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March 13, 1972

Mr. Lawrence E. Jerome
1467 Navarro Drive
Santa Clara, California 95051

Dear Mr. Jerome:

Your letter of February 11 asking me for particulars concerning the history of Lake Apopka in relation to the proposed drawdown for restoration purposes has led me to re-evaluation of all my old records and other facts in order to answer to the best of my ability.

I first knew and worked on the lake in 1951, and again several years later, from 1955 and until about 1967. During this period I participated in our Game and Fresh Water Fish Commission programs on the lake and helped gather fishery data from it. After 1967 other government groups and committees in addition to the Game and Fresh Water Fish Commission began to take an ever increasing interest in the problems of the lake and I was no longer intimately associated with development of ideas concerning Lake Apopka. However, because I own a home and live at Winter Garden within sight of the lake, and because Lake Apopka is in the drainage basin of the St. Johns River (via the Ocklawaha River), which is my responsibility, I could not help but remain interested and very much concerned.

This letter in a way is an expression of my continuing concern, through an attempt to integrate, for my own benefit as well as yours, what I know about Lake Apopka. Any opinion expressed are my own, and not necessarily those of the Game and Fresh Water Fish Commission, although I have freely discussed them with our people.

The area of the lake is given as 31,000 acres. This is true today, give or take a few hundred acres, but before the era of the muck farms it must have covered well over 50,000 acres. The additional area, on the lake's northward side, was shallow peat and muck-covered lake bottom, alternately marshy, dry, or covered with water. It is now farmland, 2½ feet below the level of Lake Apopka, when the lake stands at 67 feet above sea-level. Since these farms occupy an area of more than 18,000 acres, it can be seen that the percentage of old lake bottom now in farms is more than 35 percent. The Reconstruction Finance Corporation supplied funds

for this drainage project. The first of the farmland (2,589 acres) was completed in 1942. In 1943 an additional 6,000 acres was reclaimed. These lands constitute the Zellwood Drainage and Water Control District, (1963 Report: Henry Swanson, Orange County Agricultural Agent). By the year 1963 more than 9,000 additional acres of Lake Apopka's northern flood plain had been converted to farmlands. This area is not included in the Zellwood Drainage and Water Control District, according to Mr. Swanson (1963). Since that time perhaps 2,000 more acres of the lake's northern extremities have been put to agricultural uses.

In the year 1955 the canal connecting Lakes Apopka and Beauclair was deepened and widened, and a new lock and spillway were built. Efficiency in artificial water level control accordingly began to be gradually improved.

During the period 1942 to November 18, 1964 water levels were regulated (water was spilled over the dam) when they reached maximum of 66 feet msl. After November 18, 1964 the regulation schedule called, and continues to call for a maximum of 67.5 and a minimum of 66.5 feet, msl.

The daily water level records I have date back to 1936. Between 1936 and 1942 the monthly mean of these daily water level elevations in Lake Apopka ranged between a high of 69.3 feet in October 1936 and a low of 65.9 feet msl in April and June of 1939.

Between 1942 and 1964 these mean water elevations fluctuated between a high of 68.7 feet in September and October of 1947 and the all-time low of 64.2 feet msl in July and August 1956. This latter figure represents the combined effects of drainage and drought in a year of very low rainfall.

It can therefore be seen that the lake's levels have become progressively lower until the 1960's when they tended to be more or less stabilized and controlled at elevations ranging between 66.5 and 67.5 feet, msl.

Water management of Lake Apopka has permitted a much smaller range of vertical water level fluctuation (1942 to date) than had been permitted under natural conditions, before the impact of the drainage district (prior to 1942), and a greatly reduced area of littoral, or shallow shore region which could alternately flood or dry, and was present along the entire northern side of the lake. Thus the horizontal range through which the lake could alternately contract and expand was also very greatly reduced.

To answer another of your questions, the citrus processing plant at Winter Garden had been contributing effluent for a number of years prior to 1946, but had greatly increased its capacity between that time and the present. The sewage treatment plant at Winter Garden was also expanded at this time, and its expansion, along with the population, is still continuing.

I was working on a seining program on Lake Apopka in 1951 and I recall there were then still very large areas of floating and submerged vegetation growing throughout the lake. They were so thick that some of the boat trails shown on the old maps of the lake were still in use. I believe the die-off of submerged vegetation documented as beginning in 1946 was related to the combined effects of enrichment from sewage wastes, citrus wastes and muck farming operations.

A plankton bloom was observed for the first time in Lake Apopka in 1947 (Dequine). Subsequent enormous but short-term increases in the gamefish populations of the lake were documented between the years 1948 and 1952. After 1952 the quality and quantity of the gamefish fishery began to deteriorate. The large increases in gizzard shad and the accompanying reductions in gamefish populations which Mr. Horel, I and others were able to demonstrate, from the year 1956 and following, should not have come as a surprise. I believe that the delicate ecosystem of the lake had already been disrupted by the year 1952.

The selective treatment of the waters of Lake Apopka to reduce shad and improve gamefish populations, carried out in the three sucessive years of 1957, 1958 and 1959 did in fact succeed in producing a marked increase in sportfishing success, but it was only a temporary improvement. The charge has been made that the sudden release of nutrients from the dead bodies of more than 20 million pounds of gizzard shad killed in the 3 successive years and allowed to remain in the lake also contributed to the assassination of Lake Apopka. I do not believe it. Mr. Horel found that the annual die-off of shad in years subsequent to the treatments was as great as that effected by the treatments. The presence of these fish whether living or dead, was merely a partial expression of the deteriorated water quality of the lake.

The hyacinth control program through use of chemicals to kill the floating plants was begun in 1947 or 1948 on a small scale. This program was shortly thereafter greatly expanded. The floating plants which by their presence would, to a greater or lesser degree, have absorbed the ever-increasing load of fertilizers, sewage and other wastes from the lake waters were proscribed, condemned and exterminated mercilessly. Lake Apopka then entered the phase of heavy algal growths, oxygen deficiencies and fish mortalities. An extremely detrimental result of the weed poisoning program was total elimination of the habitat of macro-invertebrates living in and upon the floating aquatic plants. These organisms are of paramount importance to the food-web.

Fish kills began to be widespread in 1962. They were associated with leached fertilizers from the farms, wastes from the sewage treatment plants, citrus processing effluent, resulting algae conditions, oxygen deficiencies, and with unrestricted use of pesticides. DDT was one of the principal pesticides employed.

Pesticides were applied to the farms from aircraft. The planes were frequently observed to spill this spray over the lake waters also. In the year 1963 more than a million dollars was spent by the farms on such spray materials alone.

By the year 1965 management of the lake level had become quite efficient. Water was let out through the canal and locks before it was able to accumulate in large quantities from rainfall. Thus, despite abundant rains in 1965, the lake level was at the low elevation of 66.2 feet on October 21, 1965. The flushing action, I felt at the time, had the result of lessening the nutrient content of the water and increasing its ability to transmit light by reducing the algal content. A very moderate increase in growth of submerged and emergent aquatic vegetation then occurred (cf. letter, attached). The low level of the lake prior to that time had exposed some of the narrow band of firm sandy shoreline encircling it and permitted the Potamogeton and Vallisneria present to multiply when the lake became higher.

After the year 1965, which marked the definitive collapse of the catfish and sportfishery of Lake Apopka, fish camps went broke and fish kills occurred with such frequency as to be neither remarkable nor newsworthy. The U. S. Fish and Wildlife Service and the U. S. Public Health Service had previously reported 160 parts per million DDT and DDE, and 50 ppm TDE in the fat of largemouth bass, and 7 ppm DDT and DDE, and 8 ppm TDE in the flesh of bluegill collected from Lake Apopka on June 12, 1963, following an estimated three million pound kill of gizzard shad which had begun on May 16, 1963.

On January 4, 1971, in an attempt to study geological and other possible problems related to a proposed fishery restoration drawdown, a partial and experimental lowering of the lake level began. By May 14, 1971 it was completed. In this time the lake level had been lowered by 2.1 feet - from 66.5 to 64.4 feet msl.

Concurrently, dead and dying alligators, turtles, snakes and water birds in addition to fish, were observed. By the end of June 1971 a team of scientists from the University of Georgia, working under a cooperative agreement with our Game and Fresh Water Fish Commission, said they had isolated a causative agent: Aeromonas liquifaciens. Although present in all the lakes of the area, this facultative bacterium was said to be present in very large numbers not only in the water but also in the "prop-wash" from airboats running over the lake's surface. Large quantities of this bacterium must be present in the air over and surrounding Lake Apopka and Winter Garden.

One therefore wonders: first the fish, then the alligators, snakes, turtles and birds - will we be next to go?

The success of any restoration project for Lake Apopka will of course depend on the degree to which pollutants and their sources of introduction are removed.

It is also necessary that an adequate flood plain, which can alternate between flooding and drying, be restored. The question remains of course as to how large the flood plain to be restored will have to be. Or can be. This has not been determined.

The present water regulation schedule for Lake Apopka, as previously mentioned, is from 66.5 to 67.5 feet. But under natural conditions, this fluctuation zone had a range not of 1 foot, but of more than 3 feet - from under 66 feet to more than 69 feet, mean sea level. Logically it would seem desirable, if not absolutely necessary, to restore this wider fluctuction range. But of course such an action would cause property damage to some of the dwellings on the lake. Also affected would be the muck farms, some, or all of which might have to be eliminated.

As of this writing Lake Apopka has water hyacinths covering an estimated area of one-third of its water surface. Control measures have been suspended for more than a year. I have had recent reports that commercial fishermen are making fair to good catches of catfishes, and that there are some largemouth bass and black crappie also being caught. In other words, the fishery seems to have improved somewhat.

I have often wondered as to what extent the lake would improve if the only management procedure undertaken were to continue to suffer the floating plants to grow.

Sincerely,

H L Moody

Harold L. Moody
River Fishery Project Leader

am also enclosing two recent newspaper clippings.

Would appreciate your sending me a copy of anything you write

H

cc: Woods
Banks
Bickerstaff
Horel