

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 Big Fish Lake in
Pasco County, Florida

Big Fish Lake

General Lake Description

Big Fish Lake (Figure Big Fish-1) is located in the Coastal Rivers Basin in Pasco County, Florida (Sections 21, 22, 27, 28 and 32 Township 24S, Range 19E). The area surrounding the lake is categorized as the Land-O-Lakes subdivision of the Tampa Plain in the Ocala Uplift Physiographic District; a region of many lakes on a moderately thick plain of silty sand overlying Tampa Limestone (Brooks 1981). As part of the Florida Department of Environmental Protection's Lake Bioassessment/Regionalization Initiative, the area has been identified as the Tampa Plain Lake Region; an area of slightly acidic, darkwater, mesotrophic lakes (Griffith *et al.* 1997).

Land surface elevations in the Big Fish Lake basin and surrounding uplands range from approximately 65 to 100 ft above NGVD (*i.e.*, the National Geodetic Vertical Datum of 1929). A sandy ridge runs north to south through the lake's watershed to a berm located along the southern boundary of Sections 27 and 28 and divides the watershed into eastern and western sub-basins. Land surface elevations are lowest in the western sub-basin. An east-west oriented ridge in the eastern sub-basin further divides the sub-basin into numerous smaller basins. Surface water pooled in the various sub-basins results in the development of a complex system of interconnected and isolated open water and wetland habitats, which collectively comprise Big Fish Lake. Since summer 2000, the lake has been intermittently augmented with ground water from the Floridan aquifer (SWFWMD Water Use Permit No. 20005897.003). The lake has a drainage area of 2.41 square miles (Florida Board of Conservation 1969) and discharges to the west when water level exceeds 76.05 ft above NGVD (Figure Big Fish-2).

The "Gazetteer of Florida Lakes" (Florida Board of Conservation 1969, Shafer et al. 1986) lists the lake area at 277 acres at an elevation of 76 ft above mean sea level. The United States Geological Survey 1954 1:24,000 Masaryktown, Fla. and Ehren, Fla. (photorevised in 1988) quadrangle topographic maps indicate a water level elevation of 76 ft above mean sea level. This elevation corresponds to lake surface area of 711 acres, based on a topographic map of the basin generated in support of minimum levels development (Figure Big Fish-3). Data used for production of the topographic map were obtained from field surveys and 1:200 aerial photography maps containing one-foot contours within the basin. Mapping was limited to areas bounded by a contour line corresponding to an elevation of 77 ft above NGVD within the lake basin in Sections 21, 22, 27 and 28, Township 24S, Range 19E. This elevation was selected upon review of lake stage data for the lake and aerial photographs of the region.

Discrepancies in reported area values for Big Fish Lake, may, in part, be explained by differences in criteria used to establish lake area. A study conducted by the Natural Resources Conservation Service in the mid-1990s (Werner 1996) illustrates this point. The study provides estimates of wetland acreage on the ranch containing Big Fish Lake, and lists the surface area of the "main body" of the lake at 313 acres, while the area encompassed by the connection of "flats" or low-lying regions between major pools is estimated at 615 acres. These estimates, derived using soil maps of the area, approximate the surface area values of 711 and 270 acres cited above. Thus, the surface area reported in the Florida Lake Gazetteer (277 acres when the surface water elevation is 76 ft above mean sea level) corresponds to only a portion of the area within the watershed where open water or wetland habitat exists.

Figure Big Fish-1. Location of Big Fish Lake in Pasco County, Florida.

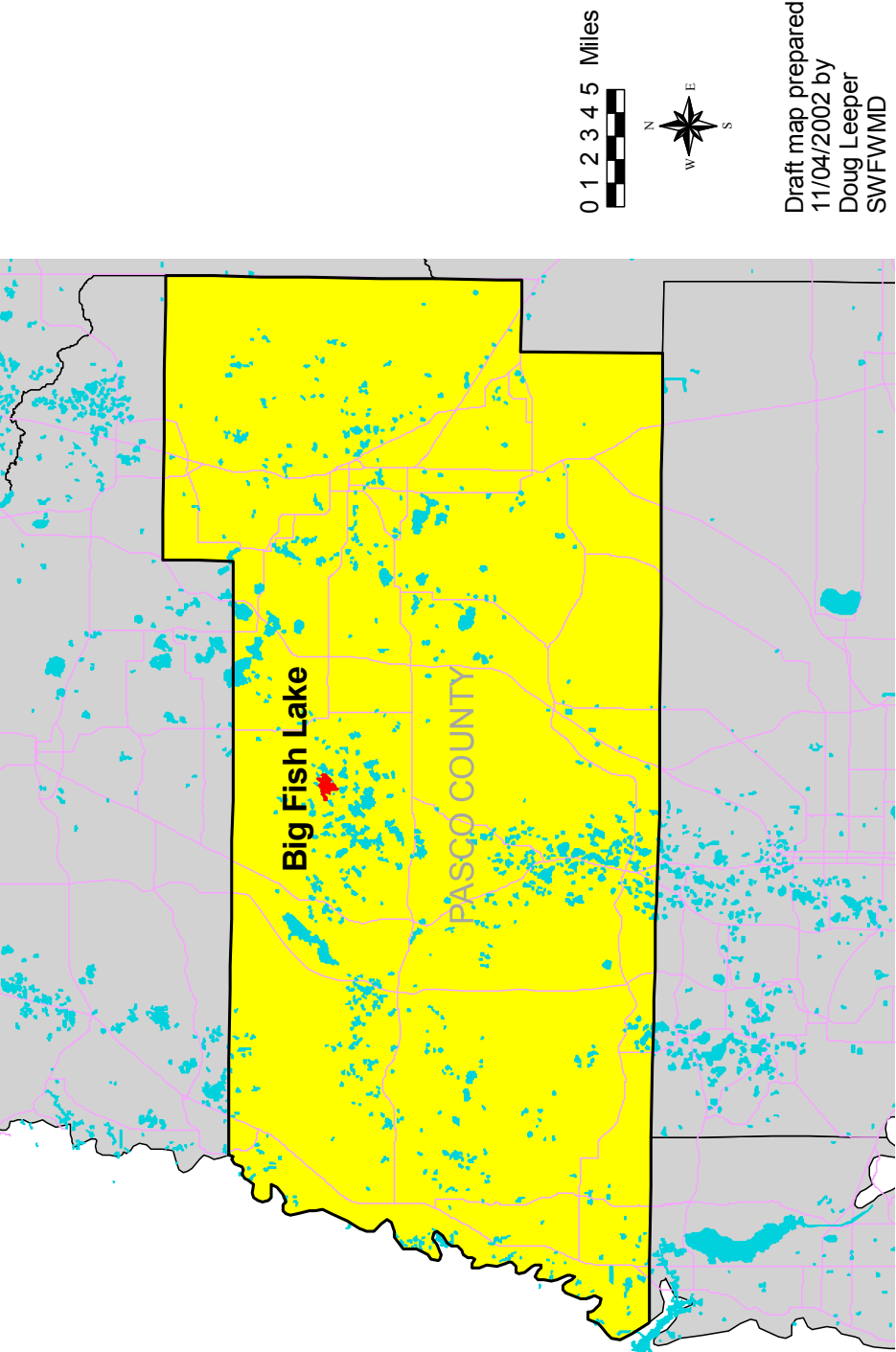


Figure Big Fish-2. Location of District lake gauge and lake outlet at Big Fish Lake, Pasco County, Florida.

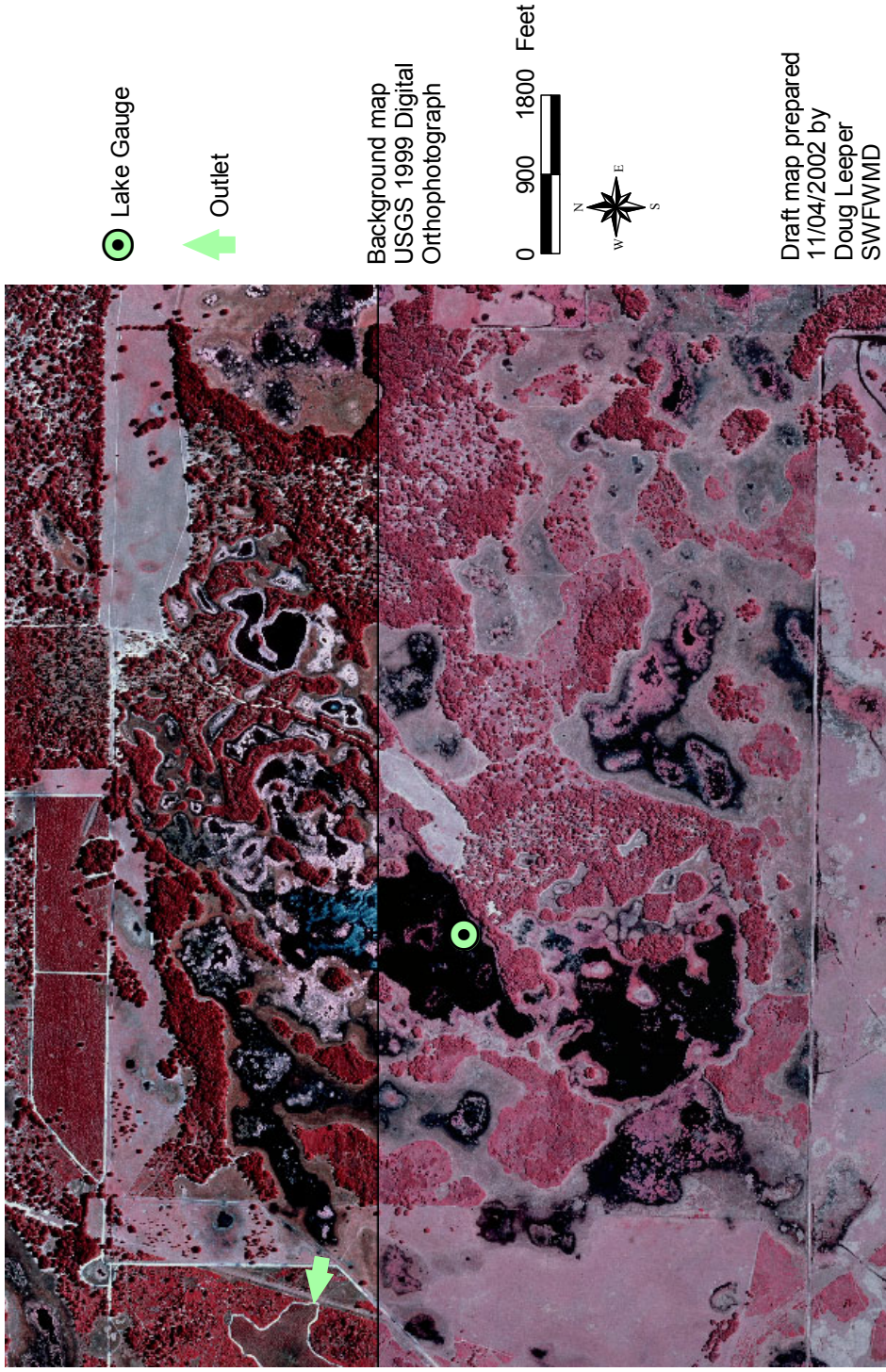
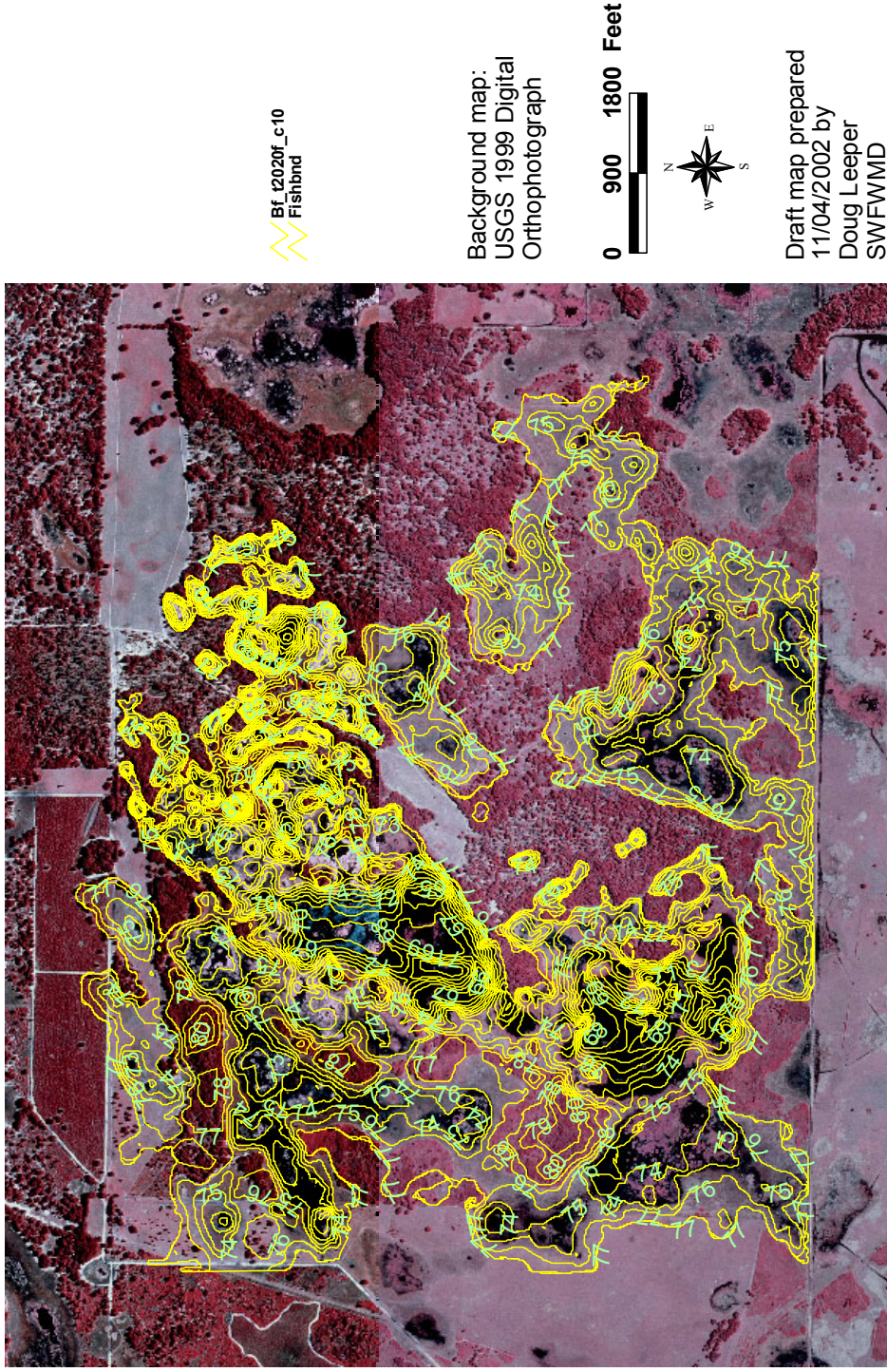


Figure Big Fish-3. One-foot contour lines within the Big Fish Lake basin, Pasco County, Florida. Values shown are elevations, in feet, relative to the National Geodetic Vertical Datum



Previously Adopted Lake Management Levels

The District has not previously adopted management water levels for Big Fish Lake.

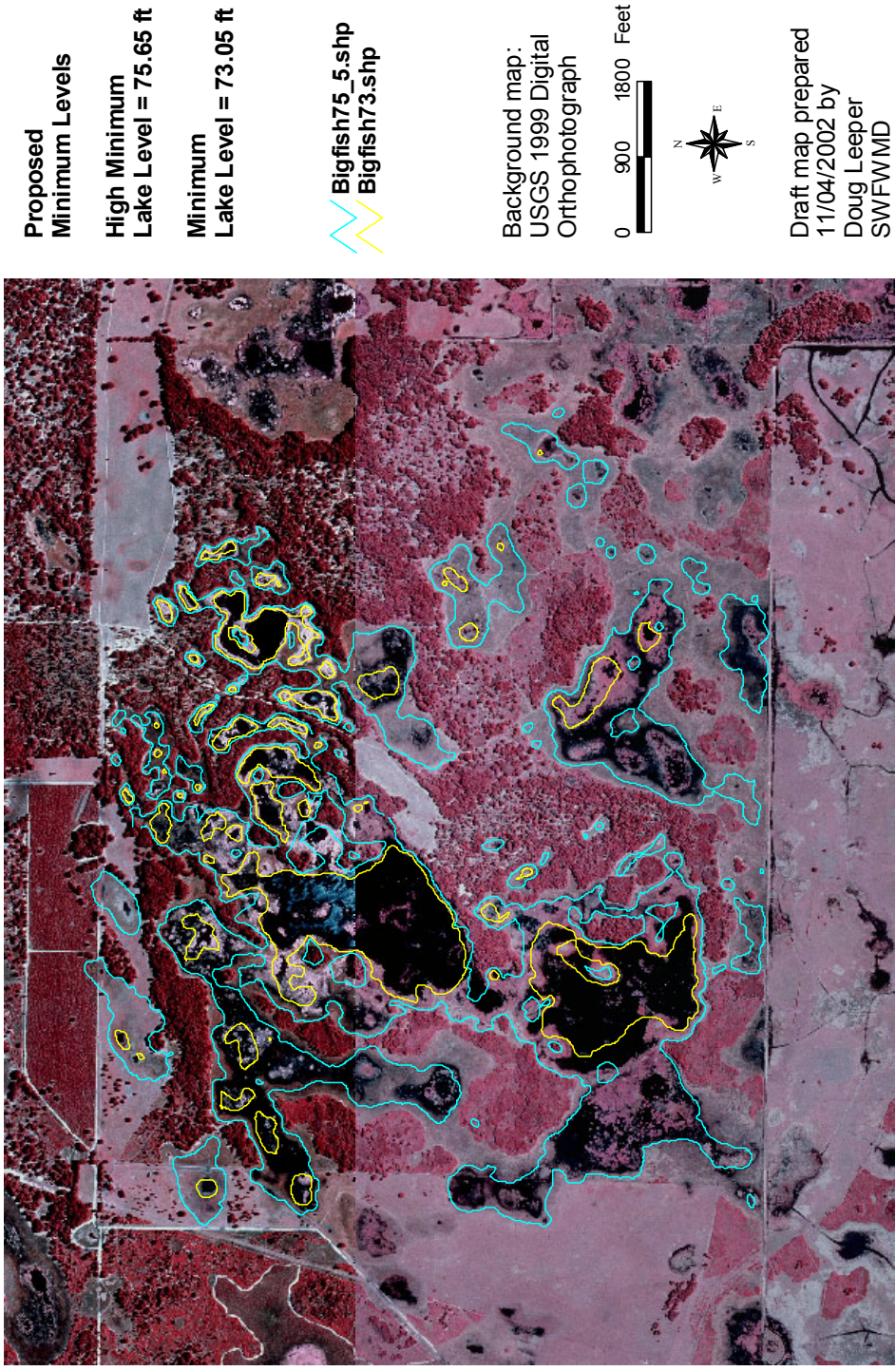
Proposed Minimum and Guidance Levels

Proposed Minimum and Guidance Levels were developed for Big Fish Lake using the methodology for Category 3 Lakes described in Leeper et al. (2001), in accordance with modifications outlined in Dierberg and Wagner (2001). Proposed levels, along with lake surface area values for each level are listed in Table Big Fish-1. The locations of the proposed minimum levels within the lake basin are shown in Figure Big Fish-4.

Table Big Fish-1. Proposed minimum levels, guidance levels and associated surface areas for Big Fish Lake, Pasco County, Florida.

Level	Elevation (feet above NGVD)	Lake Area (acres)
Ten Year Flood Guidance Level	77.41	1001
High Guidance Level	76.05	724
High Minimum Lake Level	75.65	619
Minimum Lake Level	73.05	160
Low Guidance Level	71.75	104

Figure Big Fish-4. Approximate location of the proposed Minimum Lake Level (yellow) and proposed High Minimum Lake Level (blue) for Big Fish Lake, Pasco County, Florida. Elevation values are in feet, relative to the National Geodetic Vertical Datum



Summary of Data and Analyses Supporting Recommended Minimum and Guidance Levels

Hydrologic data are available for Big Fish Lake (District Universal ID Number STA 134 134) in the Southwest Florida Water Management District's Water Management Database for the period from June 1980 through February 1987 and from March 1996 to the present date (Figure Big Fish-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 Big Fish-2).

The Category 3 Lake Normal Pool elevation (Table Big Fish-2) was established at 76.43 ft above NGVD, based on the median elevation of the lowest extent of saw palmetto (*Serenoa repens*) shrubs fringing the lake (Table Big Fish-3). 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 Big Fish-2 and Big Fish-4, Figure Big Fish-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 Control Point elevation (Table Big Fish-2). The Historic P50 and Low Guidance Level were determined using the High Guidance Level and RLWR50 (2.6 ft) and RLWR90 (4.3 ft) statistics established for the North Central Pasco and Central Hernando County Region (see Leeper *et al.* 2001 for a discussion of the reference lake water regime statistics).

The Ten Year Flood Guidance Level was established for Big Fish Lake using the methodology for open basin lakes described in current District Rules (Chapter 40D-8, Florida Administrative Code). The District used a hydrologic and hydraulic computer model of the Big Fish Lake watershed developed by District staff. The runoff hydrographs were computed using the NRCS Dimensionless Unit Hydrograph method, a 300-shape factor, a 9.5-inch rainfall depth, and a 72-hour Florida Type II Modified rainfall distribution. The conveyance system was simulated with a hydrodynamic routing model. The initial elevation of Big Fish Lake was set at the outlet control point of 76.05 ft NGVD. The Ten Year Flood Guidance Level (77.41 ft above NGVD) has not been exceeded during the period for which lake stage data are available (see Figure Big Fish-5). The highest recorded surface elevation, 76.81 ft above NGVD, occurred on January 4, 1984.

Big Fish Lake is not contiguous with any cypress-dominated wetlands and is therefore classified as a Category 3 Lake for the purpose of minimum levels development. Stands of *Panicum* sp., watershield (*Brasenia schreberi*), and other aquatic macrophytes are common in the lake basin.

Recreation/Ski, Species Richness, and Aesthetic Standards for the lake were evaluated for minimum levels development. A Recreation/Ski Standard was established at 78.7 ft above NGVD, based on a critical ski elevation of 77.0 ft and the RLWR5090 (1.7 ft) for the central Hernando County and Central Pasco County region. The standard was considered inappropriate for minimum levels development, however, as it exceeds the Low Guidance Level for the lake. The Species Richness Standard was established at 73.05 ft above NGVD, based on a 15% reduction in lake surface area from that at the Historic P50 elevation. The Aesthetic-Standard was established at the Low Guidance Level elevation of 71.75 ft above NGVD. A Dock-Use Standard was not developed for Big Fish Lake, as the basin only contains a single dock, and this dock is in disrepair. A Basin Connectivity Standard was not developed, based on the complex arrangement of sub-basins within the greater Big Fish Lake basin. Review of the dynamic ratio for lake stages bounded by the Current P10 and Current P90 elevations or the proposed High and Low Guidance Levels did not indicate that potential changes in basin susceptibility to wind-induced sediment resuspension would be a problem for minimum levels development (Figure Big Fish-6). 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 Big Fish-6).

The Species Richness Standard, the most conservative (*i.e.*, the highest) of the appropriate standards, was used to establish the proposed Minimum Lake Level at 73.05 ft above NGVD. The proposed Minimum Lake Level is 0.4 ft lower than the Historic P50 elevation. Total lake area at the proposed Minimum Lake Level is about 85% of the area associated with the Historic P50 elevation. The proposed High Minimum Lake Level was established at 75.65 ft above NGVD, an elevation corresponding to the Minimum Lake Level plus the RLWR50 (2.6 ft) for the Central Hernando County and Central Pasco County region. The proposed High Minimum Lake Level is 0.4 ft below the High Guidance Level and about 5.5 ft below the Low Floor Slab elevation. Lake area at the proposed High Minimum Lake Level is about 85% of that associated with the High Guidance Level.

Figure Big Fish-5. Mean monthly surface water elevation, and proposed guidance and minimum levels for Big Fish Lake, Pasco 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).

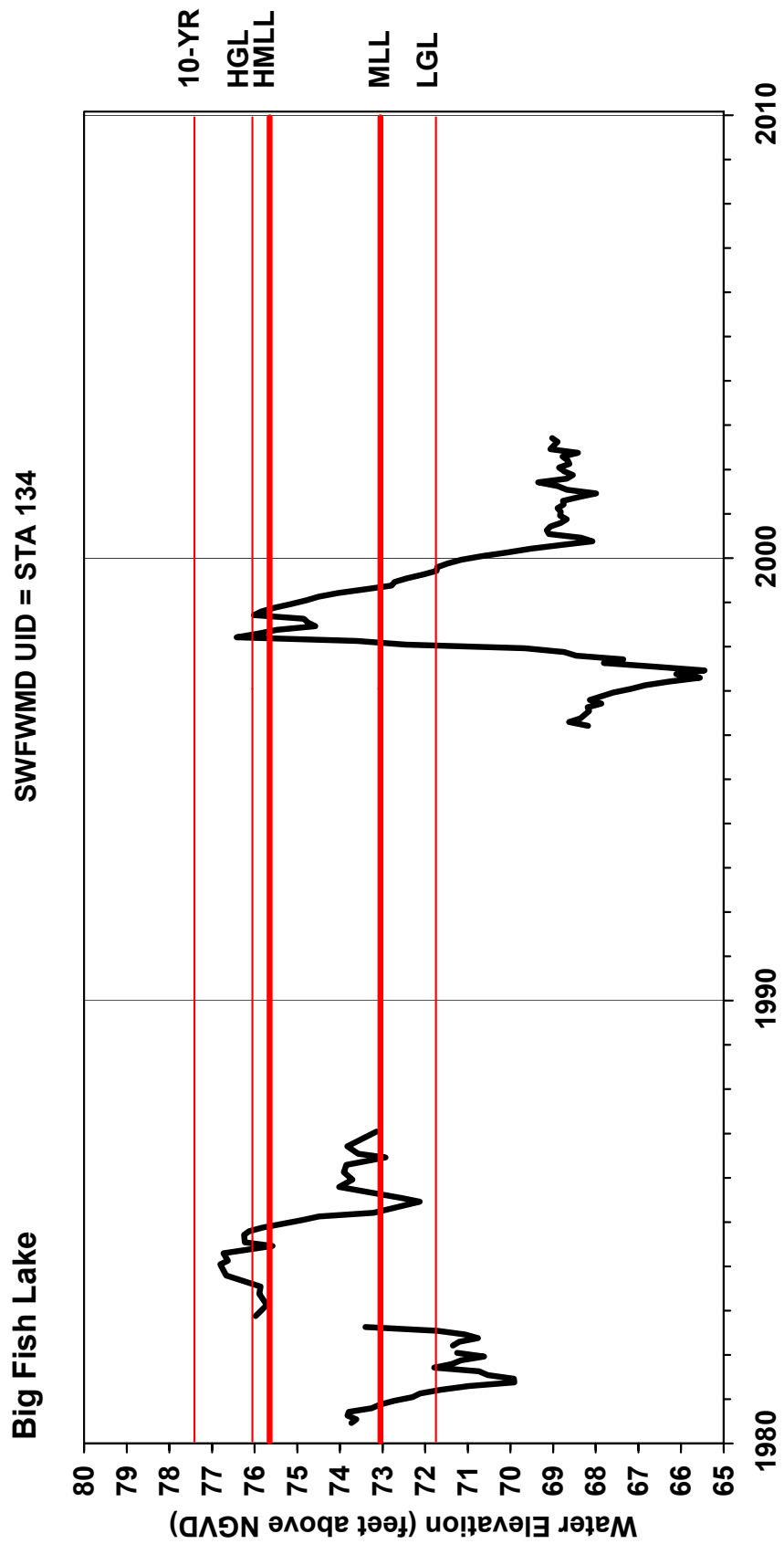


Table Big Fish-2. Elevation data and associated area values used for establishing minimum levels for Big Fish Lake, Pasco County, Florida.

Level of Feature	Elevation (feet above NGVD)	Total Lake Area (acres)
Current P10	75.85	663
Current P50	71.56	100
Current P90	67.83	15
Category 3 Lake Normal Pool	76.43	821
Low Floor Slab	81.14	NA
Control Point	76.05	724
High Guidance Level	76.05	724
Historic P50	73.45	189
Low Guidance Level	71.75	104
Recreation/Ski Standard	78.7	1053
Species Richness Standard	73.05	160
Aesthetic Standard	71.75	104

NA = not available / not applicable

Table Big Fish-3. Elevation data used for establishing the Category 3 Lake Normal Pool Elevation for Big Fish Lake, Pasco County, Florida. Data were collected in October 1996, March and May 1997.

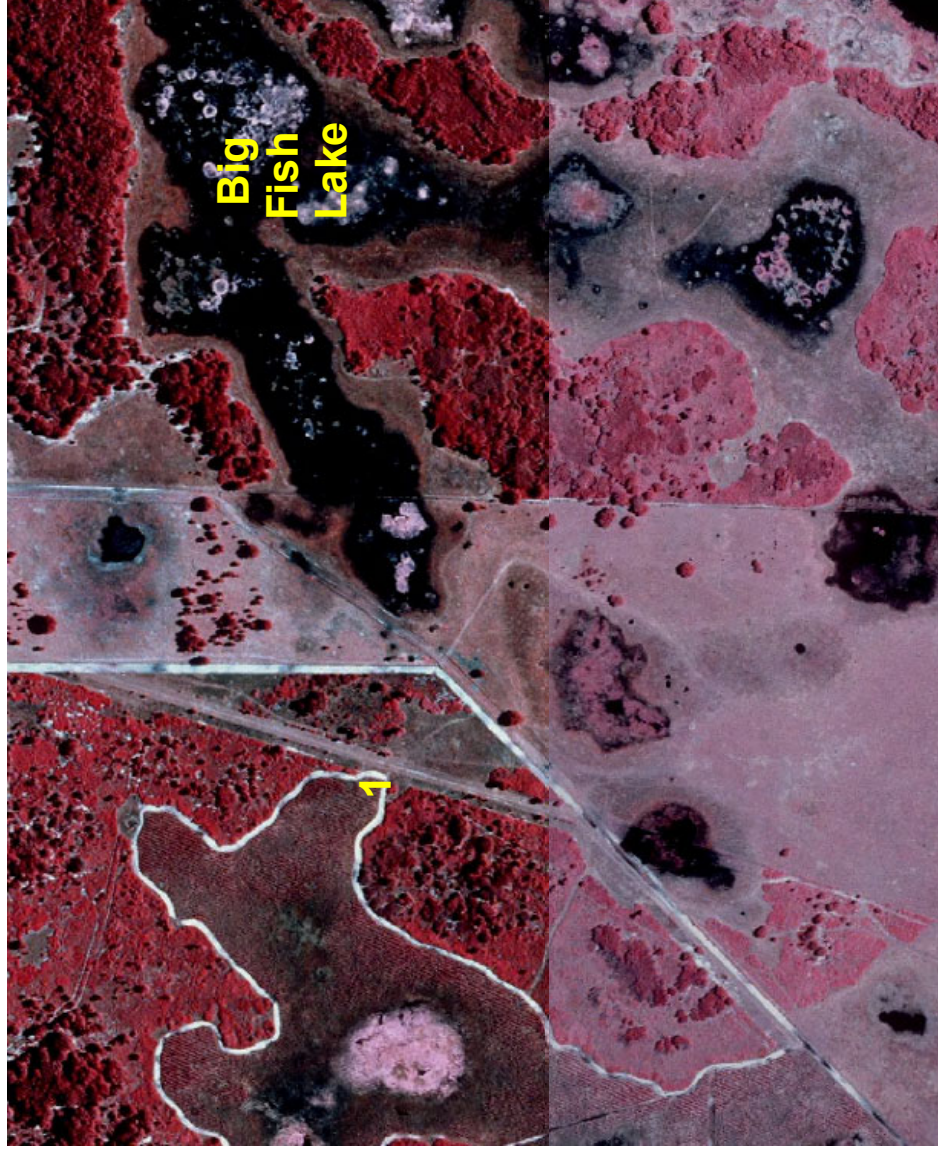
Hydrologic Indicator	Elevation (feet above NGVD)
Base of saw palmetto (<i>Serenoa repens</i>)	77.40
Base of saw palmetto (<i>Serenoa repens</i>)	77.29
Base of saw palmetto (<i>Serenoa repens</i>)	77.11
Base of saw palmetto (<i>Serenoa repens</i>)	77.10
Base of saw palmetto (<i>Serenoa repens</i>)	76.98
Base of saw palmetto (<i>Serenoa repens</i>)	76.90
Base of saw palmetto (<i>Serenoa repens</i>)	76.88
Base of saw palmetto (<i>Serenoa repens</i>)	76.87
Base of saw palmetto (<i>Serenoa repens</i>)	76.87
Base of saw palmetto (<i>Serenoa repens</i>)	76.87
Base of saw palmetto (<i>Serenoa repens</i>)	76.80
Base of saw palmetto (<i>Serenoa repens</i>)	76.69
Base of saw palmetto (<i>Serenoa repens</i>)	76.69
Base of saw palmetto (<i>Serenoa repens</i>)	76.67
Base of saw palmetto (<i>Serenoa repens</i>)	76.66
Base of saw palmetto (<i>Serenoa repens</i>)	76.63
Base of saw palmetto (<i>Serenoa repens</i>)	76.59
Base of saw palmetto (<i>Serenoa repens</i>)	76.57
Base of saw palmetto (<i>Serenoa repens</i>)	76.57
Base of saw palmetto (<i>Serenoa repens</i>)	76.56
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Base of saw palmetto (<i>Serenoa repens</i>)	76.53
Base of saw palmetto (<i>Serenoa repens</i>)	76.50
Base of saw palmetto (<i>Serenoa repens</i>)	76.50
Base of saw palmetto (<i>Serenoa repens</i>)	76.50
Base of saw palmetto (<i>Serenoa repens</i>)	76.47
Base of saw palmetto (<i>Serenoa repens</i>)	76.43
Base of saw palmetto (<i>Serenoa repens</i>)	76.41
Base of saw palmetto (<i>Serenoa repens</i>)	76.40
Base of saw palmetto (<i>Serenoa repens</i>)	76.38
Base of saw palmetto (<i>Serenoa repens</i>)	76.36
Base of saw palmetto (<i>Serenoa repens</i>)	76.33
Base of saw palmetto (<i>Serenoa repens</i>)	76.33
Base of saw palmetto (<i>Serenoa repens</i>)	76.32
Base of saw palmetto (<i>Serenoa repens</i>)	76.31
Base of saw palmetto (<i>Serenoa repens</i>)	76.30

Base of saw palmetto (<i>Serenoa repens</i>)	76.30
Base of saw palmetto (<i>Serenoa repens</i>)	76.28
Base of saw palmetto (<i>Serenoa repens</i>)	76.25
Base of saw palmetto (<i>Serenoa repens</i>)	76.24
Base of saw palmetto (<i>Serenoa repens</i>)	76.20
Base of saw palmetto (<i>Serenoa repens</i>)	76.18
Base of saw palmetto (<i>Serenoa repens</i>)	76.18
Base of saw palmetto (<i>Serenoa repens</i>)	76.14
Base of saw palmetto (<i>Serenoa repens</i>)	76.11
Base of saw palmetto (<i>Serenoa repens</i>)	76.10
Base of saw palmetto (<i>Serenoa repens</i>)	76.06
Base of saw palmetto (<i>Serenoa repens</i>)	75.97
Base of saw palmetto (<i>Serenoa repens</i>)	75.97
Base of saw palmetto (<i>Serenoa repens</i>)	75.93
Base of saw palmetto (<i>Serenoa repens</i>)	75.85
Base of saw palmetto (<i>Serenoa repens</i>)	75.84
Base of saw palmetto (<i>Serenoa repens</i>)	75.82
Base of saw palmetto (<i>Serenoa repens</i>)	75.78
Base of saw palmetto (<i>Serenoa repens</i>)	75.43
N	57
Mean	76.44
Standard Deviation	0.38
Median	76.43

Table Big Fish-4. Summary of structural alteration and control point elevation information for Big Fish Lake in Pasco County, Florida. Numbers correspond to those shown in Figure Big Fish-6.

No.	Description	Elevation (feet above NGVD)
1	Control point: vegetated natural ground	76.05

**Figure Big Fish-6. Outlet conveyance system for Big Fish Lake, Pasco County, Florida.
Numbered site is described in Table Big Fish-4.**



Background map:
USGS 1999 Digital
Orthophotograph

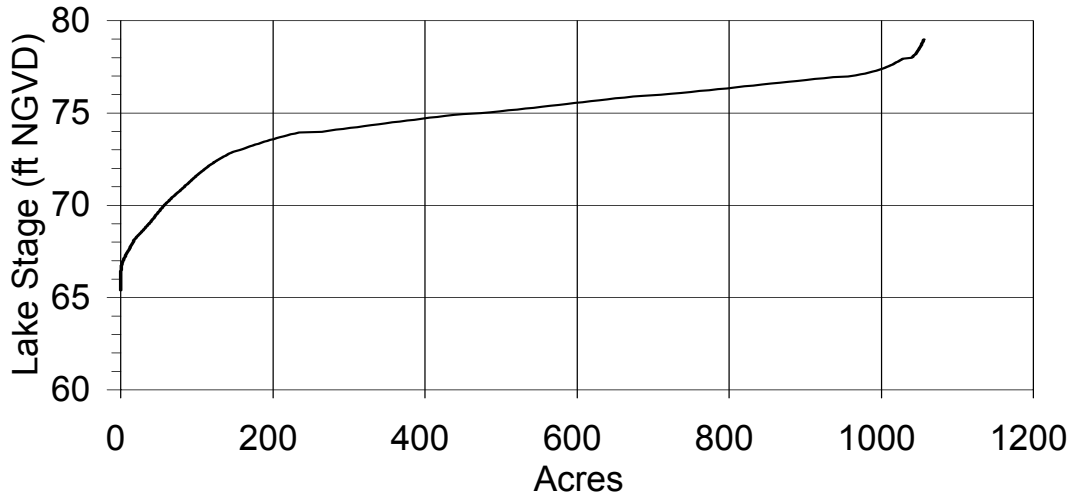
0 300 600 Feet



Draft map prepared
11/04/2002 by
Doug Leeper
SWFWMD

Figure Big Fish-7. Surface area, volume, potential herbaceous wetland area, and dynamic ratio versus lake stage for Big Fish Lake, Polk County, Florida.

Stage and Area



Stage and Volume

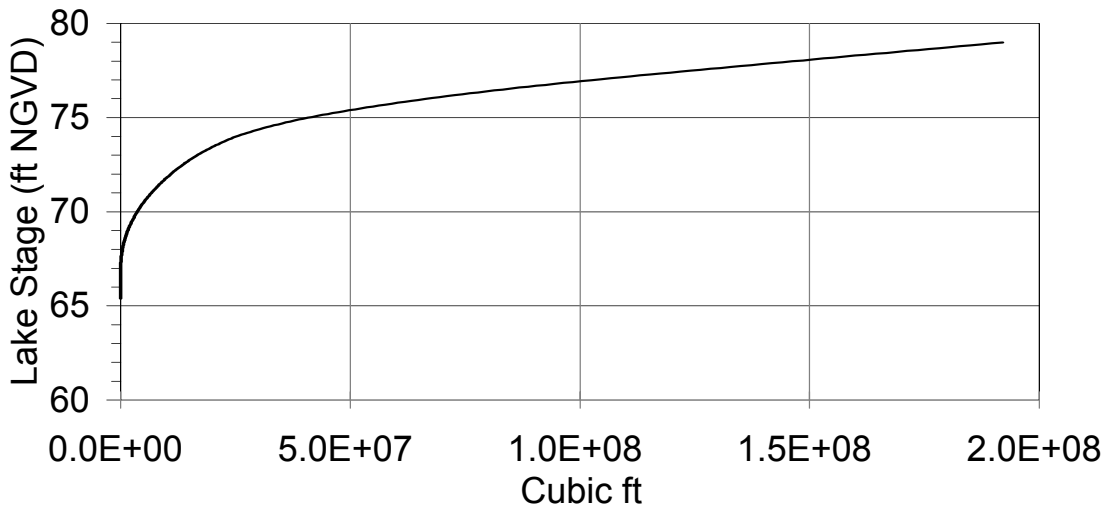
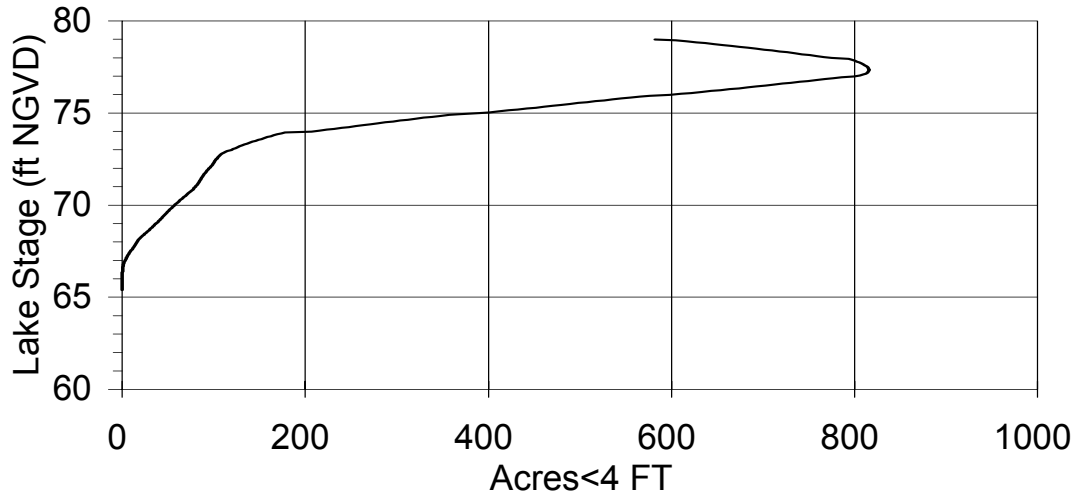
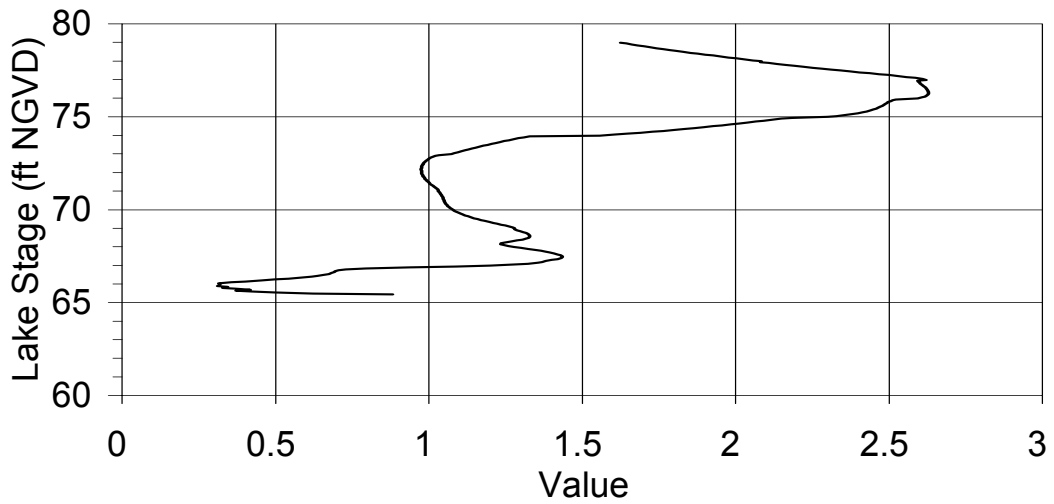


Figure Big Fish-7 (continued).

Stage and Herbaceous Wetland Area



Stage and Dynamic Ratio



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

Basso, R. 1996. Big Fish Lake, Florida: an analysis of anthropogenic and climate factors affecting lake size. Unpublished manuscript.

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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.

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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.

Padreira, D. 1996. Water problems revealed. Tampa Tribune, August 12, 1996. Tampa, Florida.

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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.

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Southwest Florida Water Management District. Various Dates. Aerial photographs of the Big Fish Lake area in Pasco County, Florida. Dates of photographs: April 27, 1941; March 23, 1951; March 27, 1957; January 21, 1968; April 24, 1974; March 8, 1982; March 21, 1988; December 5, 1991; and April 14, 1995. Brooksville, Florida.

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Southwest Florida Water Management District. 1986. Coastal Rivers Basin, Cross Bar, aerial photography with contours. Sheet No. 22-24-19. Brooksville, Florida. Prepared by Kucera International, Lakeland, Florida.

Southwest Florida Water Management District. 1986. Coastal Rivers Basin, Cross Bar, aerial photography with contours. Sheet No. 27-24-19. Brooksville, Florida. Prepared by Kucera International, Lakeland, Florida.

Southwest Florida Water Management District. 1986. Coastal Rivers Basin, Cross Bar, aerial photography with contours. Sheet No. 28-24-19. Brooksville, Florida. Prepared by Kucera International, Lakeland, Florida.

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