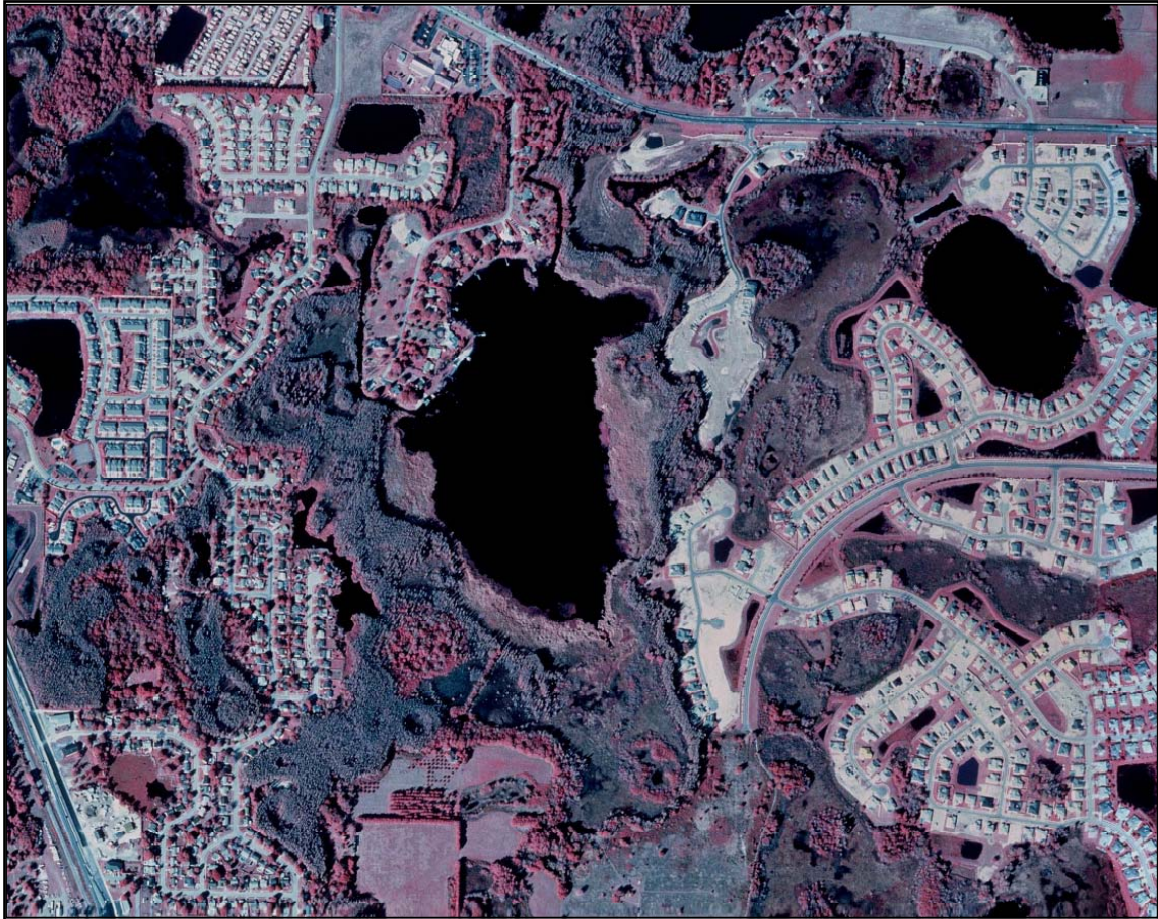


Minimum and Guidance Levels for Bird Lake in Pasco County, Florida



March 2005

Ecologic Evaluation Section
Resource Conservation and Development Department



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Southwest Florida Water Management District
Brooksville, Florida 34604-6899

The Southwest Florida Water Management District (District) does not discriminate upon the basis of any individual's disability status. This non-discriminatory policy involves every aspect of the District's functions, including one's access to, participation, employment, or treatment in its programs or activities. Anyone requiring accommodation as provided for in the American with Disabilities Act should contact (352) 796-7211 or 1-800-423-1476, extension 4215; TDD ONLY 1-800-231-6103; FAX (352) 754-6749.

Minimum and Guidance Levels for Bird Lake

State law (Section 373.042, Florida Statutes; hereafter F.S.) directs the Department of Environmental Protection or the water management districts to establish minimum flows and levels for lakes, wetlands, rivers and aquifers. As currently defined by statute, the minimum level of an aquifer or surface water body is "the level of groundwater in the aquifer and the level of surface water at which further withdrawals would be significantly harmful to the water resources of the area". Adoption of a minimum water level does not necessarily protect a water body from significant harm. However, protection, recovery or regulatory compliance can be gauged once a standard has been established.

Minimum flows and levels are to be established based upon the best available information and shall be developed with consideration of "...changes and structural alterations to watersheds, surface waters and aquifers, and the effects such changes or alterations have had, and the constraints such changes or alterations have placed on the hydrology of the affected watershed, surface water, or aquifer...", with the caveat that these considerations shall not allow significant harm caused by withdrawals (Section 373.0421, F.S.). Additional guidance for the establishment of minimum flows and levels is provided in the Florida Water Resources Implementation Rule (Chapter 62-40.473, Florida Administrative Code; hereafter F.A.C.), which requires that "consideration shall be given to the protection of water resources, natural seasonal fluctuations in water flows, and environmental values associated with coastal, estuarine, aquatic and wetland ecology, including: a) recreation in and on the water; b) fish and wildlife habitats and the passage of fish; c) estuarine resources; d) transfer of detrital material; e) maintenance of freshwater storage and supply; f) aesthetic and scenic attributes; g) filtration and absorption of nutrients and other pollutants; h) sediment loads; i) water quality; and j) navigation."

To address this legislative mandate within its jurisdictional boundaries, the Southwest Florida Water Management District (District or SWFWMD) has developed specific methodologies for establishing minimum flows or levels for lakes, wetlands, rivers and aquifers, and adopted them into its Water Level and Rates of Flow Rule (Chapter 40D-8, F.A.C.). For lakes, methodologies have been developed for establishing Minimum Levels for systems with fringing cypress-dominated wetlands greater than 0.5 acre in size, and for those without fringing cypress wetlands. Lakes with fringing cypress wetlands where water levels currently rise to an elevation expected to fully maintain the integrity of the wetlands are classified as Category 1 Lakes. Lakes with fringing cypress wetlands that have been structurally altered such that lake water levels do not rise to former levels are classified as Category 2 Lakes. Lakes without fringing cypress wetlands are classified as Category 3 Lakes. Chapter 40D-8, F.A.C. also provides for the establishment of Guidance Levels, which serve as advisory information for the District, lakeshore residents and local governments, or to aid in the management or control of adjustable water level structures.

Typically, two Minimum Levels and three Guidance Levels are established for lakes, and upon adoption by the District Governing Board, are incorporated into Chapter 40D-8, F.A.C. The levels, which are expressed as elevations in feet above the National Geodetic Vertical Datum of 1929 (NGVD), are described below.

- The Ten Year Flood Guidance Level is provided as an advisory guideline for lakeshore development. It is the level of flooding expected on a frequency of not less than the ten-year recurring interval, or on a frequency of not greater than a ten percent probability of occurrence in any given year.
- The High Guidance Level is provided as an advisory guideline for construction of lakeshore development, water dependent structures, and operation of water management structures. The High Guidance Level is the elevation that a lake's water levels are expected to equal or exceed ten percent of the time on a long-term basis.
- The High Minimum Lake Level is the elevation that a lake's water levels are required to equal or exceed ten percent of the time on a long-term basis.
- The Minimum Lake Level is the elevation that a lake's water levels are required to equal or exceed fifty percent of the time on a long-term basis.
- The Low Guidance Level is provided as an advisory guideline for water dependent structures, information for lakeshore residents and operation of water management structures. The Low Guidance Level is the elevation that a lake's water levels are expected to equal or exceed ninety percent of the time on a long-term basis.

In accordance with Chapter 40D-8, F.A.C., Minimum and Guidance Levels were developed for Bird Lake, a Category 1 Lake located in Pasco County, Florida. The levels were established using best available information, including field data obtained specifically for the purpose of minimum levels development, and were adopted by the District Governing Board on August 24, 2004. Elevations of the levels in feet above the National Geodetic Vertical Datum of 1929 are listed in Table 1, along with lake surface area values for each level. The approximate location of the adopted Minimum Lake Level within the lake basin is shown in Figure 1. Data and analyses used for development of the levels are described in the remainder of this report.

Table 1. Currently adopted minimum levels, guidance levels and associated surface areas for Bird Lake in Pasco County, Florida.

Level	Elevation (feet above NGVD)	Lake Area (acres)
Ten Year Flood Guidance Level	68.2	NA
High Guidance Level	66.8	149
High Minimum Lake Level	66.6	143
Minimum Lake Level	65.2	94
Low Guidance Level	64.3	81

NA = not available

Figure 1. Approximate location of the currently adopted Minimum Lake Level for Bird Lake in Pasco County, Florida.



Legend

Proposed Minimum Lake Level

— 65.2 ft above NGVD



Map prepared January 6, 2004 using 1999 USGS digital orthophotography, one-foot contours based on photogrammetric mapping of Cypress Creek conducted in January 2001 by 3Di, Florida, LLC, and elevation data collected by SWFWMD Staff on April 15, 2003.

0 500 1,000 Feet

Data and Analyses Supporting Development of Minimum and Guidance Levels for Bird Lake

Lake Setting and Description

Bird Lake (Figure 2) is located in Pasco County, Florida (Section 36, Township 26 South, Range 18 East and Section 31, Township 26 South, Range 19 East) in the Hillsborough River Basin of the Southwest Florida Water Management District. White (1970) classified the area of west-central Florida containing Bird Lake as the Northern Gulf Coastal Lowlands physiographic region. Brooks (1981) characterized the region surrounding the lake as the Land-O-Lakes subdivision of the Tampa Plain in the Ocala Uplift Physiographic District, and described the area as a plain with many small lakes overlying moderately thick limestone with karst features. 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, and described as an area of neutral to slightly alkaline, low to moderate nutrient, clear-water lakes interspersed in sandy uplands (Griffith *et al.* 1997).

Lying within the Lake Hanna Outlet Drainage Basin, Bird Lake receives inflow from Lake Toni, Lake 26 (Water & Air Research, Inc.) and Lake Floyd through a series of wetlands and canals (Figure 3). The lake discharges to Lake Kell, through a channel dug in the wetlands located to the southwest of the lake, and through several culverts lying under County Line Road. Uplands adjacent to the lake are currently used for residential development and livestock grazing. There are no surface water withdrawals from the lake currently permitted by the District. There are, however, a few permitted groundwater withdrawals in the area.

The 1943 and 1974 (photorevised 1987) United States Geological Survey 1:24,000 Lutz, Fla. quadrangle maps do not include a surface water elevation for Bird Lake. The "Gazetteer of Florida Lakes" (Florida Board of Conservation 1969, Shafer *et al.* 1986) lists the lake area as 150 acres at an elevation of 65 ft above the National Geodetic Vertical Datum of 1929 (NGVD). Based on a topographic map of the basin generated in support of minimum levels development (Figure 4), the lake covers an area of 90 acres when the surface level is at 65 ft above NGVD.

Figure 2. Location of Bird Lake in Pasco County, Florida.

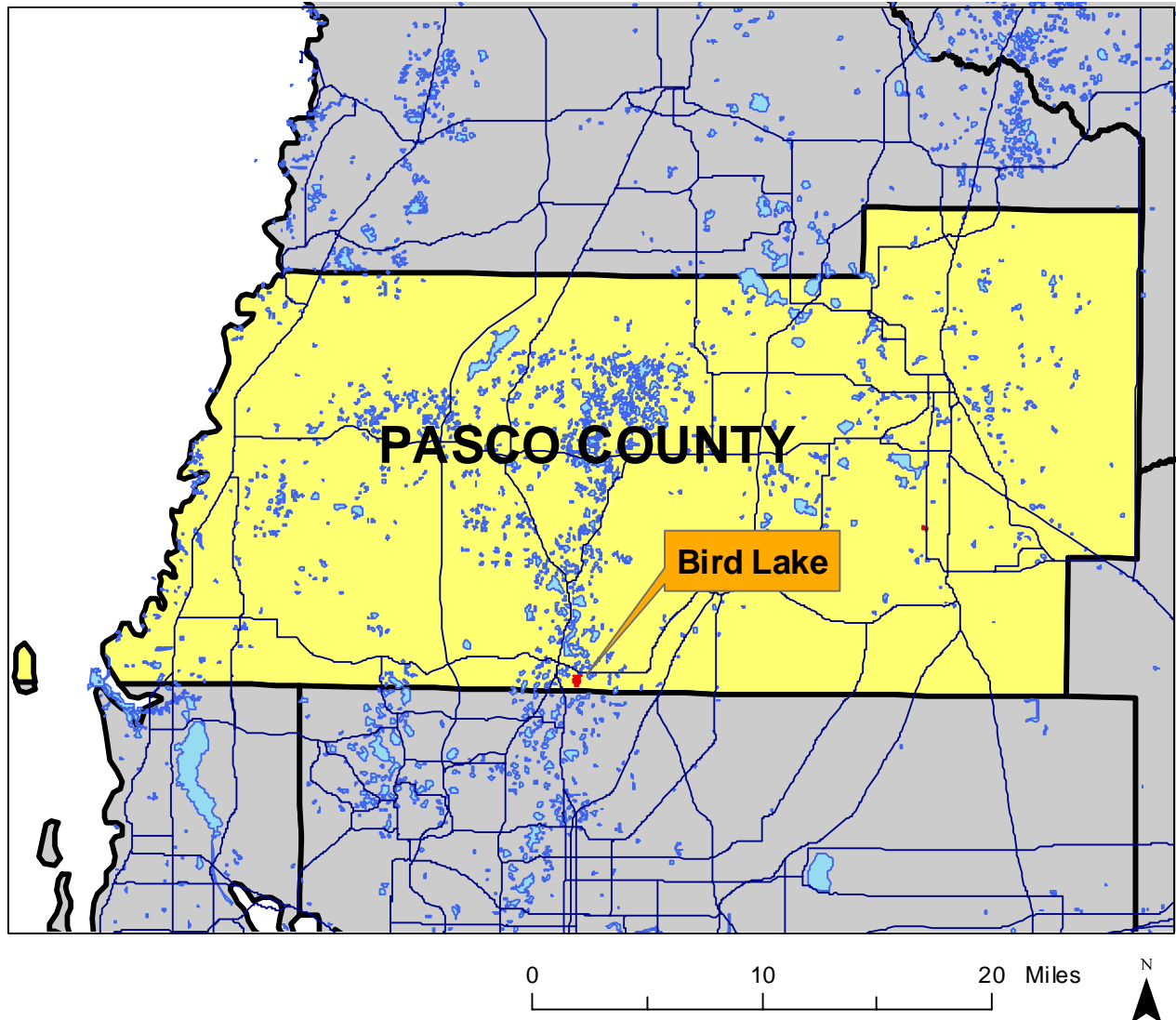
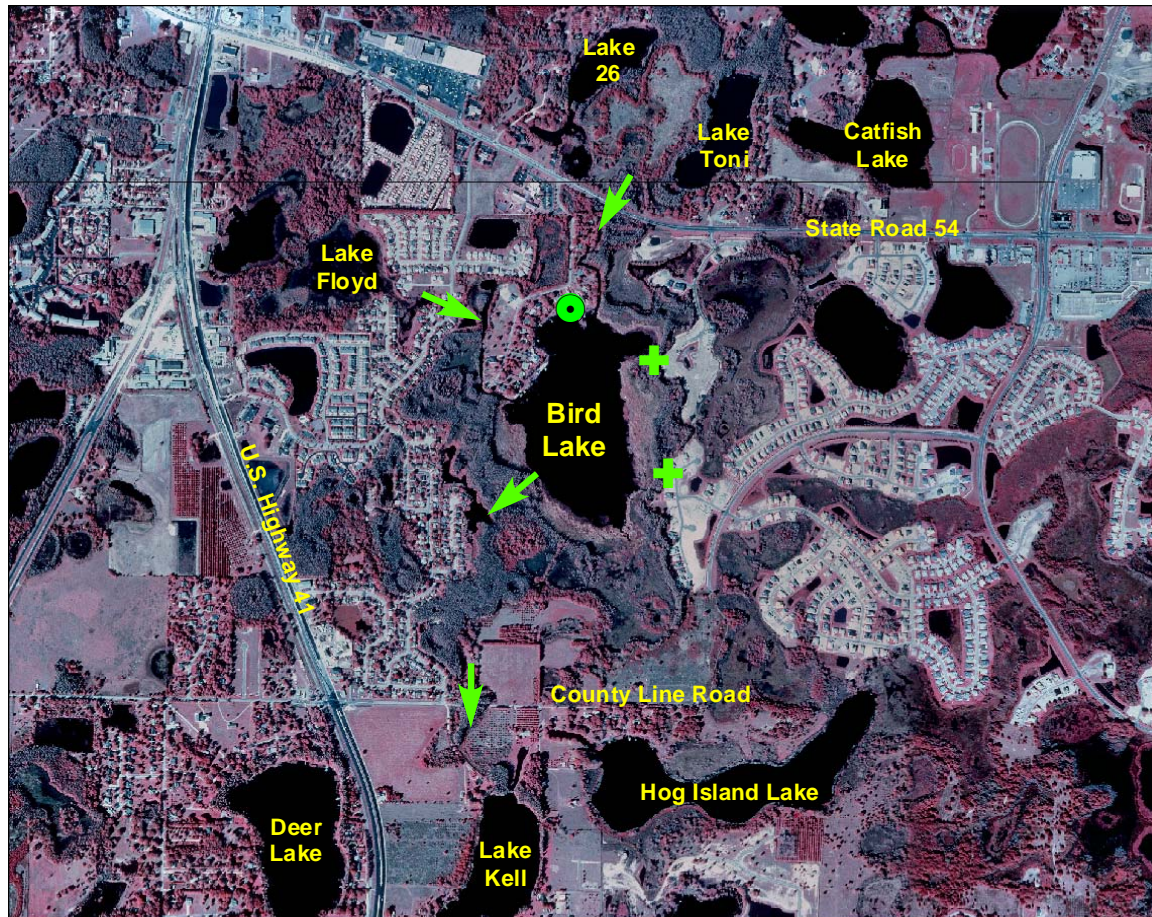





Figure 3. Location of District lake-level gauge, inlets/outlets, and sites where hydrologic indicators were measured at Bird Lake in Pasco County, Florida.



-  Lake gauge
-  Inlet/Outlet
-  Hydrologic Indicators

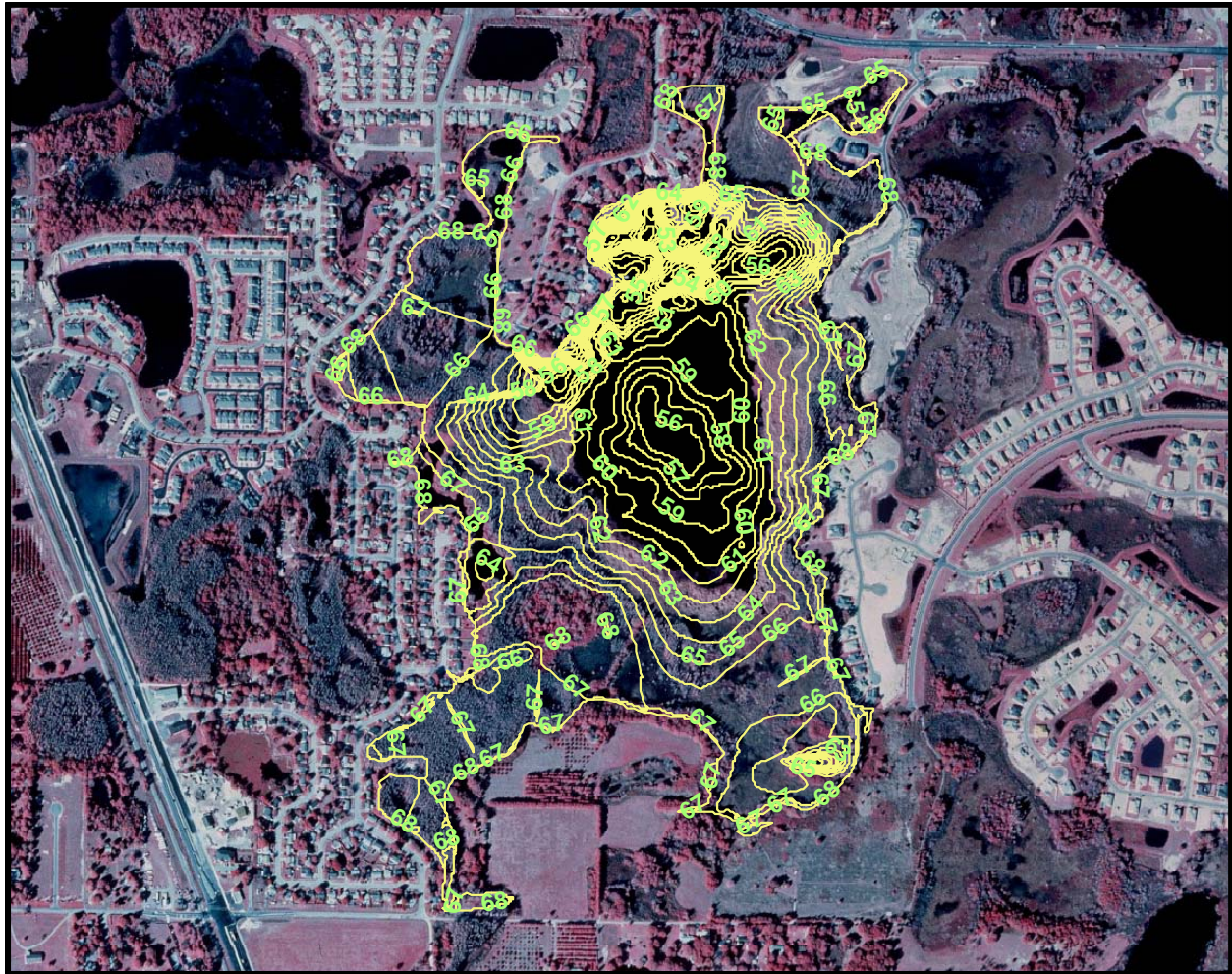
0 1 Miles

Aerial photography from 1999 USGS
Digital Orthophotograph.

Map prepared February 27, 2004.



Figure 4. One-foot contours within the Bird Lake basin in Pasco County, Florida. Values shown are elevations, in feet above the National Geodetic Vertical Datum of 1929.



Map prepared December 19, 2003 using 1999 USGS digital orthophotography, one-foot contours based on photogrammetric mapping of Cypress Creek conducted in January 2001 by 3Di, Florida, LLC, and elevation data collected by SWFWMD Staff on April 15, 2003.



0 500 1,000 Feet

Previously Adopted Lake Management Levels

Based on work conducted in the 1970s (see SWFWMD 1996), the District Governing Board adopted management levels for Bird Lake in September 1980 (Table 2). A Maximum Desirable Level of 65.00 ft above NGVD was also developed, but was not adopted by the Governing Board. The previously adopted levels and the Maximum Desirable Level were developed using methods that differ from the current District approach for establishing Minimum and Guidance Levels. The levels do not, therefore, necessarily correspond with levels developed using current methodologies.

Table 2. Previously adopted guidance levels and associated surface areas for Bird Lake in Pasco County, Florida.

Level	Elevation (feet above NGVD)	Total Lake Area (acres)
Ten Year Flood Guidance Level	67.70	178
High Level	67.50	176
Low Level	65.00	90
Extreme Low Level	63.00	68

Summary of Data and Methods Used for Developing Minimum and Guidance Levels for Bird Lake

Hydrologic data are available for Bird Lake (District Universal ID Numbers STA 324 325) from February 1978 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 guidance and minimum levels are shown in Figure 6. For the entire period of record, the hydrologic data were 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 66.2 ft above NGVD based on the elevation of cypress buttresses in wetlands along the northeast and southeast shores of the lake (Table 4, Figure 3). The low floor slab elevation, extent of structural alteration and control point elevation were determined using available one-foot contour interval aerial maps and field survey data (Table 3, Figure 7). The Normal Pool elevation is above the control point elevation (65.1 ft above NGVD), so the lake is considered to be Structurally Altered.

Based on the availability of Historic hydrologic data for Bird Lake, the High Guidance Level was established at the Historic P10 elevation of 66.8 ft above NGVD. The Historic P50 and Low Guidance Level were established at 65.4 and 64.3 ft above NGVD, respectively, using the Historic P50 and Historic P90 elevations (Table 3).

The Ten Year Flood Guidance Level for Bird Lake was established at 68.2 ft above NGVD using the methodology for open basin lakes described in current District Rules (Chapter 40D-8, Florida Administrative Code). For the analysis, the NETWORK flood routing model was used. Model input was based on a ten-year storm event with a 120-hour duration and an 11.3-inch rainfall depth. Based on available lake stage data, the Ten Year Flood Guidance Level was exceeded twice during the past 25 years (Figures 5 and 6). The highest elevation for Bird Lake recorded in the District Water Management Data Base, 68.40 ft above NGVD, occurred on September 3, 1985. The low of record, 62.45 ft above NGVD, occurred on June 28, 1994.

Bird Lake contains diverse stands of aquatic macrophytes and other hydrophytes, including cypress (*Taxodium sp.*), willow (*Salix caroliniana*), hydrilla (*Hydrilla verticillata*), cattail (*Typha sp.*), pickerelweed (*Pontederia cordata*), arrowhead (*Sagittaria lancifolia*), fanwort (*Cobomba caroliniana*), torpedo grass (*Panicum repens*) and spatterdock (*Nuphar luteum*). Except for the northwestern shoreline area, the remaining approximately two-thirds of lake shoreline consists of cypress-dominated wetlands of 0.5 or more acres in size, so the lake is classified as a Category 1 or 2 Lake for the purpose of minimum levels development. Because the Historic P50 elevation is less than 1.8 feet below the Normal Pool elevation, the lake was classified as a Category 1 Lake. Note that herein, for discussion purposes, the elevation 1.8 ft below the Normal Pool elevation is identified as the Cypress Standard. For Bird Lake, this standard was established at 65.2 ft above NGVD.

Based on the relationship between the Cypress Standard and the Historic P50 elevation, the Minimum Lake Level was established at the Cypress Standard elevation (65.2 ft above NGVD). The High Minimum Lake Level was established at 66.6 ft above NGVD, an elevation 0.4 ft below the Normal Pool elevation. The High Minimum Lake Level is 3.4 ft below the Low Floor Slab elevation and 5.9 ft below the lowest spot in the roads located in the immediate lake basin

For comparative purposes, minimum level standards used for establishing Minimum Lake Levels for lakes without fringing cypress wetlands (see current District rules and Leeper *et al.* 2001) were developed for Bird Lake (Table 3). The Recreation/Ski Standard would be established at 66.1 ft NGVD, based on the sum of the elevation at which the lake could contain a safe skiing area (65.0 ft NGVD), and the difference between the Historic P50 and Historic P90 elevations (1.1 ft). The Dock-Use Standard would be established at 65.8 ft above NGVD, based on the P10 elevation of sediments at the end of the 14 docks at the lake (62.7 ft above NGVD, Table 6), a clearance value of 2 ft based on use of powerboats in the lake, and the difference between the Historic P50 and Historic P90 (1.1 ft). The Species Richness Standard would be established at 64.7 ft above NGVD, based on limiting reduction in lake surface area to less than a 15% decrease from the lake area at the Historic P50 elevation. The Aesthetic-Standard for the lake would be established at the Low Guidance Level elevation of 64.3 ft above NGVD. The Basin Connectivity Standard would be established at 63.0 ft NGVD, based on the sum of the elevation that ensures connectivity among lake sub-basins (59.9 ft

NGVD), a 2 ft clearance for movement of biota and use of powerboats in the lake, and the difference between the Historic P50 and Historic P90 elevations (1.1 ft). Based on basin morphology, a Mixing Standard for preventing change in the sediment re-suspension pattern would not be established. 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).

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

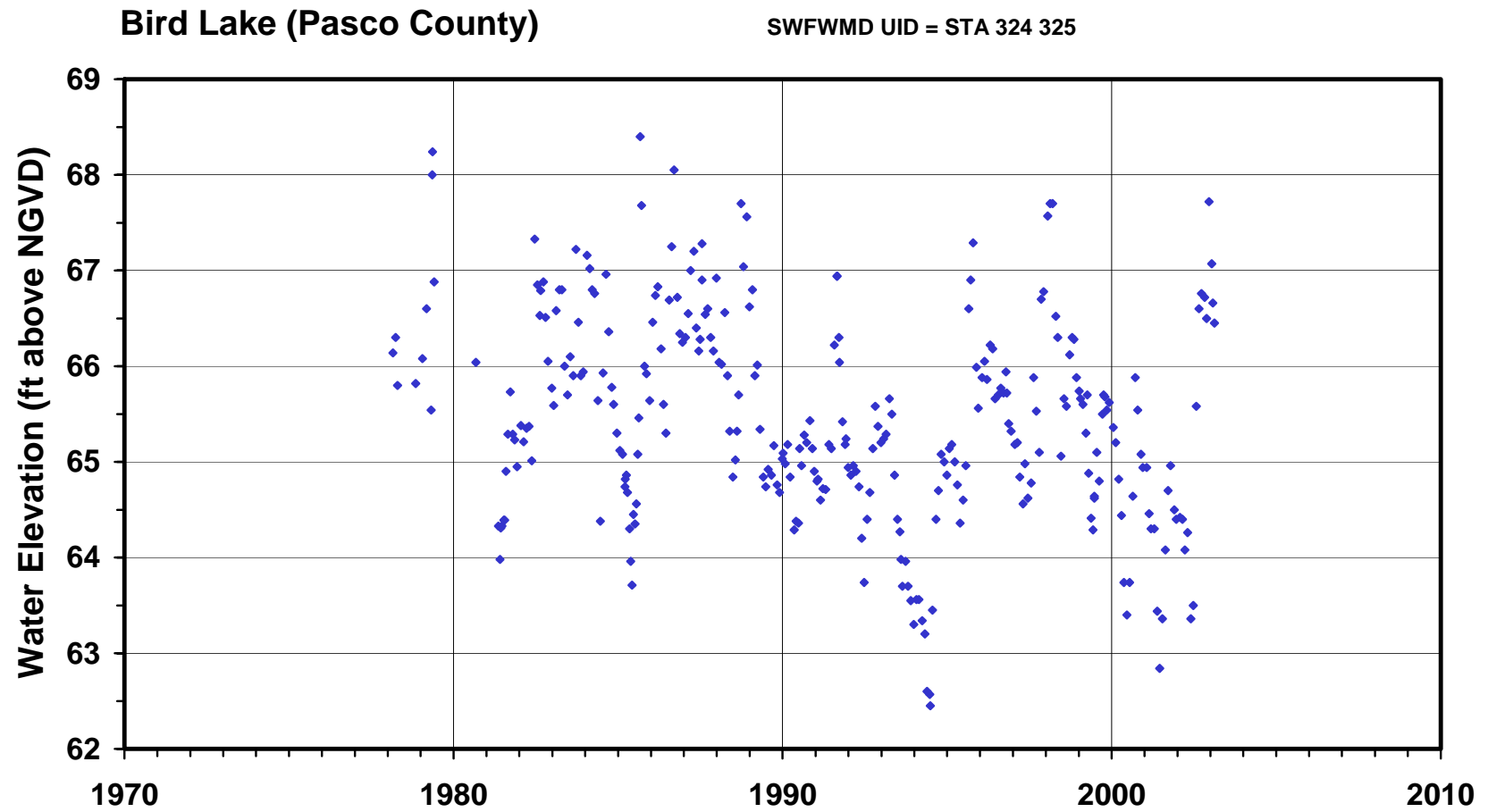


Figure 6. Mean monthly surface water elevation through February 2003, and guidance and minimum levels for Bird Lake in Pasco County, Florida. Adopted levels include the Ten Year Flood Guidance Level (10-YR), High Guidance Level (HGL), Low Guidance Level (LGL), High Minimum Lake Level (HMLL), and Minimum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

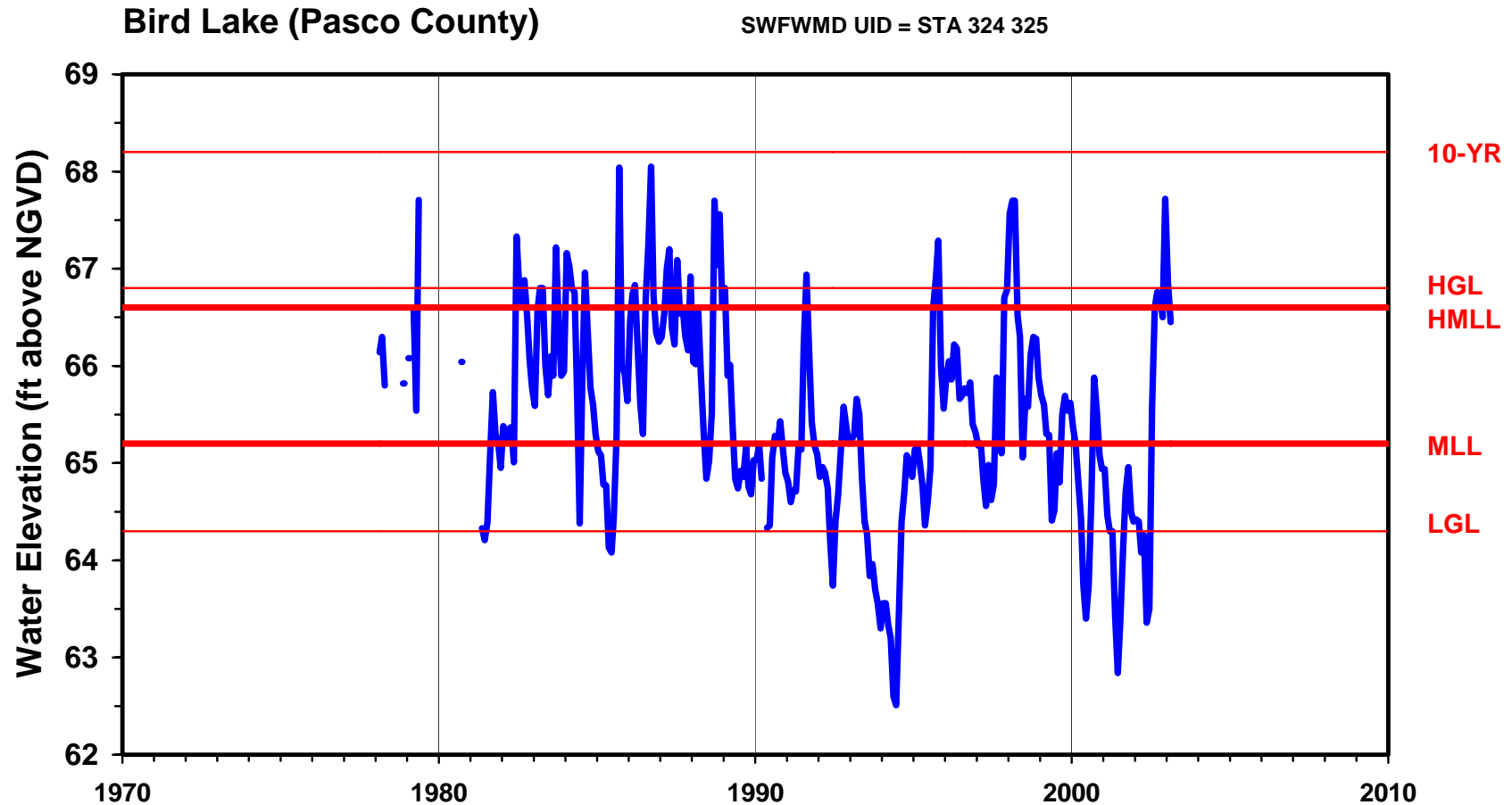


Table 3. Elevation data and associated area values used for establishing minimum levels for Bird Lake in Pasco County, Florida.

Level or Feature	Elevation (feet above NGVD)	Lake Area (acres)
Historic P10	66.80	149
Historic P50	65.37	96
Historic P90	64.25	81
Normal Pool	67.0	166
Low Floor Slab	70.0	NA
Low Other (pool deck)	71.0	NA
Low Road	72.5	NA
Control Point	65.1	92
High Guidance Level	66.8	149
Historic P50	65.4	96
Low Guidance Level	64.3	81
Cypress Standard	65.2	94
*Recreation/Ski Standard	66.1	128
*Dock-Use Standard	65.8	108
*Species Richness Standard	64.7	85
*Aesthetic Standard	64.3	81
*Connectivity Standard	63.0	68
*Mixing Standard	NA	NA

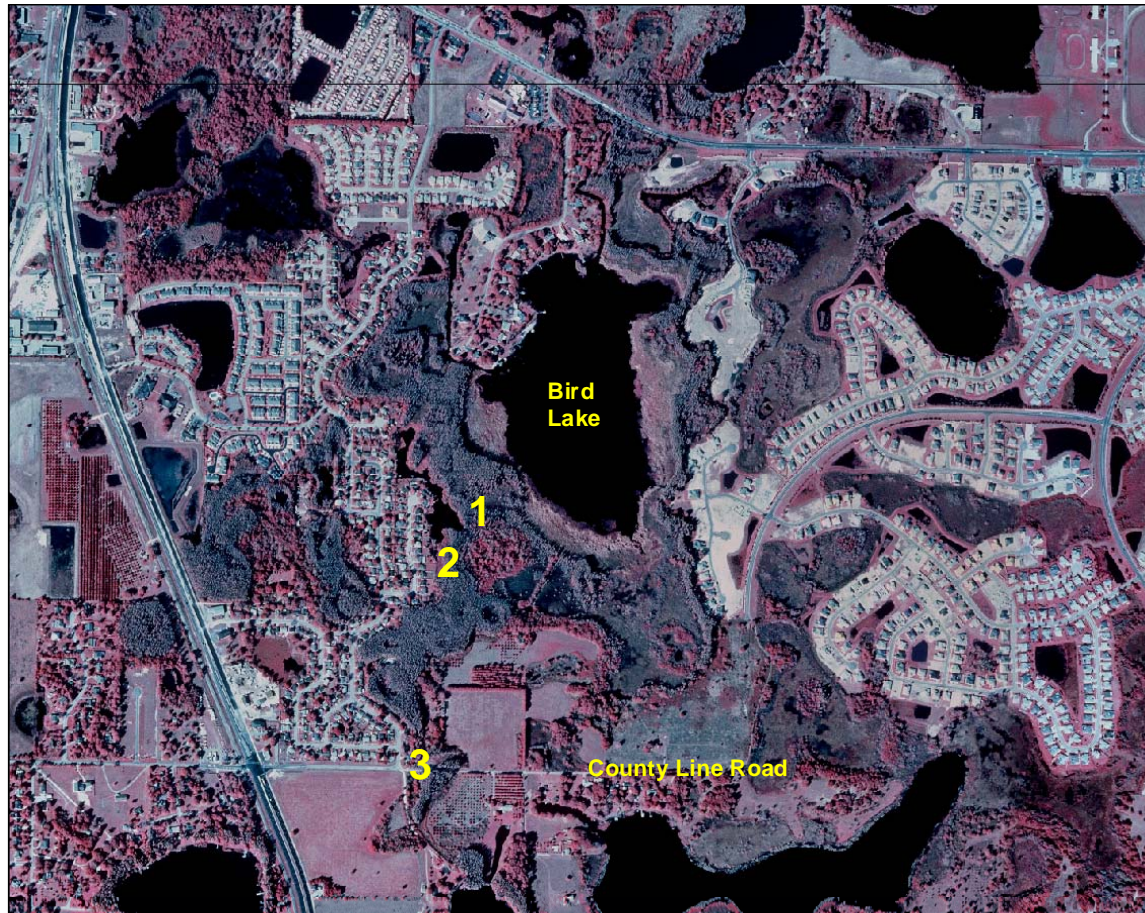
NA = not applicable/not available

*Category 3 Lake Standards established for comparative purposes only; not used for minimum levels development.

Table 4. Elevation data used for establishing the Normal Pool Elevation for Bird Lake in Pasco County, Florida. Data were collected in February 2004 at two wetland sites by SWFWMD staff.

Hydrologic Indicator	Elevation (feet above NGVD)
Cypress buttress inflection point	66.81
Cypress buttress inflection point	66.96
Cypress buttress inflection point	66.96
Cypress buttress inflection point	66.96
Cypress buttress inflection point	66.96
Cypress buttress inflection point	66.96
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Cypress buttress inflection point	66.96
Cypress buttress inflection point	66.96
Cypress buttress inflection point	67.06
Cypress buttress inflection point	67.06
Cypress buttress inflection point	67.06
Cypress buttress inflection point	67.06
Cypress buttress inflection point	67.06
Cypress buttress inflection point	67.06
Cypress buttress inflection point	67.06
Cypress buttress inflection point	67.16
Cypress buttress inflection point	67.16
Cypress buttress inflection point	67.21
N	22
Median	67.0
Mean	67.0
Standard Deviation	0.1

Figure 7. Outlet conveyance system for Bird Lake in Pasco County, Florida.



Aerial photography from 1999 USGS
Digital Orthophotograph.

Map prepared February 20, 2004.

0 0.25 0.5 Miles

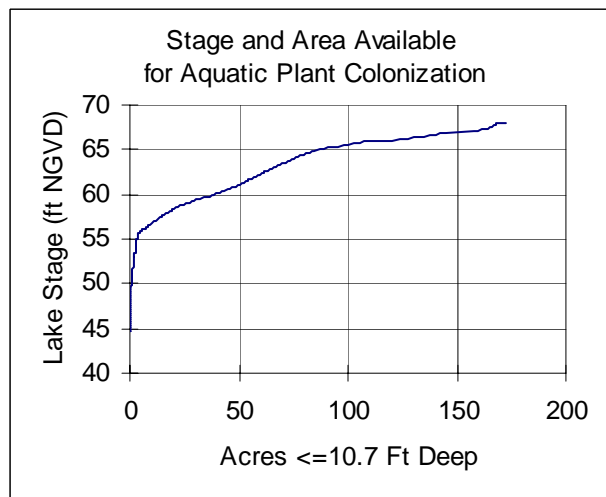
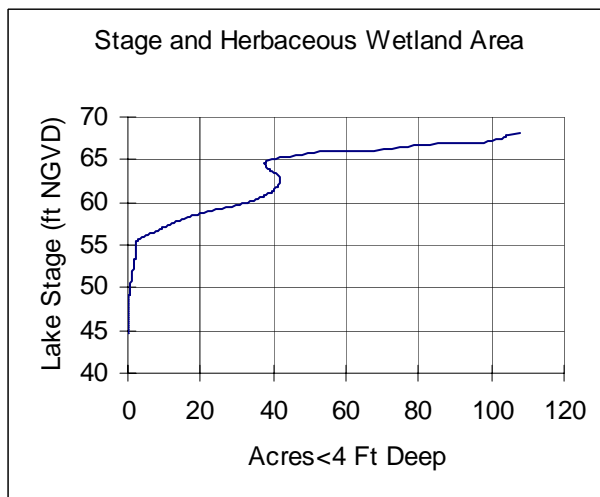
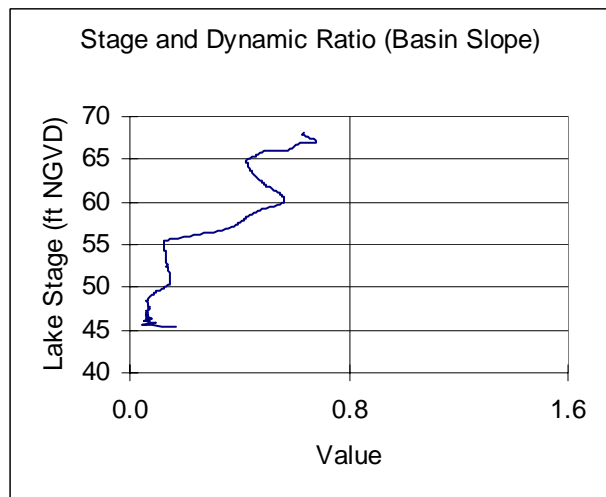
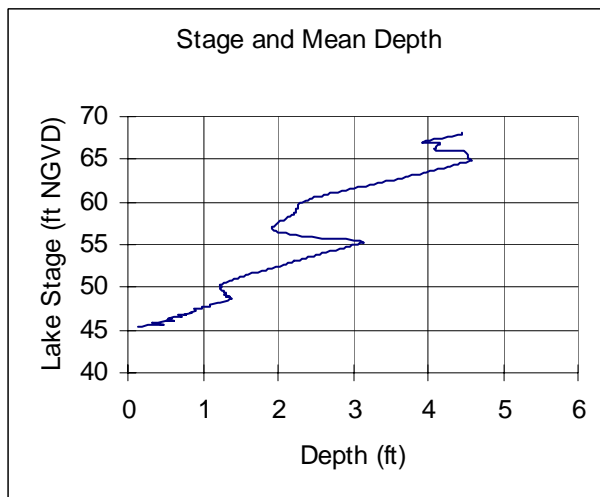
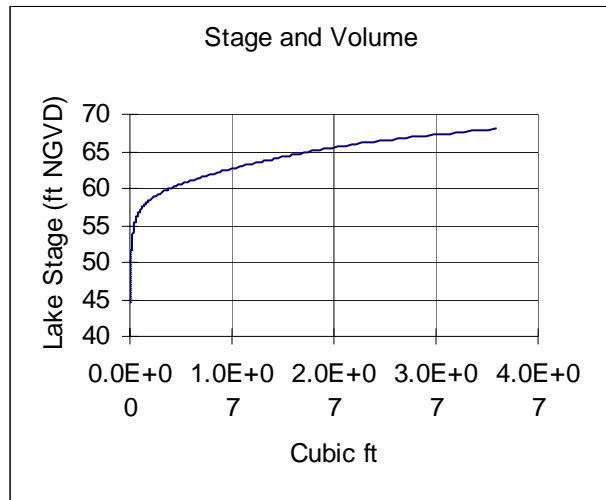
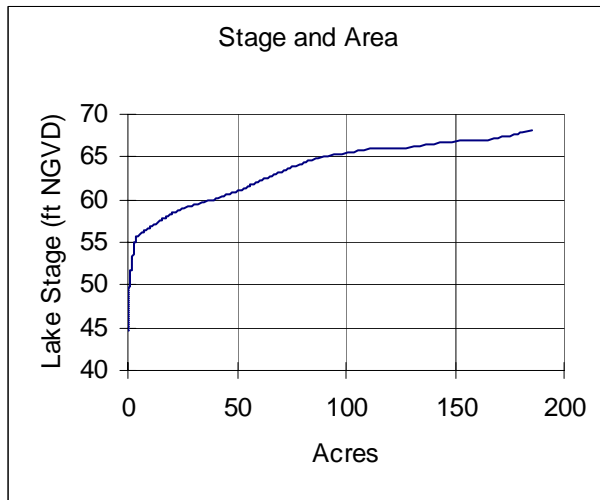


Site	Description	Elevation (feet above NGVD)
1	Ground elevation; high spot in flow line through cypress wetland	65.1
2	Ground elevation; high spot in flow line through cypress wetland	65.1
3	Range of invert elevations at north end of six culverts located under County Line Road. Invert at north end of the lowest culvert is 63.65 ft above NGVD; invert at south end of the culvert is 63.11 ft above NGVD.	63.65 – 65.91

Table 6. Summary statistics for elevations associated with docks (n = 14) at Bird Lake in Pasco County, Florida, based on data collected by SWFWMD staff on April 15, 2002. Percentiles (P10, P50, P90) represent elevations exceeded by 10, 50 and 90 percent of the docks.

Statistic	Elevation of Sediments at Waterward Ends of Docks (feet above NGVD)	Elevation of Dock Platforms (feet above NGVD)
Mean (SD)	60.2 (2.2)	68.3 (0.9)
P10	62.7	69.4
P50	60.8	68.3
P90	58.6	67.3
Maximum	63.1	69.9
Minimum	54.7	66.8

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



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