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Eustis Fisheries Lab  
P. O. Box 1903  
Eustis, Florida 32726

July 7, 1981

Mr. Dennis Holcomb  
Game and Fresh Water Fish Commission  
620 S. Meridian Street  
Tallahassee, Florida 32304

Dear Smokie:

The following is a summary of investigations of the fish kill on Lake Apopka which occurred on or about June 19, 1981. The fish kill was first reported June 20, 1981. Harold Moody observed the kill that afternoon and reported it to be massive.

Samples were first taken at dawn June 21, 1981 (sample sites are shown on the attached map). The maximum oxygen concentration encountered was 3.0 ppm. Chlorophyll a samples ranged from 193 to 225 mg/m<sup>3</sup> (other pertinent water quality parameters are shown in attached data). Phytoplankton analysis showed the bloom to be primarily Anacystis and Spirulina with total counts ranging from  $10.4 \times 10^7$  to  $11.1 \times 10^7$  individuals/l (a summary to phytoplankton data is attached)

The area covered by dead fish on the morning of June 21, 1981 is shown on the attached map. The number of dead fish was determined by running transects through this area and stopping at timed intervals to count the fish in an estimated 20 X 20 ft. area along side the boat. The average of these samples was 10.8 dead fish/400 ft<sup>2</sup>. Conservatively expanded to 50 percent of Lake Apopka (30,630 acres) equals 18 million dead fish. In addition approximately 0.5 million dead fish were washed up along four miles of shore around Montverde.

Species composition of the kill was about 80% gizzard and threadfin shad, 10% black crappie, and 10% catfish (primarily brown bullheads). No largemouth bass were seen (there are not many in the lake). A few juvenile bluegills, one tilapia, and 15-20 sunshine bass were observed. Electrofishing and gill net samples taken July 1 and 2, 1981, showed that young-of-the-year and age I sunshine bass were still common.

The fish kill was investigated a second time at dawn June 23, 1981. Selected water chemistry parameters showed little change from June 21, 1981. Oxygen concentrations ranged from 4-7 ppm with the exception of the water around the Montverde area which ranged from 1.3 - 2.7 ppm. There was also little change in the phytoplankton population (see attached data). Most of the fish had decayed sufficiently to sink by this date although many washed ashore on the east side of the lake.

The fish kill was evidently a result of oxygen depletion following a week of above normal water temperatures (dawn water temperatures reached 86° F) and stormy weather (a water spout was reported) on June 19, 1981. These conditions were aggravated by low water levels.

Sincerely,



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William E. Johnson  
Biologist Supervisor I

WEJ:sct

cc: Forrest Ware  
Sam McKinney

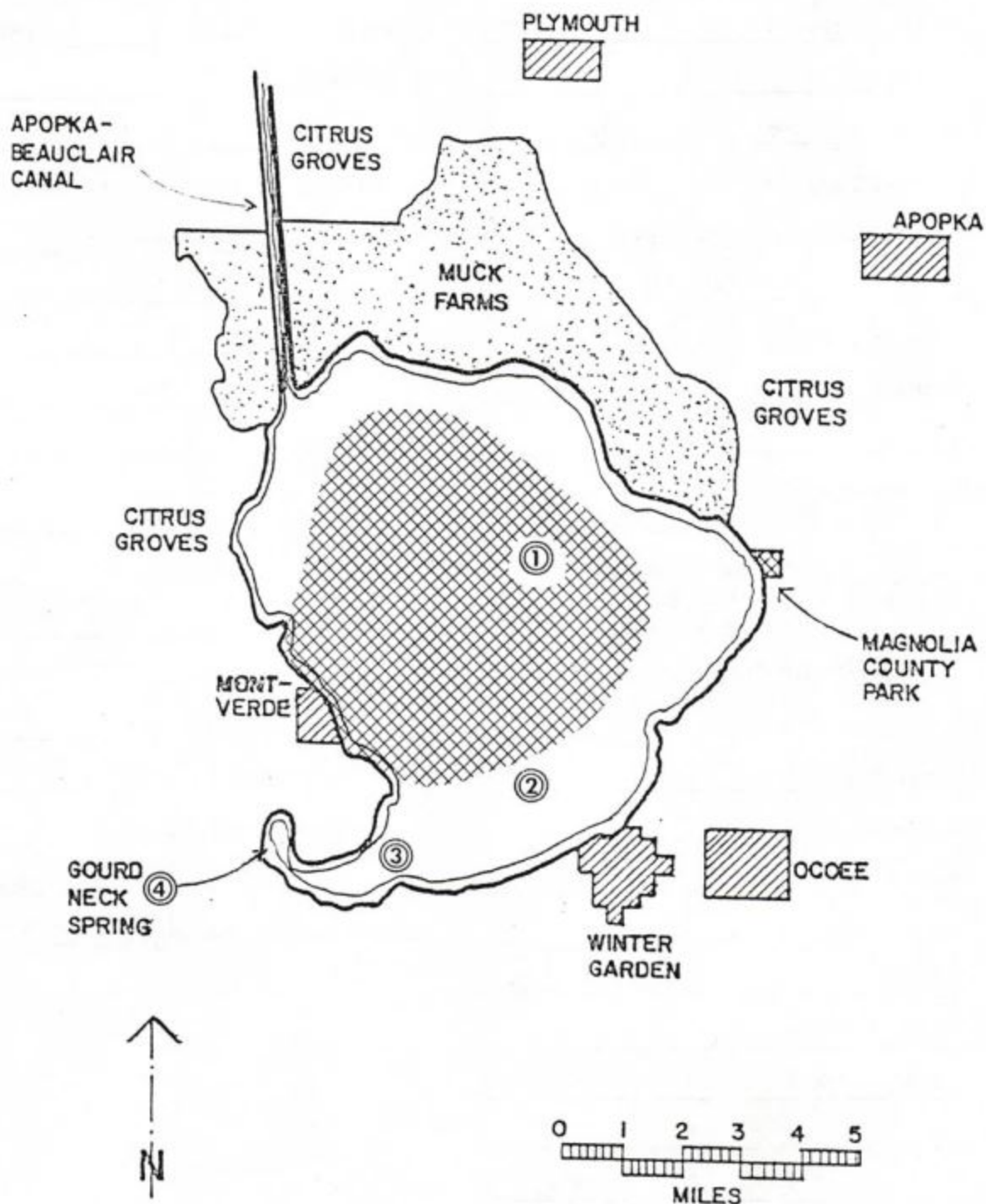
# LAKE APOPKA



Station Number



Approximate area of dead fish,  
morning June 21, 1981.



(original map from Brezonik et al.  
1977)

# CRITICAL DATA

Results expressed as mg/liter unless otherwise noted

STATION NO. 1

FIELD DATA				LAB DATA	
Lake: <u>Apopka</u>				Chlorophyll <i>a</i> (µg/m <sup>3</sup> ): <u>208.5</u>	
County: _____				Phaeophytin (µg/m <sup>3</sup> ): <u>0</u>	
Date: <u>6-21-81</u> Time: <u>0630</u>				Sulfate: _____	
Sample Type: <u>Composite</u> Depth <u>0.5</u> m				Turbidity (Jackson Units): _____	
Station Location: <u>1/3 Across</u> Lake <u>off Magnolia Park</u>				Unfiltered <u>98</u> Filtered _____	
Station Depth: <u>2</u> m				Calcium: _____	
Secchi: <u>7"</u>				Magnesium: _____	
pH: <u>8.4</u>				Sodium: _____	
Specific Cond. (Microhm/cm): <u>450</u>				Potassium: _____	
ML: _____ (X10) Phenolphthalein Alkalinity: (as mg/L CaCO <sub>3</sub> ) _____				Nitrate Nitrogen: _____ <u>0.01</u>	
ML: _____ (X10) Methyl Red-Brom Cresol Green Alkalinity: (as mg/L CaCO <sub>3</sub> ) _____				Ammonia Nitrogen: _____ <u>0.54</u>	
Water Color: _____				Total Organic Nitrogen: _____ <u>8.86</u>	
Algae Bloom: _____				Dissolved Organic Nitrogen: _____	
Type of Watershed: _____				Particulate Organic Nitrogen: _____	
Type of Pollution: _____				Ortho Phosphate (as PO <sub>4</sub> ): _____ <u>0.12</u>	
Dissolved Oxygen Meter Temperature				Total Phosphate (as PO <sub>4</sub> ): _____ <u>0.56</u>	
Meter	Winkler				
3.3	2.7	0	29°C		
3.1	2.6	1	29°C		
	2.5	2	29°C		

# CRU: CAL DATA

Results expressed as mg/liter unless otherwise noted

STATION NO. 2

FIELD DATA				LAB DATA	
Lake: <u>Apopka</u>				Chlorophyll a (mg/m <sup>3</sup> ): <u>192.5</u>	
County: _____				Phaeophytin (mg/m <sup>3</sup> ): <u>48.1</u>	
Date: <u>6-21-81</u> Time: <u>0700</u>				Sulfate: _____	
Sample Type: <u>Composite</u> Depth: <u>0.5</u> m				Turbidity (Jackson Units): _____	
Station Location: <u>1</u> mi. off Winter Garden				Unfiltered <u>132</u> Filtered _____	
Station Depth: <u>1.5</u> m				Calcium: _____	
Secchi: _____				Magnesium: _____	
pH: <u>8.9</u>				Sodium: _____	
Specific Cond. (Micromhos/cm): _____				Potassium: _____	
ML: _____ (X10) Phenolphthalein Alkalinity: (as mg/L CaCO <sub>3</sub> ) _____				Nitrate Nitrogen: <u>0.01</u>	
ML: _____ (X10) Methyl Red-Brom Cresol Green Alkalinity: (as mg/L CaCO <sub>3</sub> ) _____				Ammonia Nitrogen: <u>0.54</u>	
Water Color: _____				Total Organic Nitrogen: <u>10.04</u>	
Algae Bloom: _____				Dissolved Organic Nitrogen: _____	
Type of Watershed: _____				Particulate Organic Nitrogen: _____	
Type of Pollution: _____				Ortho Phosphate (as PO <sub>4</sub> ): <u>0.08</u>	
Dissolved Oxygen Meter Temperature				Total Phosphate (as PO <sub>4</sub> ): <u>0.84</u>	
Meter	Winkler				
<u>3.9</u>	<u>3.0</u>	<u>0</u>	<u>29°C</u>		
<u>2.3</u>	<u>2.9</u>	<u>1</u>	<u>29°C</u>		



# CHEMICAL DATA

Results expressed as mg/liter unless otherwise noted

STATION NO. 3

FIELD DATA				LAB DATA	
Lake: <u>Apopka</u>				Chlorophyll a (mg/m <sup>3</sup> ): <u>224.5</u>	
County: _____				Phaeophytin (mg/m <sup>3</sup> ): <u>16.0</u>	
Date: <u>6-21-81</u> Time: <u>7:30</u>				Sulfate: _____	
Sample Type: Composite Depth <u>0.5</u> m				Turbidity (Jackson Units): _____	
Station Location: <u>Hull Point off</u>				Unfiltered <u>120</u> Filtered _____	
<u>Gourdneck Springs</u>				Calcium: _____	
Station Depth: _____				Magnesium: _____	
Secchi: _____				Sodium: _____	
pH: <u>8.4</u>				Potassium: _____	
Specific Cond. (Micromhos/cm): _____				Nitrate Nitrogen: <u>0.02</u>	
ML: _____ (X10) Phenolphthalein Alkalinity: (as mg/L CaCO <sub>3</sub> ) _____				Ammonia Nitrogen: <u>0.48</u>	
ML: _____ (X10) Methyl Red-Brom Cresol Green Alkalinity: (as mg/L CaCO <sub>3</sub> ) _____				Total Organic Nitrogen: <u>9.84</u>	
Water Color: _____				Dissolved Organic Nitrogen: _____	
Algae Bloom: _____				Particulate Organic Nitrogen: _____	
Type of Watershed: _____				Ortho Phosphate (as PO <sub>4</sub> ): <u>0.08</u>	
Type of Pollution: _____				Total Phosphate (as PO <sub>4</sub> ): <u>0.72</u>	
Dissolved Oxygen Meter Temperature					
Meter Winkler					
<u>2.3</u>	<u>1.8</u>	<u>0</u>	<u>29°C</u>		
<u>2.1</u>	<u>-</u>	<u>1</u>	<u>29°C</u>		
_____					

## CHEMICAL DATA

Results expressed as mg/liter unless otherwise noted

STATION NO. 4

FIELD DATA			LAB DATA	
Lake: <u>Apopka</u>			Chlorophyll a (rr/m <sup>3</sup> ):	<u>16.0</u>
County: _____			Phaeophytin (rr/m <sup>3</sup> ):	<u>16.0</u>
Date: <u>6-21-81</u> Time: <u>8:00</u>			Sulfate:	_____
Sample Type: Composite Depth <u>0.5</u> m			Turbidity (Jackson Units):	_____
Station Location: <u>50 ft. East of</u> <u>Gourdneck Springs</u>			Unfiltered <u>8</u> Filtered: _____	
Station Depth: _____			Calcium: _____	
Secchi: _____			Magnesium: _____	
pH: <u>8.4</u>			Sodium: _____	
Specific Cond. (Microsmos/cm): _____			Potassium: _____	
ML: _____ (X10) Phenolphthalein Alkalinity: (as mg/L CaCO <sub>3</sub> ) _____			Nitrate Nitrogen: _____	<u>1.70</u>
ML: _____ (X10) Methyl Red-Brom Cresol Green Alkalinity: (as mg/L CaCO <sub>3</sub> ) _____			Ammonia Nitrogen: _____	<u>0.36</u>
Water Color: _____			Total Organic Nitrogen: _____	<u>1.44</u>
Algae Bloom: _____			Dissolved Organic Nitrogen: _____	
Type of Watershed: _____			Particulate Organic Nitrogen: _____	
Type of Pollution: _____			Ortho Phosphate (as PO <sub>4</sub> ):	<u>0.06</u>
			Total Phosphate (as PO <sub>4</sub> ):	<u>0.09</u>
<u>Dissolved Oxygen</u>	<u>Meter</u>	<u>Temperature</u>		
<u>Meter</u>	<u>Winkler</u>			
<u>1.7</u>	<u>1.9</u>	<u>0</u>		
<u>0.9</u>	<u>1.6</u>	<u>1</u>		
<u>0.5</u>	<u>-</u>	<u>2</u>		

Summary of phytoplankton populations in Lake Apopka following the fish kill of June 19, 1981, (all values  $\times 10^7$ ).

Date	6-21-81	6-21-81	6-21-81	6-21-81	6-23-81	6-23-81
Station no.	1	2	3	4	1	2
Blue-green						
Anacystis	3.96	3.31	3.09	0.39	3.52	3.18
Spirulina	3.78	4.31	3.78	0.30	3.35	4.22
Lyngbya	1.35	1.39	1.13		1.83	1.39
Agmenellum		0.52	0.69		0.96	0.52
Anabaena	0.09	0.04	0.30		0.09	0.09
Green						
Pediastrum	0.30	0.30	0.39		0.48	0.30
Scenedesmus	0.04	0.22	0.30		0.30	0.09
Staurastrum					0.13	
Actinastrum				0.04		
Carteria						
Yellow-green						
Amphipleura	0.61	0.44	0.52		0.61	0.44
Asterionella			0.13		0.35	
Melosira						0.22
Navicula		0.13				
Flagellates						
Chlamydomonas	0.09		0.09			0.48
Pedinomonas			0.52			
Carteria	0.17	0.39				
Euglena		0.09				
Total	10.39	11.14	10.94	0.73	11.62	10.93