

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 Lake Rogers in
Hillsborough County, Florida

Lake Rogers

General Lake Description

Lake Rogers is located in the Northwest Hillsborough Basin in Hillsborough County, Florida in Section 27, Township 27S, Range 17E (Figure Rogers-1). 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 Keystone Lakes region, and described as an area of numerous slightly acidic, low nutrient, and mostly clear-water lakes (Griffith *et al.* 1997). Lake Rogers lies within the Cosme-Odessa Wellfield, which is one of the major water supply wellfields operated by Tampa Bay Water. The Hillsborough County Parks and Recreation Department maintains the area surrounding the lake as a county park (Lake Rogers Park).

Lake Rogers is an isolated lake, although surface inflow and outflow may occur through culverts under Race Track Road and Gunn Highway (Figure Rogers-2). There are currently no surface water withdrawals from the lake permitted by the District. There are, however, several groundwater withdrawals in the vicinity of the lake, including those associated with the Cosme-Odessa Wellfield. In 1998 and 2002, the lake was augmented with water pumped from Lake Pretty through Horse Lake and Lake Raleigh (Wylupek 2001, personal observation).

The Florida Lake Gazetteer (Florida Board of Conservation 1969, Shafer *et al.* 1986) lists the lake area at 93 acres. The United States Geological Survey 1956 (photorevised 1987) 1:24,000 Citrus Park, Fla. quadrangle map indicates a water level elevation of 36 ft above mean sea level. This elevation corresponds to a lake surface area of 23 acres, based on a topographic map of the basin generated in support of minimum levels development (Figure Raleigh-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 Rogers-1. Location of Lake Rogers in Hillborough County, Florida.

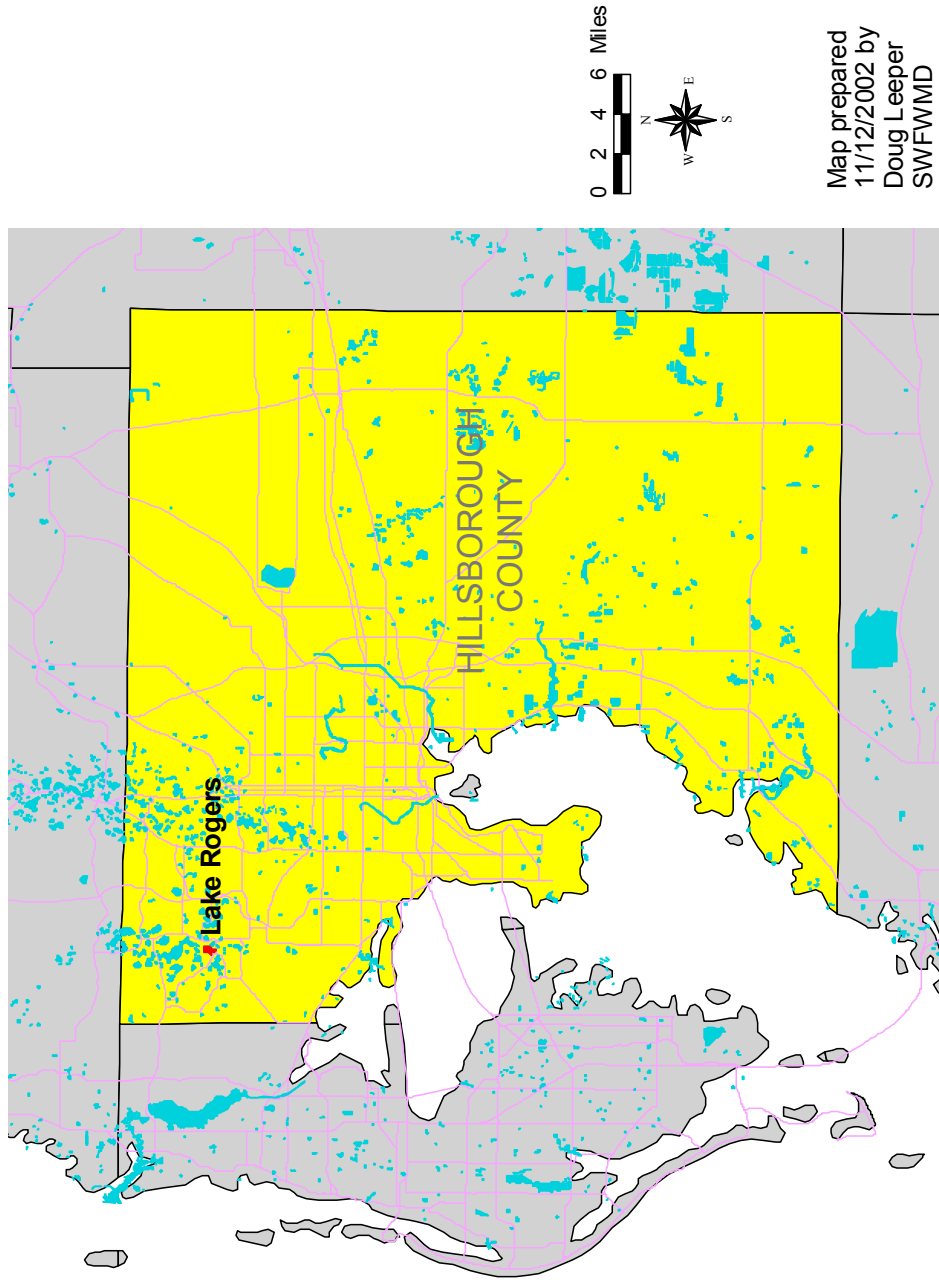


Figure Rogers-2. Location of District lake gauges, inlets/outlets and sites where hydrologic indicators were measured for Lake Rogers, Hillsborough County, Florida.

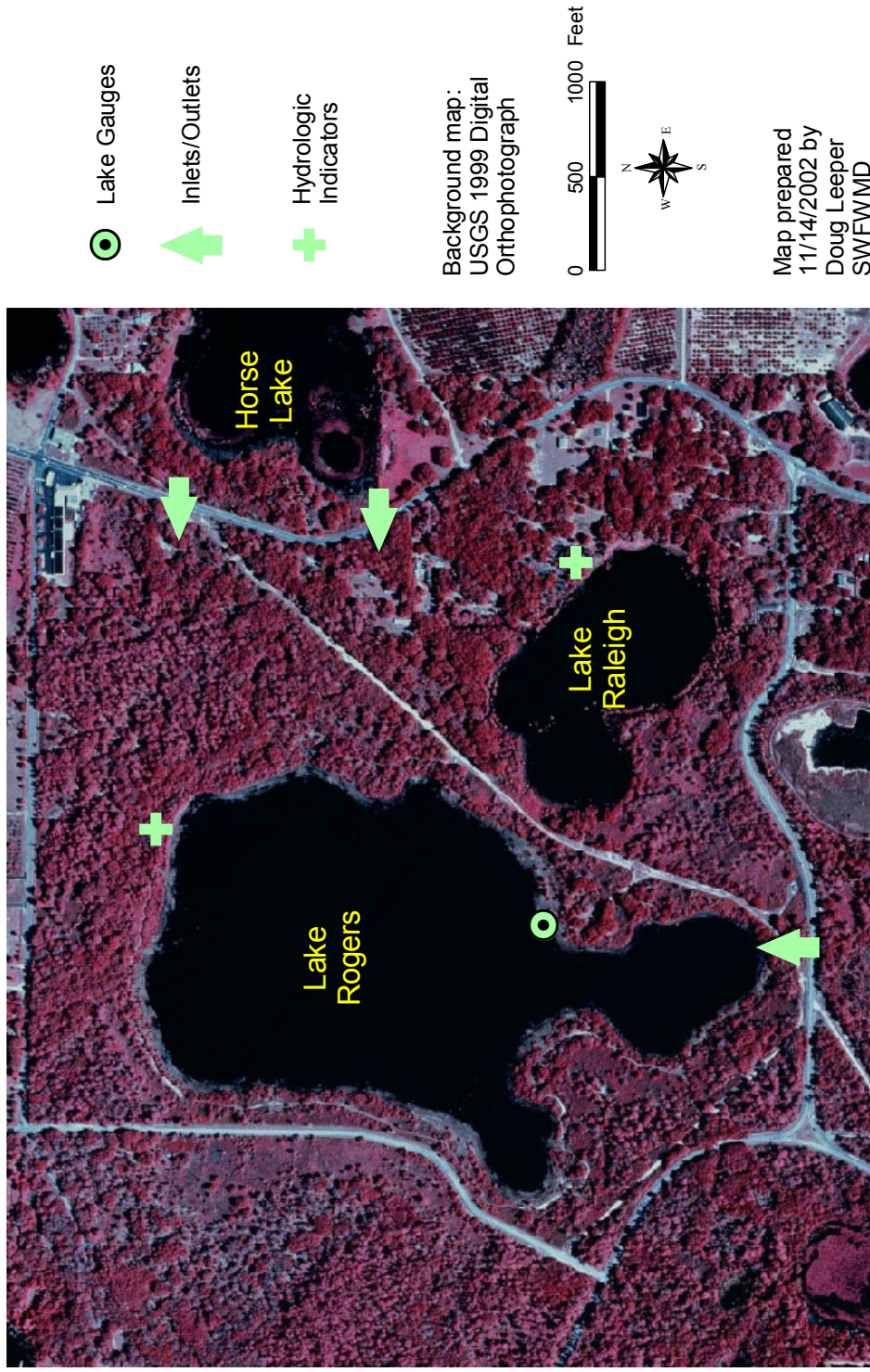
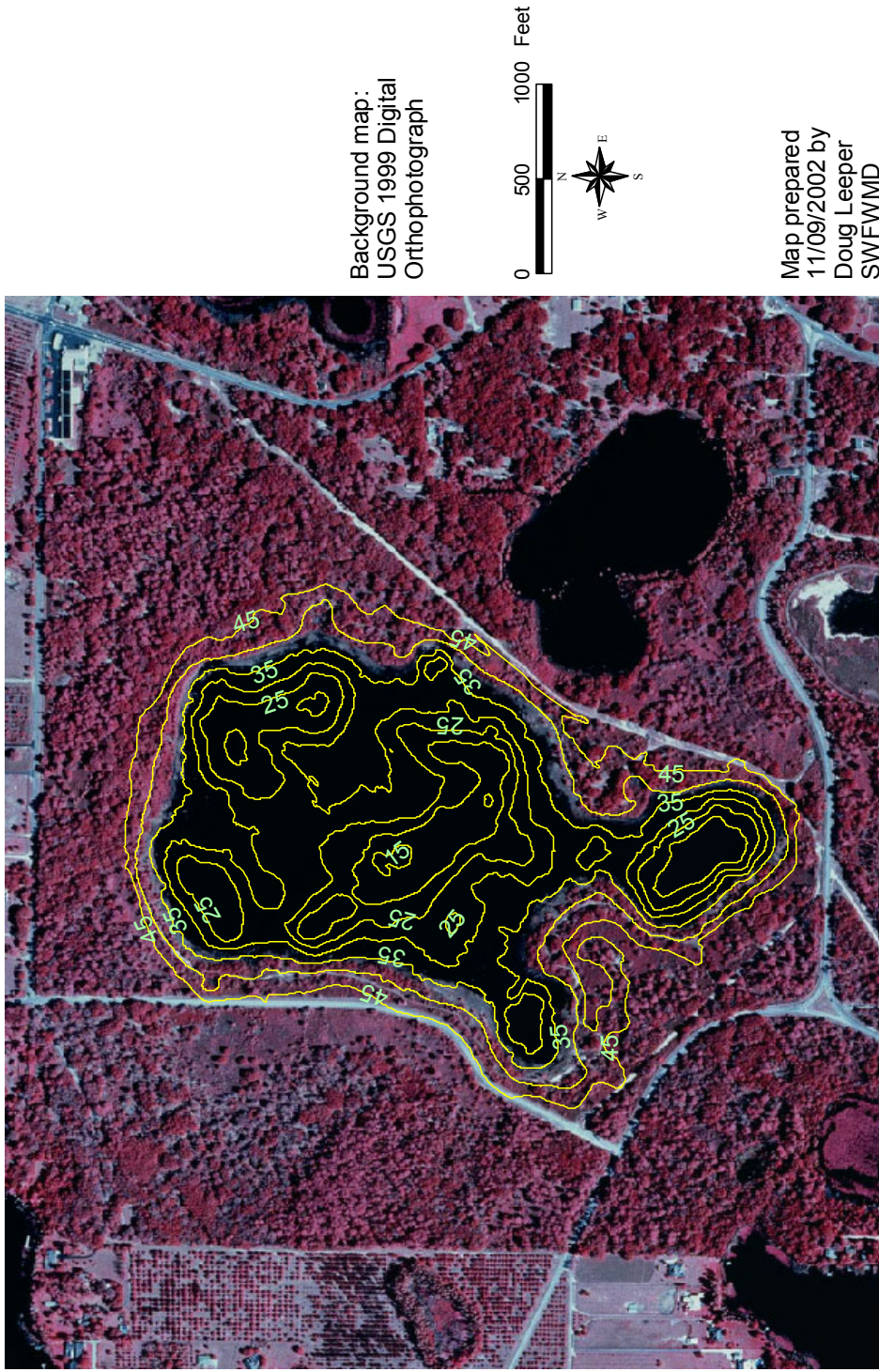


Figure Rogers-3. Five-foot contours within the Lake Rogers basin, Hillsborough County, Florida. Values shown are elevations, in feet, relative to the National Geodetic Vertical Datum.



Previously Adopted Lake Management Levels

Based on work conducted in 1977 (see SWFWMD unpublished data), the District developed recommended lake management levels for Lake Rogers in 1980 (Table Rogers-1). In response to a request made by the City of St. Petersburg, which owns the land surrounding the lake, the District Governing Board did not adopt the recommended levels.

Table Rogers-1. Guidance Levels recommended in 1980 for Lake Rogers, Hillsborough County, Florida

Level	Elevation (feet above NGVD)
Minimum Flood Level	43.00
Maximum Desirable	42.50
Low Management Level	40.50
Extreme Low Management Level	38.50

Proposed Minimum and Guidance Levels

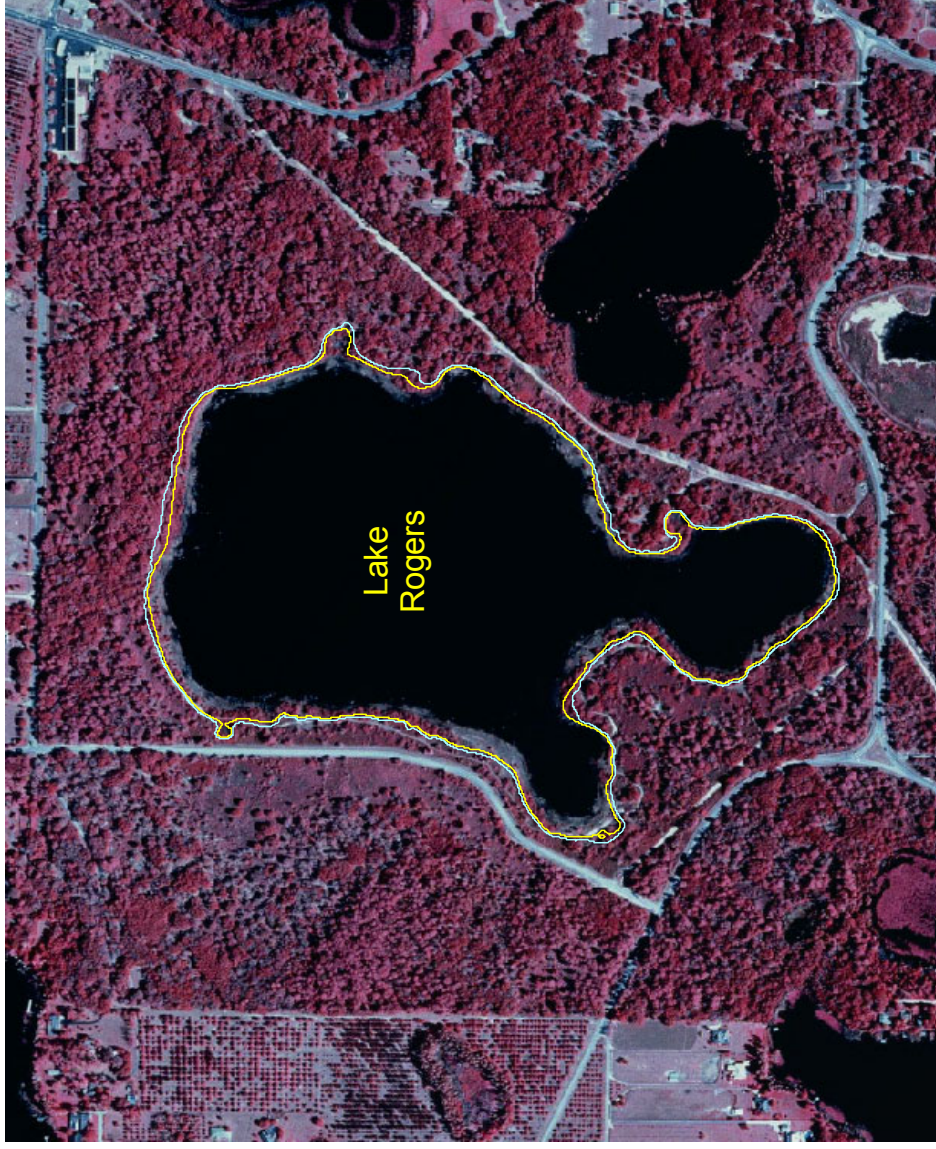
Proposed Minimum and Guidance Levels were developed for Lake Rogers based on the methodology for Category 3 Lakes described in Leeper *et al.* (2001), in accordance with modifications outlined by Dierberg and Wagner (2001), and based on review of spot elevation information for various features within the basin. Proposed levels, along with lake surface area values for each level are listed in Table Rogers-2. The locations of the proposed minimum levels within the lake basins are shown in Figure Rogers-4.

Table Rogers-2. Proposed Minimum Levels and Guidance Levels with associated lake surface areas for Lake Rogers, Hillsborough County, Florida.

Level	Elevation (feet above NGVD)	Total Lake Area (acres)
Ten-Year Flood Guidance Level	45.80	NA
High Guidance Level	44.88	129
High Minimum Lake Level	40.00	105
Minimum Lake Level	39.00	101
Low Guidance Level	42.78	118

NA = not available


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



**Proposed
Minimum Levels**
**High Minimum
Lake Level = 40.0 ft**
**Minimum
Lake Level = 39.0 ft**

**Background map:
USGS 1999 Digital
Orthophotograph**

0 500 1000 Feet



**Map prepared
11/12/2002 by
Doug Leeper
SWFWMD**

Summary of Data and Analyses Supporting Development of the Proposed Minimum and Guidance Levels

Hydrologic data are available for Lake Rogers (Southwest Florida Water Management District Universal Identification Numbers = STA 409 410 and 409 606) for the period from May 1930 through December 1980, for a few dates in 1981 and from October 1984 to the current date (Figure Rogers-5). Prior to April 1995, water level data were collected from a site in the northern portion of the lake (STA 409 410). Since April 1995, water level has been measured using a series of gauges located along the lake's eastern shore (Figure Rogers-2). For the period of record from January 1964 through the present date, hydrologic data for the lake are classified as Current data. Current data collected through January 2002 were used to calculate the Current P10, P50, and P90 (Table Rogers-3).

The Category 3 Lake Normal Pool elevation for Lake Rogers was provisionally established at 48.68 ft above NGVD, based on the ground elevation at the base of saw palmetto (*Serenoa repens*) shrubs and longleaf pine (*Pinus palustris*) trees located along the lake's north shore (Table Rogers-4). This elevation is substantially higher than the Category 3 Lake Normal Pool recently established for Lake Raleigh (44.88 ft above NGVD, Table Rogers-5); a surprising difference, since the lakes are connected when surface water levels exceed 43.1 ft above NGVD. In addition, a survey of the region conducted in 1977 indicated that the saw palmetto fringe existed around Lake Rogers at an elevation of about 42 ft above NGVD (SWFWMD unpublished data).

Based on these considerations, the Category 3 Lake Normal Pool for Lake Raleigh (44.88 ft above NGVD) was substituted for the Lake Rogers provisional Category 3 Lake Normal Pool. Use of the Lake Raleigh Category 3 Lake Normal Pool for Lake Rogers is supported by data collected from the Lake Rogers basin. In October 2000, a field team comprised of technical representatives from the District and other interested parties identified a normal pool elevation of 44.91 ft for Lake Rogers, based on a single cypress tree growing within the lake basin (Czerwinski 2000).

The extent of structural alteration was determined using available one-foot contour interval aerial maps and field survey data (Tables Rogers-3 and Rogers-6, Figure Rogers-6). There are no homes located within the immediate lake basin, so a low floor slab elevation was not established. The low floor slab elevation for Lake Raleigh, was however, determined and reviewed (Table Rogers-3). The low spot on one of the dirt roads used for accessing Lake Rogers Park was identified at 42.8 ft above NGVD. Culverts that could allow water to flow into or out of the basin were identified under Race Track Road and Gunn Highway. Based on the elevation of the culvert invert, Lake Rogers was determined to be a closed basin lake. A control point elevation was, therefore, not established, and Lake Rogers is considered not to be Structurally Altered for the purpose of minimum levels development.

Based on the relationship between the Category 3 Lake Normal Pool elevation and the Current P10, the High Guidance Level was established at the Category 3 Lake Normal Pool elevation (Table Rogers-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) (Table Rogers-3, see SWFWMD 1999 for a discussion of the reference lake water regime statistics).

The Ten Year Flood Guidance Level of 45.8 ft above NGVD was established for Lake Rogers using the methodology for closed basin lakes described in current District Rules (Chapter 40D-8, Florida Administrative Code). The closed basin criteria were selected because Lake Rogers has no positive outfall. Lake stage in the basin appears to be impacted after 1961 by groundwater withdraws from the Cosme-Odessa Wellfield. In accordance with the closed-basin methodology, the 10-year flood level was based on a frequency analysis of the lake stage record from 1930 to 1961. A frequency analysis using data collected since 1961 would have lowered the 10-year flood level as a result of using lake stage data from a period impacted by groundwater withdrawals. Based on available data, the Ten Year Flood Guidance Level has been equaled or exceeded on five dates during the past 72 years. The peak stage recorded for Lake Rogers, 46.0 ft above NGVD, occurred on September 1, 1937. In recent years, a peak stage of 39.48 ft above NGVD occurred on March 31, 1998 as a result of the augmentation of the lake with water pumped from Lake Pretty through Lakes Horse and Raleigh (Wylupek 2001).

Lake Rogers 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. The basin contains extensive stands of maidencane (*Panicum hemitomum*) and other wetland vegetation. Terrestrial vegetation has encroached onto much of the former lake bed.

Aesthetics, Species Richness and Basin Connectivity Standards were evaluated for minimum levels development. The Aesthetics Standard for Lake Rogers was established at the Low Guidance Level elevation of 42.78 ft above NGVD. The Species Richness Standard was established at 40.00 ft above NGVD, based on a 15% reduction in lake surface area from that at the Historic P50 elevation. The Basin Connectivity Standard was established at 36.6 ft, based on use of non-gasoline powered boats in the lake, a critical high-spot elevation of 34.5 ft and the RLWR5090 for the northern Tampa Bay area (1.1 ft). No docks are located in the lake basin, so a Dock-Use Standard was not developed. Similarly, a Recreation/Ski Standard was not developed, based on restrictions imposed upon skiing activity within the basin. 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 Rogers-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 Rogers-7).

The Aesthetics Standard, the most conservative (*i.e.*, highest) of the identified standards was used to establish a proposed Minimum Lake Level at 42.78 ft above NGVD. A proposed High Minimum Lake Level was established at 43.78 ft above NGVD, an

elevation corresponding to the provisional Minimum Lake Level plus the RLWR50 (1.0 ft) for the northern Tampa Bay area.

Comparison of the proposed Minimum Levels with spot elevation information for the basin suggested that use of the Aesthetics Standard is not appropriate for minimum levels development for Lake Rogers. The proposed minimum levels would result in flooding of an access road that runs through Lake Rogers Park, between Lake Rogers and Lake Raleigh. In addition, compliance with the proposed minimum levels would result in destruction of mature, upland vegetation that has encroached into the lake basin. For example, a large oak tree located near the lake gauge site at an elevation of 43.13 ft above NGVD (Czerwinski 2000) could be injured or killed as a result of sustained water levels near or above the proposed High Minimum Lake Level. Based on a field inspection conducted in October 2000, similar impacts could be expected throughout the basin. At several sites, technical representatives for the District and other interested parties identified transitional vegetation zones at about 40 to 41 ft above NGVD (Czerwinski 2000, Shea 2000). The transitions from herbaceous upland or wetland species to mature woody species occurring in this elevation range were found to be coincident with scarp features.

Proposed minimum levels were, therefore, developed based on consideration of potential flooding and preservation of identified lake attributes. To mitigate potential flooding of the park access road and mature upland plant assemblages, the proposed High Minimum Lake Level was established at 40.0 ft above NGVD. Staging of the lake at or above this level for ten percent of the time would not be expected to cause significant mortality of the mature upland vegetation within the basin, but would be expected to kill some encroaching shrubby and small, woody upland plants. The proposed High Minimum Lake Level is equivalent to the Species Richness Standard and would, therefore, be expected to at least partially address concerns related to loss of species diversity within the basin. The proposed Minimum Lake Level was established at 39.0 ft above NGVD, an elevation corresponding to the High Minimum Lake Level minus the RLWR50 (1.0 ft) for the Northern Tampa Bay area. The proposed minimum levels would provide for basin connectivity and the associated movement of aquatic fauna and recreational boaters among the lake sub-basins. Compliance with the proposed minimum levels would result in flooding of the two barbeque grill / picnic pavilions along the north shore of the lake, and inundation of several spots along the unimproved walking trail that encircles the lake.

The proposed High Minimum Lake Level is 4.9 ft below the High Guidance Level and 2.8 ft below the low spot in the park access road located between Lake Rogers and Lake Raleigh. Lake surface area at the proposed Minimum Lake Level is about 82% of that associated with the Historic P50 elevation.

Figure Rogers-5. Mean monthly surface water elevation, and proposed guidance and minimum levels for the Lake Rogers, 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).

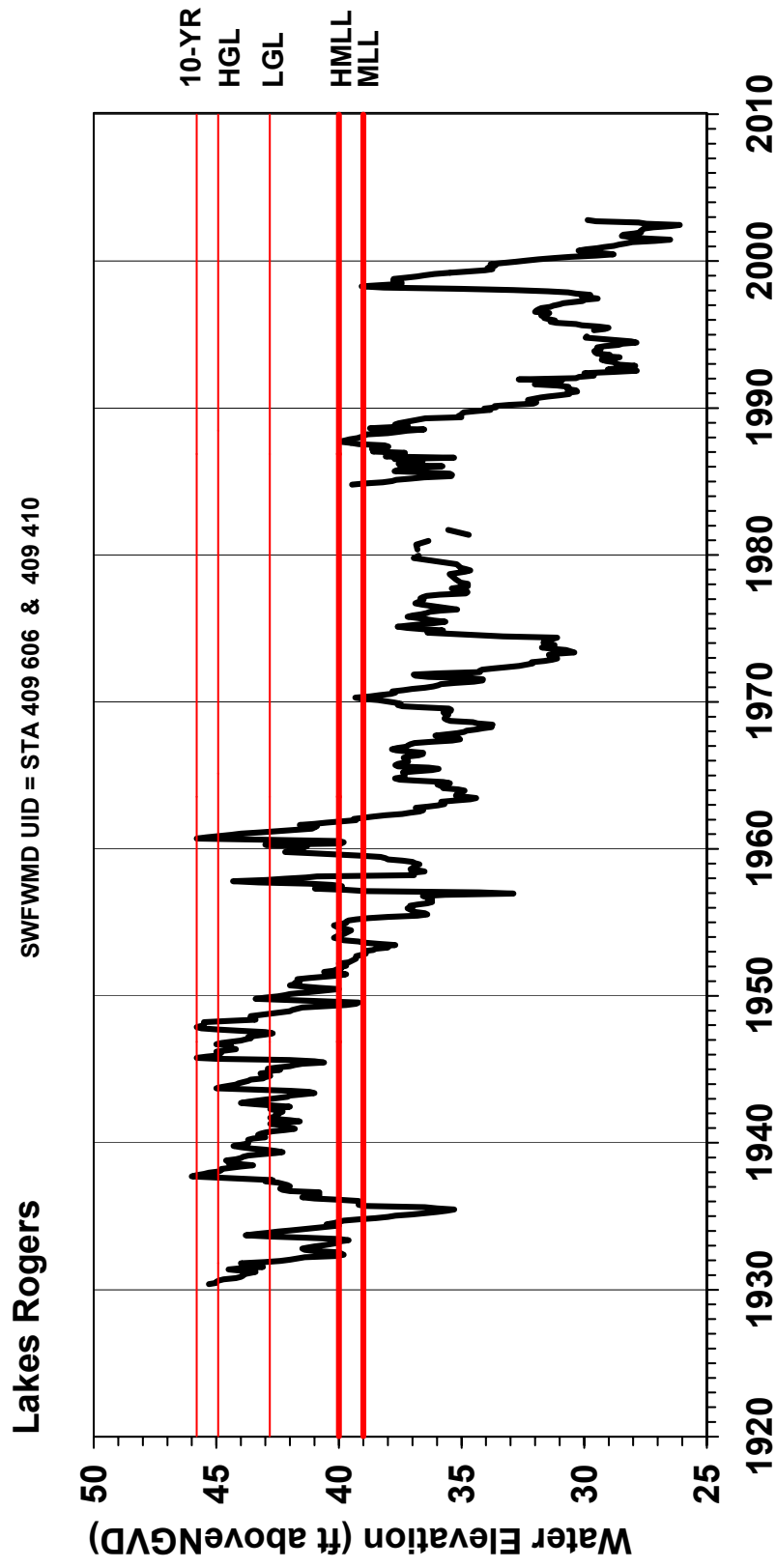


Table Rogers-3. Summary of elevation data and associated lake surface areas used for establishing minimum levels for Lake Rogers in Hillsborough County, Florida.

Level or Feature	Elevation (feet above NGVD)	Total Lake Area (acres)
Current P10	37.77	95
Current P50	35.13	82
Current P90	29.35	50
Category 3 Lake Normal Pool	44.88 *	129
Low Floor Slab	NA	NA
Low Other (low floor slab in the Lake Raleigh basin)	47.07	NA
Low Other (pool deck in Lake Raleigh basin)	45.58	NA
Low Road (low spot in dirt road used for park access)	42.8	NA
Low Road (Crawley Road, west of the lake)	46.53	NA
Low Other (ground elevation at barbeque grill near picnic shelter)	37.8	NA
Low Other (ground elevation at low spot on trail adjacent to the north shore of the lake)	35.1	NA
High Guidance Level	44.88	129
Historic P50	43.88	124
Low Guidance Level	42.78	118
Aesthetics Standard	42.78	118
Species Richness Standard	40.00	105
Basin Connectivity Standard	36.60	89

* Category 3 Lake Normal Pool elevation based on value established for Lake Raleigh

NA = not applicable

Table Rogers-4. Elevation data used for establishing the Category 3 Lake Normal Pool elevation for the Lake Rogers. Data were collected on December 23, 1997; water level was 31.86 ft above NGVD.

Hydrologic Indicator	Elevation (feet above NGVD)
Base of Saw Palmetto (<i>Serenoa repens</i>)	48.84
Base of Saw Palmetto (<i>Serenoa repens</i>)	48.51
Base of Saw Palmetto (<i>Serenoa repens</i>)	48.18
Lakeward Long Leaf Pine (<i>Pinus palustris</i>)	49.19
N	4
Mean	48.68
Standard Deviation	0.43
Median	48.68

Table Rogers-5. Supplemental elevation data used for establishing the Category 3 Lake Normal Pool elevation for the Lake Rogers. Data were collected in the Lake Raleigh basin on June 1, 1998; the lake water level was 38.10 ft above NGVD.

Hydrologic Indicator	Elevation (feet above NGVD)
Cypress (<i>Taxodium</i> sp.) normal pool	44.86
Cypress (<i>Taxodium</i> sp.) normal pool	45.00
Cypress (<i>Taxodium</i> sp.) normal pool	44.90
Cypress (<i>Taxodium</i> sp.) normal pool	44.77
Cypress (<i>Taxodium</i> sp.) normal pool	45.14
Cypress (<i>Taxodium</i> sp.) normal pool	44.84
N	6
Mean	44.92
Standard Deviation	0.13
Median	44.88

Table Rogers-6. Summary of structural alteration/control point elevation information for the Lake Rogers. Numbers correspond to those shown in Figure Rogers-6.

No.	Description	Elevation (feet above NGVD)
1	Invert at east end of 24 inch reinforced concrete pipe under Gunn Highway	46.3
2	Invert at east end of 24 inch reinforced concrete pipe under Gunn Highway; low spot in road north of pipe location is 49.95 ft above NGVD	46.78
3	Ground elevation at spot in dirt park-access road	43.1
4	Ground elevation at low spot in dirt park-access road	42.8
5	Invert at south end of culvert under walking trail bridge; centerline of bridge platform is at 44.77 ft above NGVD	41.46
6	Invert at north end of buried 24 inch reinforced concrete pipe under Race Track Road; centerline of road at pipe location is 48.0 ft above NGVD	43.49
7	Invert at south end of 12 inch metal pipe; invert of north end is ~42.6 ft above NGVD (north end of pipe is buried)	43.2
8	Centerline of berm	47.4
9	Low spot in Crawley Road	46.53

Figure Rogers-6. Outlet conveyance system and spot elevation sites for Lake Rogers, Hillsborough County, Florida. Numbered sites are described in Table Rogers-6.

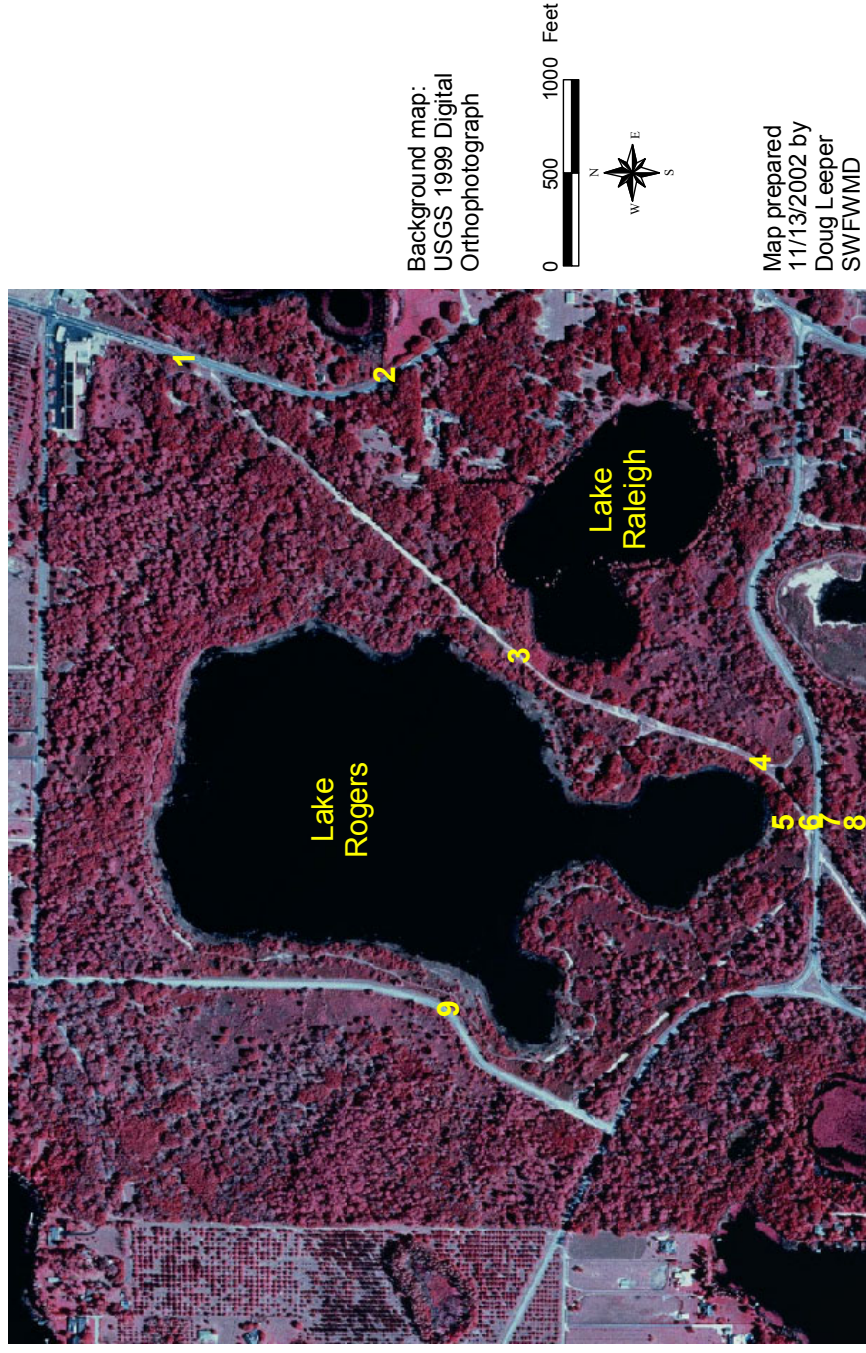
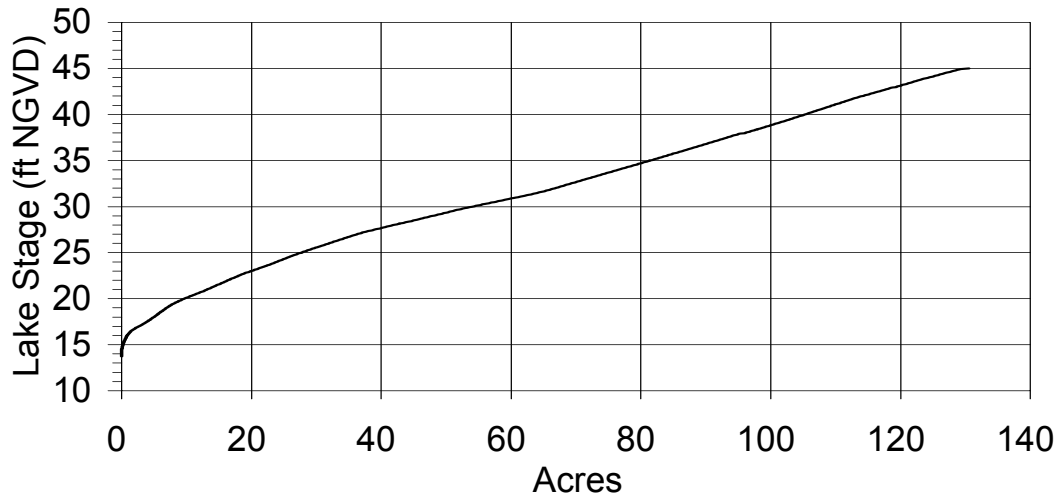


Figure Rogers-7. Surface area, volume, potential herbaceous wetland area, area potentially colonized by aquatic macrophytes, and dynamic ratio versus lake stage for Lake Rogers, Hillsborough County, Florida.

Stage and Area



Stage and Volume

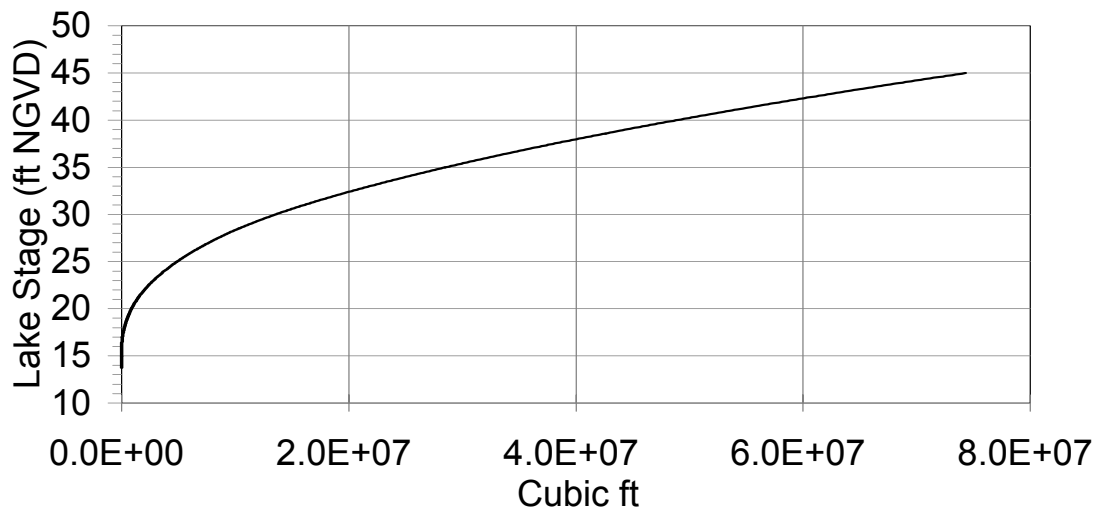
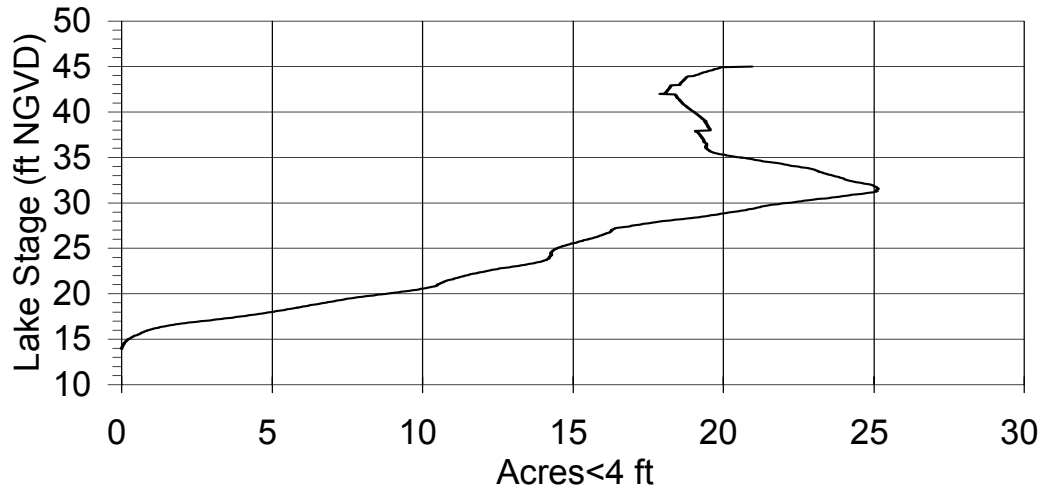


Figure Rogers-7. (continued)

Stage and Herbaceous Wetland Area



Stage and Area Available for Aquatic Plant Colonization

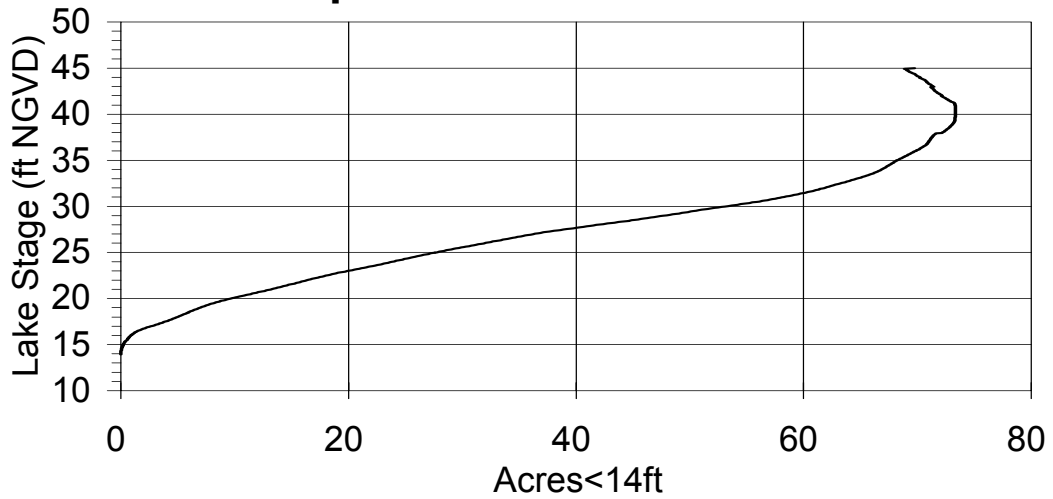
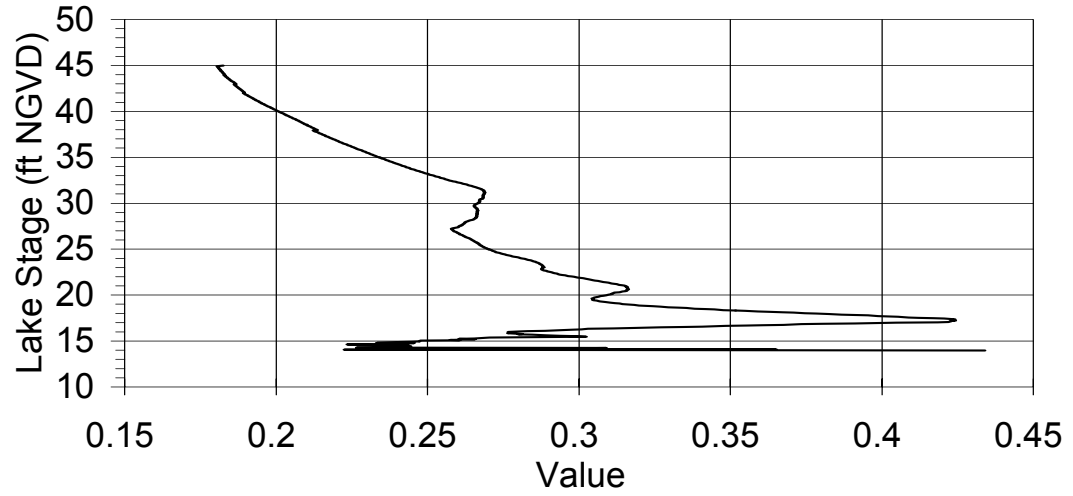


Figure Rogers-7. (continued)

Stage and Dynamic Ratio



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