APPENDIX A — 1997 MEMORANDUM - MINIMUM SURFACE WATER LEVELS DETERMINED FOR SYLVAN LAKE

MEMORANDUM F.O.R. 94-1514

DATE: May 22, 1997

TO: Jeff Elledge, Director
Resource Management Department

THROUGH: Charles A. Padera, Director
Water Resources Department

For Edgar F. Lowe, Ph.D, Director
Environmental Sciences Division

Greeneville B. (Sonny) Hall, Ph.D, Technical Program Manager
Environmental Sciences Division

Clifford P. Neubauer, Ph.D, Supervising Environmental Specialist 5/23/97
Environmental Sciences Division

FROM: Ric Hupalo, Environmental Specialist IV
Environmental Sciences Division

RE: Minimum Surface Water Levels determined for Sylvan Lake, Seminole County (Project # 01-43-00-5161-10900)

The purpose of this memorandum is to forward recommended minimum lake levels and hydroperiod categories determined for Sylvan Lake to the Department of Resource Management (Table 1). Sylvan Lake was selected for investigation because it is one of the priority lakes identified in the Minimum Flows and Levels Project Plan. The lake also has a relatively long stage record and extensive wetlands.

Table 1. Recommended minimum surface water levels for Sylvan Lake. Terminology is defined in 40C-8.021, F.A.C.

MINIMUM LEVEL	ELEVATION (ft NGVD)	HYDROPERIOD CATEGORY
Minimum Frequent High Level	40.4	Seasonally Flooded
Minimum Average Level	38.9	Typically Saturated
Minimum Frequent Low Level	37.5	Semipermanently Flooded

Sylvan Lake is located 5.2 miles west of Sanford and 4.1 miles northwest of the City of Lake Mary in Seminole County (Figure 1). Sylvan Lake is within an area where one to two foot declines of the surficial aquifer are projected by the year 2010. Recharge to the Floridan aquifer around the lake is low (0-4 in/yr, Boniol et al. 1993). Nearby, recharge varies greatly, ranging from discharge areas at the Wekiva River to high recharge (>12 in/yr) around the City of Lake Mary (Boniol et al. 1993). Sylvan Lake is within the Casselberry-Oviedo-Chulota Hills Physiographic Division of the Central Lakes District. This region is a sand hill karst with solution

basins, the hills are less than 95 feet in elevation and have a parent material of Plio-Pleistocene sand and shell (Brooks 1982).

Hydrology and Lake Morphometry

Sylvan Lake has an area of 186 acres when the lake level is at approximately 40 ft NGVD. The lake basin has a complex morphology comprised of shallow solution basins and submerged ridges. Consequently, water depths vary greatly across the lake, ranging from 7 to 15.5 feet deep when the lake level is 39.53 ft NGVD. Ridges or plateaus between the solution basins were typically 7.5 ft deep whereas, basins were 10 to 15.5 ft deep. The Sanford SW USGS Topoquad Map delimits an intermittent flowage way from the lake that drains north to Yankee Lake and intermittently discharges to the lower Wekiva River (Figure 1). The stage record indicates that the lake outfall may be near 41 ft NGVD.

A stage record of monthly readings exists from January 1979 (data from Seminole County, Figure 2). The lake level has recovered from the severe drought of the early 1990's and recently has declined from a record high level. One monthly reading has been recorded for 83 percent of the months since January 1979. The only extensive period of missing data was from Aug-89 to Oct-92 and occurred during a severe drought. Table 2 lists the relative standing of the stage values by percentile rankings, sorted to reflect percent exceedance. The data were not plotted as a stage-duration curve of lake levels because the data are monthly values. The lake has fluctuated 5.59 ft during the period of record. The average and median water levels are 39.12 and 39.07 ft NGVD, respectively. On the date of our field survey (May 6, 1997), the lake level was 39.53 ft NGVD. Consumptive use allocations in the land sections (23, 24, 25, 26, 27, 34, 35, 36) adjacent to Sylvan Lake are listed in Table 3 (data supplied by Division of Permit Data Services). Currently, there are no permitted surface water withdrawals from the lake.

Table 2. Percentiles of the monthly stage data for Sylvan Lake; Jan-79 to Apr-97, values are sorted to express percent exceedance.

Percentile	Stage	Percentile	Stage
0	41.64	50	39.07
1	41.36	60	38.70
5	41.09	70	38.40
10	40.90	80	38.00
20	40.44	90	37.25
30	39.86	95	37.04
40	39.48	100	36.05

Table 3. Water use (Floridan aquifer) in the land sections surrounding Sylvan Lake.

CUP Permit No.	Allocation (MGY)	Frost & Freeze (MGY)	Use Description	Project Acreage	Land Section
2-117-0240AUGV	157.0	0	Recreation Area	120.0	26
2-069-0166AN	44.1	14.3	Citrus	100.0	24
2-117-0062AUFM	43.4	2.4	Nursery	20.0	35
2-117-0175ANF	36.7	0	Turf - recreation area	36.0	35
2-117-0122ANF	22.5	0.3	Nursery Plants	12.0	36
2-117-0185AUSFM	15.2	0.4	Containerized Nursery	7.0	36
2-117-0050AUF	14.9	0	Ferns	7.0	36
2-117-0213ANRM	12.4	0	Indoor Foliage	6.5	26
2-117-0213ANRM	9.1	0	Heating/Cooling	11.5	26
2-117-0213ANRM	4.9	0	Landscape	5.0	26
Totals	360.2	17.4		325.0	

Hydric Soils

Approximately 170 acres adjacent to Sylvan Lake were mapped by SCS (1990) as hydric soils on 1981 base photography (Figure 3). These soils are identified by Mapping Units (MUID) 10 and 17 in Figure 3. Basinger, Samsula, and Hontoon soils, depressional (MUID 10) generally consist of 58 percent Basinger-type soils, 15 percent Samsula-type soils and 12 percent Hontoon-type soils. Basinger soil is a mucky fine sand and Samsula and Hontoon are muck soils. MUID 17 consists of Brighton, Samsula, and Sanibel mucks. In most years the soils in map units 10 and 17 are ponded for 6 to 9 months or more except for during extended dry periods. Following drainage, the muck components of MUID 10 and MUID 17 are very susceptible to rapid shrinkage and gradual subsidence due to oxidation and compaction. Natural vegetation in these areas includes swamp hardwood tree species as well as marsh vegetation such as maidencane and sawgrass (SCS 1990).

Soil pits and muck probing along an elevation gradient on the southwest shoreline at Transect 1 (Figure 1) indicated shallow muck or mucky sand from 42 to 40.6 ft NGVD. At 40.6 ft NGVD 0.8 ft of muck was measured. The muck rapidly increased to greater than 2.8 ft deep and continued to an elevation of approximately 38 ft NGVD. The average elevation of the muck surface at Transect 1 was 39.17 ft NGVD.

Wetlands and Littoral Zone Vegetation

Wetlands were classified by the USBS Wetland Inventory in 1987 using 1983 CIR aerial photography (Figure 4). Similar polygons, using a different vegetation classification, were delimited by the District's Wetland Mapping Program (Table 4). The following six wetland habitats were delimited for Sylvan Lake by the USBS Wetland Inventory:

1. Palustrine Emergent Persistent Semipermanently Flooded (PEM1F);
2. Palustrine Scrub-Shrub Broad-leaved Deciduous / Broad-leaved Evergreeen Semipermanently Flooded (PSS1/3F);

3. Palustrine Scrub-Shrub Broad-leaved Evergreeen Seasonally Flooded (PSS3C);
4. Palustrine Forested Broad-leaved Deciduous / Evergreen Seasonally Flooded (PF01/03);
5. Palustrine Forested Broad-leaved Deciduous Seasonally Flooded (PF01C) and;
6. Palustrine Forested Evergreen, Seasonally Flooded (PF07C).

Table 4. Wetlands surrounding at Sylvan Lake.

USBS Wetland Types	SJRWMD Wetland Types	Approx. Acreage
PF07C, PF01/3C	Bayhead	49
PF01C	Hardwood Swamp	12
PSS3C, PSS1/3F	Shrub Bog	19
PEM1F	Wet Prairie	11
PEM1F	Shallow Marsh	84
	Total Wetland Acreage:	171

One transect was located within Sylvan Lake County Park to collect elevation, soil, and vegetation information (XS1, Figure 1). Transect 1 extended from a low slash pine flatwood across shoreline, emergent marsh, and aquatic bed communities (Figure 5). The pine flatwood was characterized by slash pine and gallberry. Shoreline vegetation was comprised of an open stand of slash pine, dahoon holly, wax myrtle, and Virginia chain fern and a wet prairie of bloodroot. Scattered throughout the wet prairie zone were dead slash pine trees. The herbaceous wetlands were characterized by either maidencane or a mixture of sawgrass, buttonbush, pickerelweed, and arrowhead. At lower elevations shallowly flooded aquatic beds of purple bladderwort or deeply flooded aquatic beds of water-lily were present. Additional information was collected in the lake littoral zone and in the center of the lake. Elevation data from plant communities, common plant species, and other significant features are summarized in Figure 5 and Table 5. Scientific names for plant species are provided in Table 6. Data were collected by ES and Surveying staff using the lake water level on May 6, 1997 (determined from Seminole Co. BM 2923101) as the elevation datum.

A surface water hydrologic model is not available for Sylvan Lake. The recommended minimum levels are based upon consideration of biological features associated with long-term typical water levels. Three levels with corresponding hydroperiod categories (adapted from Cowardin et al. 1979) are recommended below. A short description of the functions of each minimum level and some of the related data used in the determination follows.

Table 5. Elevation Summary from survey of Lake Sylvan. Unit is ft NGVD.

Feature	Min	Mean	Median	Max	N
Dock decks	39.5	41.9	42.3	42.9	6
Low slash pine flatwoods	41.1	41.6	41.7	42.0	8
Wet prairie	40.2	40.4	40.5	40.6	3
Emergent marsh - maidencane	39.4	39.8	39.8	40.1	6
Emergent marsh - mixed emergents	38.8	39.4	39.5	39.9	9
All muck soil	38.5	39.2	39.0	40.6	50
All wetland vegetation	37.1	39.1	39.0	40.6	51
Shallow aquatic bed - bladderwort	38.5	38.9	38.9	39.2	29
Littoral aquatic bed - mixed emergents	37.1	37.7	37.6	38.6	4
Waterward sawgrass (littoral)	36.1	36.6	36.6	37.1	5
Littoral aquatic bed - water-lily	31.0	33.8	33.8	36.8	20
Waterward water-lily aquatic bed	32.1	33.0	33.0	33.7	6
Open water near lake center	24.0	29.0	29.1	32.5	11

MINIMUM FREQUENT HIGH LEVEL

The recommended Minimum Frequent High Level is 40.4 ft NGVD. The minimum level recommended was based on maintaining annual anaerobiosis of the wet prairie, the transition zone between uplands and wetlands that surround the lake. The recommended Minimum Level corresponds to the average elevation of the wet prairie (Table 5). Approximately 0.7 ft of muck occurred at Transect 1 at 40.4 ft NGVD. The minimum Frequent High Level (40.4 ft NGVD), with the assigned hydroperiod category of Seasonally Flooded, conserves the character and functions of the marsh and wet prairie communities of the lake. Frequent, prolonged flooding to this level provides water levels on the marsh which enable fish and other aquatic organisms to feed or spawn, and maintains the present plant species and soil ecotone between wetland and upland communities.

Emergent marshes and aquatic beds of the floodplain (sawgrass, bladderwort), mixed emergent littoral aquatic beds (sawgrass, pickerelweed, arrowhead), and floating-leaved littoral aquatic beds (water-lily) will have average water depths of 1.2 ft, 2.7 ft, and 6.6 ft, respectively. Dock deck elevations averaged 1.5 ft above this recommended minimum level (Table 5). The water level 40.4 ft NGVD ranked at the 20th percentile in the record of monthly stage values.

MINIMUM AVERAGE LEVEL

The recommended Minimum Average Level is 38.9 ft NGVD with an associated hydroperiod category of Typically Saturated. The Minimum Average level and the hydroperiod category Typically Saturated approximates a "typical" lake level that is less than the long-term median and average water levels while still protecting the wetland resource. The Minimum Average level was calculated by subtracting 0.25 feet from the mean elevation (39.17 ft NGVD) of the muck soil at Transect 1. The 0.25 ft relationship was formulated to protect peat soils of the herbaceous wetlands of the Upper St. Johns River basin (Hall 1987). Stephens (1974) demonstrated that subsidence and oxidation of peat soils occurs when the mean elevation of the water table was more than 0.25 below the soil surface for extended periods. The water level 38.9 ft NGVD

ranked at the 54th percentile in the record of monthly stage values, the median and average lake levels were 39.07 and 39.12 ft NGVD, respectively.

The emergent marshes and shallow aquatic beds at Transect 1 become exposed at this recommended minimum level. Declining water levels in the seasonally flooded and semipermanently flooded emergent marshes provide foraging habitat for wading birds. Great Egrets need water depths less than 0.8 ft and the small herons need depths less than 0.5 ft to forage efficiently when water levels are receding (Bancroft et al. 1990). Littoral aquatic beds of mixed emergent plant species remain shallowly flooded (average depth 1.2 ft) and permanently flooded aquatic beds of water-lily average 5.1 feet deep. This maintains structural cover and foraging habitat for aquatic organisms.

MINIMUM FREQUENT LOW LEVEL

This level (37.5 ft NGVD), with the assigned hydroperiod category of Semipermanently Flooded, recognizes the benefit of low-water conditions during periods of low rainfall. The recommended minimum level was based on the average elevation of the mixed emergent littoral aquatic bed at Transect 1 (37.74 ft NGVD). A drawdown (-0.25 ft) will stimulate the production of the emergent wetland vegetation, such as sawgrass, and protect the substrate from oxidation and subsidence. This vegetation will serve as cover for fish and as a substrate for aquatic invertebrates when the area refloods. Occasional drawdown conditions are necessary since moist, aerobic soil conditions stimulate decomposition and promote seed germination in many wetland plants. However, excessive drawdown over prolonged periods results in oxidation or subsidence of organic soils.

The emergent marshes and shallow aquatic beds of the floodplain will be temporarily dewatered. A water level of 37.5 is 1.7 ft below the average elevation of the muck soil at Transect 1 (Table 5). SCS soil surveys describe the typical dry season low water table of many muck and peat soils as less than ten to twelve inches below the soil surface. A moderate drought is expected to lower the water table of marshes more than one foot, to approximately 1.7 ft below the soil surface.

The water depth in the mixed emergent aquatic bed of the littoral zone averages zero, but ranges to 0.4 ft. The littoral aquatic bed of water-lily will have an average water depth of 3.7 ft. Water depths in the open water of the lake will range from 5 ft to 13 ft. The water level 37.5 ft NGVD ranked at the 83th percentile in the record of monthly stage values.

Table 6. Plant species observed at Sylvan Lake.

SPECIES	COMMON NAME	DEP	USACOE
Cephalanthus occidentalis	buttonbush	OBL	OBL
Cladium jamaicense	sawgrass	OBL	OBL
Eliocharis sp.	spikerush	OBL	OBL
Hypericum fasciculatum	marsh St. Johnswort	OBL	FACW+
Ilex cassine	dahoon holly	OBL	FACW
Ilex glabra	inkberry	UPL	FACW
Lachnanthes caroliniana	bloodroot	FAC	OBL
Ludwigia peruviana	primrose willow	OBL	OBL
Myrica cerifera	wax myrtle	FAC	FAC+
Nymphaea odorata	water-lily	OBL	OBL
Osmunda regalis	royal fern	OBL	OBL
Panicum hemitomon	maidencane	OBL	OBL
Pinus elliottii	slash pine	UPL	FACW
Pontederia cordata	pickerelweed	OBL	OBL
Rubus betulifolius	blackberry	FAC	FAC
Sagittaria lancifolia	arrowhead	OBL	OBL
Serenoa repens	saw palmetto	UPL	UPL
Taxodium disticum	bald cypress	OBL	OBL
Utricularia spp	bladderwort	OBL	FACW-OBL
Woodwardia virginica	virginia chain fern	FACW	OBL

Literature Cited

Bancroft, G.T., S.D. Jewell, and A.M. Strong. 1990. Foraging and nesting ecology of herons in the Lower Everglades relative to water conditions: Final Report to the South Florida Water Management District. National Audubon Society Ornithological Research Unit p. 139.

Brooks, H.K. 1982. Guide to the Physiographic Divisions of Florida; compendium to the map Physiographic Disvisions of Florida, 8-5M-82. Cooperative Extension Service, University of Florida, Institute of Food and Agricultural Services, Gainesville, FL.

Cowardin, L.M., V. Carter, F.C. Golet and E.T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. FWS/OBS-79/31. U.S. Fish and Wildlife Service, Washington, D.C. p. 24.

Hall, G.B. 1987. Establishment of minimum surface water requirements for the greater Lake Washington basin. Technical Publication SJ87-3. Palatka, FL: St. Johns River Water Management District.

Soil Conservation Service, 1990. Soil Survey of Seminole County Area, Florida. United States Department of Agriculture 164 pp.

Stephens, J.C. 1974. Subsidence of organic soils in the Florida Everglades - a review and update. *In*: Gleason, P.J. (ed), Environments of South Florida, Memoir 2, Miami Geological Society, Miami, FL pp 352-361.

Please call me (ext. 4338), Cliff Neubauer (4343), or Jane Mace (4389) if you wish to discuss these minimum levels or hydroperiod definitions.

RH:bs

attachments

c: Hal Wilkening
Jane Mace
David Clapp
Larry Battoe
Eric Olsen
Bob Freeman
Tommy Walters
Sandy McGee
MFL-REG
Larry Fayard
Price Robison

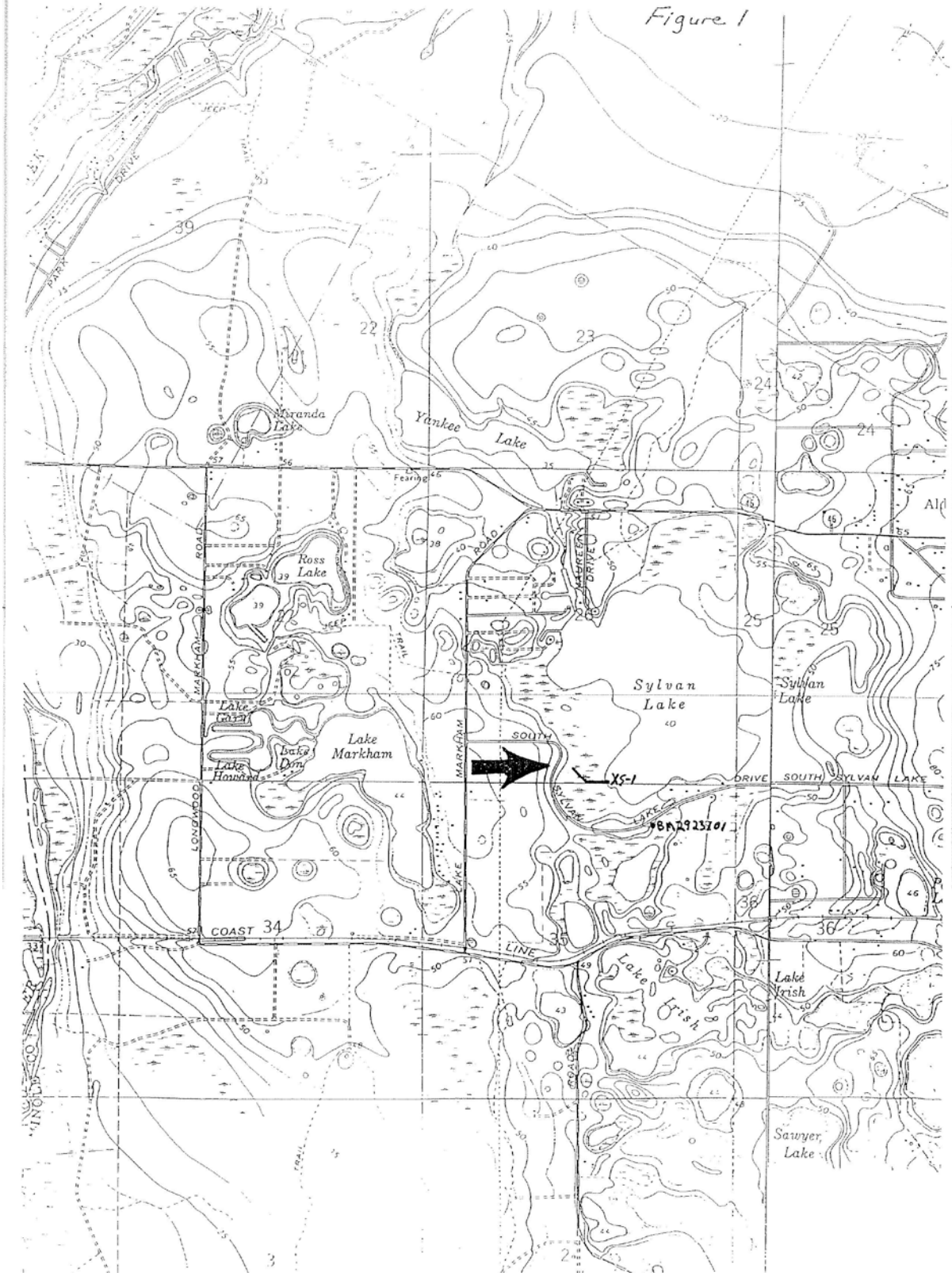
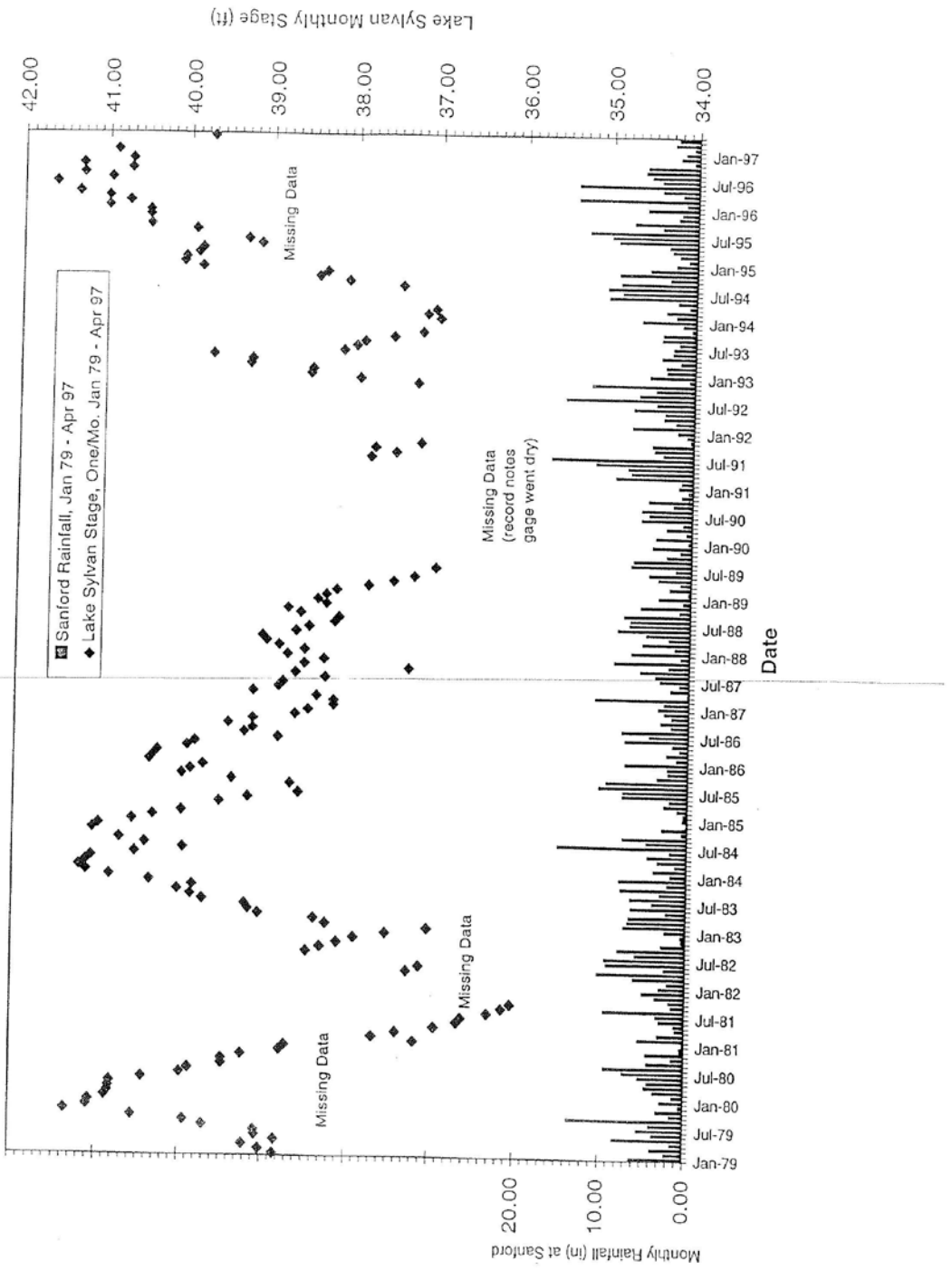
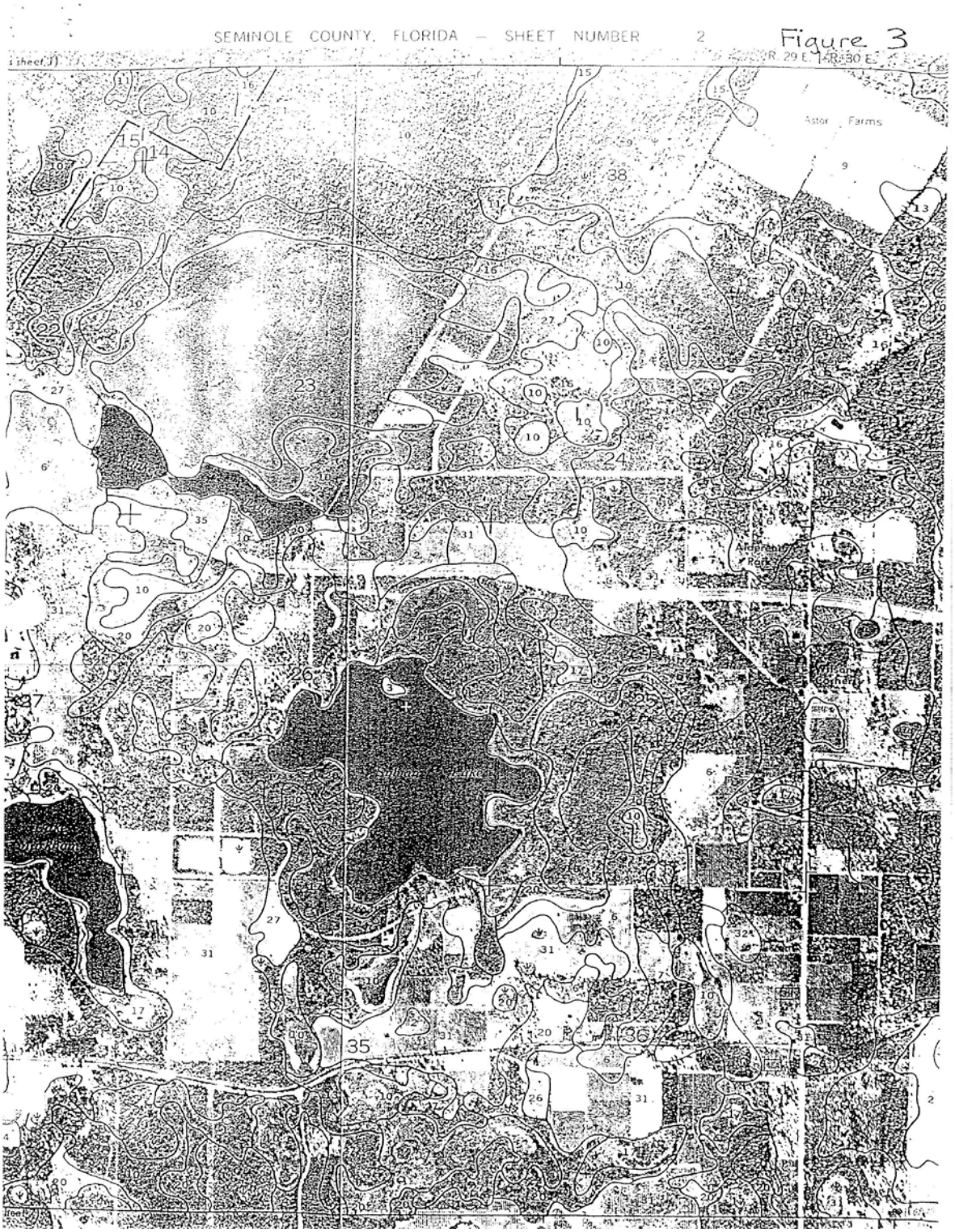


Figure 1
Miranda Lake
Yankee Lake
Ross Lake
Lake Markham
Lake Howard
Lake Dorn
Sylvan Lake
Sylvan Lake
Lake Irish
Lake Irish
Sawyer Lake
XS-1
SOUTH SYLVAN LAKE DRIVE
COAST LINE
MARKHAM ROAD
LONGWOOD
MAUREEN DRIVE
Fearing
PBA2923701

Figure 2


Lake Sylvan Monthly Stage (ft)
42.00
41.00
40.00
39.00
38.00
37.00
36.00
35.00
34.00
Sanford Rainfall, Jan 79 - Apr 97
Lake Sylvan Stage, One/Mo. Jan 79 - Apr 97
Missing Data
Missing Data
(record notes
gage went dry)
Missing Data
Missing Data
Monthly Rainfall (in) at Sanford
20.00
10.00
0.00
Jan-97
Jul-96
Jan-96
Jul-95
Jan-95
Jul-94
Jan-94
Jul-93
Jan-93
Jul-92
Jan-92
Jul-91
Jan-91
Jul-90
Jan-90
Jul-89
Jan-89
Jul-88
Jan-88
Jul-87
Jan-87
Jul-86
Jan-86
Jul-85
Jan-85
Jul-84
Jan-84
Jul-83
Jan-83
Jul-82
Jan-82
Jul-81
Jan-81
Jul-80
Jan-80
Jul-79
Jan-79
Date


SEMINOLE COUNTY, FLORIDA — SHEET NUMBER 2
Figure 3
Astor Farms

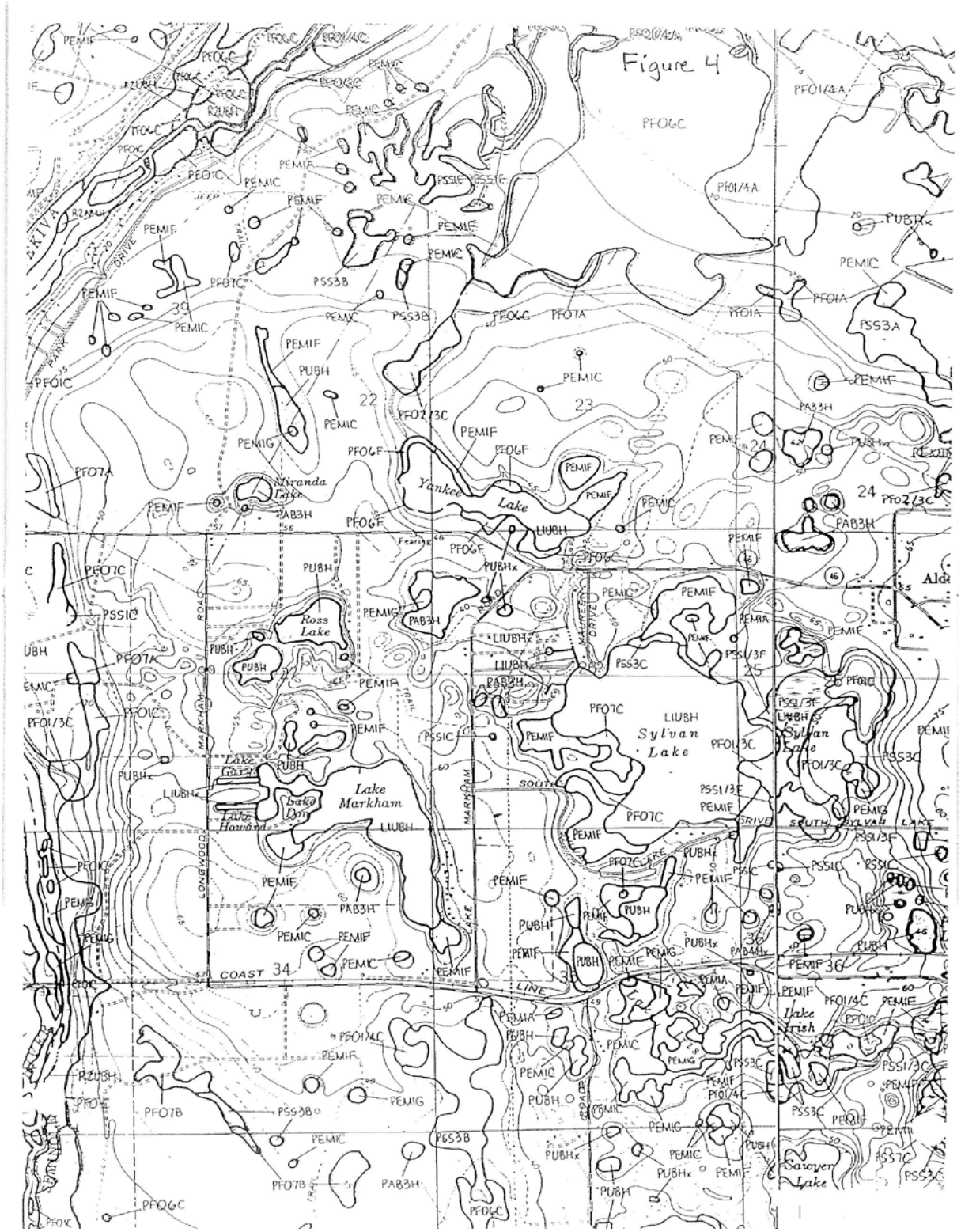


Figure 4
Yankee Lake
Miranda Lake
Ross Lake
Lake Markham
Lake Hayward
Lake Tansy
Baker Dam
Sylvan Lake
Lake Trish
Sawyer Lake
COAST
LINE
SOUTH
MARKHAM
LONGWOOD
PEMIF
PEMIC
PEMIG
PUBH
PUBHx
LIUBH
LIUBHx
PAB3H
PSS3C
PSS3B
PSS1C
PSS1/3F
PFO7C
PFO7A
PFO7B
PFO6C
PFO6F
PFO1/4A
PFO1/4C
PFO1/3C
PFO2/3C
PFO1A
PSS3A
22
23
24
25
34
36
39

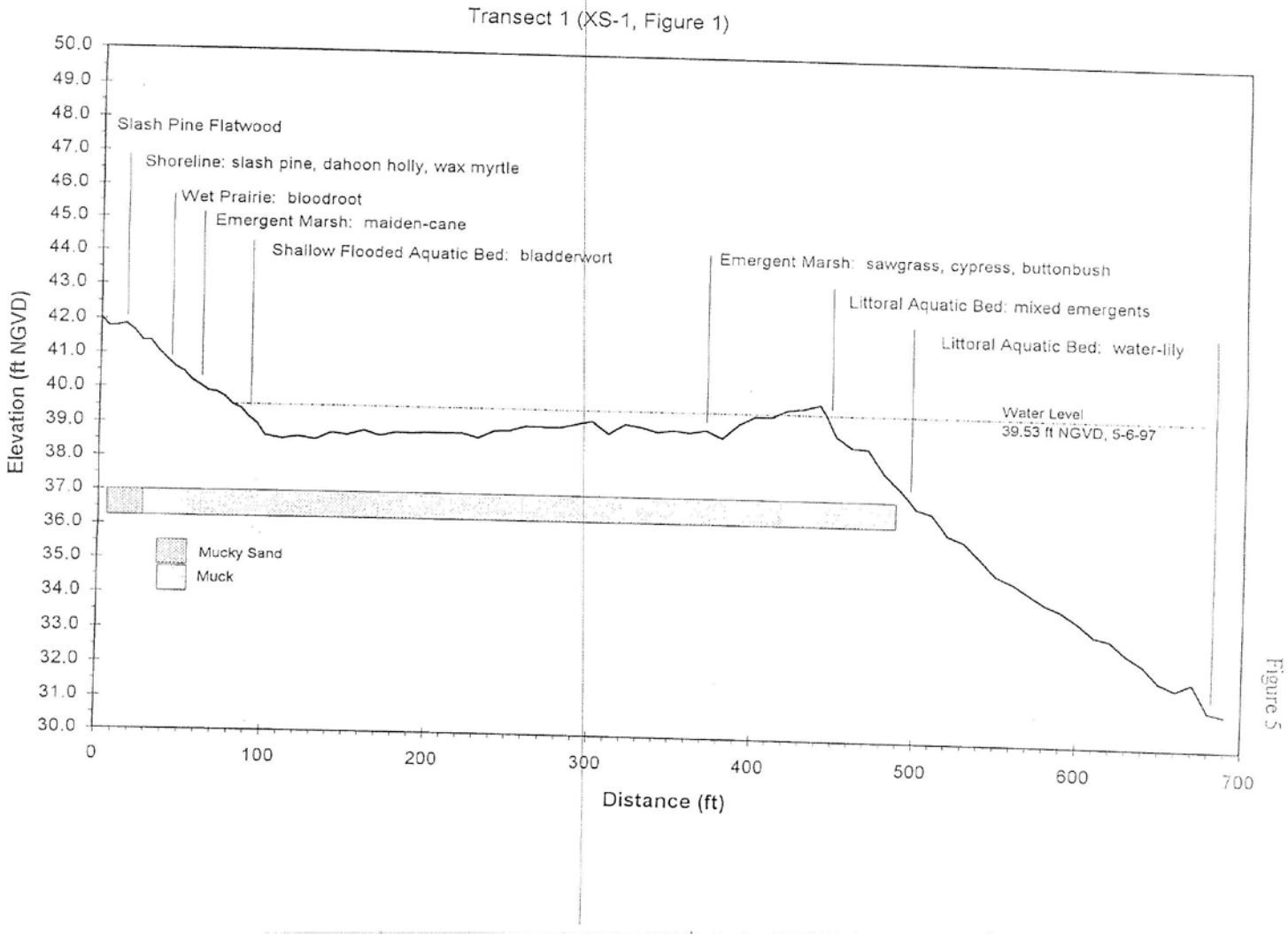

Transect 1 (XS-1, Figure 1)
Elevation (ft NGVD)
50.0
49.0
48.0
47.0
46.0
45.0
44.0
43.0
42.0
41.0
40.0
39.0
38.0
37.0
36.0
35.0
34.0
33.0
32.0
31.0
30.0
Slash Pine Flatwood
Shoreline: slash pine, dahoon holly, wax myrtle
Wet Prairie: bloodroot
Emergent Marsh: maiden-cane
Shallow Flooded Aquatic Bed: bladderwort
Emergent Marsh: sawgrass, cypress, buttonbush
Littoral Aquatic Bed: mixed emergents
Littoral Aquatic Bed: water-lily
Water Level
39.53 ft NGVD, 5-6-97
Mucky Sand
Muck
0
100
200
300
400
500
600
700
Distance (ft)

Figure 5