Category 3 Lake Minimum Levels in the Northern Tampa Bay Area: Update and Discussion

Northern Tampa Bay Phase 2 Local Technical Peer Review Group

Southwest Florida Water Management District Tampa Service Office January 11, 2002

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Review of Rule, Model or Methodology

A written report outlining Staff's proposed methods for development of minimum levels for Category 3 Lakes has been widely distributed for review.

Discussion of the proposed methodology by the SWFWMD Governing Board, Staff and other interested parties is ongoing.

Peer Review of Proposed Minimum Level Methods

Voluntary scientific peer review has been completed for the proposed methods for developing Category 3 Lake minimum levels in accordance with Florida Statutes.

Reference Materials Provided to the Peer Review Panel

Staff supplied numerous documents to the peer review panelists during the review process (see the Category 3 Lakes Methodology Peer Review Exchange Board on the Minimum Flows and Levels 2001 Discussion Board on the District Web Site).

Interested parties provided several documents (including Hydrologic Conditions in the Northwest Hillsborough and South Pasco Counties Area, and Changes in Land Use/Drainage in the Vicinity of the Cosme-Odessa and Section 21 Wellfields) to the peer review panelists, and were afforded the opportunity to interact with the panelists.

Use of Best Available Information

Staff believe that the best <u>available</u> information has been utilized for development of the proposed methods for establishing minimum levels for Category 3 Lakes.

Minimum Lake Levels for Protection of Water Resources of the Area

Staff consider the water resources of the area to include ecology.

Harm vs. Significant Harm

Determination of significant harm is a scientifically based policy decision. Consistent with past implementation, the policy determination of significant harm is not subject to the "independent scientific peer review" provided by law.

Peer Review of Rule Language and Implementation

Florida law provides that it is scientific or technical data, methodologies, and models, including all scientific and technical assumptions employed in each model used to establish a minimum flow or level that shall be subject to independent scientific peer review.

Establishing Minimum Lake Level at the Historic P50

Staff believe (based on interpretation of State law) that the Minimum Lake Level is not intended to be the Historic P50. The Minimum Lake Level is supposed to be the elevation at which further water withdrawals would result in significant harm.

Methods – Lake Morphometry



Bathymetric maps permit evaluation of potential changes in lake area, volume, depth, slope, etc.

High Guidance Level



Established at the Historic P10, Current P10, Normal Pool or Control Point elevation.

Hydrologic Indicators - Research

Isolated Cypress Domes





Use of Category 1 & 2 Lake Minimum Level Methodology for Category 3 Lakes with Remnant Cypress Trees



Staff believe implementation of minimum level methods based on preserving cypress wetland integrity is not supportable if the wetlands no longer exist.

Species Richness Standard



Staff and the peer-review panel recommend use of the relationship between bird species richness and lake area for minimum levels development

Development and Use of Reference Lake Water Regime Statistics

Staff believe that in the absence of adequate hydrologic data, reference lake water regime (RLWR) statistics represent the best available information for describing lake hydrologic regimes in support of minimum level development.

Development of RLWR statistics for the northern Tampa Bay area is described in *Establishment of Minimum Levels for Category 1 and 2 Lakes, Northern Tampa Bay Minimum Flows & Levels White Papers* (SWFWMD 1999).

"Historic" vs. "Current" Rainfall Patterns in the Northern Tampa Bay Area

Most data used for development of northern Tampa Bay area reference lake water regime (RLWR) statistics was from recent (post-1965) times.

Calculated RLWR statistics following elimination of 6 lakes with period of record stage data pre-dating 1965.

Results (median values) :	RLWR50	1.1 ft
	RLWR90	2.2 ft

In addition, a District-sponsored study by the USGS may help address this issue.

Central Pasco County Area RLWR



Central Pasco County Area RLWR

Good correspondence between stage data for Crews Lake and Big Fish Lake.

Inclusion of Lake Hancock data not recommended for RLWR statistics, based on differences in geologic setting. However, lakes do exhibit similar fluctuation pattern:

	<u>POR</u>	Difference P10-P50	Difference P10-P90
Crews	Mar64-Feb80	2.6 ft	4.3 ft
Hancock	May78-Mar01	2.5 ft	4.8 ft

Crews Lake "historic" period of record pre-dates onset of pumpage at Cross Bar Ranch well field in 1980.

Alternative Use of RLWR Statistics

Proposed

Develop RLWR statistics by averaging the RLWR statistics calculated according to current District rules with the difference between current percentile statistics (*i.e.*, Current P10, P50 and P90).

Response

RLWR statistics are intended to reflect water level fluctuations in the absence of water withdrawals, while "current" percentile statistics are used to describe hydrologic regimes for periods when withdrawal impacts have occurred or are occurring.

Category 3 Lakes Minimum Level Standards



Species Richness



Connectivity



Recreation/Skiing



Aesthetics

R. Gan **Dock-Use**



Mixing

Category 3 Lakes Other Considerations



Submersed Plants



Outlet Modifications



Herbaceous Wetlands



Roads, Buildings, etc.

Category 3 Lakes – New Method for Other Considerations

Establishment of minimum levels <u>at least 1 ft below</u> Low Floor Slab, Low Road or some other "critical flooding elevation" may be warranted.

Possible Approach:

If the proposed High Minimum Lake Level exceeds, or is less than 1 ft below a "critical flooding elevation", the High Minimum Lake Level could be established at the elevation 1 ft below the "critical flooding elevation". The Minimum Lake Level would then be established using the difference between the Historic P10 and the Historic P50, if historic data are available, or alternatively, the RLWR50 statistic.

Category 3 Lake Normal Pool and Critical High Spot Elevations

Staff attempt to obtain 10 or more hydrologic indicator measurements for each lake system, and develop the Category 3 Normal Pool using a measure of central tendency.

The Critical High Spot Elevation (used for developing the Basin Connectivity Standard) is based on empirical data, and is typically identified as the lowest spot in areas of connectivity among lake sub-basins.

Big Fish Lake – Category 3 Lake Normal Pool



Elevation at the base of Serenoa repens N=57 Mean 76.44 ft SD 0.38 Med 76.43 Min 75.43 77.40 Max

Big Fish Lake – Herbaceous Wetland and Submersed Aquatic Vegetation



Review of potential changes in herbaceous wetland and submersed aquatic vegetation coverage associated with water level fluctuation did not suggest that these factors should be considered for development of minimum lake levels for Big Fish Lake.

Lakes Helen, Ellen and Barbara – Critical High Spot & Basin Connectivity Standard



Critical High Spot (49.13 ft, rounded down to 49 ft) Basin Connectivity Std = 49 + 2 (clearance) + 1.1 (RLWR5090) = 52.1 ft

Cypress Lake - Critical High Spot



Critical High Spot Elevation or Basin Connectivity Standard were not developed for Cypress Lake.

Lake Crenshaw – Dock Use Standard





+ RLWR5090 + 2 feet Dock-End Sediment Elevation

Lake Crenshaw - Inlets



Lake Crenshaw receives some inflow from areas north of Van Dyke Road.

Round Lake - Dredge Holes



Dredging will be mentioned in future reports on minimum levels for Round Lake.

Control Point Establishment

Staff support development of control point elevations in accordance with current District rules.

Chapter 40-D8, Florida Administrative Code

The Control point elevation "means the elevation of the highest stable point along the outlet profile of a surface water conveyance system that principally controls lake water level fluctuations".

Lakes Church & Echo - Control Point



Review of survey notes indicate measurements on culverts were taken following removal of sediments.

Lakes Church & Echo - Control Point



Control Point changed to 34.92 ft at site in a maintained ditch. High Guidance Level established at Current P10 (35.64 ft), so change in control point will not affect proposed minimum levels.

Saddleback Lake - Control Point

Control Point (53.65 ft) established at stable point in channel north of structure near Berger Road.

Staff does not recommend changing the control point elevation.

High Guidance Level established using the Current P10 (54.59 ft), so control point does not affect proposed Minimum Levels.

Lake Hobbs - Control Point



Control Point changed to ~65.6 ft at point in a stable ditch east of Calvin Lane; site is currently being re-surveyed.

High Guidance Level established at the Current P10 (65.61 ft), so the new control point will not affect proposed minimum levels.

Fairy Lake - Control Point



Control Point at pipe invert east of Lake Maurine Drive = 32.18 ft; no change is recommended. High Guidance Level established at Current P10 (33.42 ft), so control point does not affect proposed minimum levels.

Starvation Lake - Development



Starvation Lake - Proposed Levels

Ten Year Flood Guidance Level

High Guidance Level

High Minimum Lake Level

Minimum Lake Level

Low Guidance Level

52.72 ft 51.65 ft

50.65 ft

50.62 ft

Starvation Lake – Existing Levels10 Yr Flood Guidance Level55.00 ftHigh Level53.00 ftLow Level50.00 ftExtreme Low Level48.00 ft

Starvation Lake



Starvation Lake – Supporting Data

Normal Pool	53.33 ft
Control Point	52.72 ft
Historic P50	51.72 ft
Aesthetics Standard	50.62 ft
Species Richness Standard	50.65 ft
Basin Connectivity Standard	49.6 ft
Recreation/Ski Standard	NA (change)
Current P10	51.97 ft
Current P50	48.88 ft
Current P90	45.66 ft

Starvation Lake - Control Point



Starvation Lake - Contour Map



Starvation Lake - Boat Ramp



Bottom of Ramp = Top of Ramp = 46.64 ft 52.50 ft

Starvation Lake - Boat Ramp Area



Drive 53.0-53.3 ft Drive 53.6-54.1 ft Drive 54.6-55.6 ft
 Small Pines
 53.2-54.0 ft

 Large Pine
 54.6-55.2 ft

 Utility Pole
 55.9-56.0 ft

Lake Rogers - Proposed Levels

Ten Year Flood Guidance Level

High Guidance Level

High Minimum Lake Level

Minimum Lake Level

Low Guidance Level



44.92 ft 43.82 ft

42.82 ft

42.82 ft

Lake Rogers – Alternative Minimum Levels

High Minimum Lake Level42.2 ft(Critical Flood Elevation 43.2 ft – 1 ft)

Minimum Lake Level (HMLL – RLWR50) 41.2 ft

Lake Rogers – Supporting Data Normal Pool 44.92 ft Historic P50 43.92 ft **Aesthetics Standard** 42.82 ft **Species Richness Standard** 40.00 ft 36.60 ft (change) **Basin Connectivity Standard Recreation/Ski Standard** NA (change) Current P10 37.86 ft Current P50 35.68 ft Current P90 29.96 ft

Lake Rogers



SWFWMD (1977) – Lake Levels Study Notes

Saw palmetto fringe–north shore 41.85 ft Saw palmetto fringe–south shore <u>42.35 ft</u> mean 42.1 ft

SWFWMD (1989) – Aerial Photographs Elevation of road between Lakes 42 - 43 ft Raleigh and Rogers

Water & Air Research, Inc. (1994) - Report Recommend "biological minimum level" 35.0 ft based on basin connectivity at 35 ft Note: A recently determined critical high spot value of 34.5 ft was used to establish the Basin Connectivity Standard at 36.6 ft.

SWFWMD (1997) - Survey Notes		
Palmetto line		48.84 ft
Palmetto line		48.51 ft
Palmetto line		48.18 ft
Lakeward long leaf pine		<u>49.19 ft</u>
	mean	48.68 ft

SWFWMD (1997?) – Draft Transect DataPinus elliotti30.36 ftTaxodium ascendens36.36 ft

Lin (2000) – Field Trip Summary Historical normal pool based on soils 46.01 ft

Czerwinski (2000) – Field Memorandum Ground at live oak near gauges 43.14 ft

Scarp with a vegetation transition from herbs to shrub & woody to mature woody plants Top 40.82 ft Base 40.03 ft

Normal pool (1 cypress); similar to SWFWMD normal pool for Raleigh (44.92 ft, n=6 cypress) 44.91 ft

Lake Rogers - Existing Information Czerwinski (2000) – Field Memorandum (cont.) Soil Normal Pool (Dr. Lin) 46.06 ft (46.01?) Scarp (base) at soils site 40.72 ft 44.48 ft Vegetation transition between ferns and woody assemblage at scarp site Vegetation transition from 37.67 ft Smartweed to dog fennel **Target Elevation** ~40 ft

Shea (2000) – Memorandum

Lake stage data "break' around 1964. Could be related to gauge relocation and datum error, but some data corroborate a stage decline around that time (e.g., stage data for Raleigh, Church).

1948 aerials show cypress fringe that may have been inundated.

Waste water discharged to basin - 1970s and 80s.

Target Elevation~ 40 ft

SWFWMD (2001) – Survey Notes Low spot on road between Lakes Raleigh and Rogers

43.2 ft

Small *Pinus sp.*(~0.6 ft dbh, n =10) along north shore

38 ft (mean & median)

Wylupek (2001) – Report

Raleigh pumped to max desirable (40.0 ft). Rogers reached max of 39.48 by end of emergency pumping (Mar1998).

Lake Raleigh - Proposed Levels

Ten Year Flood Guidance Level

High Guidance Level

High Minimum Lake Level

Minimum Lake Level

Low Guidance Level

45.80 ft

44.92 ft

43.82 ft 42.82 ft

42.82 ft

Lake Raleigh – Alternative Minimum Levels

High Minimum Lake Level42.2 ft(Critical Flood Elevation 43.2 ft – 1 ft)

Minimum Lake Level (HMLL – RLWR50) 41.2 ft

Lake Raleigh – Supporting Data Normal Pool 44.92 ft Historic P50 43.92 ft **Aesthetics Standard** 42.82 ft **Species Richness Standard** 42.00 ft 36.60 ft (change) **Basin Connectivity Standard Recreation/Ski Standard** NA (change) Current P10 40.37 ft Current P50 37.40 ft Current P90 30.65 ft

Lake Raleigh



Lake Raleigh - Existing Information

SWFWMD (1977) – Lake Levels Study Notes "2/3 up cypress buttresses" N=3 43.15 ft

SWFWMD (1989) – Aerial Photographs Elevation of road between Lakes 42 - 43 ft Raleigh and Rogers

Lake Raleigh - Existing Information

Water & Air Research, Inc. (1994) - Report Recommend "biological minimum level" 35.0 ft based on basin connectivity at 35 ft Note: A recently determined critical high spot value of 34.5 ft was used to establish the Basin Connectivity Standard at 36.6 ft.

Recommend "cultural minimum level" 37.0 ft based on raising water level to docks

SWFWMD (1997?) – Draft Transect DataQuercus virginiana39.4 – 43.5 ftSerenoa repens43.9 – 44.7 ft

Lake Raleigh - Existing Information *Upcavage (1998) – Field notes* Estimated normal pool based on 46.2 – 46.4 ft cypress buttress

SWFWMD (1998) – Field notes Normal pool based on cypress Buttresses

44.86 ft 45.00 ft 44.90 ft 44.77 ft 45.14 ft <u>44.84 ft</u> mean 44.92 ft

Lake Raleigh - Existing Information

Wylupek (2001) – Report

Raleigh pumped to max desirable (40.0 ft). Rogers reached max of 39.48 by end of emergency pumping (Mar 1998).