

December 11, 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 Padgett in
Pasco County, Florida**

Lake Padgett

General Description

Lake Padgett (Figure 1) is located in the Hillsborough River Basin of the Southwest Florida Water Management District (SWFWMD or District) in Pasco County, Florida (Sections 24 and 25, Township 26S, Range 18E). The region surrounding the lake is categorized as the Land-O-Lakes subdivision of the Tampa Plain in the Ocala Uplift Physiographic District (Brooks 1981). The area is characterized 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).

Drainage areas for Lake Padgett are listed at 6.6 square miles (Florida Board of Conservation 1969) and ~5.4 square miles (Henderson 1983). The lake receives inflow from Lake Bell to the north and Lake Saxon to the east (Figure 2). A series of culverts drain the lake to the south under Carson Drive, and ultimately, through numerous wetlands and lakes, to Cypress Creek. Residential and commercial development encircles most of the lake. Significant wetlands areas remain intact, however, particularly along the south and northwest shores. Pasco County government maintains a boat ramp in a private park located along the lake's eastern shore. There are no surface water withdrawals from the lake currently permitted by the District. There are, however, numerous permitted groundwater withdrawals in the area.

The 1974 (photorevised 1987) United States Geological Survey 1:24,000 Lutz, Fla. quadrangle map shows a surface water elevation of 69 ft above the National Geodetic Vertical Datum of 1929 (NGVD) for Lake Padgett. The "Gazetteer of Florida Lakes"

(Florida Board of Conservation 1969, Shafer *et al.* 1986) lists the lake area as 200 acres and the surface elevation at 70 ft above NGVD. Based on a topographic map of the basin generated in support of minimum levels development (Figure 3), the lake covers an area of 206 and 184 acres, respectively, when the surface level is at 70 and 69 ft above NGVD. Data used for production of the topographic map were obtained from field surveys conducted in February 2003 and one-foot contours developed from contour data prepared using photogrammetric methods.

Figure 1. Location of Lake Padgett in Pasco County, Florida.

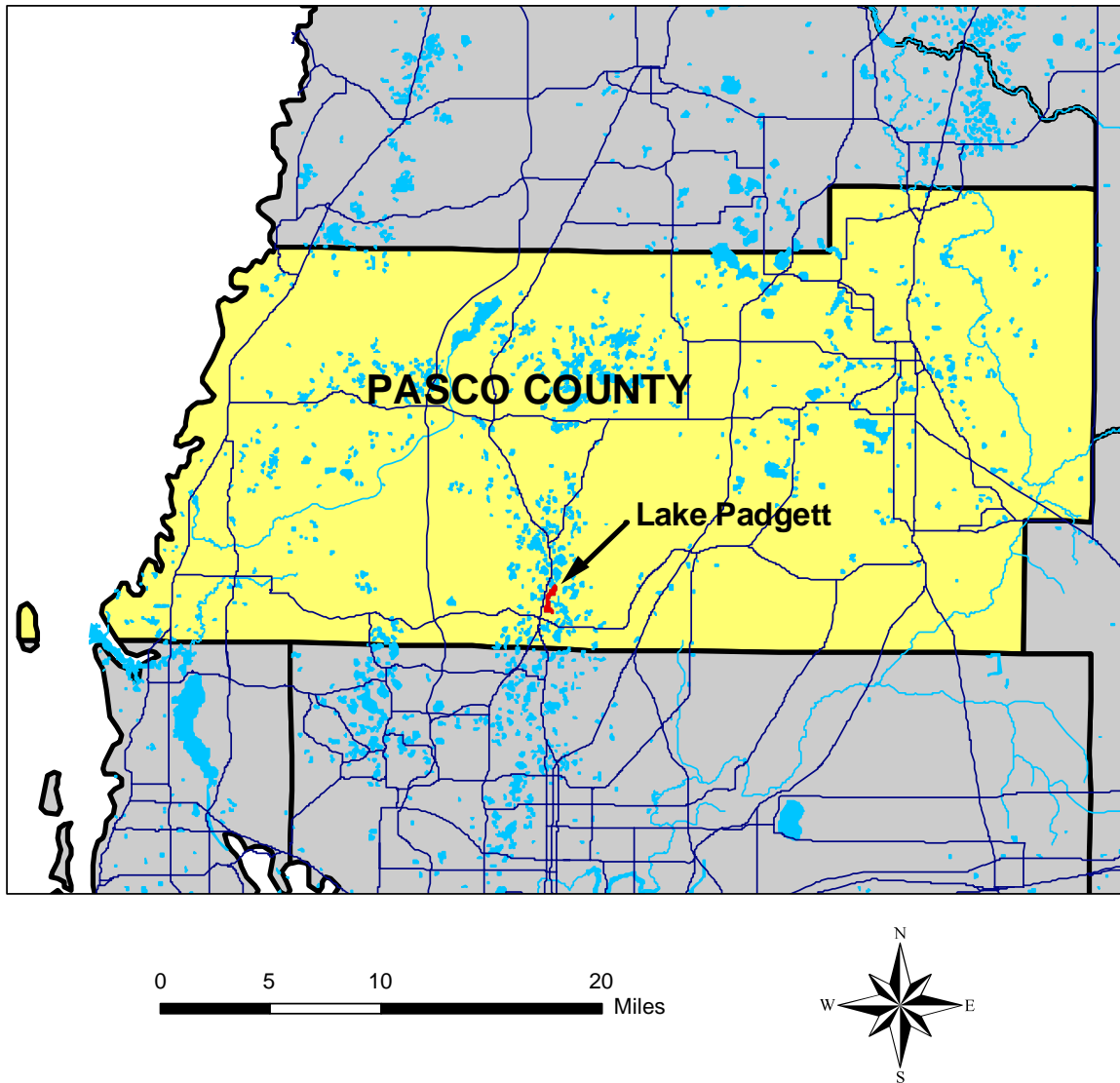
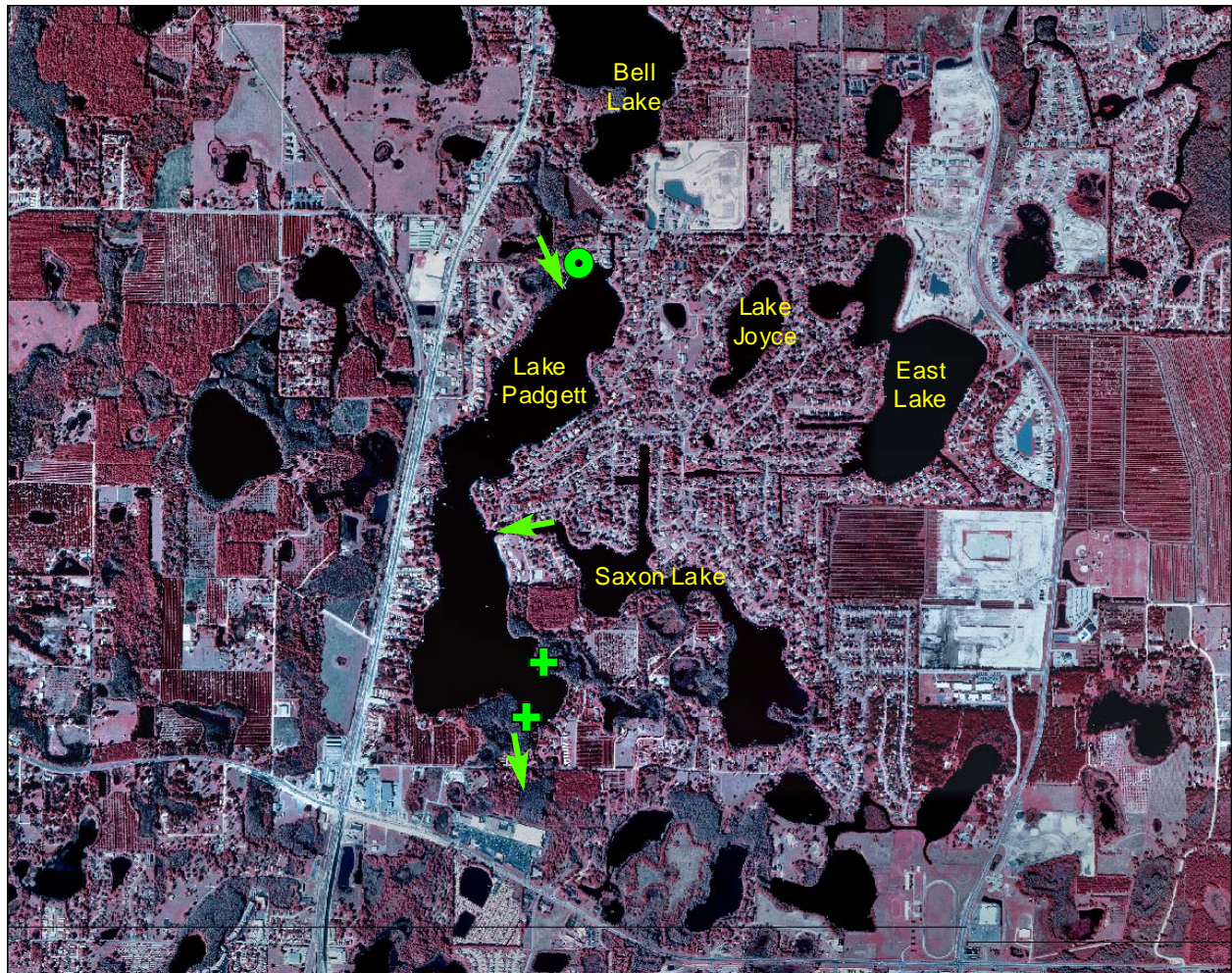


Figure 2. Location of District lake-level gauge, inlets/outlets, and sites where hydrologic indicators were measured at Lake Padgett in Pasco County, Florida.



 Lake gauge

 Outlet

 Hydrologic Indicators

0 0.25 0.5 1 Miles

Aerial photography from 1999 USGS
Digital Orthophotograph.

Map prepared June 12, 2003

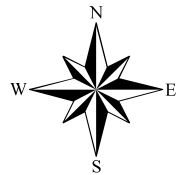
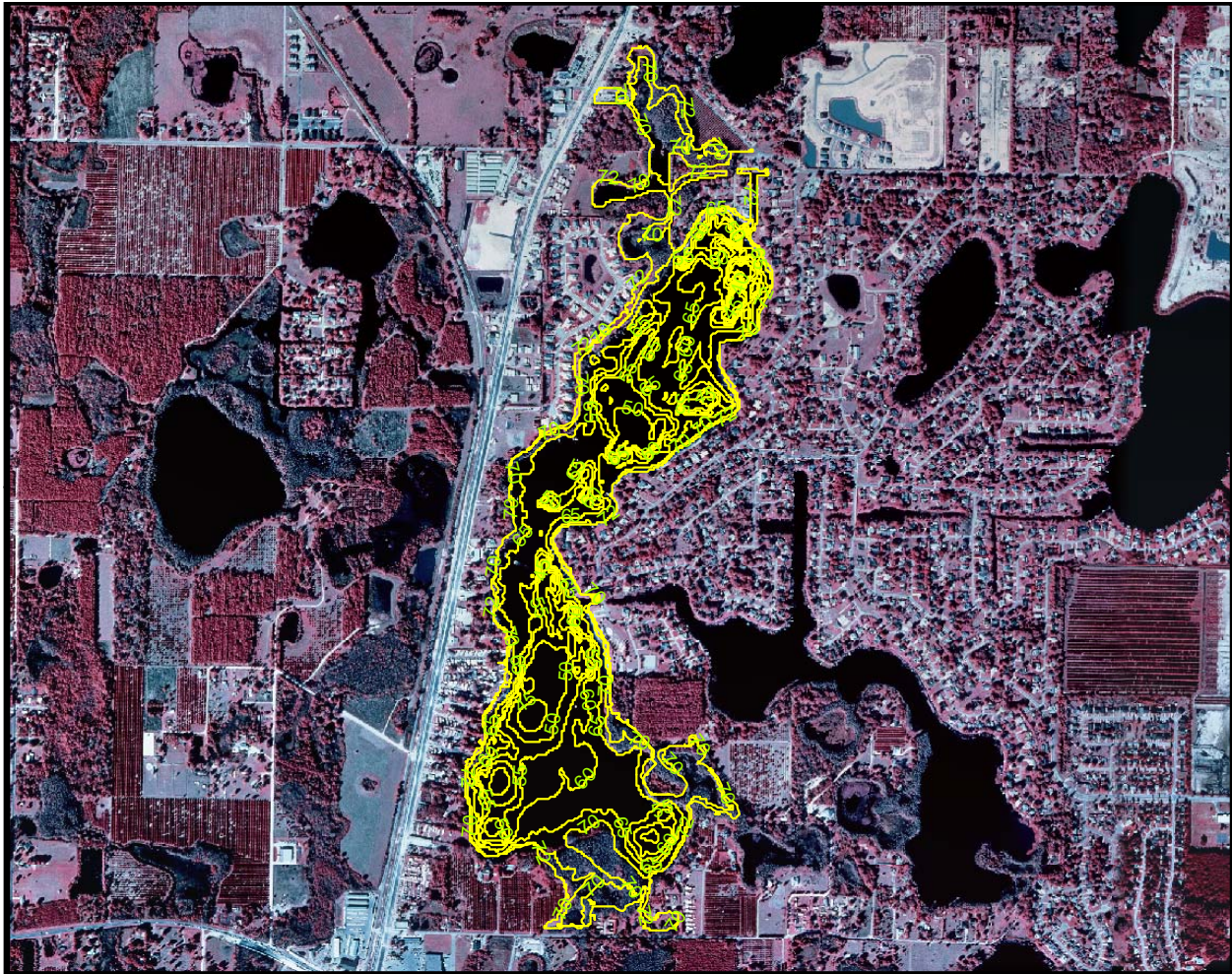
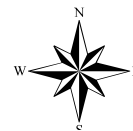


Figure 3. Five-foot contours (and the 172-ft contour) within the Lake Padgett basin in Pasco County, Florida. Values shown are elevations, in feet above the National Geodetic Vertical Datum of 1929.



Map prepared June 12, 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 February 13, 2003.

0 1,000 2,000 4,000 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 Lake Padgett in April 1985 (Table 1). A Maximum Desirable Level of 70.75 ft above NGVD was also developed, but was not adopted by the Governing Board.

Table 1. Adopted guidance levels and associated surface areas for Lake Padgett in Pasco County, Florida.

Level	Elevation (feet above NGVD)	Total Lake Area (acres)
Ten Year Flood Guidance Level	71.34	236
High Level	71.25	235
Low Level	69.00	184
Extreme Low Level	67.50	169

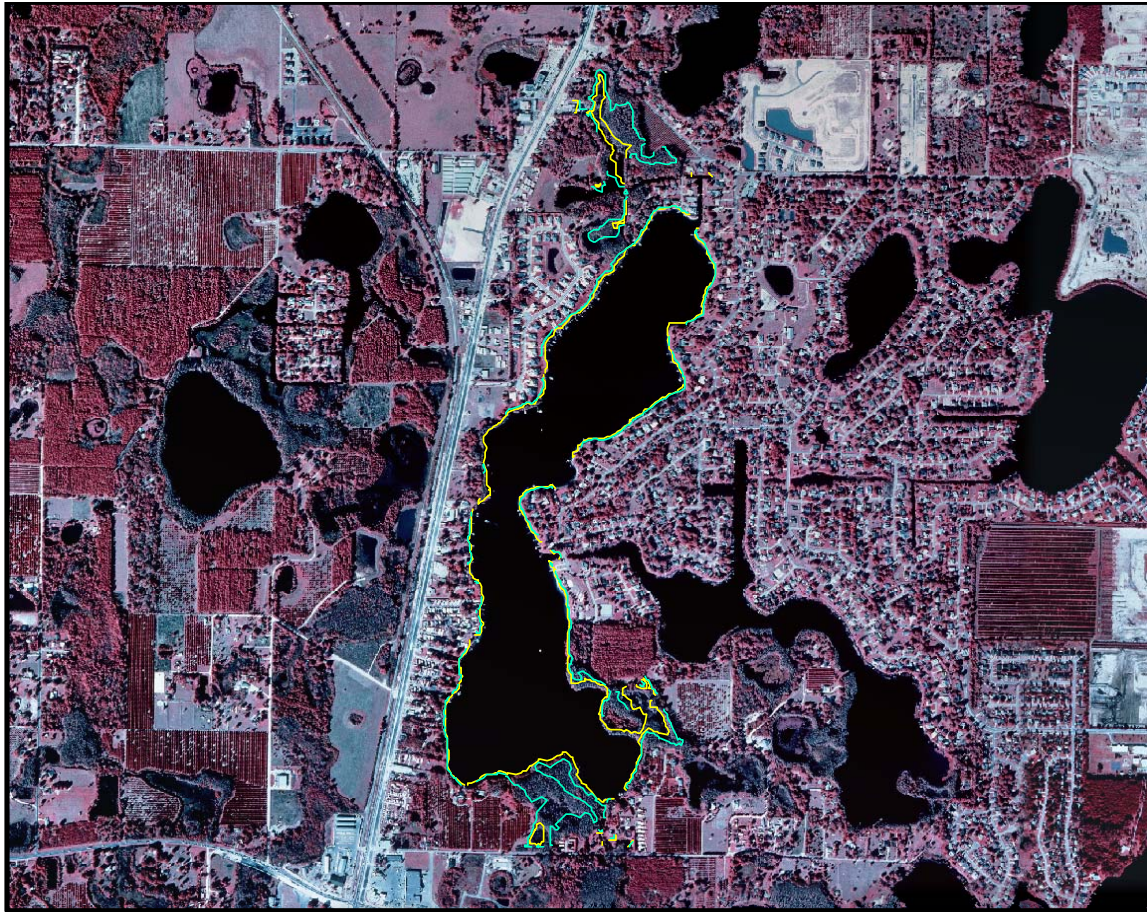
Proposed Minimum and Guidance Levels

Proposed Minimum and Guidance Levels were developed for Lake Padgett using the methodology for Category 1 and 2 Lakes described in SWFWMD (1999) and current District Rules (Chapter 40-D8, Florida Administrative Code). Additional lake-level information was developed using methods outlined in Leeper *et al.* (2001), in accordance with modifications outlined by Dierberg and Wagner (2001). 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 Lake Padgett in Pasco County, Florida.

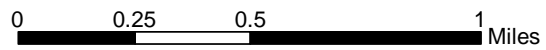
Level	Elevation (feet above NGVD)	Lake Area (acres)
Ten Year Flood Guidance Level	71.5	237
High Guidance Level	70.5	219
High Minimum Lake Level	70.5	219
Minimum Lake Level	69.5	192
Low Guidance Level	68.4	176

Figure 4. Approximate location of the proposed Minimum Lake Level (yellow) and proposed High Minimum Lake Level (blue) for Lake Padgett in Pasco County, Florida.

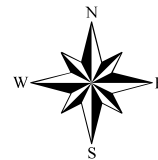


Legend

- 69.5 ft above NGVD
- 70.5 ft above NGVD



Map prepared December 11, 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 February 13, 2003.



Summary of Data and Analyses Supporting Recommended Minimum and Guidance Levels

Hydrologic data are available for Lake Padgett (District Universal ID Numbers STA 325 326 and STA 325 624) from January 1965 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 January 2003 were used to calculate the Historic P10, P50, and P90 (Table 3).

The Normal Pool elevation was established at 71.3 ft above NGVD based on the elevation of cypress buttresses in two wetlands in the southern portion of the basin (Table 4, Figure 2). 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 (Tables 3 and 5, Figure 7). The Normal Pool elevation is above the control point elevation (68.7 ft above NGVD), so the lake is considered to be Structurally Altered.

Based on the availability of Historic hydrologic data for the lake basin, the High Guidance Level was established at the Historic P10 elevation of 70.5 ft above NGVD (Table 3). The Historic P50 and Low Guidance Levels (69.6 and 68.4 ft above NGVD, respectively) were determined using the Historic P50 and Historic P90 elevations.

The Ten Year Flood Guidance Level for Lake Padgett was established at 71.5 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 has been exceeded numerous times during the past 38 years (Figures 5 and 6). The highest elevation for Lake Padgett recorded in the District Water Management Data Base, 71.90 ft above NGVD, occurred on September 9, 1988. The low of record, 66.27 ft above NGVD, occurred on June 18, 2001.

Lake Padgett contains diverse stands of aquatic macrophytes and other hydrophytes, including hydrilla (*Hydrilla verticillata*), cattail (*Typha* sp.), pickerelweed (*Pontederia cordata*), spatterdock (*Nuphar luteum*), maidencaine (*Panicum hemitomon.*), pennywort (*Hydrocotyle umbellata*), eelgrass (*Vallisneria* sp.), red maple (*Acer rubrum*), and wax myrtle (*Myrica cerifera*). The northwest and southern portion of the lake are contiguous with 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 is 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 Lake Padgett, this standard is established at 69.5 ft above NGVD. Based on the relationship between the Cypress Standard and the Historic P50 elevation, the proposed Minimum

Lake Level was established at the Cypress Standard elevation (69.5 ft above NGVD),

A provisional High Minimum Lake Level was established at 70.9 ft above NGVD, an elevation 0.4 ft below the Normal Pool. This level was considered inappropriate, however, since it is higher than the Historic P10 elevation. The proposed High Minimum Lake Level was, therefore, established at the High Guidance Level elevation (70.5 ft above NGVD). The proposed High Minimum Lake Level is 3.5 ft below the Low Floor Slab elevation, 1.6 ft below the concrete slab of the lowest carport in the immediate lake basin, and 1.2 ft below the low spot on the roads that encircle the lake.

For comparative purposes, minimum level standards used for establishing Minimum Lake Level for lakes without fringing cypress wetlands (see Leeper *et al.* 2001) were developed for Lake Padgett (Table 3). The Dock-Use Standard was established at 69.9 ft above NGVD, based on the elevation of sediments at the end of 90% of the 105 docks at the lake, a clearance value of 2 ft based on use of powerboats in the lake, and the difference between the Historic P50 and Historic P90 (1.2 ft). The Aesthetic-Standard for Lake Padgett was established at the Low Guidance Level elevation of 68.4 ft above NGVD. The Basin Connectivity Standard was established at 67.7 ft above NGVD, based on a critical high-spot elevation of 64.5 ft above NGVD, which insures connectivity among the lake sub-basins, a 2 ft clearance for use of powerboats in the lake, and the difference between the Historic P50 and Historic P90. The Species Richness Standard was established at 67.1 ft above NGVD, based on a limiting reduction in lake surface area to a 15% decrease from the area at the Historic P50 elevation. The Recreation/Ski Standard was established at 62.2 ft above NGVD, based on a critical ski elevation of 61 ft above NGVD and the difference between the Historic P50 and Historic P90. Based on basin morphology, a Mixing Standard for preventing change in the sediment re-suspension pattern was not established. 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 7).

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

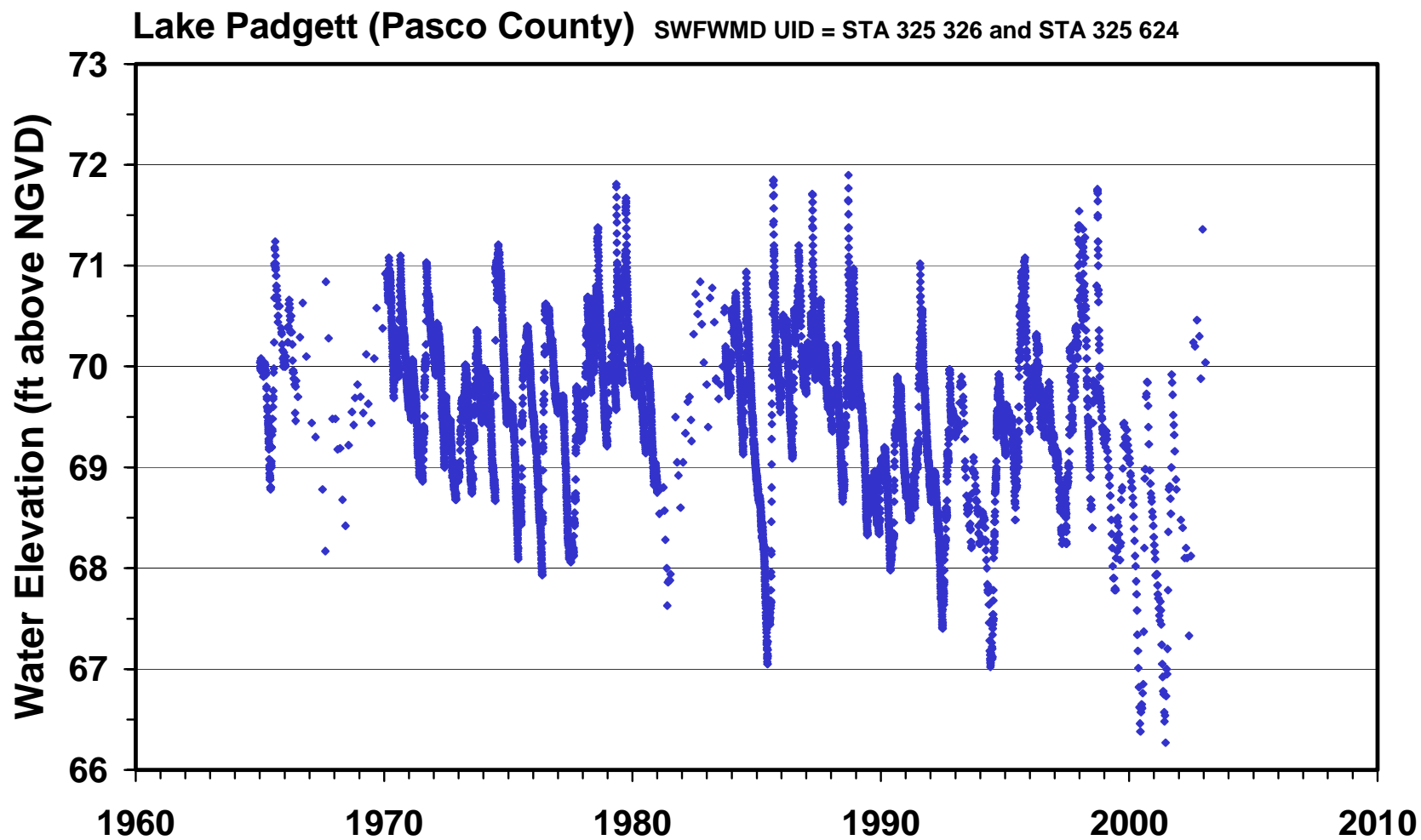


Figure 6. Mean monthly surface water elevation through January 2003, and proposed guidance and minimum levels for Lake Padgett in Pasco County, Florida. Proposed levels include the Ten Year Flood Guidance Level (10-YR), High Guidance Level (HGL), Low Guidance Level (LGL), High Minimum Lake Level (HMLL),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

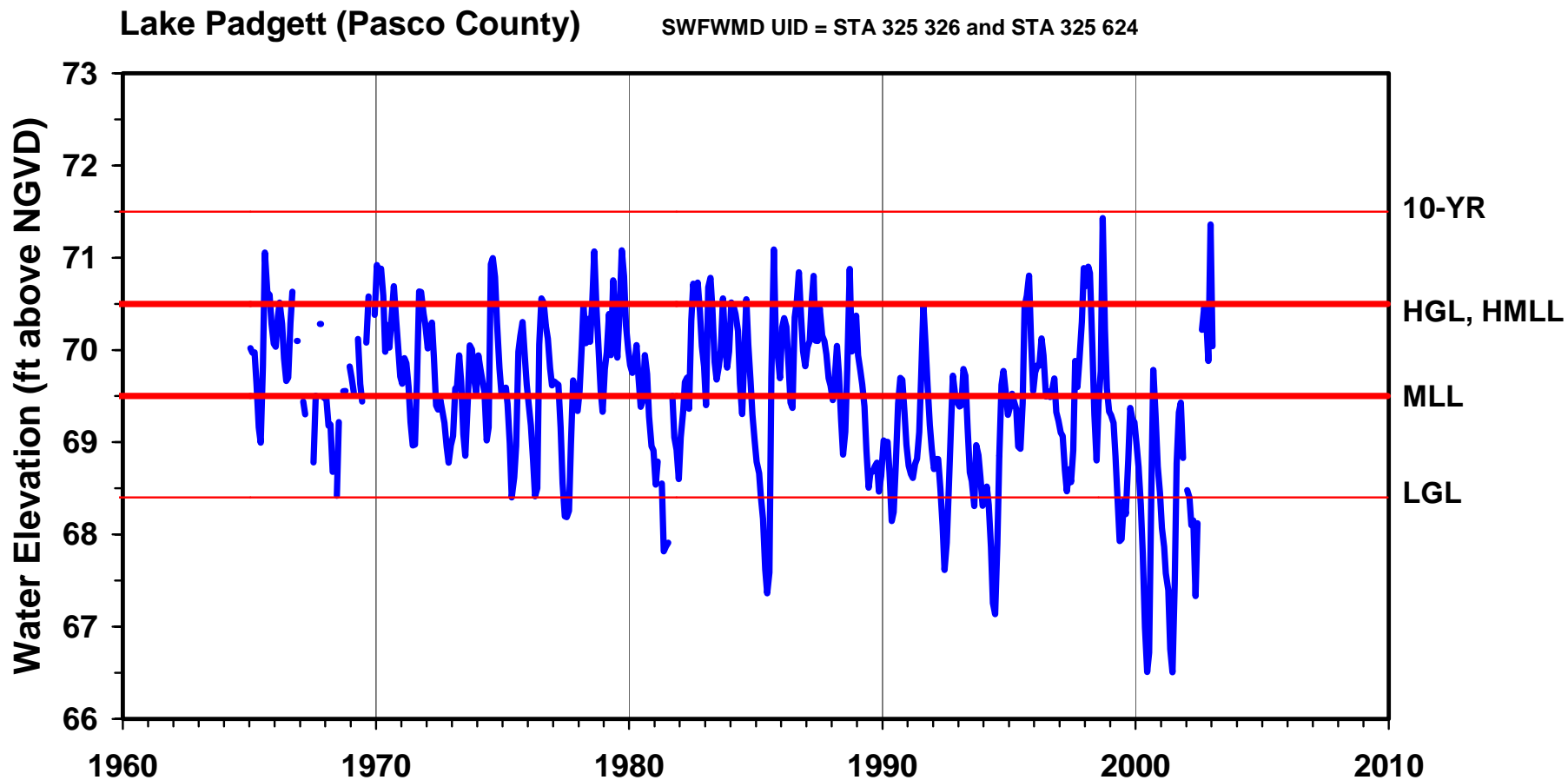


Table 3. Elevation data and associated area values used for establishing minimum levels for Lake Padgett in Pasco County, Florida.

Level or Feature	Elevation (feet above NGVD)	Lake Area (acres)
Historic P10	70.49	219
Historic P50	69.59	194
Historic P90	68.40	176
Normal Pool	71.3	235
Low Floor Slab	74.0	NA
Low Other (concrete slab of covered picnic shelter)	73.0	NA
Low Other (floor elevation of second floor of boathouse/cabana)	72.4	NA
Low Other (concrete slab of covered carport)	72.1	NA
Low Other (ground shot at well)	71.9	240
Low Road	71.7	239
Control Point	68.7	179
High Guidance Level	70.5	219
Historic P50	69.6	194
Low Guidance Level	68.4	176
Cypress Standard	69.5	192
*Dock-Use Standard	69.9	199
*Aesthetic Standard	68.4	176
*Connectivity Standard	67.7	170
*Species Richness Standard	67.1	166
*Recreation/Ski Standard	62.1	97

NA = not applicable/not available

*Category 3 Lake Standards developed for comparative purposes only.

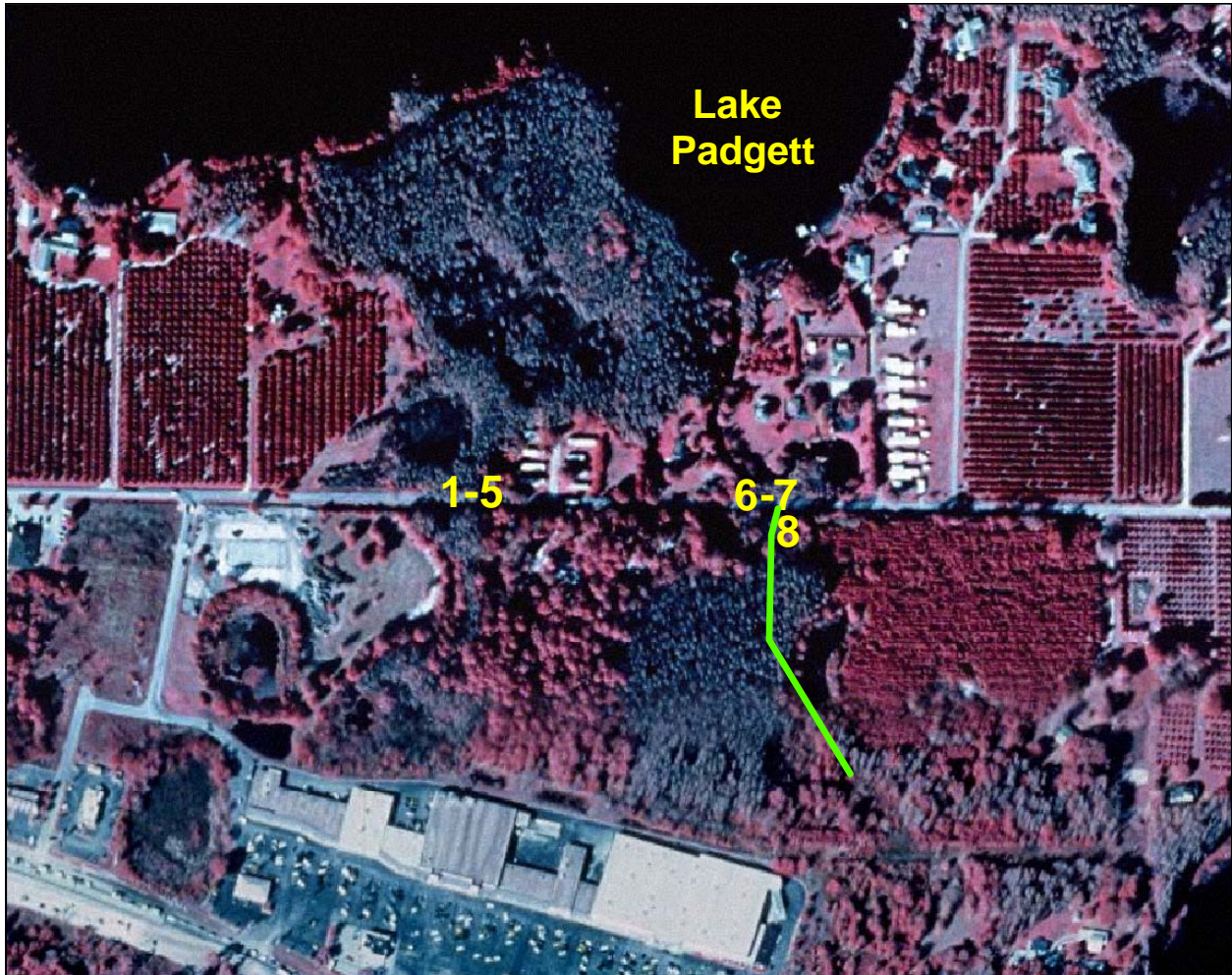
Table 4. Elevation data used for establishing the Normal Pool Elevation for Lake Padgett in Pasco County, Florida. Data were collected by SWFWMD staff in February 2003.

Hydrologic Indicator	Elevation (feet above NGVD)
Cypress buttress inflection point	71.09
Cypress buttress inflection point	71.09
Cypress buttress inflection point	71.19
Cypress buttress inflection point	71.19
Cypress buttress inflection point	71.19
Cypress buttress inflection point	71.29
Cypress buttress inflection point	71.29
Cypress buttress inflection point	71.29
Cypress buttress inflection point	71.29
Cypress buttress inflection point	71.29
Cypress buttress inflection point	71.29
Cypress buttress inflection point	71.39
Cypress buttress inflection point	71.39
Cypress buttress inflection point	71.39
Cypress buttress inflection point	71.49
Cypress buttress inflection point	71.59
Cypress buttress inflection point	71.59
Cypress buttress inflection point	71.69
Cypress buttress inflection point	71.69
Cypress buttress inflection point	71.79
N	20
Median	71.3
Mean	71.4
Standard Deviation	0.2

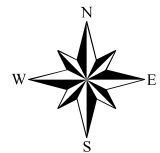
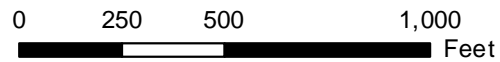
Table 5. Outlet conveyance system and control point summary information for Lake Padgett in Pasco County, Florida. Numbered sites correspond to those shown in Figure 7.

Site	Description	Elevation (feet above NGVD)
1	Invert at north end of 1.7 ft x 2.5 ft, 32-ft long oval concrete culvert	69.06
2	Invert at north end of 1.7 ft x 2.5 ft, 32-ft long oval concrete culvert	69.26
3	Invert at north end of 1.7 ft x 2.5 ft, 32-ft long oval concrete culvert	69.23
4	Invert at north end of 1.7 ft x 2.5 ft, 32-ft long oval concrete culvert	68.58
5	Invert at north end of 1.7 ft x 2.5 ft, 33-ft long oval concrete culvert	68.09
6	Invert at south end of 1.7 ft x 2.5 ft, 33-ft long oval concrete culvert	68.63
7	Invert at north end of 1.7 ft x 2.5 ft, 33-ft long oval concrete culvert	68.72
8	Control point; high spot in ditch through swamp	68.7

Figure 7. Outlet conveyance system for Lake Padgett in Pasco County, Florida. Numbered sites are described in Table 5.



Aerial photography from 1999 USGS
Digital Orthophotograph.

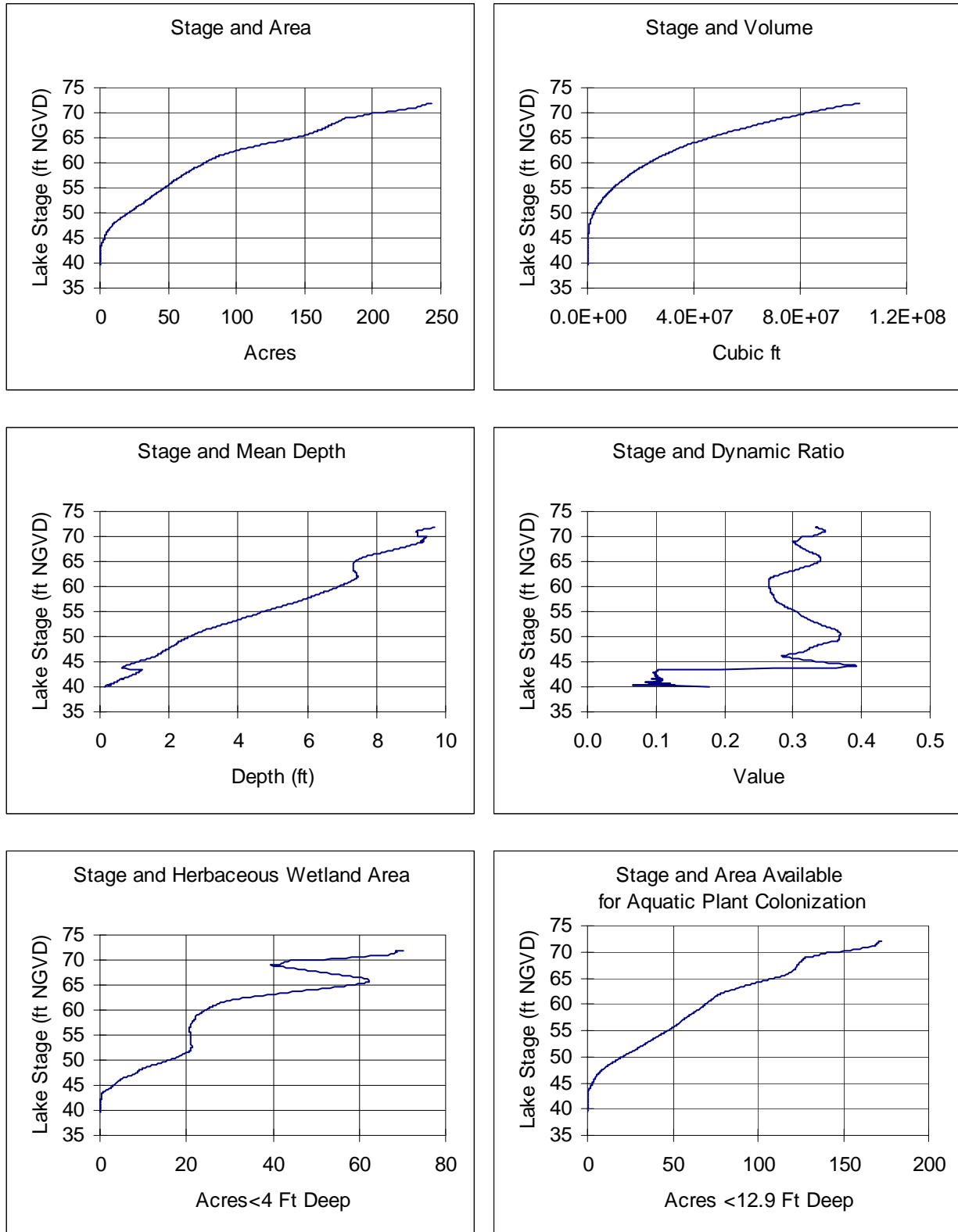


Map prepared June 12, 2003

Table 6. Summary statistics for elevations associated with docks (n = 105) at Lake Padgett in Pasco County, Florida, based on data collected by SWFWMD staff on April 9, 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)	64.9 (1.7)	71.7 (0.7)
P10	66.7	72.5
P50	65.0	71.9
P90	63.2	70.7
Maximum	68.5	73.1
Minimum	55.7	70.0

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



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