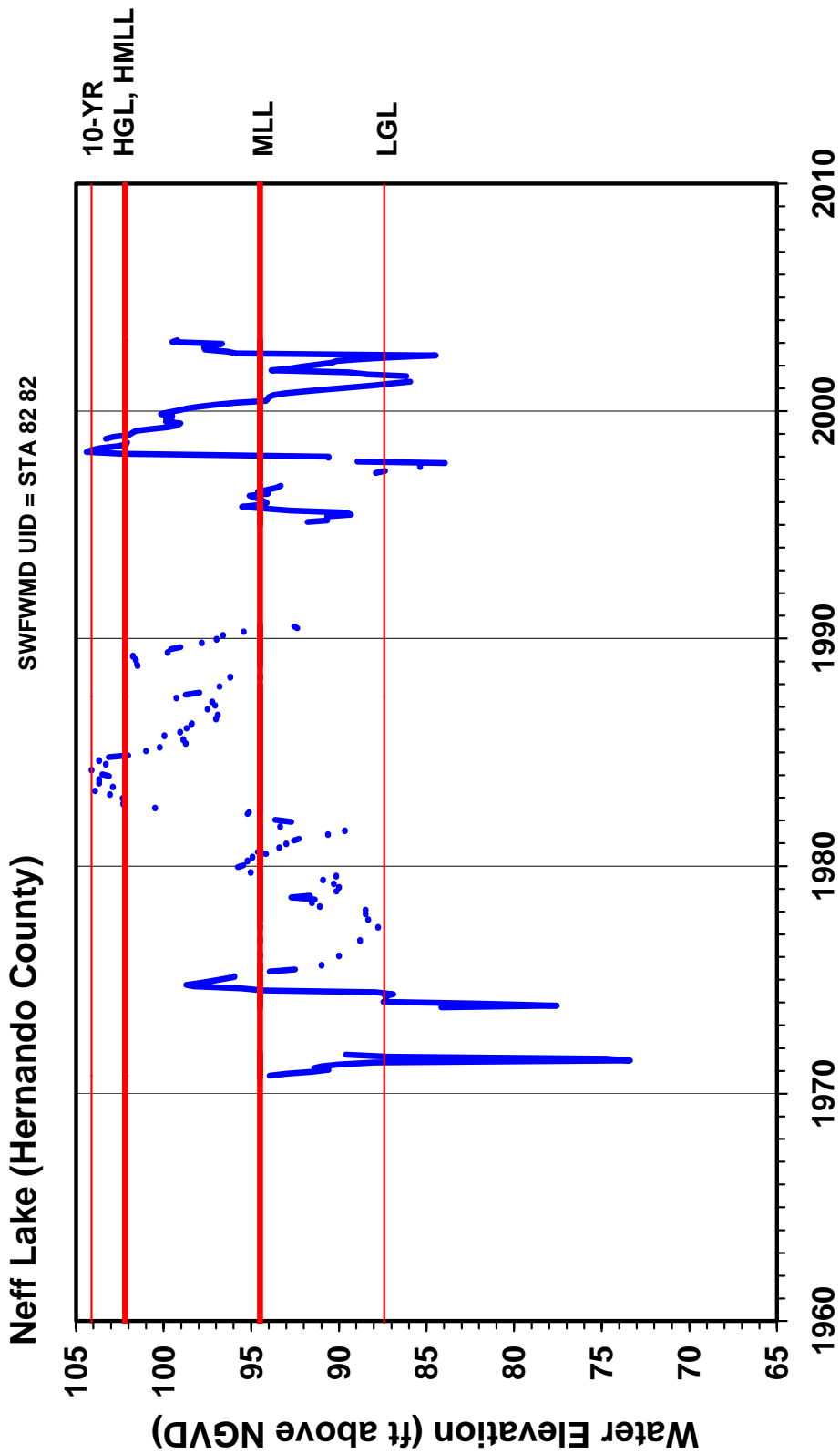


Figure 6. Mean monthly surface water elevation through February 2003, and proposed guidance and minimum levels for Neff Lake in Hernando County, Florida. Proposed levels include the Ten Year Flood Guidance Level (10-YR), High Guidance Level (HGL), Low Guidance Level (LGL), High Minimum Lake Level (HMLL),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



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

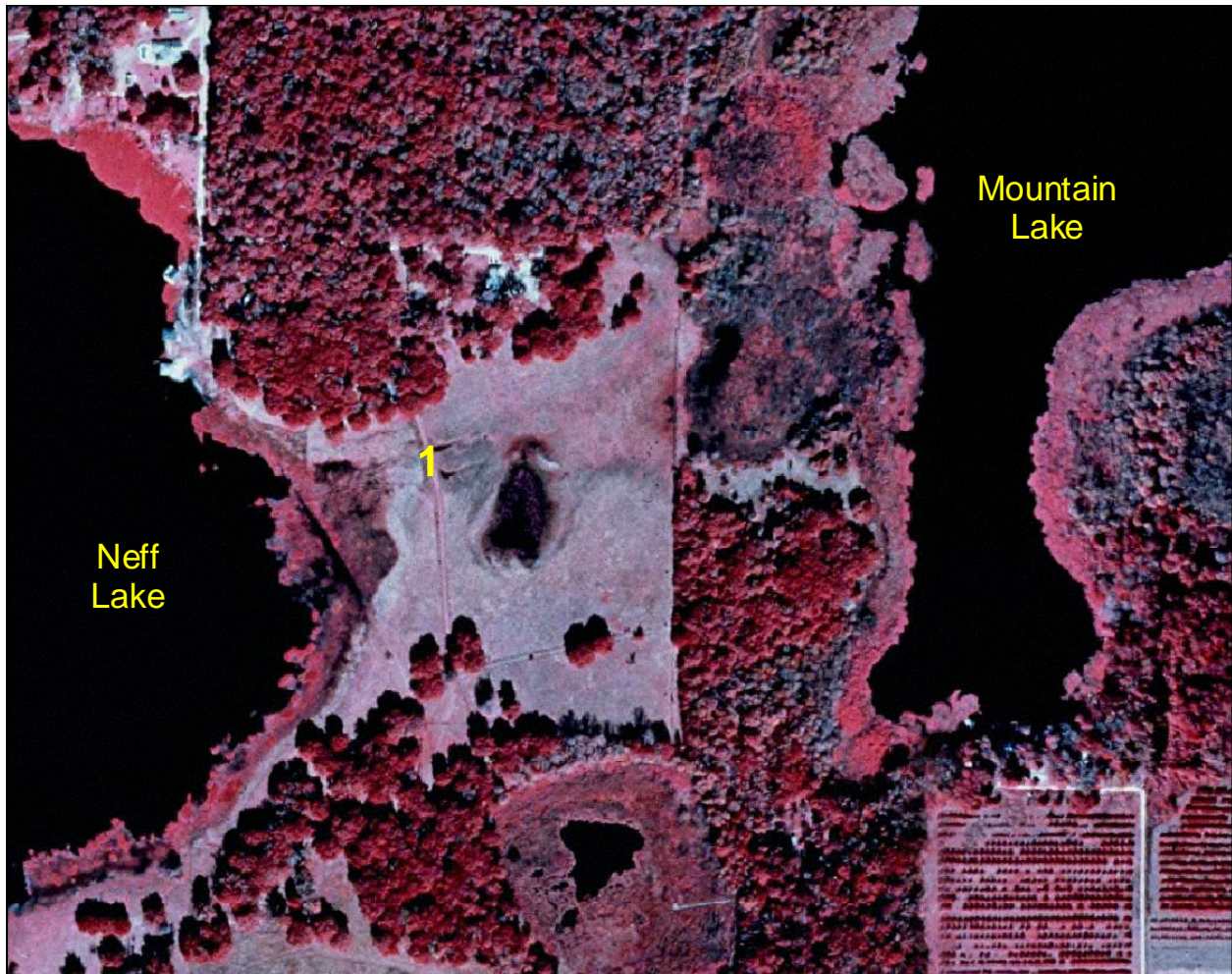
<b>Level or Feature</b>	<b>Elevation (feet above NGVD)</b>	<b>Lake Area (acres)</b>
Historic P10	102.16	255
Historic P50	94.48	105
Historic P90	87.44	31
Normal Pool	110	NA
Low Floor Slab (Neff Lake)	108.3	NA
Low Floor Slab (Mountain Lake)	109.6	NA
Low Road (Neff Lake)	104.4	NA
Low Other (Neff Lake - floor slab of restroom/laundry building)	105.7	NA
Low Other (Mountain Lake top of public boat ramp)	105.5	NA
Low Other (Neff Lake – floor slab of first floor garage under house)	98.4	159
Connectivity Standard	101.3	239
Recreation/Ski Standard	99.0	169
Species Richness Standard	93.4	90
Aesthetic Standard	87.4	31

NA = not available

**Table 4. Elevation data used for establishing the Normal Pool Elevation for Neff Lake in Hernando County, Florida. Data were based on field observations in February 2003 and SWFWMD aerial photography with elevation contours maps.**

<b>Hydrologic Indicator</b>	<b>Elevation (feet above NGVD)</b>
Base of live oak in the Neff Lake basin	~120
Base of saw palmetto in the Neff Lake basin	~110 -115

**Figure 7. Conveyance system by which Mountain Lake and Neff Lake in Hernando County, Florida are connected.**



Aerial photography from 1999 USGS Digital Orthophotograph.

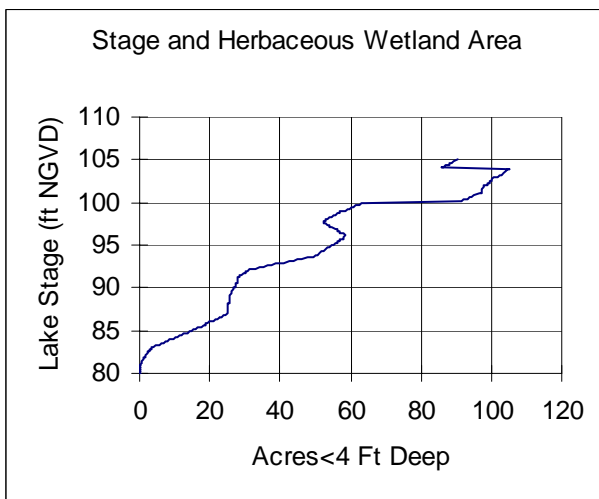
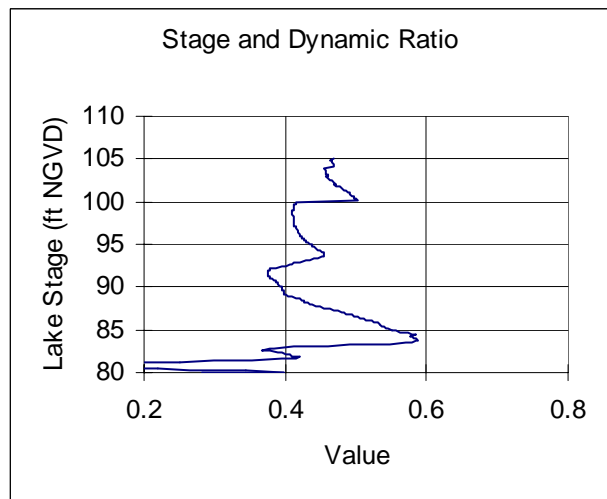
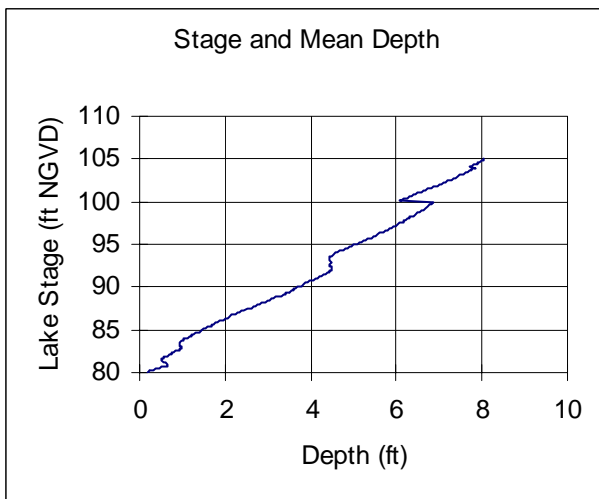
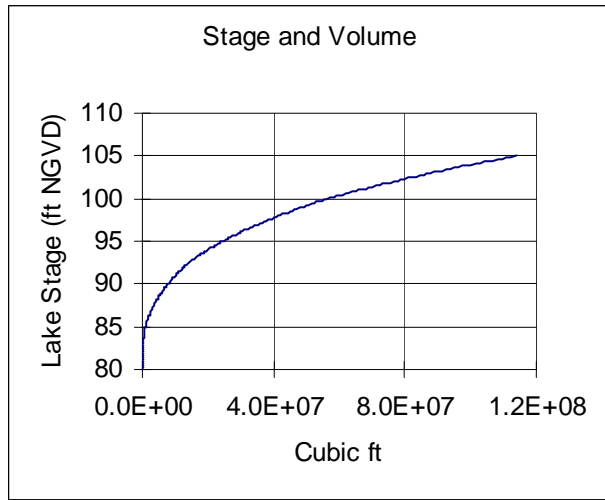
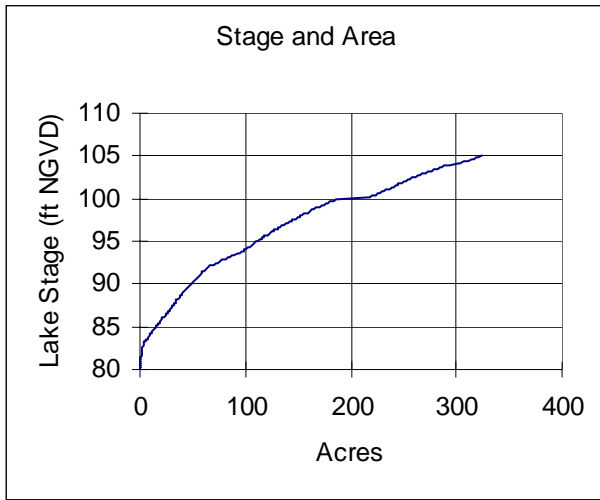
Map prepared June 5, 2003

0 500 1,000 Feet



Site	Description	Elevation (feet above NGVD)
1	Invert at east end of 24 inch diameter, 20 ft long corrugated metal pipe; invert at west end of pipe is 102.40 ft above NGVD	102.54

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



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

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.

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.

Florida Board of Conservation. 1969. Florida lakes, part III: gazetteer. Division of Water Resources. Tallahassee, 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. Gainesville and Tallahassee, 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, June 14, 2001 draft. 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. 1987. Withlacoochee River Basin, Bystre Lake East, aerial photography with contours. Sheet No. 17-23-20. Brooksville, Florida. Prepared by Photogrammetric Services, Inc., Reynoldsburg, Ohio.

Southwest Florida Water Management District. 1987. Withlacoochee River Basin, Bystre Lake East, aerial photography with contours. Sheet No. 20-23-20. Brooksville, Florida. Prepared by Photogrammetric Services, Inc., Reynoldsburg, Ohio.

Southwest Florida Water Management District. 1996. Lake Levels Program lake data sheets / 1977-1996, Withlacoochee River Basin – 19. Brooksville, Florida.

Southwest Florida Water Management District. 2001. Survey Section Field Book SSFB 19/152. Pages 51-53, October 22, 2002. Southwest Florida Water Management District, Brooksville, Florida.

United States Geological Survey. 1954. Spring Lake quadrangle, Florida, 7.5 minute series (topographic) map; Spring Lake, Fla., 29082-D3-TF-024, 1954, Photorevised 1988, DMA4540 IV NE-Series V847. Department of Interior. Washington, D.C.