

Historical Perspectives on the Hydrology and Vegetation in Orange Lake



by

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September 2001

St. Johns River Water Management District

Executive Summary

The history of Orange Lake and the nature of its vegetation have been the subject of conjecture for many years. There are numerous beliefs regarding the history of the lake based on different perspectives. The purpose of this report is to provide information regarding the history of vegetation in Orange Lake and the history of human-made structures that may have affected the physical and biological characteristics of the lake.

In 1881, a railroad trestle bridge was constructed across the southeastern end of Orange Lake. Because the portion of the railroad spanning the lake was a bridge, the impacts of this project to the lake were probably minimal. However, at some point prior to 1937, the railroad trestle bridge was converted into an earthen-filled berm. In 1926, an earthen-filled highway berm (now Highway 301) was constructed across the lake, parallel to the railroad. Both the railroad and the highway have short bridges, allowing Orange Lake water to continue to flow eastward. An 1893 map indicates that the area that is currently to the east of the highway and railroad was historically part of Orange Lake. Although flow continued to occur under the railroad and highway bridges, the combination of the earthen-filled highway and railroad berms served to cut the most eastern section of the lake off from the rest of the lake. Additional alterations made within the original lake boundary include the construction of farm dikes and the draining of marsh in the Orange Lake Muck Farm area during the 1930s, and the construction of a weir at the highway 301 bridge in 1963, which prevents the flow of water out of the lake during low water events. Additionally, smaller dikes have been built around the lake during the 20th century and are described in the report.

Excerpts from historical literature indicate that floating wetlands have been a part of Orange Lake for at least 130 years. In the mid-1800s, while camping along the shores of Orange Lake, General George A. McCall described seeing a large floating island containing trees and stated that he learned that floating islands were a common feature of Orange Lake (McCall 1868). The 1868 *Webb's Historical, Industrial and Biographical Florida* includes a drawing of the floating islands of Alachua County. Numerous writings from the first half of the 20th century describe the floating islands of Orange Lake including Marjorie Rawling's famous book, *Cross Creek*. Interviews with long-time local residents also confirm that floating wetlands have been a part of Orange Lake for a very long time. In the 1930s, one local individual started a floating

island tour business at Orange Lake, bringing nationwide attention to the community. Many other references to Orange Lake's floating wetlands are described in this report.

Plant fragments analysis of Orange Lake sediment cores (Clark and Reddy 1998) in combination with radiocarbon dating (^{14}C) of these cores, provides additional evidence that a variety of marsh communities, including complex floating marshes, have existed in Orange Lake for hundreds of years. Complex floating marshes occurred in the southeastern section of the lake at least 600 to 700 years ago and in the northern section of the lake – at least 1300 years ago.

Clark and Reddy (1998) found evidence of past drawdowns on Orange Lake through analysis of peat sediments collected from the lake. They determined that peat horizons that were described as fine, sapric, blocky, and/or platy were formed from open water sediments that were exposed. They found peat horizons of this type from cores taken from 10 sites in the lake, including 6 sites that currently have water depths of over 5 feet. This indicates that these even these deep sites have experienced sediment exposure in the past. Other evidence of past drawdowns and exposure in Orange Lake comes from charcoal bands that Clark and Reddy (1998) found in the majority of sediment cores taken from the lake. This indicates that fire likely has played an important role in the vegetative composition of the lake.

Analysis of aerial photos from 1937 through 1998 indicates that the lake has not experienced a trend of increasing vegetation (i.e. acreage) over time. The extent of vegetation fluctuates based largely on lake water levels and time since an extreme low water event.

Although historical information indicates that Orange Lake has contained complex floating marshes for a long time, it is unknown if the density of this vegetation has increased in more recent years. Whether or not the railroad, highway, farm dikes, weir and other alterations have affected the density, distribution, or composition of vegetation is also unknown.

Several hypotheses which may explain how the railroad, highway, farm dikes and weir could have increased vegetation density and composition in the lake are presented in the report. However, insufficient information and evidence exist to determine whether the density and composition of vegetation has changed over the past century.

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I. INTRODUCTION

Orange Lake is a shallow, marsh-fringed lake in north central Florida which ranges in size, depending on water levels, from approximately 4,000 acres at 50 ft NGVD (National Geodetic Vertical Datum) to 13,900 acres at 60 ft NGVD. It has long been recognized for its excellent fishery resources and for floating islands (Figure 1). Floating islands are mats of vegetation often associated with peat and other organic material and sometimes containing trees or shrubs, that float freely within the lake. Large contiguous floating marshes, consisting of similar vegetation, are also found interspersed with emergent marshes contiguous to the lake shore.

Floating marshes and mobile floating islands are perceived by some resource managers and lake users as problems that need to be controlled. Mobile islands of floating vegetation can block access to boat launch points and fishing areas. Some fishery managers also contend that floating vegetation diminishes the quality of sportfish habitat. It is believed by some resource managers that floating and emergent vegetation in Orange Lake has increased substantially in recent years, and necessitates increased management activities.

In 1994, the St. Johns River Water Management District (SJRWMD) Governing Board formed the Orange Creek Basin Advisory Council to assess management options for the Orange Creek Basin. This Advisory Council is made up of representatives from various natural resource agencies, Alachua and Marion counties, residents, environmental groups, fish camp owners, and other stakeholders. The Advisory Council also formed a Scientific Advisory Committee consisting of academic and agency scientists to assess technical aspects of management alternatives, including management of vegetation. The District has initiated a number of studies designed to provide information to the Scientific Advisory Committee and the Advisory Council to assist them in their decisions.

Several hypotheses relating to the extent of floating and emergent marshes in Orange Lake and their relationship to control structures, water levels, and management techniques have been proposed by various interested parties. One hypothesis is that constrictions at the southeastern portion of the lake have contributed to an increase in floating vegetation within the

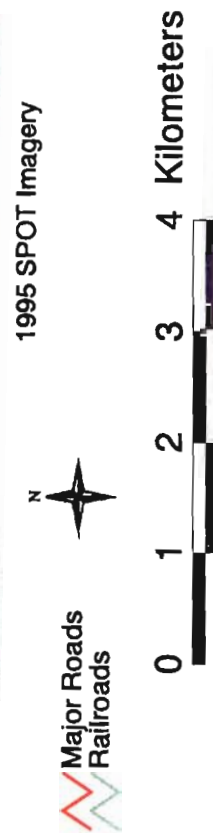
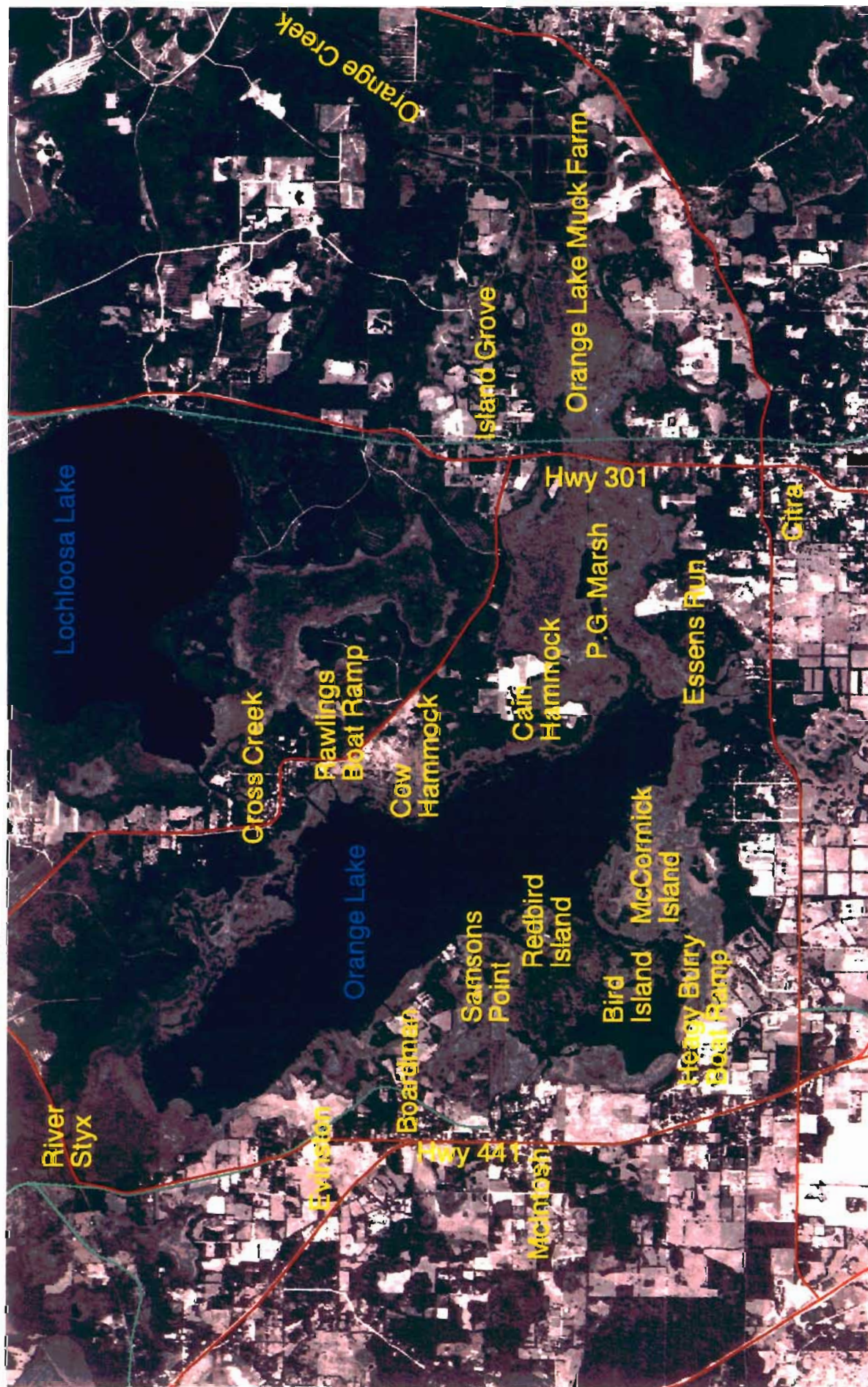


Figure 1: Orange Lake Vicinity Map

lake by preventing the movement of floating islands out of the lake. The southeastern portion of Orange Lake is bordered by a Highway 301, a railroad, several dikes, and a muck farm (Figures 2 and 3).

These roads and dikes were constructed across what was historically part of the lake, cutting off the southeastern most section from the rest of the lake (Jessen 1972). Discharge from the lake flows through this altered area, underneath the highway and railroad bridges, through a channelized stream which borders the muck farm dikes and then connects to Orange Creek. A weir which prevents flow out of the lake when lake levels fall below 57 feet NGVD is also present at the highway overpass.

Another hypothesis is that the constrictions have resulted in a lake-wide retention of sediments which has altered the hydrology and nutrient levels, indirectly affecting the amount of floating and emergent vegetation in the lake. Alternatively another hypothesis is that extended low water periods contribute to an increase in floating islands and marshes. Still another hypothesis is that the floating and emergent marsh coverage within the lake has not changed significantly over the long term and increases that have occurred in past years are simply the result of long term cyclic processes rather than direct succession towards a more vegetated lake.

The purpose of this analysis is to provide historical information which will assist managers in determining whether extensive floating marshes and islands are a natural part of the Orange Lake ecosystem or a recent phenomenon resulting from or increasing as a result of some human activities. This study focuses on the history of floating and emergent marshes within Orange Lake and historical events that may have affected the biological or physical characteristics of the lake.

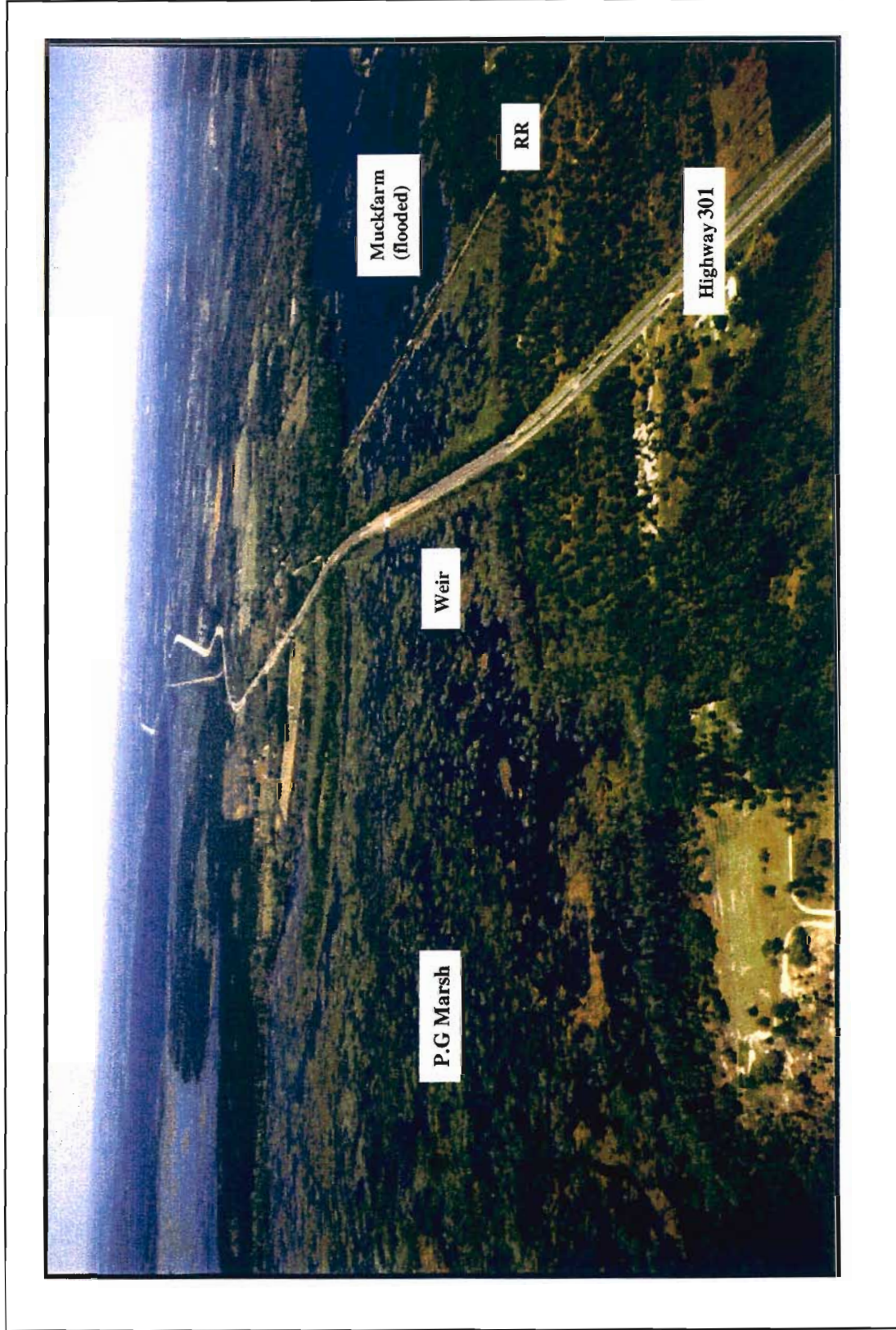


Figure 2. Aerial photo of the southeastern section of Orange Lake showing Highway 301 and the Railroad crossing Orange Lake. Photo taken Spring 1998 during high water period.

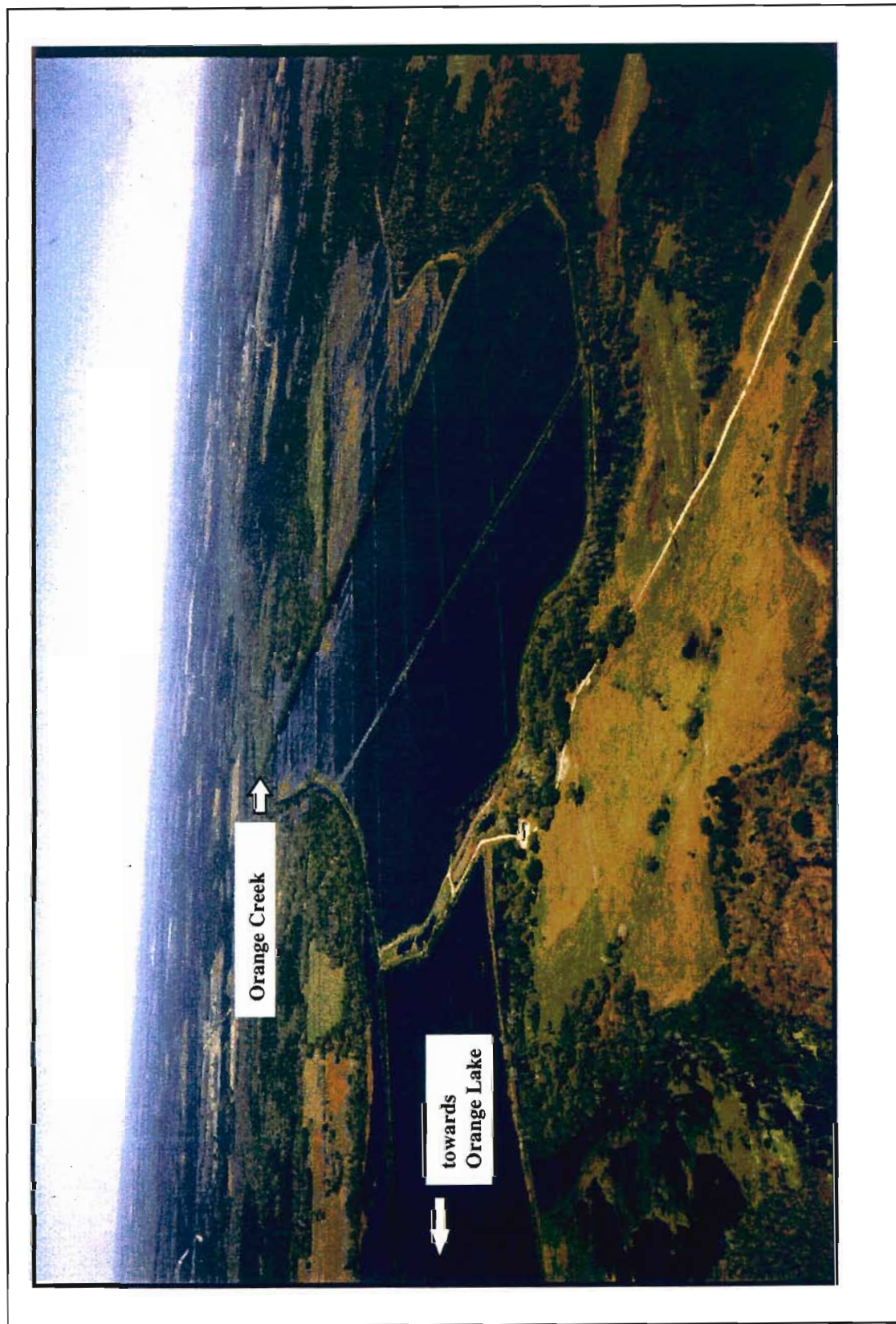


Figure 3: Aerial photo of Orange Lake Muck Farm and Shand's Dike located to the east of Orange Lake. Photo taken in Spring 1998 during high water period.

II. METHODS

Historical literature relating to Orange Lake was reviewed for information on floating marshes and islands and hydrologic modifications which may have affected Orange Lake. Files at the Matheson Historical Center in Gainesville, Florida, the P.K. Yonge Special Collections Library at the University of Florida, and the Florida State Archives in Tallahassee were searched for relevant information. Over 50 historical books, reports, and pamphlets were reviewed including many on the history of Alachua and Marion Counties and the entire state. An annotated list of references is given in Appendix A. Also included were accounts of tourism in Florida during the 1800s and early 1900s. Jessen (1972) and Knetsch (1989) were particularly helpful in determining the chronology of important events related to Orange Lake. Newspaper articles on Orange Lake dating back to 1912 were also reviewed (SJRWMD 1992). A list and short description of newspaper articles related to Orange Lake is given in Appendix B.

Local residents were consulted regarding the history of Orange Lake and its floating islands. A list of contacts and a summary of communications with them is provided as Appendix C.

In addition to the literature review and interviews with local residents, a search for maps and photos of the area was conducted. The Florida State Archives Department was contacted for old survey maps and photos of the Orange Lake area. Other historical maps and aerial photographs were found at the Map Library and the P.K. Yonge Special Collections Library at the University of Florida. Aerial photographs were also available at the SJRWMD for various years beginning in 1937.

III. HISTORICAL FINDINGS

HISTORICAL HIGH AND LOW WATER EVENTS IN ORANGE LAKE

High and low stage data is available from the United States Geological Service recording gauges for Orange Lake from the 1930s to the present.

Low Water Periods - Two extreme low water events have occurred in the past 50 years in Orange Lake: the first in the 1950s and the second in the 1990s. According to rainfall data

collected at the Gainesville Regional Airport gauge, normal summer rainfall peaks failed to occur in 1952, 1954 and 1963, 1987 and 1989. The lowest recorded daily stage in the lake occurred during the 1950s drought when water levels reached 50.38 ft NGVD on August 11, 1956 (Appendix D). Between December 1955 and August 1957 all average monthly stages were less than 53.0 ft NGVD. The second severe low water period during the past 50 years occurred between 1989 and 1994. Between May 1990 and June 1991 all monthly average stages were below 54.0 ft NGVD and water levels dropped to 51.86 ft. NGVD on February 25, 1991.

Many newspaper articles described the problems for fishermen and fish camp owners caused by the low water levels. One article stated that the drought during 1956 was the worst since at least 1891 (Florida Times Union 1956a). Several other articles stated that anglers were intensely fishing isolated holes and deeper areas where fish were congregating and that the State Game Commission suspended fishing restrictions for fear of fish die off as the water levels plummeted (Gainesville Daily Sun 1956a; Florida Times Union 1956a; and Tampa Morning Tribune 1956). One article described the congregation of bluegills (*Lepomis macrochirus*) and catfish (*Ameiurus* sp.) in the northwest corner of the lake and how "...between 100 and 200 people are fishing the two-acre spot from daylight to dark..." (Orlando Sentinel 1956).

Newspaper articles and anecdotal information from long-time residents indicate that water levels in Orange Lake also fluctuated considerably before hydrological records were kept. One article written during the 1950s drought reported that there were "*persistent stories that it [Orange Lake] did go dry about 100 years ago.*" According to this article, "older citizens" reported that a diary kept by Dixon Irvine (an early settler) detailed the occurrence, and that the diary related that water was so scarce, cattle owners had to drive their cattle to Withlacoochee or the Ocklawaha. Unfortunately, the diary was lost (Florida Times-Union 1956b). Another article written during the 1950s dry period states that Orange Lake has had its "ups and downs" and on several occasions before 1900, it was reported completely dry. The article also noted that the lake has been "almost dry" in 1906, 1916-17, and 1931-32 (Ocala Star Banner 1958a). Of course, what is meant by "almost dry" cannot be determined. In order to essentially dry up, the lake would have to have been below 48 ft NGVD, two feet lower than it was during the extreme drought of 1955-56. These dates of reported low water on Orange Lake correspond to periods of below average rainfall reported by a Florida Geological Survey Report. According to this report,

the Gainesville area experienced lower than average rainfall for four periods between 1900 and 1960: 1906-1911, 1914-1918, 1931-1934, and 1954-1956 (Clark et al. 1964).

Mr. Milton Hicox, long-time local resident of Orange Lake area, stated that people could walk out to the P.G.¹ area during extreme low water periods and during the droughts of the 1930s and 1950s, people walked across a completely dry Cross Creek. He also recalled that years ago people older than him stated there was a severe low water period around 1917 (Mr. Milton Hicox, pers. com. 1997). Oscar Baynard, the Audubon Society warden who protected Bird Island in Orange Lake wrote that during a dry period between 1911 and 1912, Bird Island accumulated great deposits of bird guano because it had little or no water over it (Baynard 1914).

High Water Periods - The highest recorded daily stage was 61.21 ft NGVD on March 17 and 18, 1948. Extreme high water events have tended to be of short duration. The lake was briefly (usually only a few days at a time) higher than 60.0 ft NGVD in 1946, 1948, 1964, 1970, and 1998.

Accounts of high water periods were found in newspaper articles and historical documents. Oscar Baynard stated that the two years following the 1911-1912 dry period were wet and nearly all of the trees on the island died down. The trees began to recover in the next year (Baynard 1914). An article from 1912 reported that a local fisherman stated that Orange Lake water levels were the highest he had ever noted and that the oldest settlers claim that not since 1871 has there been so much water in the lake (Gainesville Daily Sun 1912). During the following two time periods between 1900 and 1960, rainfall was significantly higher than average levels: 1928-1930 and 1944-1949 (Clark et al. 1964). One article from 1958 states that for Orange Lake residents “...during the past 50 years, the biggest problem has usually been too much water, not the reverse” (Ocala Star Banner 1958a).

HISTORICAL HYDROLOGICAL ALTERATIONS AND ISSUES AFFECTING ORANGE LAKE

Hydrological alterations have affected Orange Lake since at least the early part of the 20th century. This section discusses the history of various alterations and structures which have

¹ P.G. Marsh is located in the southeastern area of Orange Lake. The term “P.G.” is widely used by locals, but the meaning and origin of the term is unknown.

affected Orange Lake. A chronology of important events in the Orange Lake area is included in Appendix E.

Alterations to the Inflow into Orange Lake

In 1927, the main inflow into Orange Lake was increased when the outflow from Newnans Lake through Prairie Creek was diverted away from Paynes Prairie through Camps Canal and into the River Styx which flows into Orange Lake. Prior to the construction of Camps Canal, none of the water from Prairie Creek entered Orange Lake except during extreme flood events. This diversion of water through Camps Canal resulted in the draining of a portion of Paynes Prairie so that it could be used for cattle grazing. In 1975, Camps Canal dike was breached and a control structure was installed which partially restored natural hydrology to Paynes Prairie, and in turn reduced inflow into Orange Lake. In 1994, the SJRWMD Governing Board passed a rule allowing the Florida Department of Environmental Protection to restore an additional portion of the flow from Prairie Creek back into Paynes Prairie. Hydrologic modeling indicates that over the long term an average of 45% of the outflow from Prairie Creek is re-diverted into Paynes Prairie while 55% still flows into Orange Lake through the River Styx. Therefore current average inflow into Orange Lake is 55% greater than the natural state (Robison et al. 1997).

Alterations to the Surface Outflow from Orange Lake

The main outflow from Orange Lake occurs in the southeastern corner of the lake and has been affected by development since at least the early 20th century. Outflow alterations include the conversion of the long railroad trestle bridge crossing Orange Lake into a filled railroad bed, the construction of a filled road (Highway 301), a muck farm dike and a gated weir. The history of these structures is discussed below.

Railroad connecting Citra and Island Grove

The railroad crossing the eastern side of Orange Lake, connecting the town of Island Grove (north of Orange Lake) with the town of Citra (south of Orange Lake) was constructed in 1881 (Yulee 1800s). Information from several sources indicates that initially the portion of the railroad crossing the lake was a long trestle bridge almost 1 mile in length and the impacts to the

outflow were probably minimal, related to the placement of pilings within the lake bottom^{2,3,4}. However, sometime during the early part of this century, the long trestle bridge was replaced by a filled diked railroad. Currently, it extends approximately 1.2 miles across the lake with a 93.5 foot bridge over an opening where the Orange Lake outflow converges into a channel leading to Orange Creek.

The exact year at which the long trestle bridge was replaced with a filled railroad is unknown and difficult to determine since the railroad companies often disposed of old records as the railroads changed hands (S. Bramson, railroad expert, personal communication, 1997). Many books on the history of railroads in Florida were reviewed; however, none mention the trestle bridge across Orange Lake. The CSX Transportation Company, current owner of the railroad, was contacted regarding the history of this section of railroad. Their records for this section of the railroad only extend back to 1963, at which time the existing railroad bridge was replaced with a concrete bridge.⁵

Aerial photographs taken in 1937 indicate that the conversion into the filled railroad occurred sometime before that year. There was an enormous increase in the weight of passenger cars beginning around 1910 as they began to be made of steel. Locomotives also became much larger following World War I. This increase in weight of train cars and locomotives often required major improvements in the railroads (K. Murdock, Central Florida Chapter of the National Railway Historical Society, personal communication, 1996 and S. Bramson, personal.

² Mr. W.J. Crossby, long time resident of the Citra area, said his grandfather altered a bicycle so that it could be ridden across the early trestle bridge and when a train came, his grandfather would climb down the trestle with his bicycle, holding on to the trestle pilings (Mr. W.J. Crossby, personal communication, June 1995). This is additional confirmation that the railroad was initially a long trestle bridge.

³ Mr. David Yulee, a Senator from Florida and railroad entrepreneur was the President of the Florida Peninsular Railroad in the 1880s. A written agreement dated May 7, 1880 between the Florida Peninsular Railroad Company and Wilson Peek Tompkins states "*...that the said party of the first part agrees to furnish to the said party of the second part all piles and square timber... for the construction of the trestle bridge over Orange Lake on the newly located line of the said Peninsular Railroad, said trestle being estimated as 4,690 feet long. The said material to consist of piles, caps, and stringers to conform to the specifications....*" (Yulee Files 1800s, P.K. Yonge Library at the University of Florida).

⁴ The Railroad company Information Folder, Jan. 1, 1888, was given to travelers and described the journey from Hawthorne to Ocala including the following statement: "*...and onward towards the eastern arm of Orange Lake which it crosses over a long trestle on pilings...*"

communication, 1997). Considering the life span of the lumber used to build the trestle and changes in train weights that occurred during the first part of the 20th century, a best estimate for the time period of the replacement of the trestle to a filled road is between 1910 and the early 1920s.

Highway 301

Highway 301, which crosses the southeastern edge of Orange Lake, was originally constructed in 1926 as State Road 21. Between 1959 and 1963, it was converted into a 4-lane highway. This filled road, located approximately one quarter mile to the west of the railroad and extending over 1 mile in length across what once was lake bottom, has a bridge approximately 160 feet long in the middle section allowing outflow from Orange Lake to enter a channelized stream, which eventually becomes Orange Creek.

Weir at Highway 301 across Orange Lake outlet

Local individuals constructed a dam of earth and concrete rubble across the Orange Lake outlet at U.S. 301 in July of 1958. This construction occurred after water levels had risen following a severe drought that lasted several years. The purpose of the dam was to maintain high water levels within Orange Lake by preventing outflow through Orange Creek (Jessen 1972 and Gainesville 1958a). Adjacent citrus farmers also felt the dam would protect orange groves along the lake from freezing during droughts. In 1959, as part of the process to rebuild the Highway 301 bridge, the dam was removed. The Alachua County Recreation and Water Conservation and Control Authority, with support from local fish camp owners, proposed the formal construction of a dam at the Orange Lake outlet at Highway 301 to limit outflow through Orange Creek and thus prevent extreme low water levels (Jessen 1972 and Robison et al. 1997). Downstream citrus owners to the east of Highway 301 objected because they desired a continuous flow of water to ensure adequate water levels during the winter frost season. In 1963, after several years of controversy between fish camp owners and some of the local orange grove farmers, a fixed crestweir was completed at Highway 301 (Figure 4) (*Gainesville Sun*, 1963).

⁵ According to CSX's public information office and bridge design office, much of the historical information and files have been lost through the years due to many turnovers in owners of this railroad section (Frank Edmons, and Melinda Dirsa, personal communications 1995).



Figure 4: Orange Lake Weir at Highway 301.

The approximately 160 foot long weir was constructed with a 3 foot, 8 inch wide low flow notch at an elevation of 55.5 ft NGVD. In 1990, during a severe drought, the low flow notch was illegally obstructed. This increased the outflow elevation to its current elevation of 57.1. ft. NGVD. Thus, water does not flow out of the lake until lake levels are higher than 57.1 ft. NGVD

Shand's Dike and Shand's Canal

Shand's Dike, located east of Highway 301 and approximately 1.5 miles east of the railroad bridge, channelizes the outflow from Orange Lake which eventually forms Orange Creek. This dike was constructed in the 1930's in order to drain approximately 1500 acres of lake bottom for farming. Shand's canal was built along the north side of the marsh from the dike to the northeast end of the muckland area. The area to the east of the dike was formerly part of the lake, but was drained to create Shand's Muck Farm in the 1930s. This farm had a total acreage of approximately 2,500 acres, 1,500 of which were originally lake bottom. The muck farm has been intermittently farmed and used as pasture since its establishment in the 1930s. Four pump stations were used to drain the former lake bottom (St. Johns River Water Management District permit application number 4-083-0125AM). During a flood in 1948, the spillway of the dike had to be dynamited because the lake was close to exceeding its storage capacity (Jessen 1972).

The SJRWMD recently purchased this property now known as Orange Creek Marsh, for restoration purposes. Historical aerial photos indicate that the major dikes associated with the muck farm existed by 1937, but extensive farming had not began in the majority of the property at that time. By 1949 (the next date for which aerial photos were available) a large portion of the farm was under operation. Between 1974 and 1979 additional drainage canals were built in the farm complex.

Orange Lake Sinkhole Intervention

The first record of interest in sinkhole activity and intervention in Orange Lake is from the 1950s during an extended low water period when a sinkhole in the southwestern corner of the lake became visible. Attempts were made to dam the sinkhole to prevent discharge of lake water through the hole. Additional interest in plugging the sinkhole occurred between 1963 and 1964, following several months of declining water levels. Another low water period beginning in 1989

again spurred local interest in sinkhole intervention. The following provides a historical summary of the interest and efforts regarding sinkhole intervention in Orange Lake.

1956-1957 Sinkhole Intervention Efforts

Since the 1950s, a complex of sinkholes in the southwestern section of Orange Lake has been the focus of much attention during periods of low water. During the 1955-57 drought when the lake level was so low that most of McIntosh Bay was dry, it became apparent that large volumes of water were being lost through a sinkhole which had become visible (the first mention of the sinkhole in newspaper accounts of low water at Orange Lake was in the *Marion Sun* 1956). Orange Lake water levels had dropped about 8 feet below normal levels and the lake had shrunk to less than half its normal size. Water from the main portion of the lake was flowing through a narrow channel and then draining out of the lake through the 70 foot-deep and 40 foot-wide sinkhole (Marion Sun-1956, Florida Times Union 1956b, and Gainesville Sun 1956c).

At this time, local individuals proposed plugging or damming the sinkholes to limit flow out of the lake. In 1957, Alachua and Marion Counties agreed to assist local individuals in building a temporary earthen dam between the sinkhole area and the rest of the lake (*Gainesville Daily Sun*, 1957a). The original plan to build a simple earthen dike was unsuccessful. After many delays due to questions of funding and technical difficulties, construction of a temporary dike made of concrete and sandbags began in August, 1957 (*Gainesville Daily Sun*, 1957b) and was completed by October 1957 (Ocala Star Banner 1957a and Gainesville Daily Sun 1957c). Completion of the temporary dike made it possible for the USGS to measure the flow of water into the sinkhole. These measurements indicated that a minimum of 2,500,000 gallons of water a day were lost to the sinkhole. The Marion County Surveyor also determined that the sinkhole does not recharge the lake and should therefore be permanently plugged (Ocala Star Banner 1957a, 1957b and 1957c).

In the next months, Marion County attempted to gain the support of Alachua County in order to plan a more permanent solution to damming the sinkhole. In December 1957, a proposal to plug Orange Lake's sinkhole with steel mesh and floating islands gained support by the Alachua County Commissioners, providing other agencies support the project. The president of the Orange Lake Watershed Association made the proposal explaining that \$300 of steel gauge

wire would be woven into a mat which would be placed over the sinkhole and floating islands would be towed over to the mat (Gainesville Daily Sun 1957d). No other mention of this proposal was found in later newspaper articles.

Ironically only a few months after completion of the sandbag dam, heavy rainfall caused water levels to rise to near normal levels in the lake and chunks of the sandbag dam slumped into the waters. By the end of March 1958, the dike was under water and lake levels had reached 58 feet NGVD (Jessen 1972). One newspaper article reported that by the summer of 1958 water levels were back to normal and fishing was great with "fish biting better than ever" (*Gainesville Sun* 1958a).

1963 Sinkhole Intervention Efforts

Between 1958 and 1963, no mention of plugging the sinkhole was found in newspaper articles. Instead, locals focused on building a permanent dam at the Orange Lake outlet at Highway 301 to replace a dam of rubble that was removed when the highway was 4-laned. This dam was completed in April 1963 (Gainesville Sun 1963). In September 1963, the proposal to plug the sinkhole was revived by a local fish camp operator. This time, he proposed that the sinkhole be filled with rocks from a local quarry. He said that he and half a dozen other local businessmen "want to throw rocks in the hole" to see if the outflow can be halted (Ocala Star Banner 1963a). DuBose issued an appeal for rock contributions and for use of heavy equipment to haul the rocks (Ocala Star Banner 1963b). The Marion County Engineer expressed some concern over this proposal stating that a previous attempt to dam the sinkhole caused muck to gush from the hole (Ocala Star Banner 1963c).

The proposal gained support, however, and by November 13, 1963, approximately 75 wrecked automobiles, a 12,000 gallon storage tank, an old school bus, and tons of boulders and clay had been pushed into the hole in an attempt to stop flow. Local fish camp owners and citrus grove owners raised \$1,400 towards the project and Marion County provided an additional \$2,800 toward the work. According to the Marion County Engineer, enough material had been placed in the 80-foot hole to fill it up to approximately 25 feet below the water surface (Florida Times Union 1963). By December, locals raised an additional \$1,000 to pay for hauling clay to the sinkhole to seal off the plug formed by the debris (Ocala Star Banner 1963d). One local

individual voiced concern over the sinkhole plugging project, stating that he feared that paint and other matter from the old automobile bodies and other debris would contaminate wells in the area (Ocala Star Banner 1963e). Due to significant rainfall, water levels had nearly increased to normal levels by the end of January 1994, just two months after the sinkhole plugging project was complete (Gainesville Sun 1964).

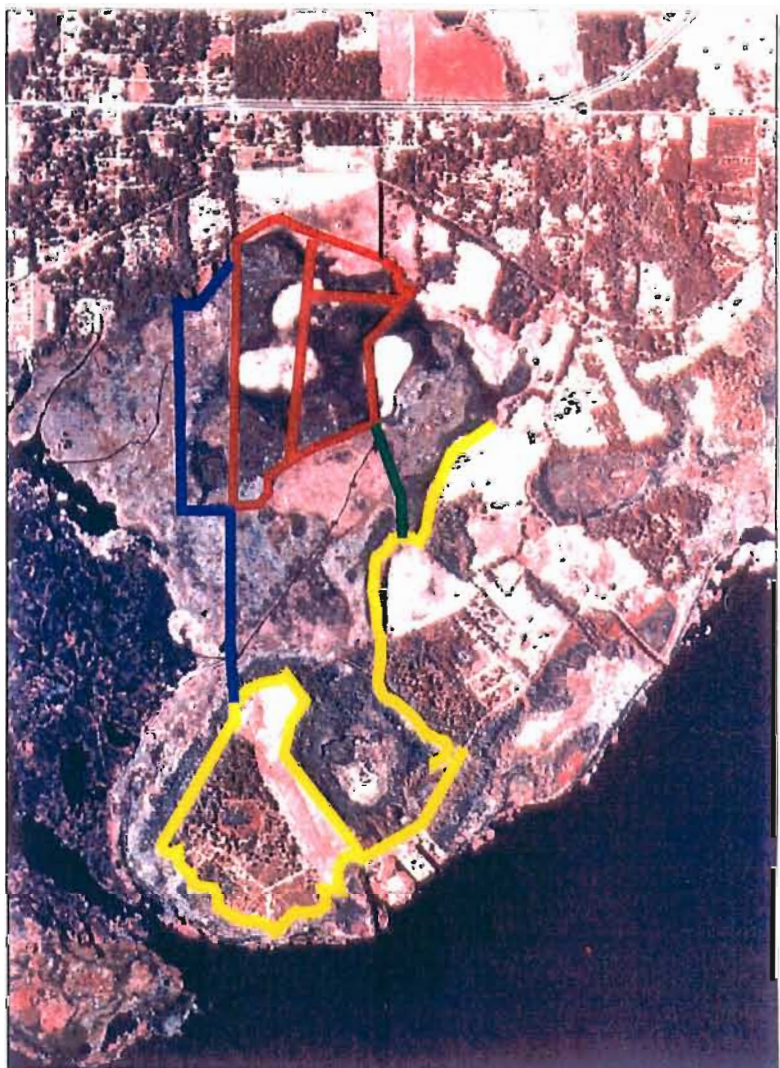
Current Sinkhole Intervention Efforts

Between the fall of 1989 and the summer of 1994, Orange Lake experienced a severe low water period with water levels falling as low as 51.84 NGVD in February 1991. As occurred during the 1950s drought, local individuals became interested in water control alternatives for Orange Lake. An association named "Save Our Lakes" was formed by local residents during the 1990s drought to address the low water issues and lobby for assistance from State agencies and the St. Johns River Water Management District. In August 1992, Orange Lake residents expressed concern that a sinkhole beneath Orange Lake had become reactivated and was one of the culprits of the low water in the lake. Divers, hired by the SJRWMD in 1992, found that water was flowing into a sinkhole cavern about 44 to 45 feet deep.⁶ Following confirmation by divers that water was flowing out of Orange Lake through the sinkhole, residents proposed that the SJRWMD or other agency plug or dam the sinkhole (Gainesville Sun 1992). The SJRWMD, in conjunction with the Orange Creek Basin Advisory Council and the Orange Creek Basin Scientific Advisory Committee, is currently assessing various water level management options for the lake including sinkhole intervention alternatives.

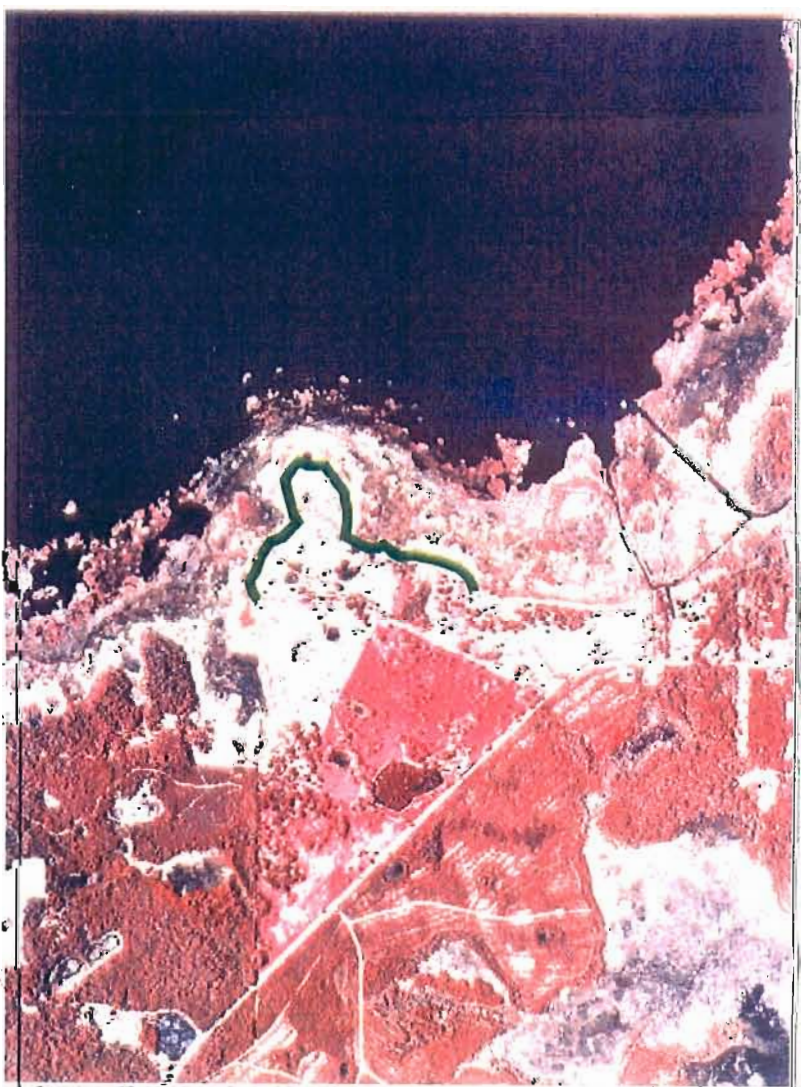
Small Dikes in Various Locations of the Lake :

Figure 5 shows the locations of dikes constructed in three main areas of the lake. Aerial photographs were examined to determine the time periods during which these dikes were

⁶ The divers that explored the Orange Lake sinkhole in 1992 did not find any remnants of the debris that was dumped into the sinkhole in 1963 (Gainesville Sun 8/23/92). However, there is actually a series of sinkholes in the southwestern corner of Orange Lake and the particular hole checked by the divers in 1992 may not have been the same spot where the debris was dumped in 1963. Alternatively, layers of thick muck may have covered up the debris. One individual who lived at Orange Lake during the 1950s and 1960s said that the sinkhole that was plugged in 1963 was located north of the the sinkhole which was examined in 1992 (Frank McKay, pers. com. July 1995). The sinkhole that was examined in 1992 is currently the deepest in the series of holes.



A. Dikes on west side of lake near Samson's Point



B. Dike along eastern shore of lake at Cow Hammock



C. Dikes around McCormick Island
(Dotted line indicates dike breached)

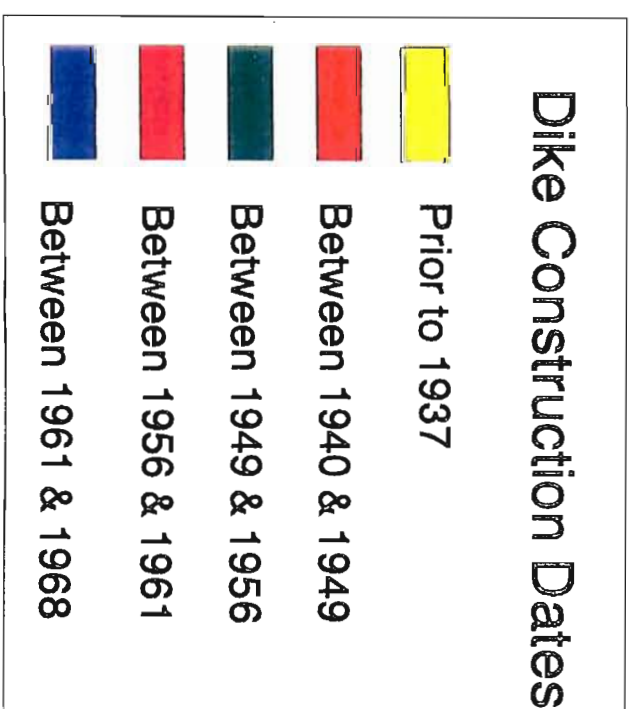


Figure 5: Construction Dates of Dikes in Three Areas of Orange Lake

constructed, as indicated by figure 5. The three areas and the history of the dikes at these locations is described below.

Dikes on western side of lake near Samsons Point

Analysis of historical aerial photos indicates that dikes located on the western edge of the lake on and adjacent to Samsons Point near the town of McIntosh were constructed in various stages. The most lakeward dike running along the outer edge of Samson's Point was constructed prior to 1937. These were possibly constructed to prevent flooding to orange groves which were located on the Samsons Point peninsula. Another set of dikes, landward of the first were constructed between 1940 and 1949. The dike located furthest to the south of this set and a dike that connects this set with the Samsons Point peninsula was constructed between 1961 and 1968.

Dike on eastern edge of lake at Cow Hammock

Historical aerial photos indicate that between 1949 and 1956, the dike at Cow Hammock was built on the Eastern side of Orange Lake just south of Marjorie Rawlings State Historic Site. The dike was likely built in order to extend grazing pasture out towards the lake.

Dikes around McCormick Island

Various dikes around McCormick Island in the southern area of Orange Lake were constructed in several stages between 1940 and 1961, as indicated by examination of historical aerial photos. The most landward or most southern dike was built between 1940 and 1949. The dike skirting the outer edge of McCormick Island was built between 1949 and 1956 and the dike located along the western side of the island was built between 1956 and 1961.

HISTORY OF VEGETATION WITHIN ORANGE LAKE

This section describes historical information from the literature and records and summarizes descriptions given by long time local residents pertaining to the floating islands and vegetation of the area. Appendix A lists the references that were reviewed in search of information on Orange Lake. Historical information found on the floating islands and marshes was limited to small excerpts from books and articles, as well as accounts from long time local residents.

Findings from Eighteenth and Nineteenth Century Literature and Historical Maps

The oldest description of floating islands in Florida the authors found was from the famous 18th century naturalist, William Bartram. Bartram (1792) described floating islands in the St. Johns River: “I... saw...vast quantities of the *Pistia stratiotes*.....It associates in...floating islands, some of them a quarter of a mile in extent, which are impelled to and fro, as the wind and current direct ...In great storms of wind and rain, when the river is suddenly raised, large masses of these floating plains are broken loose, and driven from the shores, into the wide water, where they have the appearance of islets, and float about, until broken to pieces by the winds and waves.....”⁷

Bartram (1792) further described the complexity of some of Florida’s floating islands: “...These floating islands present a very entertaining prospect...We see not only flowery plants, clumps of shrubs, old weather-beaten trees, hoary and barbed, with the long moss waving from their snags, but we also see them completely inhabited, and alive, with crocodiles, serpents, frogs, otters, crows, herons, curlews, jackdaws, ...”

The oldest account that indicates extensive areas of vegetation may have existed in Orange Lake was also found in William Bartram’s *Travels*. In Part II, Chapter VI, he states, “We... pass through a narrow pine forest; when suddenly opens to view a vastly extensive and sedgy marsh, expanding Southerly like an open fan, seemingly as boundless as the great ocean: our road crossing the head of it, about three hundred yards over; the bottom here was hard sand, a foot or more under a soft muddy surface. The traders informed me, that these vast marshes lie on the borders of a great lake, many miles in length, in magnitude exceeding Lake George, and communicating with the St. Juan’s by a river; ...” (Bartram 1792)⁸.

In the 1837 *Territory of Florida*, John Lee Williams discusses a visit to Orange Lake and states “...when this lake is rendered navigable from its head to the Ocklawaha, and thence into the St. Johns River, it will be the depot of the produce of Alachua County”(Williams 1837).

⁷ This type of floating island, which is formed by aggregation of free floating individual plants such as water lettuce (*Pistia*) or water hyacinth, are not found in Orange Lake at the present, due to control directed at these plants, but they could have been in the past.

⁸ It is often difficult to determine exactly what routes Bartram followed and what places he visited, however, the descriptions of his movements preceding and following this passage make it almost certain that he was talking about Orange Lake. At the bottom of the page Bartram notes that the river mentioned is the “Great Ockli-Waha”, and there is no other lake in the area with similar connections that comes close to fitting the description. Historians know that

Although it is unknown what Williams is referring to when he says “when this lake is rendered navigable,” it is possible that he is referring to Orange Lake or Orange Creek being clogged with vegetation.

Evidence that floating islands were a common feature of Orange Lake during the 1800s is found in General George A. McCall’s 1868 *Letters from the Frontiers*. In his discussions of camping along the shores of Orange Lake, General McCall tells the story of seeing floating islands:

“We reached the shore of Orange Lake, that fairyland of gorgeous vegetation. What a charming view was presented to my eyes. As the sun was past the meridian, I lingered only a few minutes to look at a green island which at a distance of half a mile raised its head above bright waters. The following morning, I looked out upon the lake when, to my no little surprise, the island I had observed the previous day had disappeared and, on further examination, the water of the lake seemed to have receded from the shore nearly a hundred yards. It was not until I walked down to the lake that I discovered that the island I had noticed the day before had drifted with the wind against the shore where I stood. These floating islands, as I afterwards learned, are found in many parts of Orange Lake.”

Other evidence that floating islands were an important natural curiosity in the region comes from Webb’s 1885 *Historical, Industrial and Biographical Florida* which includes a drawing of “floating islands” in the Alachua County section (Figure 6). The back of a shoreline photo of Orange Lake from the late 1800s states “*Orange Lake...is also a place of unusual interest to the traveler and naturalist. Its waters are almost literally filled with vast floating islands of aquatic vegetation and inhabited by numerous wild fowl and alligators...*” (Figure 7). There is no date on the photo with the above description, but another photo which appeared to be from the same collection was taken during the freeze of 1886.⁹

William Bartram spent considerable time in the vicinity and there is an expansive view of Orange Lake visible from “Bartram’s Trail” (C. Porter, Florida Museum of Natural History, personal communication, 1997)]

⁹ Mr. W.J. Crossby, resident of Citra, Florida has a collection of photos of the Citra area taken by a Professor Hoyt of Manchester, Iowa. The photos were called “Hoyt’s Florida views” and were to be used with a stereoscope.

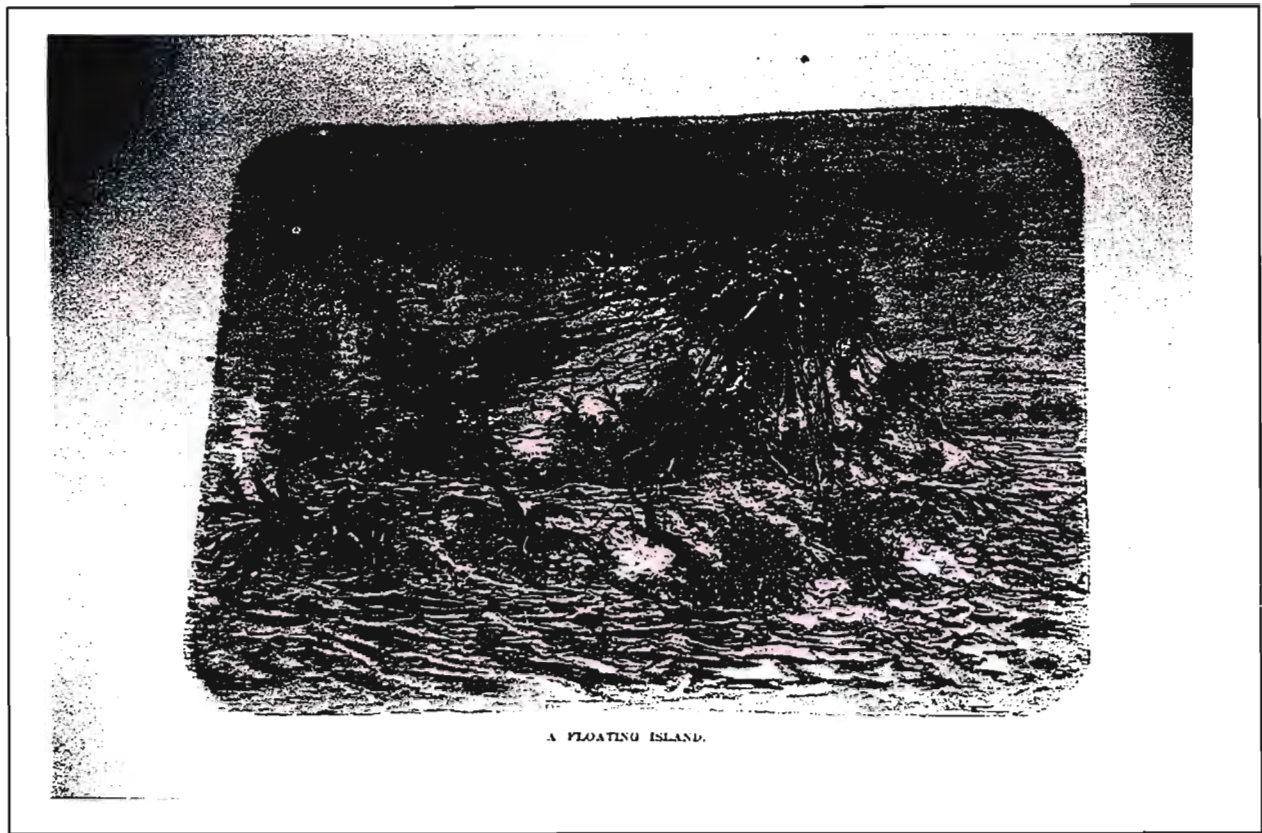


Figure 6: Copy of 1880's Painting of Floating Island in Alachua County.
(Source : Webb 1885).

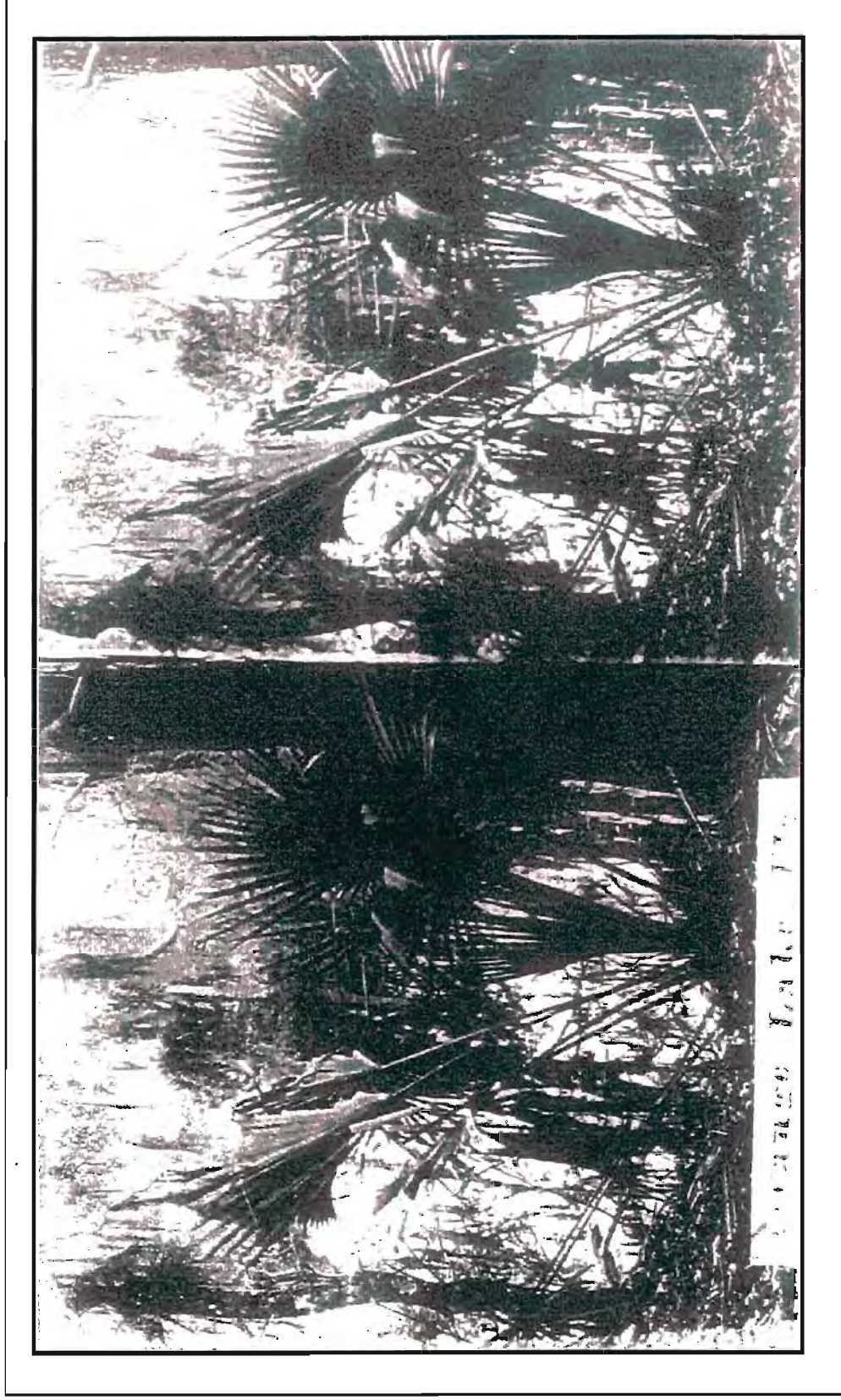


Figure 7: Stereoscopic photo of the shoreline at Orange Lake. ca. late 1800s.
The following text appeared in type on the back of the stereoscopic photo:

"...Its waters are literally filled with vast floating islands of aquatic vegetation and is inhabited by numerous wildfowl and alligators."
This photo was one of a series called "Hoyt's Florida Views" taken by a Professor Hoyt of Manchester, Iowa.
Source: Mr. W.J. Crossby, Citra, Fla.

Survey maps of Orange Lake dating back to 1833 were obtained from the Florida Department of State Archives. An 1833 map covering the southeastern portion of the lake (Township No. 12, Range No. 22S & E) shows the extent of Orange Lake at that time (Figure 8). An 1839 map of Orange Lake drawn during the Seminole War in Florida indicates extensive areas of vegetation existed along the margins of the lake¹⁰ (Figure 9). The map indicates that the lake bed did extend past Shand's Dike to the area that is now the muck farm. Unfortunately, the survey map and the accompanying field notes do not indicate the amount or type of vegetative cover or the density of vegetation within the lake.

An 1893 U.S. Geological Survey topographical map of Orange Lake indicates that the section known as the P.G. area in the southeastern section of Orange Lake was vegetated in 1893. As seen on a copy of the 1893 map, vegetation symbols cover the section from 2 miles west of the railroad to Orange Creek; however, the map does not indicate the density of vegetation or whether it was floating or emergent (Figure 10). This map also illustrates that the area which is now Shand's Muck Farm was part of Orange Lake at the time the map was made.

Findings from Twentieth Century Literature, Documents, Maps, and Interviews with Local Residents

General Descriptions

A letter dated 1903 from the U.S. Department of the Interior (DOI) agent, E.D. Stanford, regarding W.N. Camp's proposal to drain a portion of Orange Lake, states that the area he visited had *"...anywhere from 3 to 8 feet of water and certain portions were covered with floating islands of vegetation and sawgrass."* In the end, the U.S. DOI agent denied Mr. Camp the right to drain the area because it did not meet the definition of swamp land, but was considered part of the lake itself¹¹ (Knetsch 1989).

¹⁰ This map was a field map drawn by a Lieutenant in the US Army during the Seminole War. Source: U.S. National Archives Cartographic Branch. Maps, etc. relating to the seat of war in Florida... 1836-1842 (Seminole War), Copies at University of Florida, P.K. Yonge Special Collections Library.

¹¹ In the early 1900s, it was legal and acceptable to drain swamps. Mr. Camp may have tried to make the case that floating vegetation in Orange Lake was swamp, but the DOI agent determined that the floating vegetation was part of the lake itself and could not be drained (Knetsch 1989).

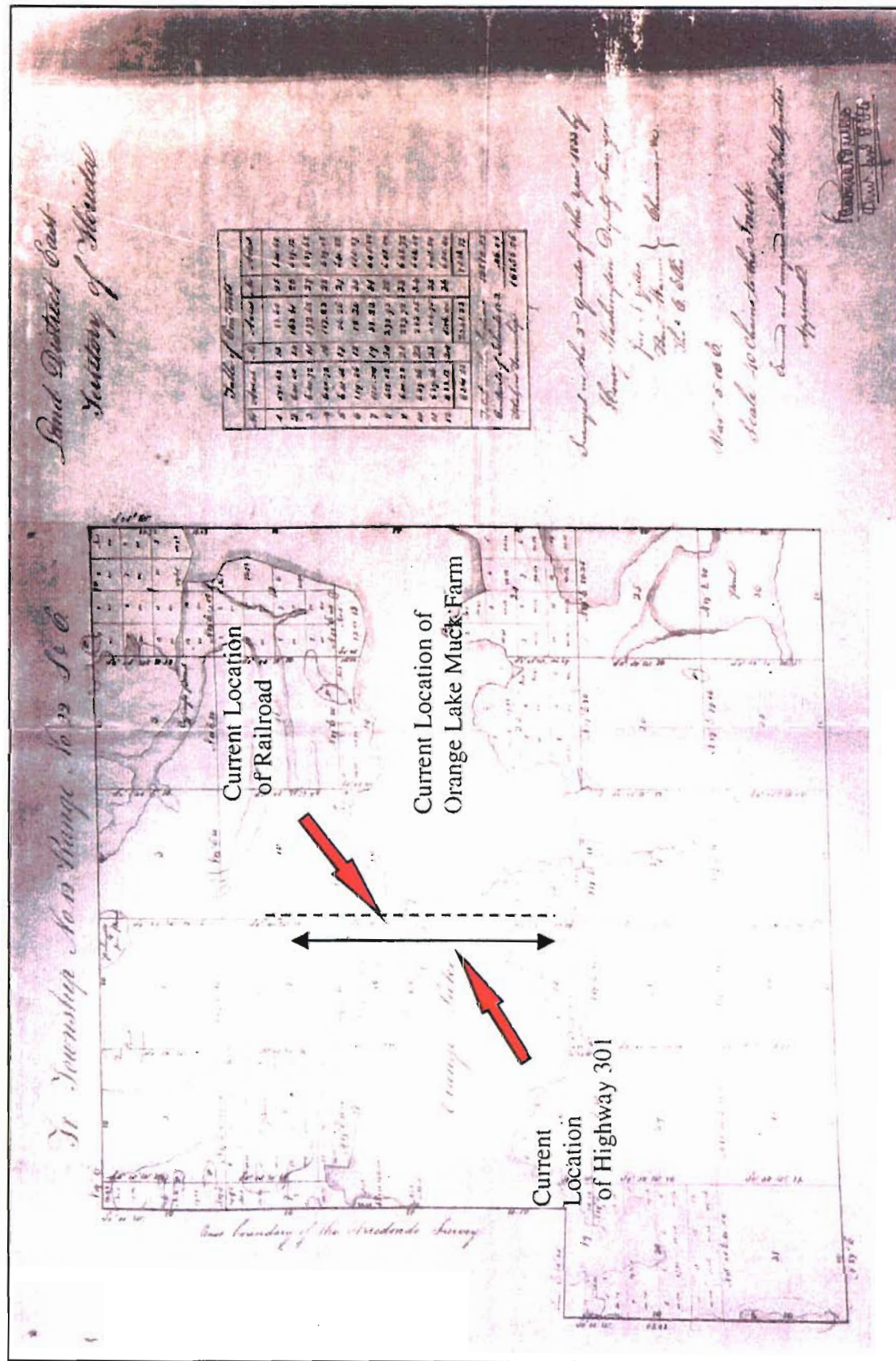


Figure 8: 1833 Survey Map of the Southeastern Section of Orange Lake. Text on map says "Surveyed in the 2nd quarter of the year 1833 by Henry Washington Deputy Surveyor"

Source: Florida Department of Environmental Protection, Bureau of Survey and Mapping.

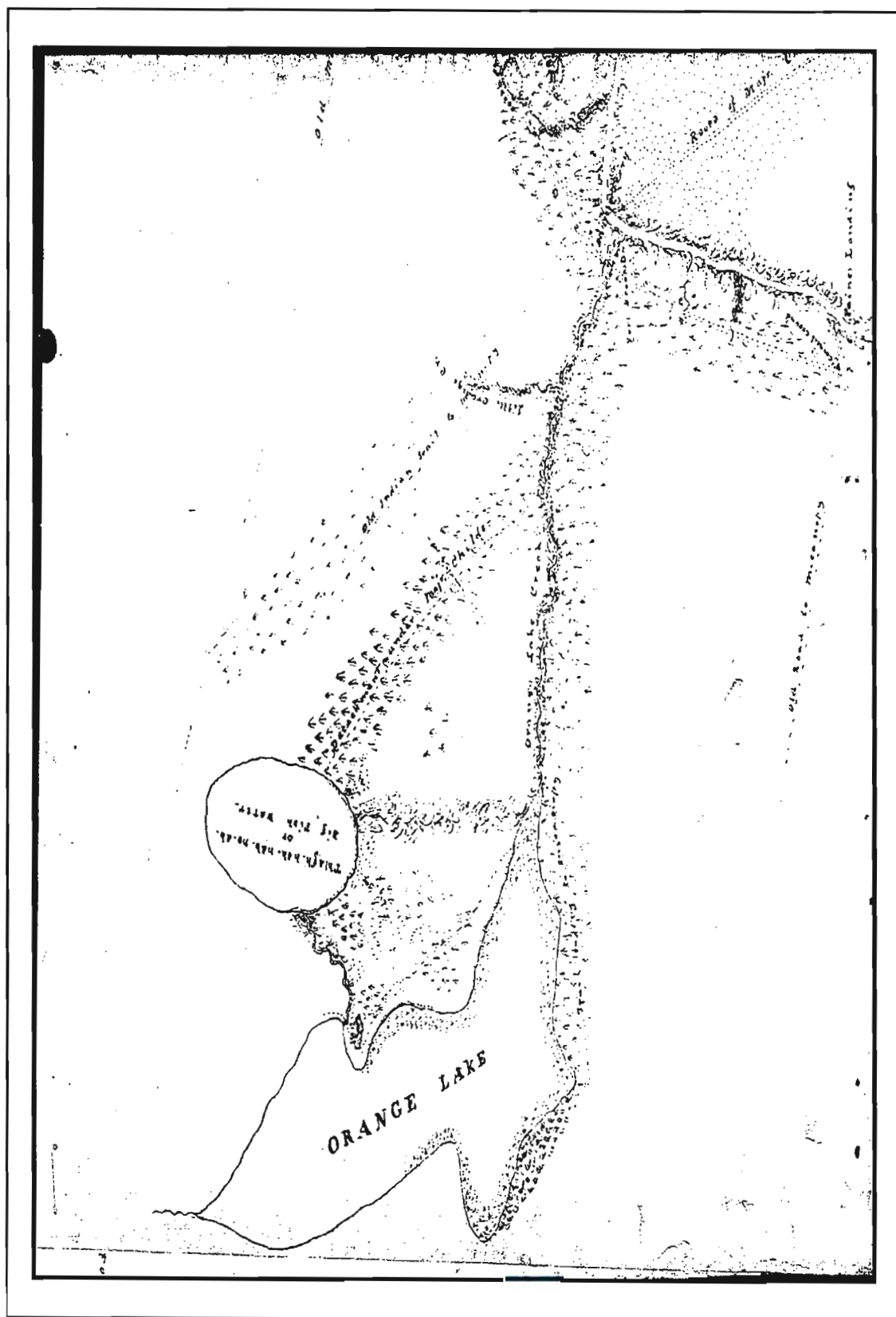


Figure 9: Copy of 1839 Map of Orange Lake and Vicinity Drawn by Lietuenant in the Army During Seminole War in Florida.

Source: P.K. Yonge Special Collections Library at the University of Florida, File - "Maps Relating to the Seat of War in Florida 1836-1842"

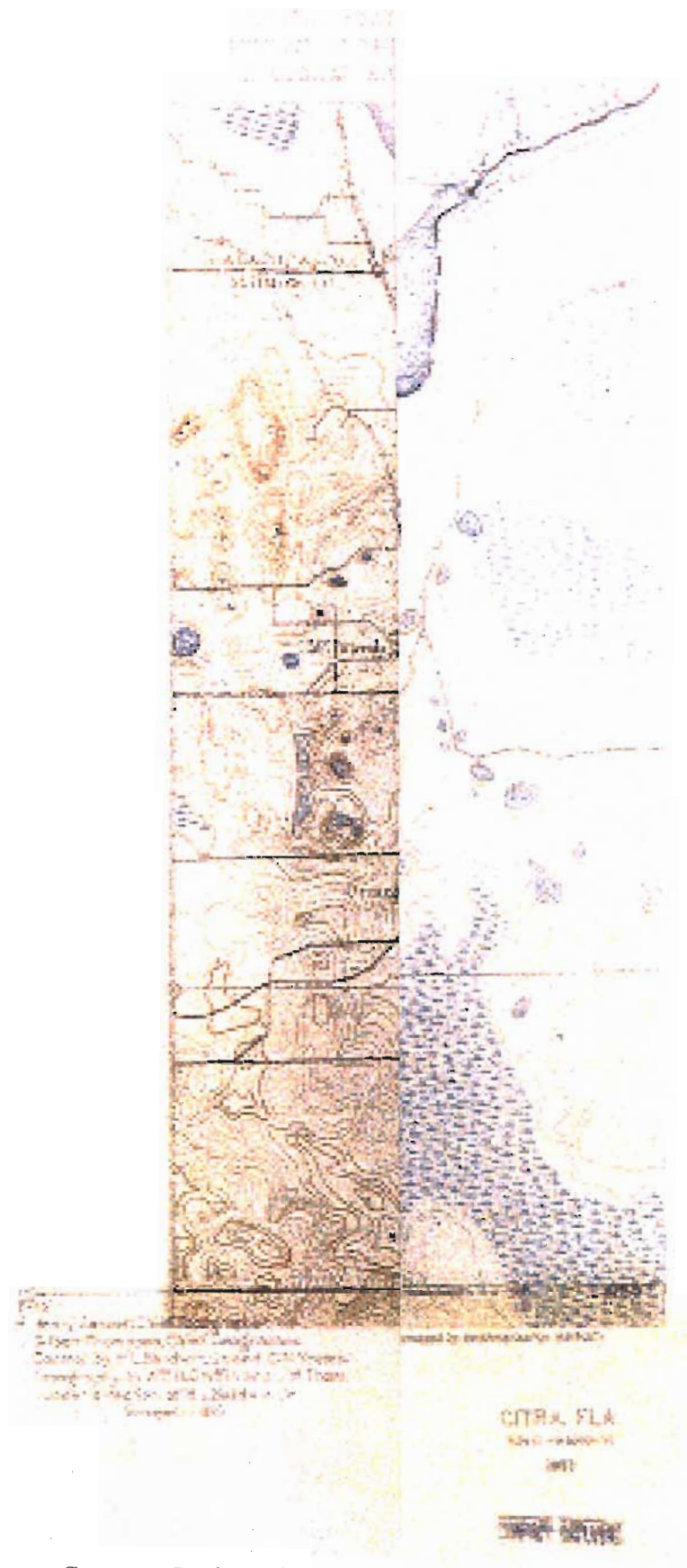


Figure 10. 1893 Map of Orange Lake. Source: University of Florida Map Library.

Source: University of Flo

A 1911 article appearing in Bird Lore magazine also reveals that there were large areas of marsh and floating islands in the lake at the time. This article states that Bird Island, located in the southwestern section of the lake was approximately 36 acres, 9 of which were willows and other shrubs, and the rest were marsh. The article also states that the adjacent Saw Grass Island and Red Bird Island were 25 and 5 acres, respectively. It says that “several large, nameless ‘tussocks’, or grassy, floating islands, all rich in bird life” are scattered around the lake (Philip 1911). Bird Island was acquired in 1910 by the National Audubon Society for \$250 in order to protect birds from plume hunters. It became the Society’s first bird sanctuary and soon after, they hired a warden to protect it (Pearson 1941). A 1911 newspaper article described the Audubon Society’s acquisition of Bird Island on Orange Lake and quoted excerpts from the report in *Bird-Lore* cited above.

Of particular interest regarding Bird Island is Marcus’s (1953) statement that the Sanctuary, a fairly substantial island, originated as a floating island. Bird Island is shown on the 1893 map of Orange Lake and it appears to be larger than it is currently. Interestingly, however, neither Redbird Island, a neighboring island also heavily used by nesting waterbirds, or Sawgrass Island, which was mentioned in Bird-Lore, are shown on this map. Although it is possible that these islands were simply left off the map for some reason, it seems more likely (since several other islands are indicated on the map in this general region) that neither Redbird Island or Sawgrass Island had formed at the time the 1893 map was created. This suggests that both may also have originated as floating islands. It is not known what Sawgrass Island was; there is no large island currently in this area that is covered with sawgrass. It is possible that Redbird, a very small island in 1911, joined with Sawgrass to make the current Redbird Island which is larger than Bird Island. Later aerial photos show that Redbird Island is at times dissociated into several islands. In any case, these descriptions illustrate the dynamic nature of these floating islands. In 1998, SJRWMD staff observed a large floating island on the eastern edge of Orange Lake that had blown in from another location. Due to the characteristic vegetation of this island, SJRWMD staff believe that it was a portion of Bird or Redbird Island that broke off and was blown to the other side of the lake.

Floating islands were a common feature of Orange Lake in the 1920s, 1930s, and 1940s, according to residents who have lived in the area for 65 to 86 years (Mr. J.T. Glisson, Mr. Snow

Slater, Mr. Dorcey Townsend, Mr. John Henry Balknight, and Mr. Horace Drew, personal communication, July 1995). The floating islands were called *tussocks*¹² by the local people and were considered to be a natural part of Orange Lake. Several long-time residents stated there used to be more tussocks in the past and they were now recently reappearing on the lake (Mr. J.T. Glisson, Mr. Snow Slater, Mr. Dorcey Townsend, Mr. John Henry Balknight, and Mr. Horace Drew, personal communication, July 1995).

Mr. J.T. Glisson stated that when he was a boy in the 1930s, tussocks surrounded the lake. According to Mr. Glisson, the locals would say that when you saw bubbling in the lake, blocks of muck would float to the surface and within a few days, become vegetated. Eventually the roots would tie the mat together and it would float. On dense tussocks, one could lay a board down and walk on them. Once the floating islands lodged against the sides of the lake and became rooted, the locals called them *shore tussocks* (J.T. Glisson, personal communication, July 1995 and Milton Hicox, personal communication, October 1996).

In Mr. Glisson's book, *The Creek*, he frequently mentions tussocks and even says one local individual used to sleep on the tussocks after he had too much to drink (Glisson 1994). Margorie Kinnan Rawlings, Pulitzer Prize winning author, mentions tussocks several times in *Cross Creek*, and also accounts the story of the locals looking for an inebriated friend in the tussocks:

"... We'll cover the lake with the kicker, then if we have to, we'll portion out the lake and cover it closer. A boat can lodge up against a tussock and you not see it for the marsh grass. The tussocks move around so bad, too." "It's his business gettin' drunk, but he'd ought to had more consideration for his friends. I paddled past that tussock a dozen times. Now tell me if you aimed to pitch a long drunk, would you pick out a floatin' tussock to do it in?"

Floating islands received a considerable amount of attention in magazines and articles during the first part of the 20th century. A 1937 newspaper article from the *Gainesville Daily Sun* titled "*Visitors spend night on floating island as rowboat overturns*" describes an event on

¹² The terms "tussock" and "floating island" are used by some individuals to refer to expansive floating marshes that

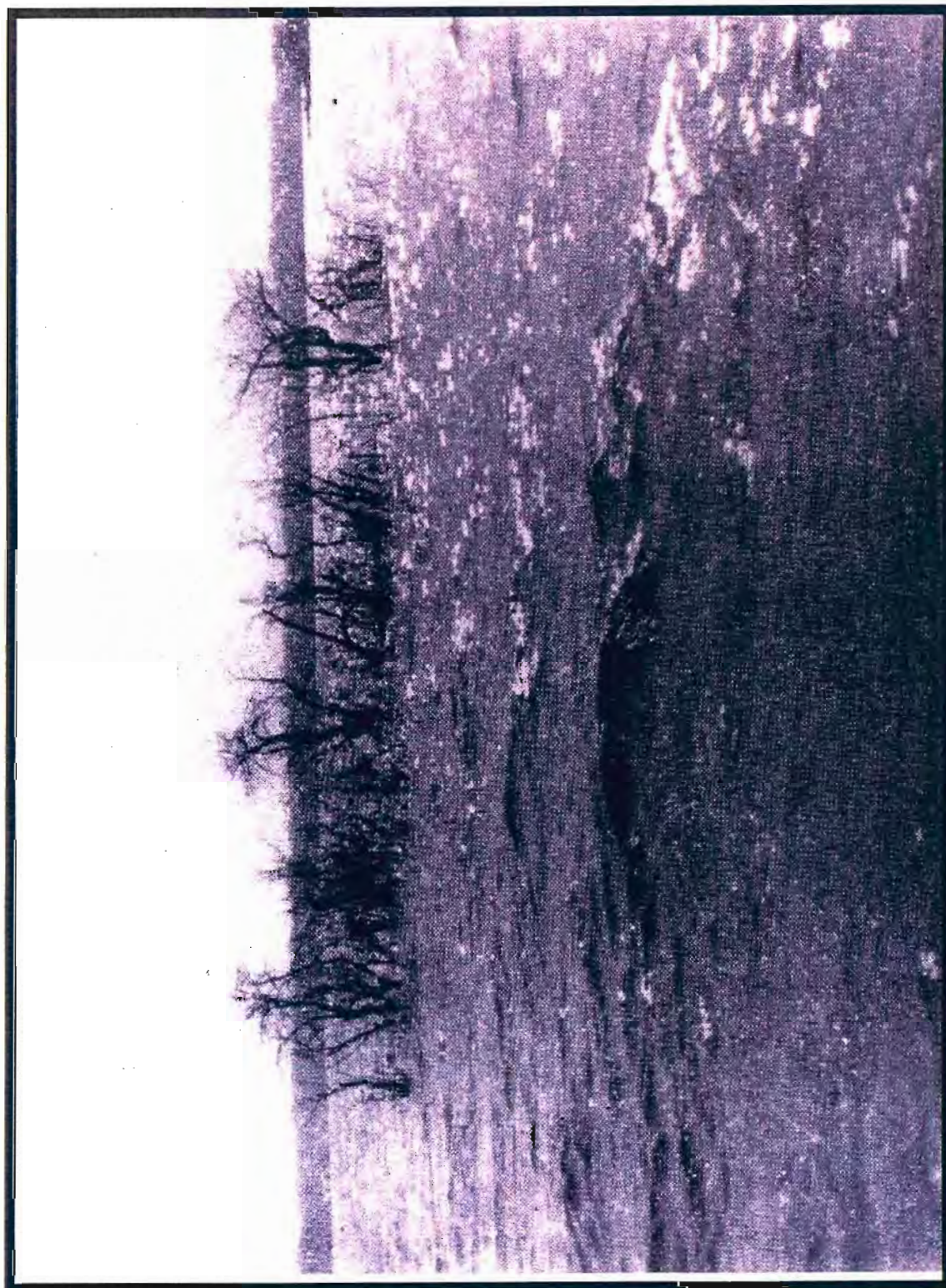
Orange Lake (*Gainesville Daily Sun* 1937). The following was an excerpt from an article on floating islands in *Nature Magazine* in 1948:

"Bushes and even trees grow on the larger floating islands. One cypress tree reached a height of twelve feet and a water maple rose even higher. At certain seasons of the year, the floating islands of Orange Lake are fragrant with masses of spider lilies in bloom, purple loosestrife grows in profusion, and elderberry and buttonball bushes take root, as well as wax myrtle and sawgrass." (Teale 1948).

Edwin Way Teale devotes a whole chapter ("Lake of Floating Islands") to Orange Lake floating islands in his 1951 book, *North with the Spring*. In this book, Teale repeats a local legend that Native Americans buried their dead on the floating islands of Orange Lake and believed their souls went to the "Land of the Sure" when the floating islands sank. The islands would often sink below the water surface during the winter months and rise during the spring and summer months (Figure 11) (Teale 1951). Teale described floating islands containing 12 to 18 foot tall cypress and red maple trees. In some cases, trees eventually fell over, pulling the floating mats up and over them. One island had a 1 foot diameter maple which eventually became too heavy and fell straight through the center of the island (Teale 1951).

Marcus (1953) suggests that there are two groups of people attracted to Orange Lake: "...those who come to see the floating islands and those who come to fish." Many local people remembered that Mr. Don McKay, a naturalist who lived in the community of Orange Lake, took people on tours to see the floating islands for 25-30 years. In the 1930s, he advertised his tours on a Highway 441 sign stating "Come see the floating islands..." (J.T. Glisson, personal communication, July 1995, Milton Hicox, personal communication, October 1996). Don McKay owned land along the lake shore where he built walkways out into the lake so that people could view the floating islands. Mr. McKay would often walk onto boards that had been placed on top of the floating islands and give demonstrations of how the islands were constructed by cutting away pieces of the marshes and islands using a crosscut saw (Figure 12) (Teale 1948, and Carlisle

are contiguous with the shoreline in addition to mobile islands of floating vegetation that float around the lake.



Source: Teale 1948

Figure 11. Photo of floating island sinking in Orange Lake.

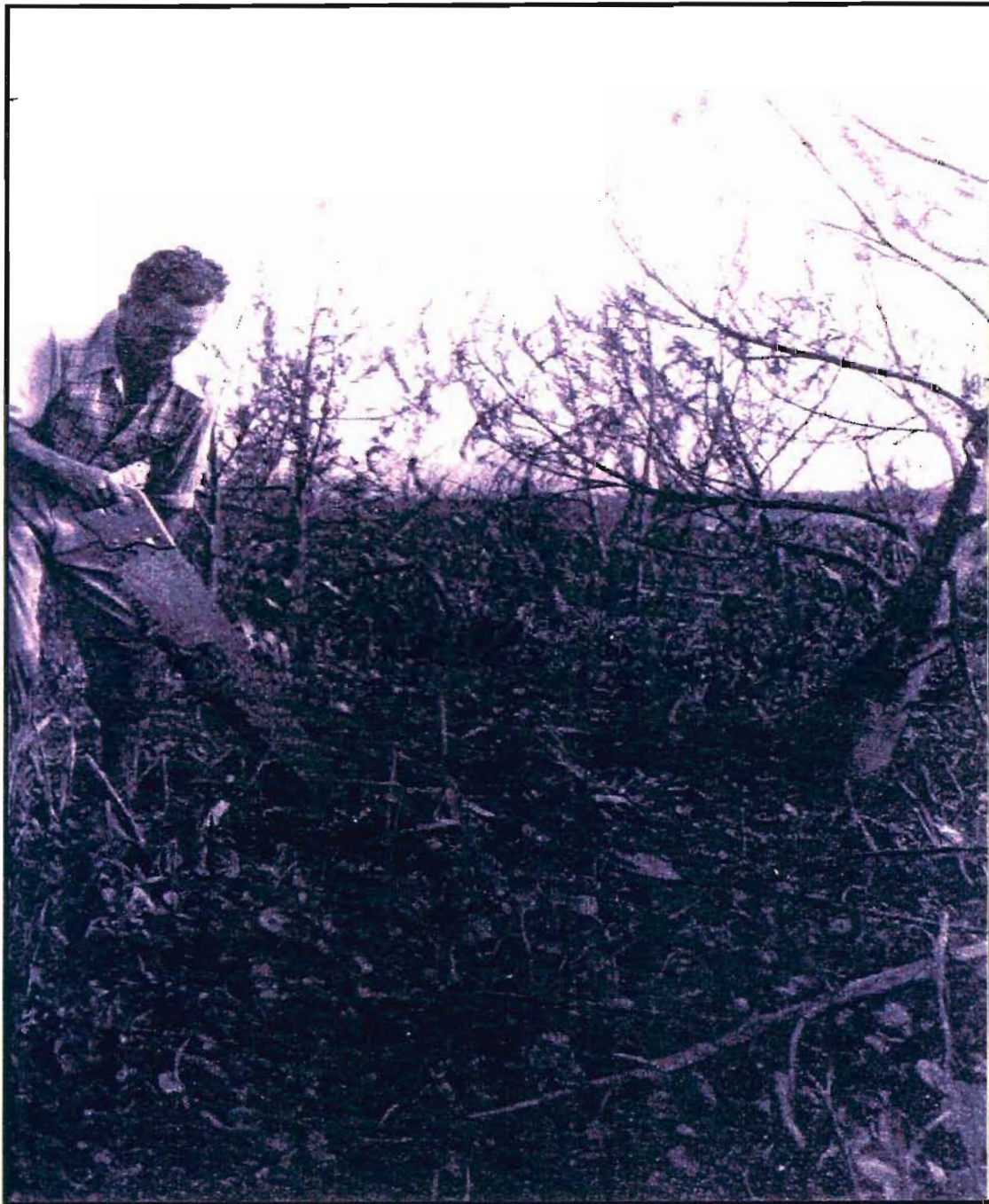


Figure 12: Photo of Don McKay sawing through dense floating marsh while standing on the marsh.

Source: Teale 1948.

and Carlisle 1961). A 1976 newspaper article from the *Gainesville Sun* also describes Don McKay's interest in the floating islands. The article says he called his place along the south shore of the lake "Floating Gardens" and for a small fee he would lead visitors through the gardens and on a boat tour of the lake, describing the vegetation and explaining how the floating islands formed (Figure 13) (Abel 1976). Don McKay built a tour boat for guiding visitors to see the floating islands and nesting birds at Bird Island and even named his boat "Floating Islands" (Teale 1948) (Figure 14). A 1963 newspaper article mentioned that floating islands "...once attracted thousands of dollars into McIntosh..." (Pepper, circa 1963 - copy in SJRWMD newspaper file). An account of McKay's interest and work with the floating islands appeared in *Ford Times Magazine* (Freeman 1960). The article describes how Mr. McKay once saw half a dozen floating islands pop up at almost the same instant when he was using dynamite to clear the channel at the mouth of Cross Creek.

Don McKay died about eight years ago, but his son, Mr. Frank McKay, was interviewed. Frank McKay said his father kept detailed records and photos of the floating islands but a fire in his office destroyed all of them. During a survey trip on Orange Lake on July 26, 1995, Frank McKay recalled how his father would explain the formation of floating islands. His father would say that floating islands formed when chunks of peat floated to the surface. Wave action would cause water lily roots (*Nuphar luteum*) to become dislodged and when the blocks of associated peat hit the surface they would become vegetated within a few days. Frank McKay remembered seeing large areas of muck that had floated to the surface and within a few days were covered with a thin grass (he pointed to a combination of a bladderwort *Utricularia sp.* and a sedge, *Eleocharis baldwinii*). McKay described this method of floating island formation in a 1939 Florida guidebook (McKay 1939).

In his collection of essays entitled *A Naturalist in Florida*, renown naturalist Dr. Archie Carr, recounts his first encounters with floating islands in Orange Lake during the 1930s or 1940s: "*The floating islands of Florida are substantial enduring parcels of land that cruise before strong winds and support a fauna and flora that travel with them. They seem a wholly natural part of the landscape...I once watched an island rookery break loose near McIntosh and on a strong west wind cruise out of sight down the middle of the lake towards Cross Creek ten*

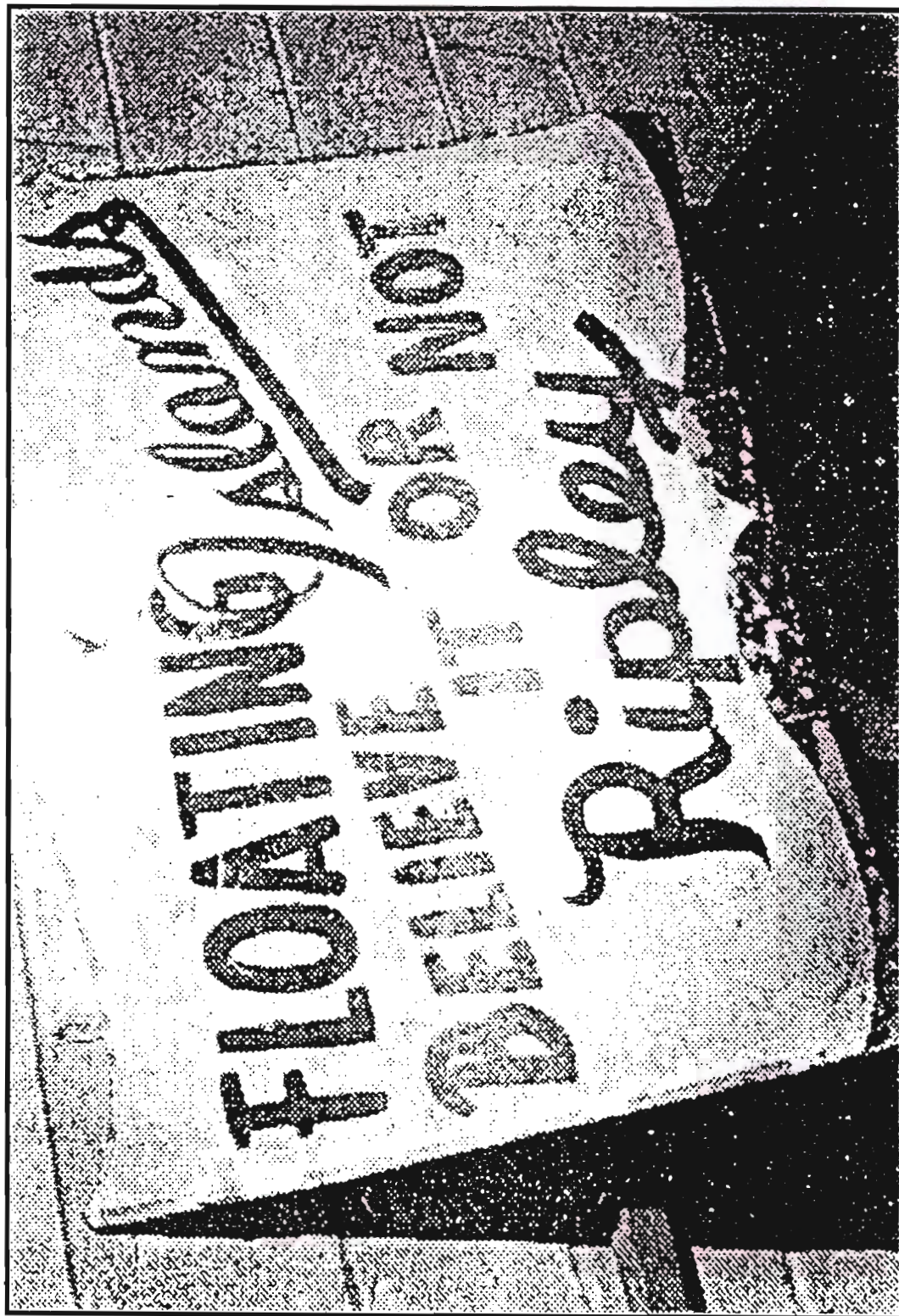


Figure 13: Advertisement for Don McKay's Floating Island Tour Business at Orange Lake (Source: Gainesville Sun December 12, 1976)



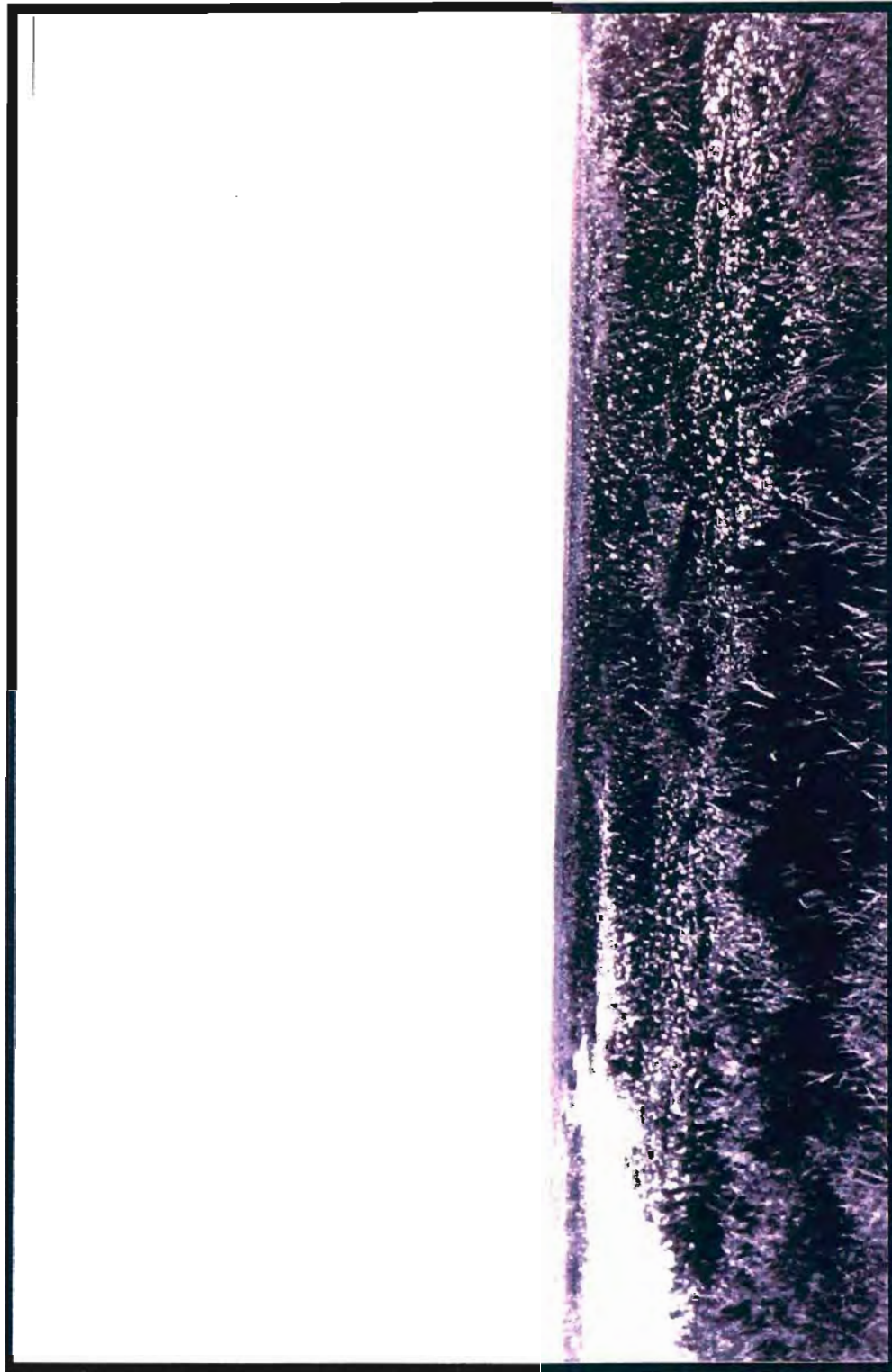
Figure 14: Photo of Don McKay on his tour boat
“Floating Islands.” Source : Teale 1948.

miles away. As you move around the edges of Orange Lake, you may see patches of bubbles, some the size of your boat, others many times as big. The catfishermen say these mark the positions of incipient floating islands destined to rise to the surface" (Carr 1994).

Dr. George Reid who conducted his masters work on black crappie in Orange Lake during the 1940s, described the extensive coverage of the floating marshes in a 1959 article. In it, he states "...in places, this "floating marsh" extends from the true lake shore outward to more than a mile." The following excerpt gives an idea of the biodiversity that he observed in these communities: "The animal life of Orange Lake's floating islands, and the surrounding marsh in general, is as varied and proportionately abundant as is the plant life. This is not surprising in view of the considerable cover, food and microhabitats afforded by the islands' plant communities, their substratum and their "shore line". Reid goes on to provide detailed descriptions of the plant and animal life associated with the floating islands and marshes (Reid 1959). Figures 15,16; and 17 are photos taken by George Reid during the 1940s indicating the vast extent and complexity of the marshes in Orange Lake at that time. Carlisle and Carlisle (1961) also describe the flora and fauna of the Orange Lake islands. They state "Each island holds an astonishing botanical collection. Great sprawling willow, seven-foot-high elderberry bushes, ten-foot pig weeds, and water maples which have been known to grow to 20 feet, are the largest forms of plant life....Marsh rabbits, raccoons and water rats sail about on these mobile homes with newts, mud eels, frogs, turtles, snakes and alligators....Beneath and beside them, at least 35 varieties of fish flourish." The complexity of the islands is described again in the following excerpt: "...the thickness of the floating islands vary from several feet to as much as eight feet. These islands are thus able to support trees as high as 25 feet and from eight to twenty inches and they are quite safe to walk on..." (Johnson 1966). Teale (1951) described the wildlife using the floating islands and stated that fish would concentrate in the areas where islands had popped up (Teale 1951).

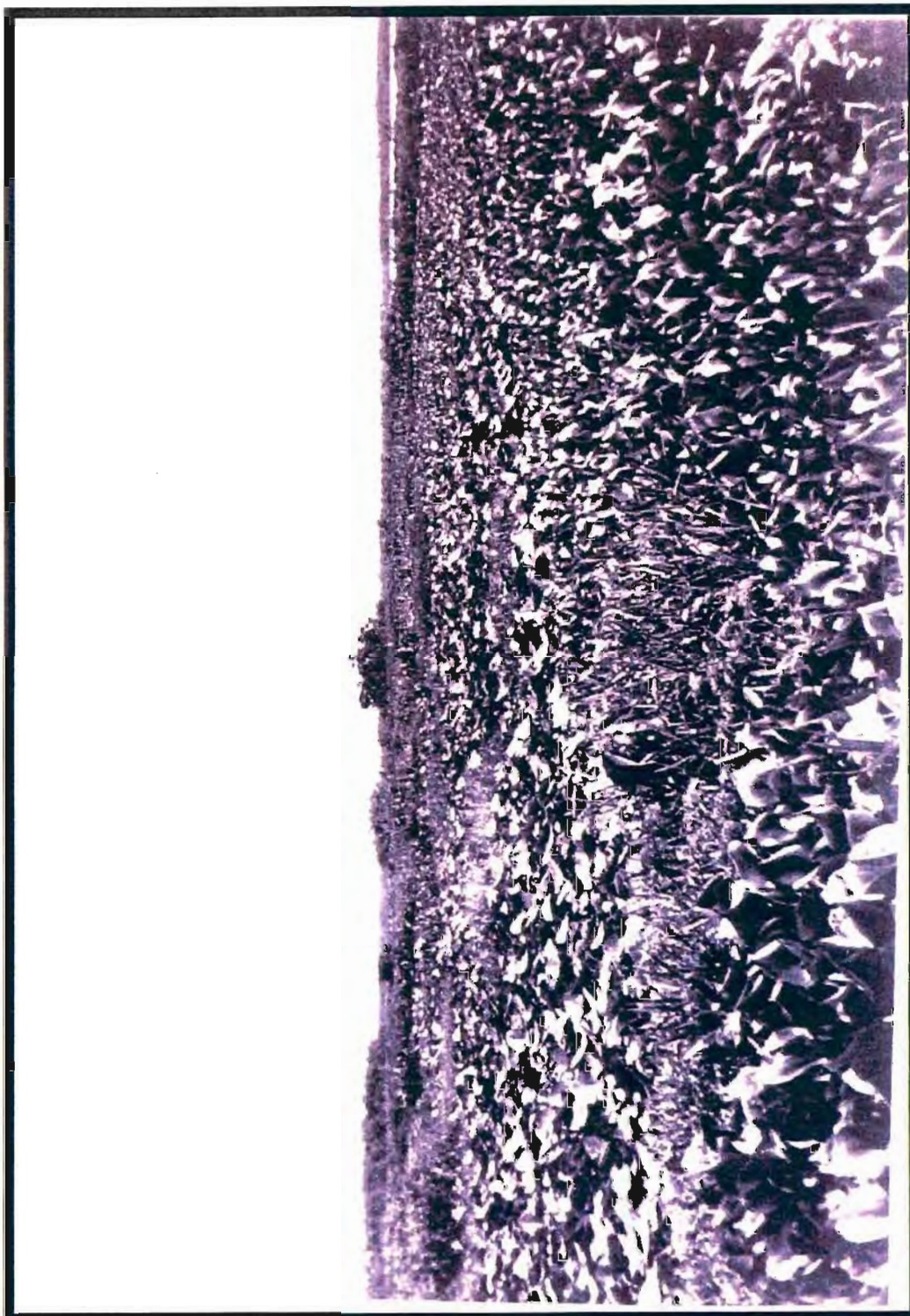
Mobility of Floating Islands

Interviews with local residents indicate that there always has been a considerable amount of movement of floating islands around Orange Lake. Mr. Frank McKay stated that when he was



Source: Reid 1949

Figure 15. 1940's photo of Orange Lake marsh (Likely P.G. Marsh in southeastern section of lake).



Source: Reid 1949

Figure 16. 1940's photo of Orange Lake marsh.



Figure 17: 1940s Photos of Various Orange Lake Marshes.

Source: Reid 1949.

a child during the 1950s and 1960s, there were usually a few substantial islands present at one time moving around the lake. Some were as large as an acre and some had trees 6-8 inches in diameter. He distinctly remembered some islands with cypress trees on them moving all over the lake. They would eventually end up close to shore and become rooted. He indicated that a group of red maple and cypress trees along the shoreline to the north of Heagy Burry Ramp at the time of our visit used to be a part of a floating island that had been tied down by the owner of the fish camp in order to shade the front of his property. The fish camps around the lake were a little wary about the floating islands as they would occasionally clog up boat paths; but, "they would just get out there and move them." People would move floating islands with boats or wait for winds to move them (Figure 18).

Local fishermen knew they must have an alternative boat landing spot when they went out on the lake because winds would often blow the tussocks around during a day so that a landing spot you used in the morning would be inaccessible in the afternoon (J.T. Glisson, personal communication, June 1995). A 1966 newspaper article described the mobility and diversity of the floating islands with the following statement: "...*these islands can be seen sailing from place to place, with the trees that grow on the islands acting as sails...*" (Johnson 1966).

Mr. W.J. Crossby of Citra, who grew up in a citrus farming family stated that the tussocks would often form a plug in the P.G. area, flooding the farms further south. Locals constructed a V-shaped contraption made out of cross saws that was used to move tussocks by pulling them with a boat. They would take care of the problem before the orange groves became flooded (W.J. Crossby, personal communication, June 1995). According to Frank McKay, on one occasion his father and a friend were on the lake near Highway 301 when an island blew in behind them, blocking their exit. They were stuck for over a day and apparently were unable to push the floating islands out of the way on this occasion. A search party was sent out, but eventually the winds shifted, the floating island moved, and Don McKay and his friend were able to return.¹³ A newspaper article states that Mr. McKay would often speak "... *humorously of putting these floating islands in one place at night and waking up to find them in another the next morning, of*

¹³ Ms. Marjorie Karow of McIntosh, had also told this author that Don McKay was once lost in the tussocks and that she remembered it being in the Ocala Newspaper at the time.

PULLING A FLOATING ISLAND, MC INTOSH, FLA., U. S. 441

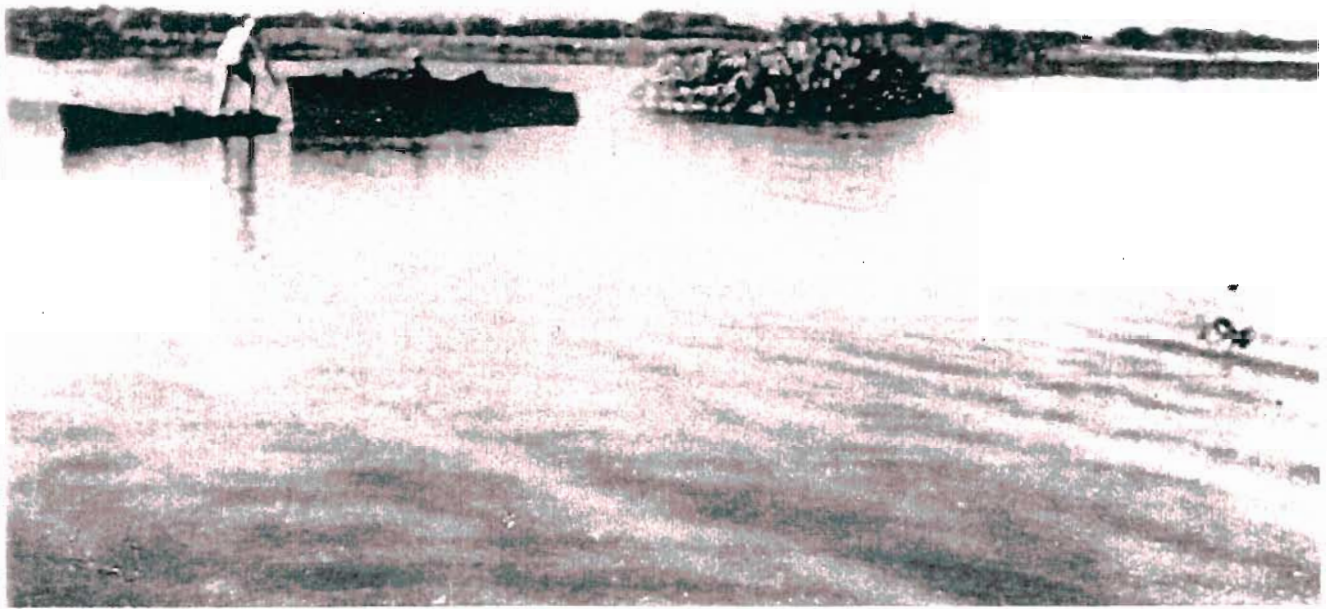


Figure 18 : Photo of a post card showing the pulling of a floating island in Orange Lake using boats (Source of photo: Florida State Archives, date unknown).

staking them down so that he will have at least one to show visitors who come, skeptically, to be shown that these floating islands do indeed float" (Patterson 1972). Don McKay always carried a crosscut saw on his boat to cut floating islands apart during times when they blocked him in (Teale 1948).

Carlisle and Carlisle (1961) tell the story of a fish camp owner on Orange Lake who was persistently annoyed by a floating island that blocked his boat dock. Finally one day, he decided to try to blow it up with dynamite. To the fish camp owner's dismay, the original floating island was not harmed and four additional floating islands were created as a result of the dynamiting.

A study recently conducted in Orange Lake regarding wildlife use of floating and emergent vegetation documented the movements of floating islands over time (Williams et al. 1997). The highly mobile nature of some of these floating islands is represented in Figure 19 which shows the locations of one floating island over a two month period. SJRWMD staff also documented that one floating island, containing several red maple (*Acer rubrum*) trees approximately 20-25 feet tall, zig-zagged across the lake during the summer of 1996. A wood duck box on one of the red maple trees on the island makes this island very distinctive. The island was grounded for at least a year before it began moving, as it was observed in the same spot near P.G. Run by staff between the Spring 1995 and June 1996. In June 1996 the island started moving following a heavy storm. It was observed several weeks later near Cross Creek and a few days later on the opposite side of the lake. It has been in the same spot on the west side of the lake since July 1996 (Figure 20).

P.G. Run Area - Southeast Area of Orange Lake

There is considerable current debate over the extent to which vegetation is accumulating in Orange Lake. In particular, some individuals believe that vegetation is accumulating in the P.G. area (southeast area of the lake) because the highway and railroad prevent vegetation from leaving the lake. However, several long-time residents state that the P.G. area has always been densely vegetated (J.T. Glisson and Snow Slater, long-time residents of Cross Creek, personal communication, July 1995). Mr. J.T. Glisson also stated when he was a child at Cross Creek in the 1920s and 1930s, older people would tell stories about P.G. marsh

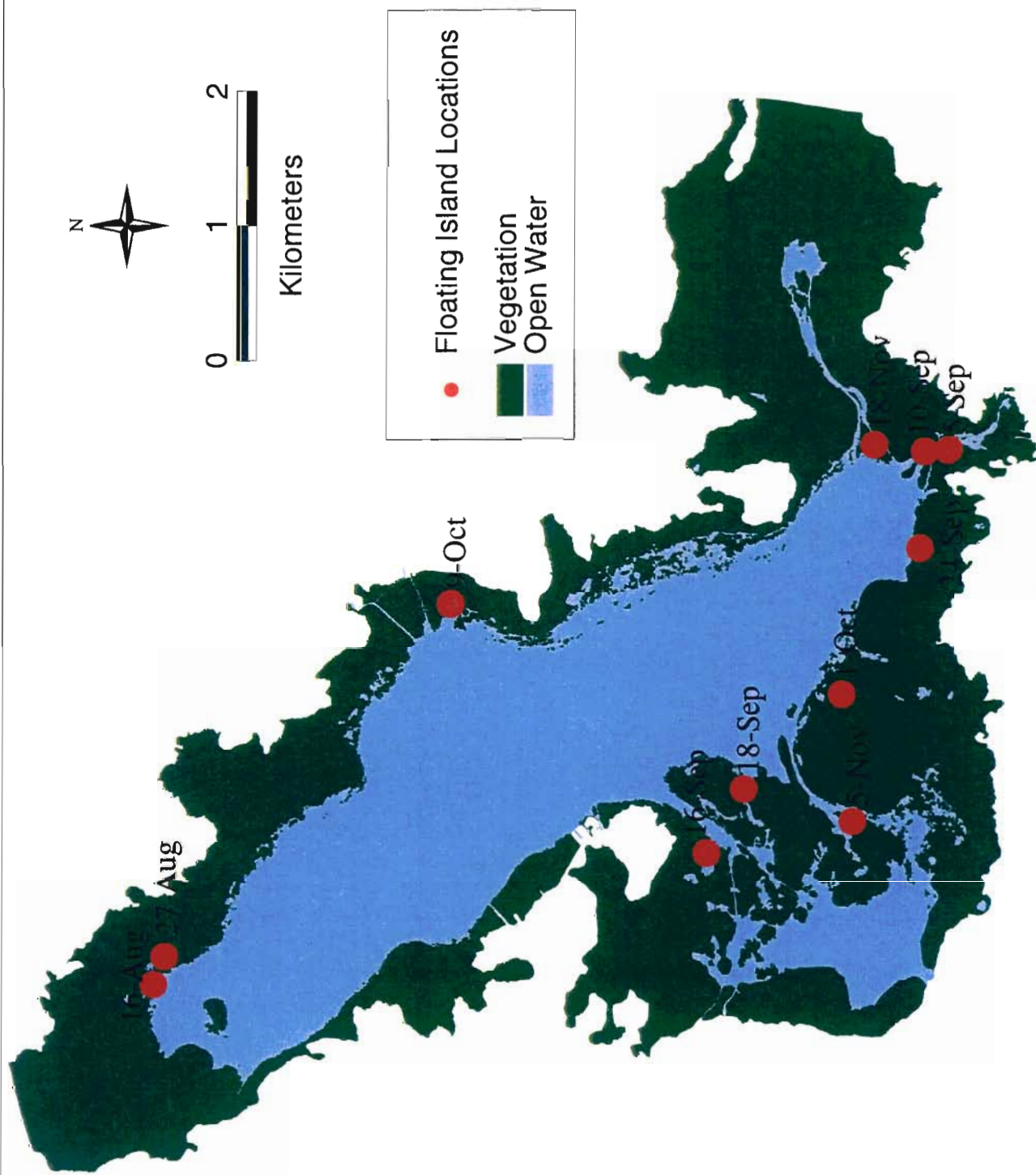


Figure 19: Locations within Orange Lake of a single floating island over a three month period in 1996. Source: Williams et al. 1997





Figure 20: Photo of mobile floating island with trees on Orange Lake.
During the Summer of 1996, this island was blown back and forth across the lake.

and how it has always been a dense marsh (J.T. Glisson, personal communication, July 1995).

Figure 15 is a photo taken in the 1940s of the P.G. marsh area looking west.

Mr. Milton Hicox, resident of Island Grove for more than 50 years, recalled that the name P.G. referred to an area of clear water about 3/4 mile long and 1/4 mile wide in the southeast corner of the lake that was surrounded by marsh and floating tussocks. Mr. Hicox said that a long time ago you could not reach the P.G. area through Orange Lake due to vegetation blocking the path. Instead, he remembered that you had to reach the open water area from a boat trail cut from the eastern shore of the lake. Many people used to get stuck out in P.G. due to the difficulty in finding the trail back through the marsh (Milton Hicox, personal communication, 1996). As mentioned earlier, the 1893 map of Orange Lake indicates the P.G. area was marsh; however, the density and type of vegetation is unknown. How much of an impact the highway, railroad, dike, and weir have had on lake vegetation is unknown.

Historical accounts of the Orange Lake water levels and relationship with floating vegetation

A relationship between low water periods and floating island formation has been suggested in various historical newspaper articles. As mentioned earlier, between 1955 and 1957, Orange Lake experienced a severe drought causing water levels to fall approximately 7 to 8 feet below normal. During and following the drought, the following excerpts describing the probable return of floating vegetation with rising water levels, appeared in newspapers:

"...the photo... gives some idea of the growth that has shot up from the fertile bottom soil. Some people believe these will float as tussocks or small islands when the lake again is filled with water..." (Source - unknown, see SJRWMD 1992).

"...only spots of open water can be seen because of the tall growth that was established while the lake bottom was dry. Some of these plants already are floating on beds of silt, and observers are wondering how much will remain afloat as the water deepens. The floating islands in the lake, shifting with the winds have for years been considered nuisances by the fishing camp operators, although at one time they caused many tourists to be attracted to the lake. These big islands have now attached themselves to the bottom

of the lake bed, and there is a question as to whether or not they will again rise with the rising water (Ocala Star Banner 1956).

“The floating islands which had brought the lake nationwide attention were floating no more. They were just part of the bottom mud....The lake came back. The floating islands, some of them more than 150 feet long and complete with small trees and nesting birds, are floating again. They are really show pieces. Leo McMullen, manager at the Lake Orange Camp, has one he loves to show the customers. It’s afloat, but pivoted to the bottom in its center. With a husky outboard he can turn it around on that pivot like a cart wheel. The ones not at all attached to the bottom may travel to the far end of the lake on one wind, and come back when the wind reverses.” (Trumbull 1958).

According to J.T. Glisson, in the late 1930s, the U.S. Army Corps of Engineers (USACOE) cleared out Cross Creek.¹⁴ This would have been several years following the drought of 1931. Black and white aerial photos from 1937 indicate that Cross Creek was almost completely blocked with vegetation at that time and there were numerous floating islands all over the lake. An article in the *Gainesville Daily Sun* dated November 20, 1938 said “Cross Creek...has been cleared by U.S. engineers and is now accessible for use by fishermen and hunters...According to J. R. Fowler of Gainesville, the creek was a main artery of water traffic in the 1880’s but since that time has been little used due to obstructions and heavy growth” (Gainesville Daily Sun 1938).

In late 1957, following a prolonged low water period, Orange Lake residents proposed a unique method to temporarily dam the sinkhole in the southwestern section of the lake. The sinkhole had become exposed as water levels receded and this proposal, as described in a newspaper article, suggested using 10-gauge steel wire and floating islands in Orange Lake to block up the sinkhole (*Gainesville Sun*, 1957c).

Hinkle (1993) states that in 1978 when water levels increased by 4 feet following a two year low water period, floating islands as large as 4 acres formed when shoreline vegetation was

¹⁴ Mr. Glisson remembers this clearly because Mr. Driggers, the man working for the USACOE rented a room from Mr. Glisson’s parents. It took several months for Cross Creek to be cleared out (J.T. Glisson, personal communication, June 1995).

uprooted. In 1979, 46 acres of floating islands containing shrubs, and herbaceous plants were chemically treated. Remnants of the shrubs on some these islands remained (Hinkle 1993).

Orange Lake water levels were extremely low in the early 1990s - with the lowest level of 51.87 ft. NGVD reported in 1991. By 1994, water levels had risen above 56.00 ft. NGVD.

Crawford Solomon, Orange Lake resident since the 1970s, described significant changes in the Orange Lake marshes between the 1970s and the 1990s. He stated that the P.G. area had a lot more open areas and Deep Marsh containing Spatterdock (*Nuphar luteum*) and that the area was much less dense than it is currently. Mr. Solomon lives along the southern shore of Orange Lake and he stated that in the past, he could easily canoe from his property out to the open water. Prior to the drought of the 1990s, the marsh was emergent out to approximately 100 yards from the shoreline. Following the drought, explains Mr. Solomon, cattails that had become established during the drought, became floating rather suddenly. Additionally some floating islands moved on their own and others were moved by Aquatic Plant Management Crew into the area. Some of these islands became attached to the shoreline. The area in front of his property became a vast thick floating marsh with peat approximately 8 feet thick in places (Crawford Solomon, personal communication, April 1997).

In the past 3-4 years, water levels have been high and floating islands have again become a common feature on the lake. SJRWMD and University of Florida scientists have described various types of floating islands ranging from very small ones composed of low floating aquatic plants such as pennywort (*Hydrocotyle* sp.) and frogbit (*Limnobium spongia*), to more complex floating islands containing thick mats of peat, shrubs such as wax myrtle (*Myrica cerifera*), or willow (*Salix caroliniana*), and small trees such as red maple (*Acer rubrum*) (Bryan and Warr 1998 & Clark and Reddy 1997).

Aerial Photo Analysis and Wetland Coverage within Orange Lake

Temporal and spatial change analysis of floating wetlands in Orange Lake conducted by Clark and Reddy (1998) indicates that a net decrease in floating/emergent vegetation occurred between January 1994 and September 1996. The biggest decline occurred between January 1994 and June 1996 with a reduction of approximately 139 hectares of floating/emergent marsh. Clark and Reddy (1994) state that the reduction in floating/emergent wetland community appears to be

primarily due to a decline in floating wetlands rather than emergent wetlands. This was determined by comparing the locations of the decline with the District's vegetation and bathymetric maps of Orange Lake. This study also documented an increase of 147 ha. of open water and a decline of 131.91 ha. of fringing Deep Marsh between January 1994 and September 1996. This decline in deep marsh was a result of incidental loss caused by chemical control of Hydrilla (*Hydrilla verticillata*) which occurred during 1996.

A more long term analysis of vegetative changes was conducted by District scientists who used stereoscopic interpretation of historical aerial photos from 8 different years between 1937 and 1995 to determine the area of open water in Orange Lake for these years. The interpreted coverages were digitized and analyzed using geographical information systems (GIS) software (Kinser, unpublished data). The area of wetlands in the lake was determined by subtracting the area of open water from the total lake area for each year. The Open Water category includes areas containing submerged aquatic vegetation such as hydrilla. Analysis of this data showed a significant positive relationship between open water acreage and "lake level" (Appendix F). The percentage of lake area that is open water decreases as lake level rises, while the percentage of total lake area that is wetlands increases as lake level rises. This relationship between lake level and open water coverage explains 73% of the variability in the amount of open water in the lake over the eight dates that were analyzed. The remaining variability was largely explained by the variable "the number of years since an extreme low water event." In the years immediately following an extreme low water event, there is less open water (more wetlands) than predicted simply from lake levels. Collectively these two factors, "lake level," and "number of years since an extreme low water event," account for 95 % of the variability in the open water and wetland coverage within the lake (see Appendix F). When these two factors are accounted for, it is apparent that wetland coverage in Orange Lake has not been increasing or decreasing linearly since 1937, but has fluctuated through time based largely on lake level and the number of years since an extreme low water period (Appendix F).

The Florida Department of Environmental Protection (FDEP) (1999) also measured the area of open water and wetlands for six different years since 1964 using aerial photographs. We used this data, shown in Table 1, to determine whether there has been an increase in wetlands in Orange Lake over the 30-year period from 1964 to 1994. We calculated the area of wetlands

TABLE 1. Area of open water and wetlands within Orange Lake as measured by FDEP (1999). Lake area was derived from the bathymetric relationships developed by ECT (1997). The area of wetlands in Orange Lake was calculated by subtracting FDEP's (1999) measurements of open water from the area of the lake at the time of the aerial photo.

	1964	1975	1988	1989	1991	1994
Month of Aerial Photo	March	January	January	April	November	November
Lake Level	58.85	57.85	56.58	57.24	55.31	57.46
Lake Area	13,482	12,871	11,311	12,169	9,403	12,423
- Open Water	7,545	6,759	6,047	5,284	4,799	4,849
- Wetlands	5,937	6,112	5,264	6,885	4,604	7,574

within Orange Lake at the time of the aerial photograph by subtracting the area of open water that FDEP (1999) measured from the area of Orange Lake at the time of the photo (calculating lake area from lake level using ECT's [1997] relationships). This analysis showed that while lake levels generally decreased during the 1964 to 1994 period, the area of wetlands within Orange Lake did not change significantly ($P = 0.81$; Figure 21). It should be pointed out that, by definition, the area of wetlands increases as lake levels drop if you include the area of exposed lake bottom in the calculations. This does not signify a long-term change in the ecosystem – it simply shows that more lake bottom is exposed as lake levels drop. Exposed lake bottom is, by definition, wetlands, even though it temporarily lies outside of Orange Lake.

FDEP's data show that the amount of vegetation within Orange Lake in 1994 is higher than one would expect when comparing to the amount of vegetation in 1975, when the lake was at a similar lake level. This is what we would expect, based on the analytical results in Appendix F which showed that we find more wetlands than expected (based on similar lake levels) after extreme low water events. FDEP's analysis provides an independent data set that supports the conclusions found in Appendix F.

The fluctuation over the years in the amount and density of marsh vegetation versus the amount of open water in the lake is also apparent when you examine historical aerial photos of the lake. Figures 22 through 26 contain aerial photos from various years for four different areas of Orange Lake. Superimposed on top of each photo is a red line which represents the 1997 boundary between marsh and open water and a green line which represents the boundary between the uplands and the lake edge (based on 1994 aerial photography). The 1997 outer marsh boundary was measured by taking continuous latitude and longitude readings using a Trimble GPS unit while tracing the outer marsh boundary in an airboat.

Figure 22 contains photos from the eastern shore of Orange Lake near Marjorie Rawlings Park. Examination of these photos indicates that the area between the green upland boundary and the red outer marsh boundary was covered with vegetation in the 1937, 1949, and 1998 photos. However, in the 1968, 1975 and 1988 aerial photos, both the area and density of marsh vegetation was less than in the 1937, 1949 and 1994 photos.

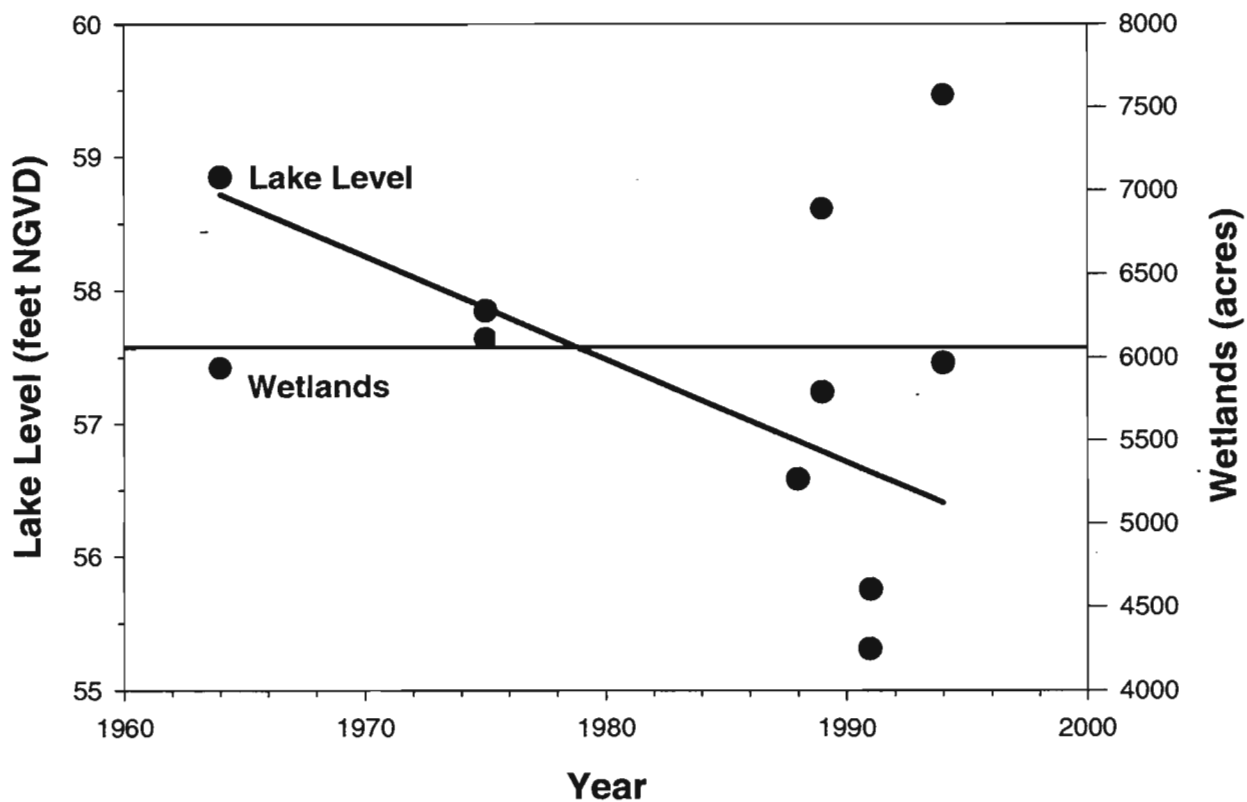
Figure 23 which shows aerial photos from 6 different years for the southeastern area of Orange Lake (P.G. Marsh) reveals that this part of Orange Lake has been largely vegetated since

at least 1937. The marsh appeared to cover more area with fewer pockets of open water in 1949, 1968, 1975 and 1980 than in 1937. However, in 1998, the amount of marsh vegetation relative to the amount of open water is similar to 1937. Fluctuations in the amount of area covered with marsh vegetation are also apparent along the southern edge of Orange Lake near McCormick Island. It is apparent in figure 24, that there is more open water in the 1949, 1968, and 1982 photos than in the 1937, 1975, and 1998 photos.

A close examination of aerial photos from the western shore of Orange Lake near the Sportsman's Cove Fish Camp also indicates significant variation in the amount of marsh vegetation over the years. In 1937, the vegetation covered a large area, appeared to be very dense in this section and extended significantly south of the 1997 outer marsh boundary shown in red. However, the 1949 photo indicates that only a small portion of marsh occurred in the section south of the 1997 outer marsh line. The 1961 photo shows further changes with large areas of open water in areas that were heavily vegetated in 1937 and 1949. The 1982 photo shows more dense vegetation with a large section extending south of the red outer marsh line. The vegetative coverage in the 1998 photo is similar to the 1937 photo in that the marsh extends a considerable distance south of the red outer marsh boundary. However, the 1937 photo contains more open water areas north of the red outer marsh boundary than the 1998 photos (Figure 25).

Examination of aerial photos from McIntosh Bay in the southwestern section of Orange Lake (Figure 26) do not show the same fluctuations as do the photos from the 4 other areas just discussed. The 1937 photo shows a large section of marsh extending several hundred meters south of the red outer marsh boundary (these photos include a portion of the marsh covered in the Sportsman's Cove series of photos). Also in the 1937 photo are very small patches of vegetation throughout McIntosh Bay. In the 1949, 1968 and 1975 aerial photos, the marsh does not extend south of the 1997 red outer marsh boundary. In the 1998 photo, large patches of vegetation are apparent throughout a significant portion of McIntosh Bay, including patchy vegetation in the area containing marsh in 1937. The vegetation in 1988 appears to be primarily Deep Marsh with Spatterdock, (*Nuphar luteum*), whereas the large clump of vegetation in the 1937 photo appears to be floating or emergent marsh. The 1998 photo also shows significant patches of vegetation in a large portion of McIntosh Bay. Ground truthing indicates the area is a combination of Deep Marsh (*Nuphar luteum*) and floating marsh and islands. The appearance of large patches of

FIGURE 21. Relationships for lake level and wetlands within Orange Lake and year for the 1964 to 1994 time period. While lake levels dropped during this time period, the acreage of wetlands within the lake did not significantly change.



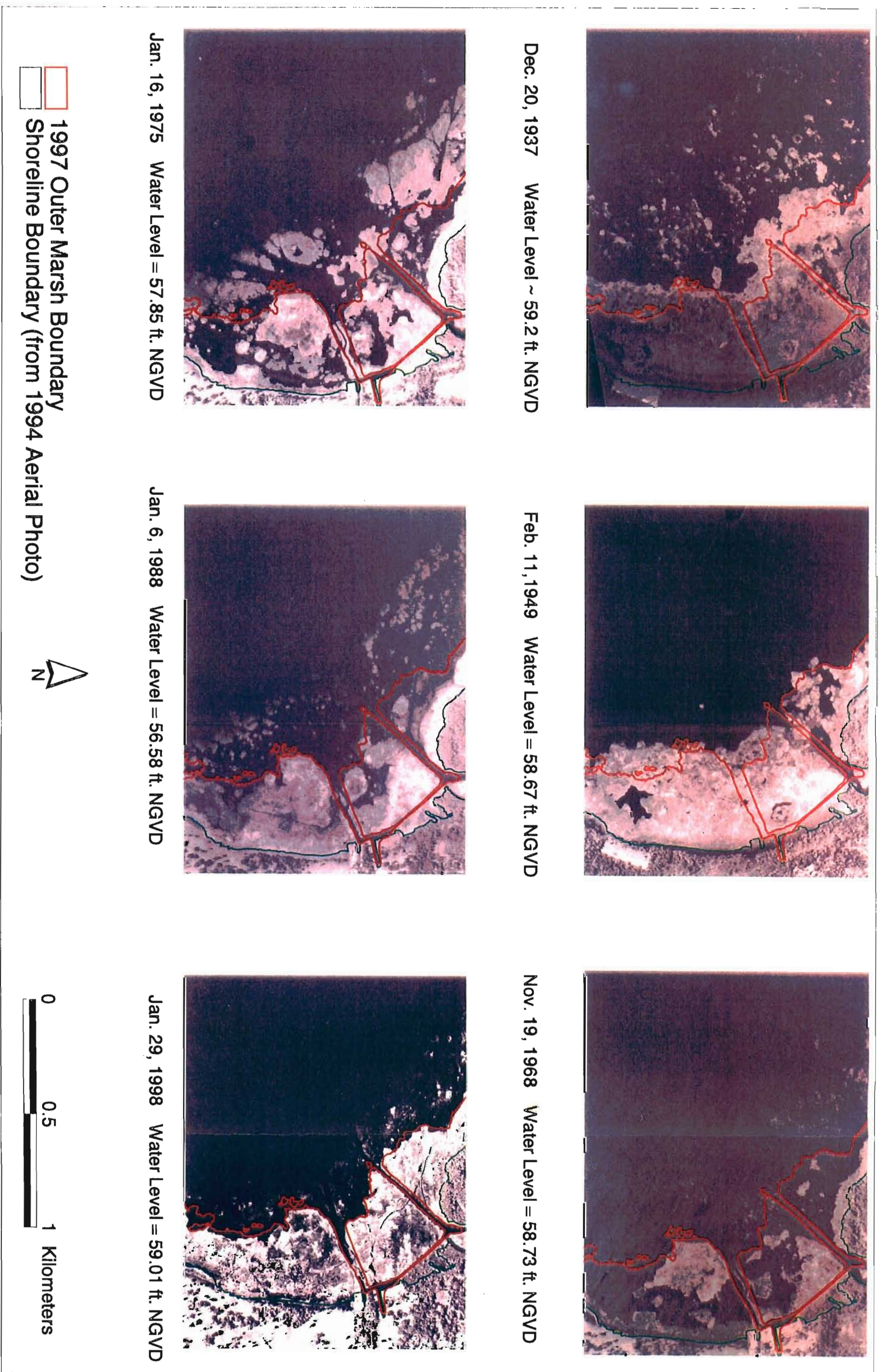


Figure 22: Aerial Photos of Orange Lake Near Marjorie Rawlings Site Showing Historical Extent of Floating and Emergent Marsh Compared to 1997 Marsh Boundary

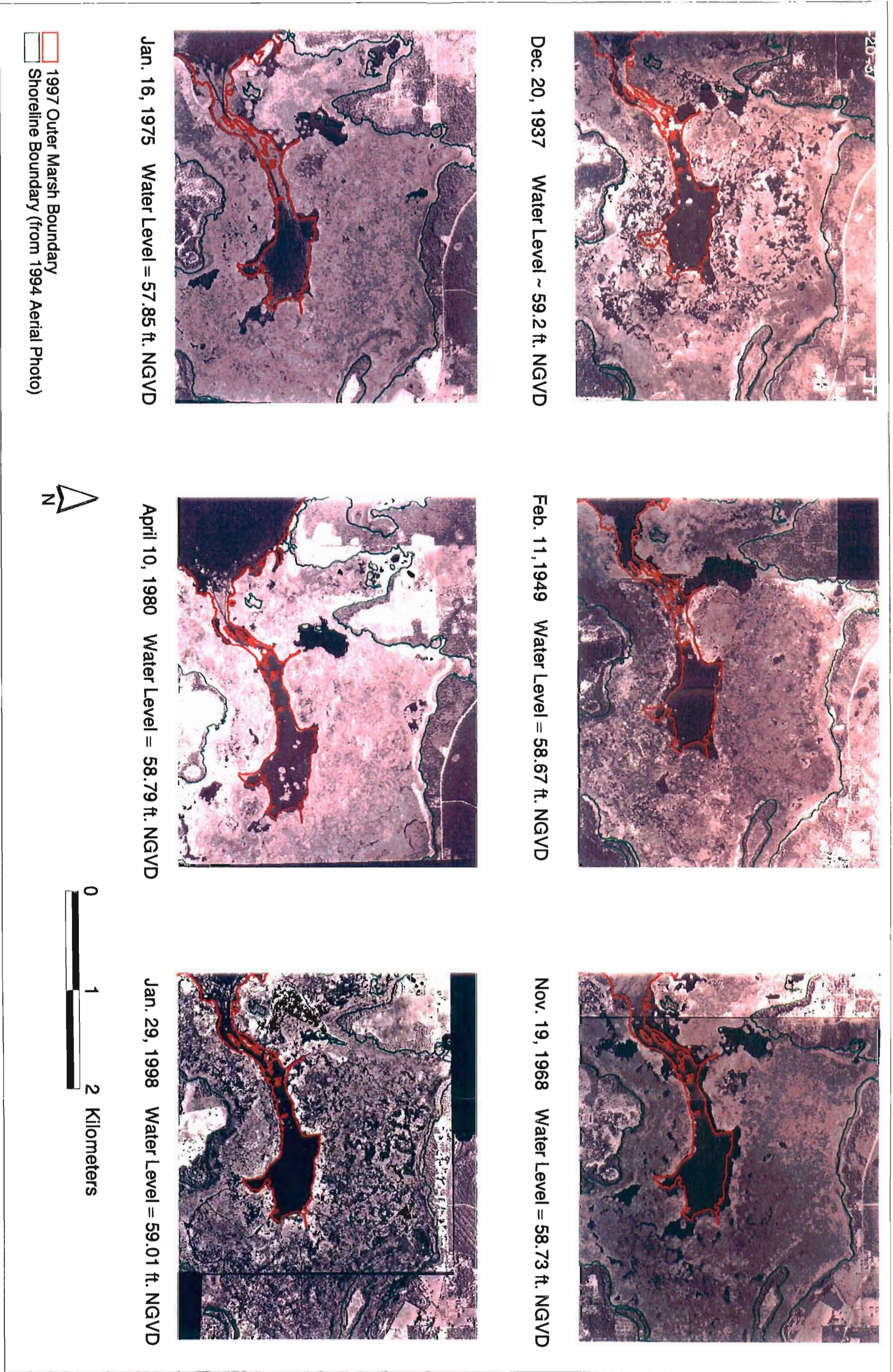


Figure 23: Aerial Photos of Southeastern Section of Orange Lake Known as PG Marsh Showing Historical Extent of Floating and Emergent Marsh Compared to 1997 Outer Marsh Boundary

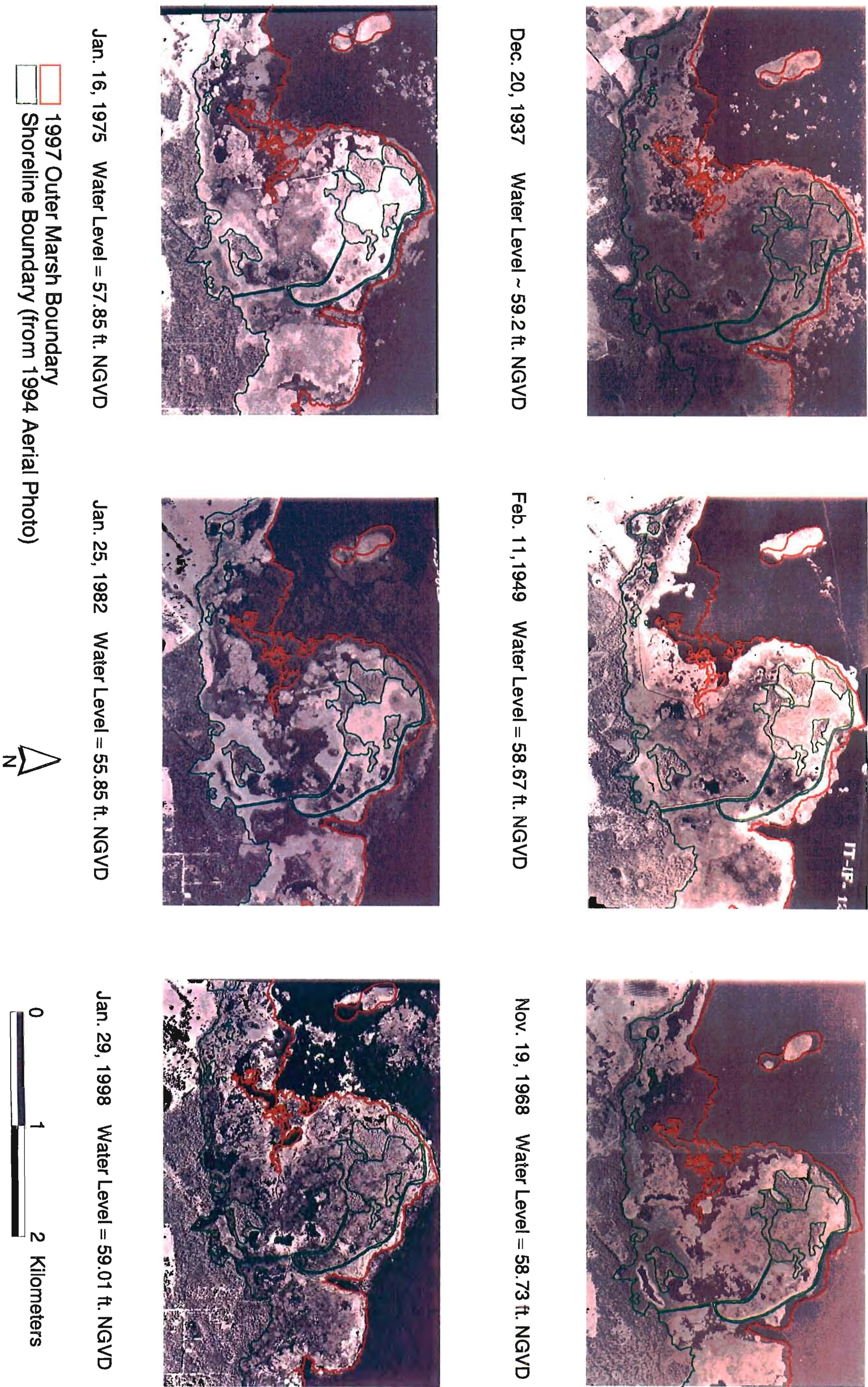


Figure 24: Aerial Photos of Southern Shore of Orange Lake Adjacent to McCormick Island Showing Historical Extent of Floating and Emergent Marsh Compared to 1997 Marsh Boundary

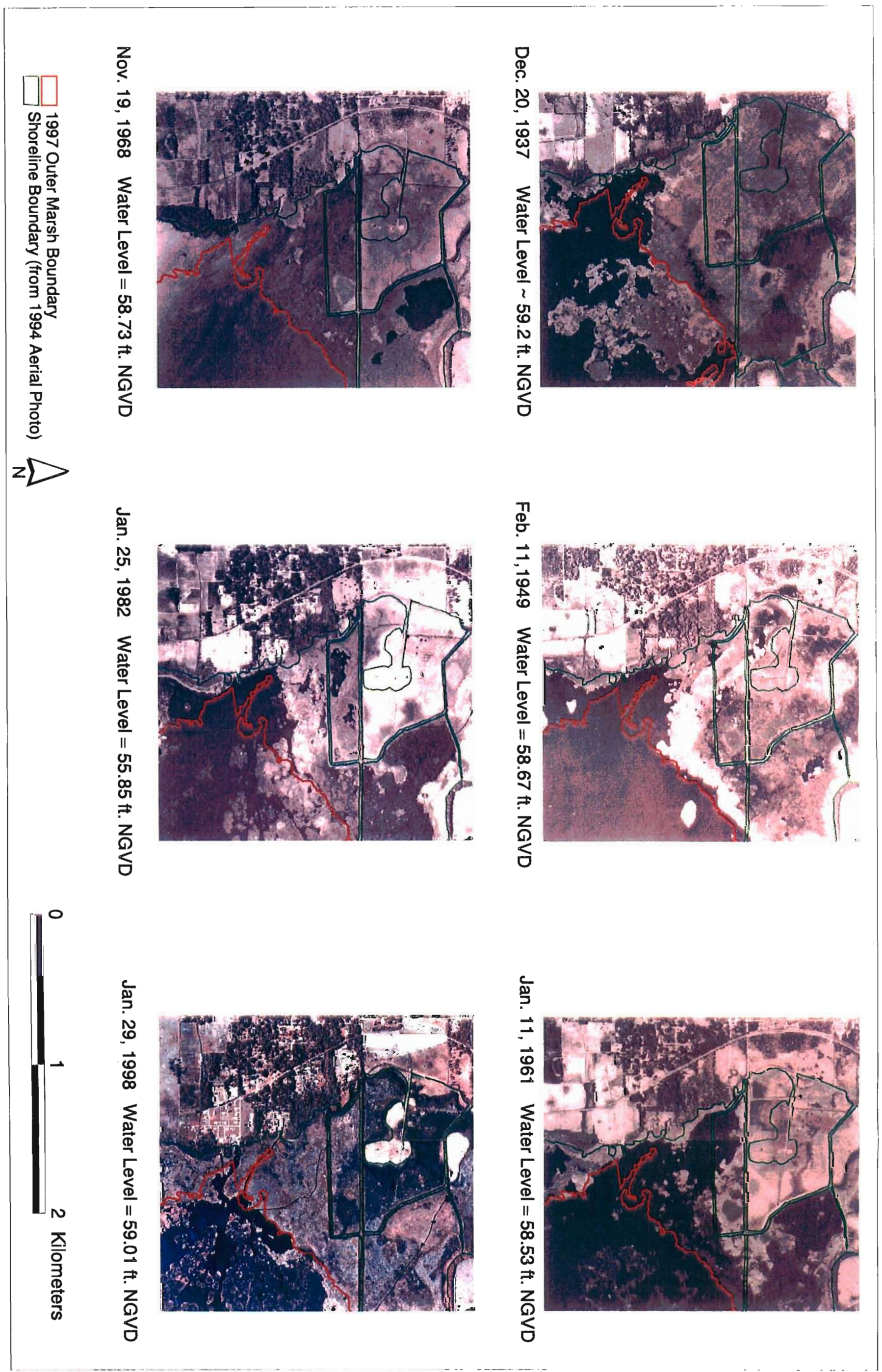


Figure 25: Aerial Photos of Western Shore of Orange Lake Near Sportsman's Cove Fish Camp Showing Historical Extent of Floating and Emergent Marsh Compared to 1997 Outer Marsh Boundary

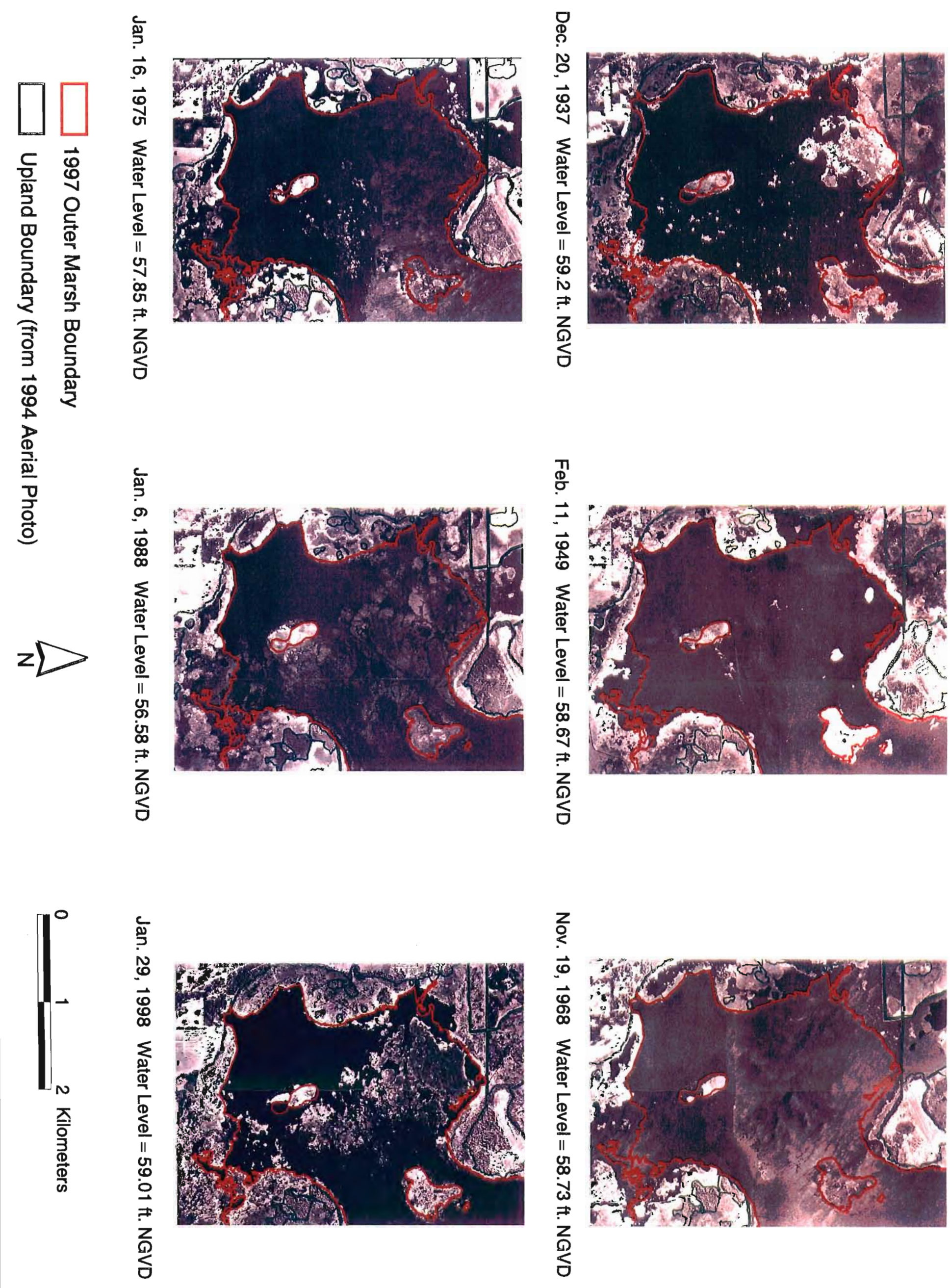


Figure 26: Aerial Photo of McIntosh Bay in the South Western Section of Orange Lake Showing Historical Extent of Floating and Emergent Marsh Compared to 1997 Outer Marsh Boundary

Deep Marsh between 1975 and 1988 is consistent with the observations made by Joe Hinkle of the FDEP. He stated that *Nuphar luteum* increased significantly in the McIntosh Bay area during this time frame (Joe Hinkle, FDEP, personal communication, 1999).

Figure 26 indicates that some areas of the lake have experienced an increase in the amount of marsh coverage over the last few decades. However, it is apparent from whole lake analyses and analyses of other specific areas of the lake (Figures 22 through 25) that overall vegetative coverage in the lake has not increased in this time frame, but has fluctuated up and down through time. Although the vegetative coverage has fluctuated, it is unknown if the density of vegetation and the thickness of floating wetlands in the lake have increased. Certain anecdotal information indicates that increases in density and thickness of floating wetlands have occurred during the past several decades (see previous section). However, insufficient information is available to answer the following questions:

- Has the overall density and thickness of floating marshes increased?
- Have floating wetlands become stacked on top of other floating and emergent marsh resulting in increased peat accumulation?

Another issue which is difficult to address is the degree to which plant species composition in the lake may have changed over the last few decades. Past information on plant species composition in Orange Lake is limited. Three sources of past information on plant species in the lake were found. The oldest plant species list found was from George Reid's thesis (Reid, 1949). The FGFWFC documented plants species observed in the lake in 1974 and the Florida Department of Environmental Protection recorded plant species composition and associated acreage observed in the lake for various years between 1983 and 1998. Appendix G indicates plant species occurrence (Table G-1) and areal extent (Table G-2) recorded during these surveys. Species recorded by Bryan and Warr (1999) in surveys conducted between 1995 and 1996 are also shown. The methodology for the FDEP surveys consisted of combining aerial and surface investigations. From boats, plant acreage estimates were made from visual observations, as well as from electronic mapping of submerged vegetation. The surveys conducted by Reid (1949), FGFWFC (1974), and Bryan & Warr (1999) used various methods of visual observation to determine plant species composition. Due to differences in survey methods and inconsistencies

in the extent of area covered in the surveys between years, the data should be interpreted with caution. The reader might also refer to Clark and Reddy (1998) for another species list developed from surveys conducted between 1996 and 1998.

Using these data to directly determine changes in plant species composition in the Orange Lake wetlands is problematic because the total acreage of wetlands fluctuates from year to year (see the "total" acres of wetlands" at the bottom of Table G-2). Acreages of plant species can therefore increase or decrease due to changes in the total acreage of wetlands, with no change in species composition in the wetlands. Table G-3 provides species composition data for these plant species by calculating the percent coverage of each plant species in the wetlands present at the time of that year's survey (using data from Table G-2).

We then ran linear regressions for the percent coverage of each species over time (1983 to 1995) using the data in Table G-3. The results, shown in Table G-4, indicate 10 plant species that significantly decreased in percent coverage over this time period. These include *Alternanthera philoxeroides* (alligator weed), *Brachiaria mutica* (paragrass), *Ceratophyllum demersum* (coon tail), *Eleocharis interstincta* (spikerush), *Lemna spp.* (duckweed), *Nelumbo lutea* (water lotus), *Nymphaea odorata* (water lily), *Panicum repens* (torpedo grass), *Polygonum densiflorum* (smartweed), and *Vallisneria americana* (eel grass; Table G-4). Five plant species showed significant increases in percent coverages over time, including *Bidens spp.* (bur marigolds), *Limnobium spongia* (frog's bit), *Decodon verticillatus* (water loosestrife), *Salix spp.* (willow), and *Sagittaria latifolia* (broad-leaved arrowhead; Table G-4).

Plant species common in floating wetlands and dense emergent/complex wetlands which showed increased percent coverages over time were *Bidens spp.* (bur marigolds), *Limnobium spongia* (frog's bit), *Decodon verticillatus* (water loosestrife), and *Sagittaria latifolia* (broad-leaved arrowhead; Table G-4). Additionally, *Scirpus cubensis* (Cuban bullrush), *Pontederia cordata* (pickerelweed), and *Sagittaria lancifolia* (duck-potato) showed dramatic increases in percent coverages in 1995 (Table G-4). These three species are also associated with floating wetlands and dense emergent/complex wetlands in Orange Lake. It is possible that the introduction or proliferation of these species in more recent decades has affected the overall vegetative composition of the lake, but insufficient information is available to determine this.

Many factors likely have affected the abundance and patterns of vegetation in Orange Lake including water levels, current or past aquatic plant control, nutrient enrichment, and natural processes. However, determining the factors most likely to have affected the temporal variations in the amount of vegetation in the lake is beyond the scope of this report.

Evidence of Past Drawdowns and Fire in Orange Lake Marshes

Clark and Reddy (1998) found evidence of past drawdowns on Orange Lake through analysis of peat sediments collected from the lake. They determined that organic sediment horizons that were described as fine, sapric, blocky and/or platy sediments were formed from Open Water Communities that were exposed during an extended low water event, resulting in the consolidation of sediments into blocks and plates. They found sediment horizons of this type from cores taken from 10 sites in the lake including 6 sites that currently have water depths of over 5 feet (Table 2 and Figure 27). This indicates that these deep sites experienced drawdowns and sediment exposure at least once in the past. A lack of platy or blocky sediments within a core does not mean that the site did not experience a drawdown in the past since some types of organic sediments may not form plates or blocks upon drying.

Other evidence of past drawdowns and exposure in Orange Lake comes from charcoal bands that Clark and Reddy (1998) found in the majority of sediment cores taken from the lake. Charcoal layers or fragments were found in 22 of 29 sediment cores collected from the lake at sites with current water depths from approximately 1 to 8 feet deep. Sixty-six percent of cores from sites with water depths greater than 5 feet (current elevations less than 53 feet NGVD) contained charcoal layers (Clark and Reddy 1998). These charcoal layers are evidence that Orange Lake experienced very low water periods in the past and that fire has likely played an important role in the plant composition of Orange Lake. Carbon 14 analysis was used to date sediment horizons from cores collected by Clark and Reddy (1998). The approximate age of each charcoal layer was estimated by using the Carbon 14 dates of sediment horizons above and below charcoal layers (Table 2). As shown in Table 2, the estimated age of charcoal layers from cores in Orange Lake ranges from less than 200 years (modern Carbon)¹⁵ to approximately 1320 years old.

¹⁵ Samples exhibiting radiocarbon activity in excess of the 1950 modern ^{14}C activity levels (see Warr et al. 1998). These samples are considered less than 200 years old. They may be younger than that but more precise dating is not obtainable.

Out of 27 charcoal layers for which age was estimated, 6 (22%) were estimated as less than 200 years old, 16 (78%) were estimated as over 200 years old and 7 (52%) were estimated as over 600 years old. These data provide strong evidence that low water periods that were severe enough to allow sediments to become exposed and marsh to burn have occurred in Orange Lake for hundreds of years. They occurred in areas that are currently over 5 feet deep. Considering the sediment accumulation that would have occurred at these sites since the time the charcoal layers were laid down, it is very likely that these sites were considerably deeper at the time the charcoal was deposited.

Charcoal layers often occurred between peat horizons originating from different parent vegetative communities. In some cases, Clark and Reddy (1998) found charcoal bands between a peat layer originating from a shallow marsh and a peat layer originating from open water or deep marsh. These changes in vegetative community may be a result of 1) fires changing the elevation of a site by burning the organic layers of the sediment or 2) a rise in water levels following a fire. In several instances, charcoal bands were found between organic and mineral layers of the sediment cores, indicating that a particular fire event was severe enough to completely burn the organic sediment layers down to the mineral sediment (Clark and Reddy 1998).

Reference to peat fires in Orange Lake which occurred during the 1955-1957 drought were found in historical newspaper articles. An article from March 1956 stated that *"smoke still obscures visibility in Island Grove area from mucklands which have been burning a week over several hundred acres.."* (Gainesville Daily Sun 1956b). Island Grove is a small town located near the southeastern section of Orange Lake where Highway 301 crosses the lake. An article from the following year described another major fire which occurred in Orange Lake: *"Island Grove - Fire which has eaten through more than 2,000 acres of muckland on Orange Lake Prairie was thought to be under control south of here today....the fire line had moved west into the dried lake bed and was now approaching the swampy ill defined shoreline of Orange Lake...The rich, peat-like muck dried out as never before in more than 50 years, burned swiftly at depths more than 20 feet. Old timers say they can't remember the prairie burning before last year's fire in the same place...). The rich bogs will smolder for months, however, and must be*

Table 2: Sediment Core Characteristics of Sites for which Clark and Reddy (1998) found either charcoal layers or horizons described as platy and/or blocky in the sediment core indicating the site experienced drawdown and exposure in the past.

Charcoal layer at the bottom of sediments indicates a past fire burned through the organic sediments all the way to the mineral soil. Approximate ages of the charcoal layer based on C14 dating are shown in red (Source: Clark and Reddy 1998 & Warr and Bryan 1998). Note that C14 dates represent years before 1950.

SiteCode	Elevation of Sediment/ Water Interface in feet (NGVD) Based on Peat Petrology by Clark and Reddy (1998)	#Charcoal Layers	# Platy or Blocky" layers	Presence of Charcoal Layer at Bottom of Core Above Mineral Layer	Approximate Age of Charcoal Layer Based on C14 Dating of Adjacent or Closest Sediment Horizons
OWa-1B	50.11	2	2	N	1270 yrs (+/- 60) ^{*2}
OWa-2A	50.23	0	1	N	---
Dma-1A	53.16	1	0	N	---
Fla-2B	48.39	0	2	N	---
Fla-2A	50.93	2	0	Y	---
OWa-3B	52.75	0	1	N	---
FMc-1A	54.24	2	1	Y	506 yrs (+/- 60) ^{**4}
FMc-2A	52.72	1	2	N	675 yrs. (+/- 60) ^{*5}
Fib-3A	53.17	2	0	Y	---
FMb-2A	54.98	2	0	Y	---
Sma-2A	55.03	2	0	N	504 yrs (+/- 50)
Fma-3A	56.93	1	0	N	?
Fma-2A	54.11	0	1	N	---
FMb-1A	55.52	3	3	N	550 yrs (+/- 60)
					512 yrs (+/- 60)
					545 yrs (+/- 60)
FMc-3A	53.84	2	0	Y	512 yrs (+/- 60)
					933 yrs (+/- 50)
SMb-2A	55.16	1	0	Y	318 yrs (+/- 60) ^{*3}
Ssa-2A	56.58	1	0	Y	---
Sma-3A	56.04	1	0	N	Between 540 yrs (+/- 60) and 648 yrs (+/- 50) ^{**7}

SiteCode	Elevation of Sediment/ Water Interface in feet (NGVD) Based on Peat Petrology by Clark and Reddy (1998)	#Charcoal Layers	# Platy or Blocky layers	Presence of Charcoal Layer at Bottom of Core Above Mineral Layer	Approximate Age of Charcoal Layer Based on C14 Dating of Adjacent or Closest Sediment Horizons
SMa-3A	56.04	1	0	N	Between 588 yrs (+/- 60) and 708 yrs (+/- 50) **7
DMa-3A	56.22	2	0	Y	306 yrs (+/- 50)
SMB-3A	55.85	4	0	N	Modern C *9
					Between 381 yrs (+/- 50) **2 and 650 yrs (+/- 70) *2
Fib-1A	54.17	1	2	Y	Between 774 yrs (+/- 70) *3 and 1538 (+/- 50)
FMa-1A	56.4	1	0	Y	---
SMB-1A	56.62	6	0	Y	293 yrs (+/- 50) *0
					Between 293 yrs (+/- 50) and 524 yrs (+/- 50)
					Between 524 yrs (+/- 50) and 660
					> 660 yrs (+/- 60) *3
SSa-1A	56.48	4	0	N	293 yrs (+/- 40) *3
					Modern C *9
					350 yrs (+/- 60)
					552 yrs (+/- 50) **5
FMB-3A	55.7	3	0	N	517 yrs (+/- 70)
SSa-3A	56.01	2	1	Y	Modern *9
					> 540 yrs (+/- 40) **1
Fia-1A	53.28	0	0	N	
DMa-2A	51.77	0	0	N	
SMA-1A	56.31	0	0	N	
TOTAL	29 Sites				26 Horizons dated

~ - Elevations shown here are based on 1996 elevations. These elevations may be much higher than the historical elevation of the sites during the time they were exposed due to sediment accumulation that has occurred since that time. * - Charcoal layer was observed, ** - Charcoal fragments were observed.

Note: Estimated age of charcoal was based on the proximity of the closest dated horizon. 1 - charcoal within this horizon, 2 - charcoal just above this horizon, 3 - charcoal just below this horizon, 4 - charcoal just above and below this horizon, 5 - charcoal 1 horizon above this horizon, 6 - charcoal 1 horizon below this horizon

7 - charcoal between these two dated horizons, 8 - charcoal layer 3 horizons above this horizon, 9 - charcoal layer between 2 horizons dated as modern

watched constantly. He [local forest ranger] described last year's three-month long traffic hazard along U.S. 301 following the big fire of that year..." (Gainesville Daily Sun 1957e).

Historical Wetland Communities in Orange Lake as Determined by Plant Fragment Analysis and Carbon 14 Dating of Peat Layers from Orange Lake

Clark and Reddy (1998) analyzed plant fragments of peat cores from Orange Lake floating and emergent marshes in order to determine the parent plant material (and thus the historic-plant communities) giving rise to the different peat layers. Their results indicate that peat underlying areas that are currently floating marshes originated from a variety of community types including floating marsh, shallow marsh, deep marsh and open water. Additionally, some areas that are currently shallow marshes and shrub swamps had underlying peat which originated from floating marshes, shallow marshes, deep marshes, and open water.

Carbon 14 (C14) analysis was used to date peat from a total of 59 horizon samples collected by Clark and Reddy (1998) from 16 sites in the lake. Tables 3-5 show the plant communities that historically occurred in the lake as indicated by plant fragment analysis and C14 dating of sediments during 3 time periods in the past: 150 to 400 years ago; > 400 to 800 years ago; and > 800 years ago. Figures H-2 through H-17 in Appendix H provide a visual representation of the cores taken at each of these sites showing the parent vegetative community for each horizon identified within the core and the estimated C14 date for those horizons that were dated.

Plant fragment findings, C14 dating results and the presence of charcoal layers in sediment cores are summarized for various sites from three areas of the lake: the southeast section (P.G. Marsh Area), the south/southwest section, and the northern section. It is important to note that the lack of charcoal from a site does not mean the site did not burn in the past. Charcoal could blow away from a site, be removed by island formation, or burn away if a fire was severe enough. Multiple charcoal horizons can also be removed from the peat profile by a severe peat fire which burns down through the peat and previous fire events. Several of the sites described below show date reversals in their sediment cores. These date reversals are best explained by the movement of

floating wetlands containing older sediments into an area and sinking on top of younger sediments. Date reversals were observed at a total of five sites in the lake (Figure 28).

Vegetative Histories of Various Sites in Orange Lake Based on Plant Fragment Analysis, ¹⁴C Dating, and Presence of Charcoal in Sediment Cores

This section summarizes the vegetative histories of various sites from 3 sections of the lake – the southeast, the south/southwest, and the north. All dates are reported as years before 1950, the standard method for reporting Carbon 14 dates. All statements that refer to the number of years old or the number of years ago actually refer to the number of years before 1950.

Examples from the southeast section of Orange Lake

a. **SMa-3A** - Site SMa-3A (Figure H-15 of Appendix H) is currently a shallow marsh site dominated by duck potato (*Sagittaria latifolia*). A close examination of Figure H-2 indicates that one peat layer from this site dated as 490 to 600 years old and another peat layer dated 600 to 700 years old were made up of peat which was formed from complex floating marsh species. Thus, this site was likely a floating marsh 500 to 700 years ago, or a floating marsh of similar age which moved into this area and sank. The only charcoal that was found in this core was scattered charcoal fragments found in horizon H indicating a fire may have occurred prior to the formation of horizon G peat approximately 490 to 600 years ago. It is also possible that the charcoal layer in horizon H was brought to the site on a floating island, and therefore does not indicate a historic fire event at this location.

b. **SMb-3A** - Site SMb-3A (Figure H-16) is a shallow marsh site which is currently vegetated by sawgrass (*Cladium jamaicensis*). It appears to have been deep marsh dominated by *Nuphar luteum* or *Nymphaea odorata* during a period approximately 1490 to 1590 years ago, and another period approximately 330 to 430 years ago. Indicators of complex floating marsh were detected in peat horizons D and E, but dating of these horizons was inconclusive due to the finding of “modern carbon” in the sample. This finding indicates that the site was a floating marsh, or a floating marsh moved onto the site and sank, sometime in the last 200 years (see footnote 15). Three charcoal bands were observed in this sediment core: two low in the core

Table 3: Historical Community Types in Southeast Section (P.G. Run Area) of Orange Lake as indicated by Plant Fragment Analysis by Clark and Reddy (1998) and Carbon 14 Dating of Peat Layers. Age of peat is shown in red as years before 1950.¹ Plant names in parentheses below the community type indicate the dominant species found.

Appendix H Figure #	Site	Present Plant Community	180 to 400 years ago	400 to 800 years ago	> 800 years ago
H-13	FMb-3A	Vegetative-Based Floating Marsh*		• ? (517 ± 70)	•
H-14	FMc-3A	Complex Floating Marsh	• Shallow or Deep Marsh (143 ± 60) • Complex Floating Marsh (287 ± 50) • Deep Marsh (299 ± 50) • Deep Marsh (293 ± 80)	• Deep Marsh (512 ± 50) • Deep Marsh (666 ± 80)	• Unknown (933 ± 60)
H-17	SSa-3A	Shrub Swamp (Willow)	• Complex Floating Marsh (137 ± 60) • Shallow or Deep Marsh (312 ± 60)	• Complex Floating Marsh (519 ± 60) • Open Water (732 ± 40) • Shallow Marsh (472 ± 60)	• Open Water (732 ± 60)
H-15	SMa-3A	Shallow Marsh (Duck Potato & Arrow Arum)		• Complex Floating Marsh (540 ± 60) • Complex Floating Marsh (648 ± 50)	
H-16	SMb-3A	Shallow Marsh (Sawgrass)	• Deep or Complex Floating Marsh (381 ± 50)	• Deep or Complex Floating Marsh (650 ± 70) • Deep, Complex Floating, or Shallow Marsh (590 ± 70)	• Deep Marsh & Open Water (774 ± 70) • Deep Marsh & Open Water (1538 ± 50)
H-12	DMa-3A	Deep Marsh (Spatterdock)	• Shallow or Deep Marsh (306 ± 50)	• Shallow Marsh (514 ± 30)	

¹ – All dates are reported as years before 1950, the standard method for reporting ¹⁴C dates.

* Vegetative based floating marshes are floating marshes that do not have a peat base associated with them.

?: Parent material was not identified

Table 4: Historical Community Types in Northern Section of Orange Lake as indicated by Plant Fragment Analysis by Clark and Reddy (1998) and Carbon 14 Dating of Peat Layers. Age of peat is shown in red as years before 1950.

Appendix H Figure #	Site	Present Plant Community	140 to 400 years ago	400 to 800 years ago	> 800 years ago
H-4	OWa-1B	Open Water	• ? (306 ± 50)		• Open Water (1270 ± 60)
H-2	FMb-1A	Vegetative Based Floating Marsh*	• Complex Floating Marsh (43 ± 50)	• Shallow or Deep Marsh (512 ± 50) • Deep Marsh (610 ± 60) • Deep Marsh (545 ± 60) • Deep Marsh (610 ± 60)	• Complex Floating Marsh (1,282 ± 70) • Open Water (1505 ± 50) • Open Water (3,796 ± 110)
H-5	SMB-1A	Shallow Marsh (Sawgrass)	• Shallow Marsh (293 ± 50)	• Deep Marsh (512 ± 70) • Deep Marsh (524 ± 50) • Deep Marsh (660 ± 60)	
H-3	FMc-1A	Complex Floating Marsh	• ? (293 ± 50)	• ? (506 ± 60) • ? (610 ± 60)	
H-6	SSa-1A	Shrub Swamp (Willow)	• Deep Marsh (293 ± 40)	• Deep or Shallow Marsh (350 ± 60) • Shallow or Deep Marsh (552 ± 50)	

1 – All dates are reported as years before 1950, the standard method for reporting ¹⁴C dates.

?: Parent material was not identified.

* - Vegetative based floating marshes are floating marshes that do not have a peat base associated with them.

Table5: Historical Community Types in Southwestern Section of Orange Lake as indicated by Plant Fragment Analysis by Clark and Reddy (1998) and Carbon 14 Dating of Peat Layers. Age of peat is shown in red as years before 1950.

Appendix H Figure #	Site	Present Plant Community	140 to 400 years ago	400 to 800 years ago	> 800 years ago
H-7	DMA-2A	Deep Marsh			• ? (785 ± 60)
H-9	FMc-2A	Complex Floating Marsh			• Deep Marsh or Open Water (933 ± 60)
H-8	FMA-2A	<i>Scirpus cubensis</i> Floating Marsh	• Unknown (306 ± 40)		
H-11	SMB-2A	Shallow Marsh (Cattail)	• Unknown (299 ± 60)		
H-10	SMA-2A	Shallow Marsh (Pickerel Weed)	• Deep Marsh (392 ± 60) • Deep Marsh (350 ± 50)	• Unknown (504 ± 50)	

1 – All dates are reported as years before 1950, the standard method for reporting ¹⁴C dates.

?: Parent material was not identified.

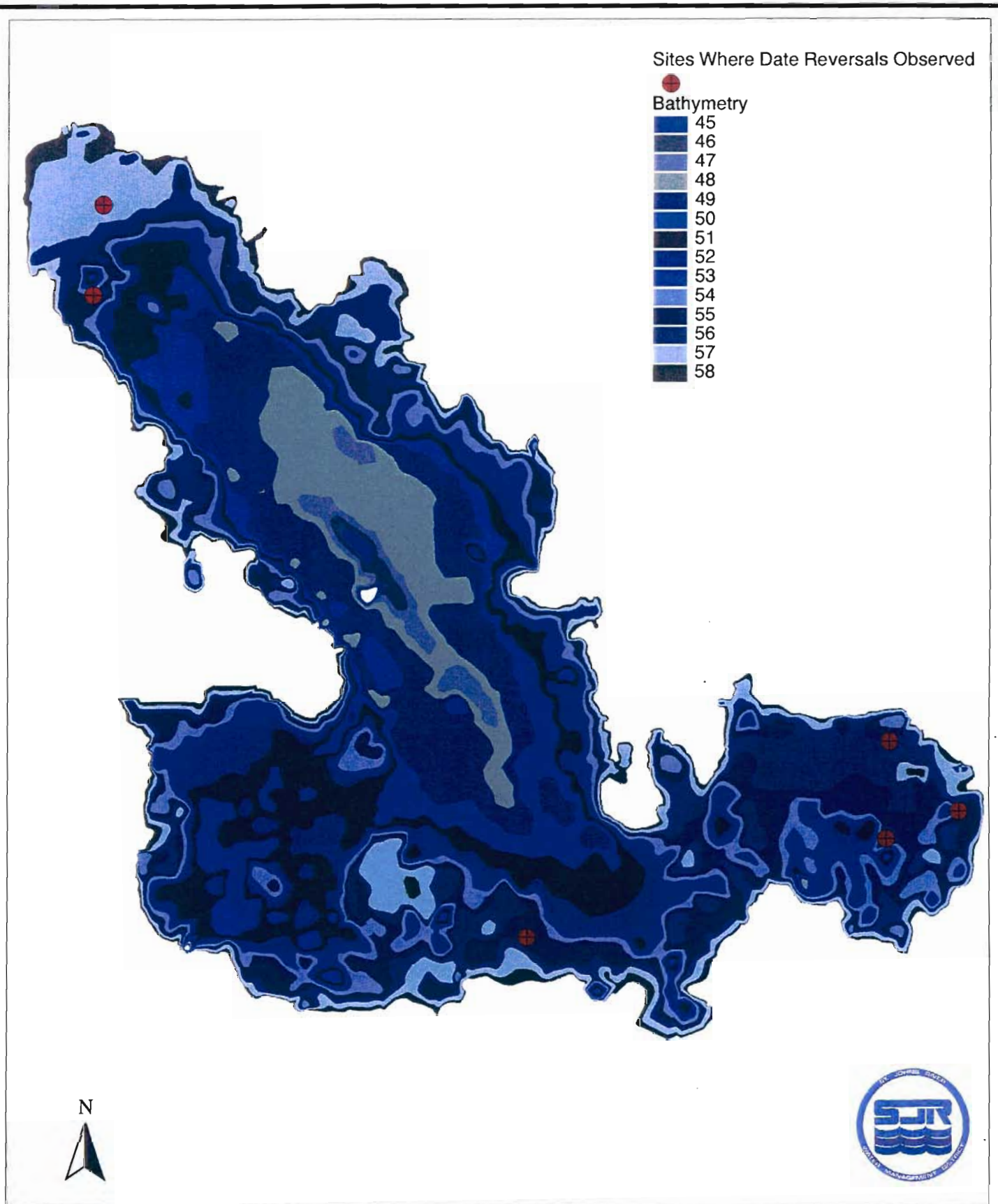


Figure 28: Sites in Orange Lake where date reversals were observed using radiocarbon dating of sediment cores collected by Clark and Reddy (1998).

between deep marsh horizons and one closer to the surface between the 2 horizons that were found to contain "modern carbon."

c. **FMc-3A** - Another site which is currently a floating marsh (FMC-3A on Figure H-14) had three peat horizons which were composed of deep marsh plant fragments. Two of these peat layers, P and N were dated as between 590 to 750 years old and between 460 to 560 years old, respectively. The site then went through a shallow marsh phase followed by another deep marsh phase 220 to 380 years ago. A floating marsh formed or moved onto the site (Horizon I) which was dated as between 240 to 340 years old. Several horizons made up of deep marsh species were observed just above the floating marsh horizon (I), but they were not dated. Charcoal was found between the lowest peat horizon and the clay layer indicating that this particular fire was likely a severe one, burning peat all the way down to the mineral soil.

d. **SSa-3A** - C14 dating of sediment horizons from this shrub swamp site indicate that date reversals have occurred at this site (Figure H-17). Horizon M was dated at 137 ± 60 years while Horizon K, which is located above M, was dated as 732 ± 60 years old. At least once in the past, a floating island containing a lower peat layer, which was at least 732 ± 60 years old, likely moved over to this site and sank. The exact time period during which this movement occurred cannot be determined by the results but it would have had to have occurred sometime less than 137 ± 60 years before 1950 since that is the C14 date for Horizon M.

e. **Dma-3A** - Date reversals are also apparent when you examine the results of the C14 dating of sediment horizons from this deep marsh site (Figure H-12). The bottom horizon (I) was dated as 306 ± 50 years old while the horizon above it was dated as 514 ± 30 years old, indicating that at some point in the past, a floating island moved over to this site and sank. Eventually a deep marsh was formed. Just above the bottom peat horizon is a charcoal layer, which indicates that this site burned sometime in the past 306 ± 50 years. Due to the lack of peat between the charcoal layer and Horizon H, it seems likely that the burn occurred relatively recently, burning all of the organics that had accumulated since the year 1640 ± 50 AD. Sometime after the burn, a floating island moved over to the site carrying with it the 514 year old peat layer.

Examples from the south and southwest section of the lake

a. **Site SMb-2A** - Site SMb-2A is currently a shallow marsh site dominated by cattail (*Typha latifolia*). Figure H-11 indicates that this site was a deep marsh between 240 and 360 years ago. Younger horizons from this site were not dated so we cannot determine when this site became a shallow marsh. Charcoal was found between the lowest peat horizon and the sand layer indicating that that particular fire was likely a severe one, burning peat all the way down to the mineral soil.

b. **Site FMc-2A** - Site FMc-2A is a complex floating marsh which appears to have been a deep marsh/ open water community between 860 and 1000 years ago and between another period 615 and 735 years ago (Figure H -9). Charcoal fragments were found within a deep marsh horizon that was just above the 615 to 735 year old horizon.

c. **Site SMa-2A** - Site SMa-2A is a shallow marsh dominated by pickerel weed (*Pontederia cordata*). Close examination of Figure H-10 indicates that this site has been a floating marsh sometime in the past 200 years (dated as modern Carbon) and was a deep marsh prior to that, between 330 to 550 years ago (horizons, D, F, and H, all originated from deep marsh). Scattered charcoal fragments were found within a horizon dated between 450 to 550 years old.

Examples from the northern section of the lake

a. **Site SSa-1A** - Site SSa-1A is a shrub swamp community dominated by Carolina Willow (*Salix caroliniana*) (Figure H-6). The plant fragment analysis and C14 dating of the peat core from this site indicates that the site has likely fluctuated between a shallow marsh dominated by sawgrass (*Cladium jamaicensis*) and a deep marsh dominated by *Nuphar luteum* and/or *Nymphaea odorata* through time. The lowest peat horizon (P) originated from deep marsh and was dated between 500 and 600 years old. Between the P horizon and the F horizon, the origin of the horizons fluctuated between deep marsh and shallow marsh with 2 charcoal bands and scattered charcoal fragments occurring between some horizons. The F horizon originated from deep marsh between 260 and 340 years old. It appears that a conversion from deep marsh to shallow marsh occurred soon after the formation of horizon F.

b. Site SMb-1A - Site SMb-1A is a shallow marsh community currently dominated by sawgrass (*Cladium jamaicensis*). Five charcoal bands are evident in the peat stratigraphy from this site (Figure H-5). Some of these bands were found between horizons formed from different plant assemblages, indicating the fires may have caused changes in communities to occur. Dating of the peat layers from this site indicates that this site was sawgrass between 250 and 350 years ago and a deep marsh between 480 and 580 years ago, as well as prior to that. The plant fragment and C14 analysis indicates that the lowest horizon in the core appeared to have formed from a deep marsh or open water community and was between 600 and 720 years old.

c. Site FMb-1A - Site FMb-1A is currently a floating marsh dominated by frogsbit (*Limnobiium spongia*) and arrow arum (*Peltandra virginica*). Figure H-2 indicates that peat from horizon E which originated from a Complex Floating Marsh community is dated at 43 ± 50 years old. As you can see from figure H-2, the peat was very deep at this site and the lowest horizon which originated from an open water community was dated between 3780 and 3910 years old. The plant fragment analysis from horizon CC indicates that the peat was composed of a species (primrose willow - *Ludwigia* sp.) which, in Orange Lake, is indicative of complex floating marshes. This horizon was dated between 1210 and 1350 years old. Dating of horizons Y and K indicates that the peat in those horizons appears to have originated from deep marsh between 490 and 670 years ago. Close examination of Figure H-2 indicates that at some point in the past, floating wetlands moved into this site and sank. The factors that illustrate this are: 1) the closeness in age of horizons Y and K, given that approximately 100 cm of peat exists between them. This amount of peat would not likely have formed in the short amount of time between the age of Y and the age of K; and 2) date reversal -the approximate age of horizon S is younger than horizon K, although horizon K is closer to the surface. Three charcoal bands were found within this core. The lowest one was found between a deep marsh horizon and a shallow marsh horizon.

The results of the plant fragment analysis and the carbon 14 dating as well as the finding of charcoal and evidence of past drawdowns in Orange Lake indicate the dynamic nature of Orange Lake wetlands. Peat accumulation, hydrology, and fire, as well as other driving forces, have all played a role in the dynamics and the community changes that have occurred in these wetlands. Floating marshes or deep marshes accumulate organic material and with continued sediment accumulation, these deeper communities might convert into shallow marsh

communities. However, certain events such as drought and fire act as setback mechanisms causing communities to convert back into deeper communities. In this manner, these events act to maintain areas of the lake in a mosaic of deepwater and shallow wetland communities. Drought may cause a once floating marsh to become a shallow marsh and if a significant fire event occurs which burns peat layers, the shallow marsh may become a deep marsh or open water community when water levels return.

IV. DISCUSSION/ CONCLUSIONS

Some of the older historical accounts reported in this document such as General George A. McCall's description of camping along the shores of Orange Lake indicate that floating islands have been a very common feature in Orange Lake for at least 150 years. McCall (1868) describes floating islands containing trees, which moved around the lake. For a floating island to support trees, it would have to contain a thick dense mat of vegetation and peat or muck. Interviews with local long-time residents indicate that floating islands or tussocks were common in Orange Lake in the first half of this century and considered a natural part of the lake. In the 1930s, the floating islands were a tourist attraction and they brought considerable local and even nationwide attention to Orange Lake as well as income to the local economy. Numerous book, magazine, and newspaper articles were written about the floating islands and marshes in the lake. In the past, floating islands occasionally blocked navigation or lake access, but long-time local residents would move them and plan alternative landing areas for their boats in case the islands blocked boat trails while they were out on the water.

An 1893 USGS map of Orange Lake indicates that the area known as P.G. Marsh, which is currently densely vegetated with floating and emergent marshes including large areas of willow swamp, was also vegetated in the late 1800s. The vegetation extended from the P.G. area east to Orange Creek, covering the area that became the Orange Lake Muck Farm in the 1930s. Interviews with local individuals also indicate that the P.G. area was marsh in the early part of this century. However, we do not know how dense this vegetation was or whether or not the density of vegetation has increased since the eastern end of the lake was dammed by Highway 301, a railroad, and muck farm dikes.

Interpretation of aerial photos from Orange Lake indicate that some areas of the lake have experienced an increase in vegetation coverage over the past few decades. However total lake analysis indicates a cyclical pattern of vegetative coverage in the lake rather than a continuous succession trend towards a more vegetated lake. Detailed analysis of aerial photography (as described in Appendix F), as well as numerous newspaper accounts also indicate that the amount of floating wetlands present in the lake fluctuates through time and is largely based on lake water levels and time since a low water event.

Plant fragment analysis and Carbon 14 dating of sediment cores from Orange Lake provide additional evidence that a variety of different marsh communities, including complex floating marsh, have existed in Orange Lake for hundreds of years. Clark and Reddy (1998) found that peat underlying areas that are currently floating marshes originated from a variety of community types including floating marsh, shallow marsh, deep marsh and open water. Additionally, some areas that are currently shallow marshes and shrub swamps had underlying peat which originated from floating marshes, shallow marshes, deep marshes and open water. Results from the C14 analysis indicate that complex floating marshes existed in the southeastern section (P.G. marsh) of Orange Lake at least 600 to 700 years ago and in the northern section of the lake at least 1300 years ago. Carbon 14 Analysis revealed date reversals in the sediment cores of several sites. These date reversals are best explained by the movement of floating islands containing older sediments into an area and sinking on top of younger sediments.

These researchers also found evidence that historically fire may have played an important role in the vegetative composition within the lake. They found that charcoal bands were present in the majority of sediment cores taken from the lake. In several instances, charcoal bands were found between organic and mineral layers of the sediment cores, indicating that the fire event was severe enough to completely burn the organic sediment layers down to the mineral sediment (Clark and Reddy 1998).

The results of the plant fragment analysis and the carbon 14 dating as well as the finding of charcoal and evidence of past drawdowns in the lake indicate the dynamic nature of Orange Lake wetlands. Peat accumulation, hydrology, and fire, as well as other driving forces, have all likely played a role in the dynamics and the community changes that have occurred in these wetlands. Certain events such as drought and fire to maintain a mosaic of wetland communities

by preventing a unidirectional trend of deepwater communities from becoming shallower communities.

Currently, the railroad, the highway and Shand's dike separate the historical southeastern end of Orange Lake from the rest of the lake. The area to the east of Shand's dike which is currently a muck farm, was historically part of the lake until the 1930s when it was diked and drained. The eastern end of Orange Lake was not significantly restricted until the trestle railroad bridge was converted into a filled rail bed [date unknown] or until the highway was built across the lake in 1926, whichever came first.

Although historical records indicate that Orange Lake has been vegetated for a long time and aerial photo analysis indicates that the vegetation coverage over the entire lake has not increased during the last century, we do not know if the density of the vegetation or thickness of the floating marshes in the lake have increased significantly in more recent years. Since it is unknown whether or not vegetation density or peat accumulation has increased in the lake, it is not possible to determine if the obstruction to the outflow area caused by a combination of Highway 301, the railroad, the muck farm dikes and canals, and the Highway 301 weir has significantly altered the hydrology and increased the rate of accumulation of vegetation in this area. There are several hypotheses that may explain how the alterations made in the southeastern part of Orange Lake could have increased vegetative density and composition in the lake, if vegetation accumulation has indeed occurred.

One hypothesis is based on the concept that high water and moderate to strong northwesterly winds historically moved floating wetlands towards the southeastern section of Orange Lake and into the muck farm area, which was once part of the lake itself. The muck farm area may have historically been shallower than the P.G. area and due to this shallowness, it may have dried out during frequent low water periods while the P.G. area would have remained inundated. Floating islands that stacked up in the muck farm area would dry out during these frequent low water events, allowing plant material to dry out and organic material to oxidize. Fires would occasionally occur, accelerating the decomposition and plant biomass removal. Fires may have also occurred in the P.G. area during more extreme events - probably spreading from the drier areas to the east.

With the construction of the highway and railroad berms, and muck farm dikes during the early part of the 20th century, the major means for wetland plant desiccation, decomposition, and oxidation may have been significantly reduced except during extreme low water events. The chance for fire in the P.G. area may have also been reduced due to the separation of the shallower, thus drier, muck farm from the rest of the lake. Without the export, oxidation, and burning of organic material, marsh vegetation in the lake may have become more dense, resulting in increased organic sediment accumulation. Further investigations of topography and sediment accumulation rates are necessary to further address this hypothesis.

The following additional hypotheses, which are based on the premise that vegetation in the lake is accumulating or becoming denser, have been presented; (1) floating wetlands in the past became stranded on uplands during floods and current constrictions caused by the railroad and highways berms, the weir, other berms in the lake, and the muck farm have changed flooding patterns and made this process less likely, (2) construction of the various structures (berms and weir) may have also resulted in a reduction in nutrient and sediment export from Orange Lake, which could be a factor facilitating the formation of dense marshes in Orange Lake, or (3) nutrient inputs have increased in the watershed over the past few decades, promoting increased vegetative growth in the lake. However, insufficient information and evidence exists to support or refute these hypotheses and it remains unclear whether the density and composition of vegetation has changed over the last century.

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Appendix A
Summary of Literature Reviewed Regarding
the History of Orange Lake

Appendix A: Summary of Literature Reviewed Regarding the History of the Orange Lake Area

Abel, G. 1976. "Don McKay has created a floating paradise" Gainesville Sun: December 12, 1976.

This newspaper article describes Don McKay's work with the floating islands on Orange Lake and his tourist attraction "Floating Gardens". At the time the article was written, "Floating Gardens" had been closed for years, but tourists were welcome to wander around for free. This Article includes pictures of McKay, his walkways and a sign advertising the floating islands.

Alachua County Bicentennial Steering Committee. 1976. Alachua County bicentennial diary: an annotated history of notable events and forgotten facts. Gainesville, Fla.

This is a calendar of past notable events. It states that a newspaper article from November 20, 1938 states that "Cross Creek is finally cleared and ready for use by fishermen and hunters. The creek connects Lochloosa and Orange Lake, and was a main artery of water traffic in the 1880s."

Alachua County Library. 1997. Gainesville Sun Index. Gainesville, Fla.

Index covers all issues that the library has back to the 1880s (many years are sparse in the 1880-1900 range). The following topics were reviewed in the index: Orange Lake, floating islands, railroad, lakes. Numerous articles were found on Orange Lake - nothing on the replacement of the trestle bridge in the index.

Ashby, J.W. 1888. Alachua, the garden county of Florida. Its resources and advantages. Alachua County immigration association.

This book boasts about how wonderful Florida is and compares it to southern California. "The atmosphere of Florida is a medicine..." There is no mention of Orange Lake.

Barbour, T. 1944. That Vanishing Eden, a naturalist's Florida. Little, Brown and Company, Boston, Mass.

This book does not mention Orange Lake. However, the author does mention "...there are many floating islands or tussocks of willow, pond apple trees, and the like.." in Lake Helen Blazes inland from Micco, Florida.

Bartram, W. 1792. The travels of William Bartram. Edited by Mark Van Doren with 13 illustrations from the original [1792] edition. 1928. 1955 republication of the 1928 edition. Dover Publications, New York, N.Y.

Part II Chapter III (p.87) discusses floating vegetation, but it seems that Bartram was somewhere along the St. Johns River as he described the floating islands,

consisting primarily of water lettuce.” In Part II, Chapter VI, he describes what seems to be Orange Lake, “We... pass through a narrow pine forest; when suddenly opens to view a vastly extensive and sedgy marsh, expanding Southerly like an open fan, seemingly as boundless as the great ocean: our road crossing the head of it, about three hundred yards over; the bottom here was hard sand, a foot or more under a soft muddy surface. The traders informed me, that these vast marshes lie on the borders of a great lake, many miles in length, in magnitude exceeding Lake George, and communicating with the St. Juan’s by a river; ...” (Bartram 1792).

Baynard, Oscar E. 1913. Foods of herons and ibises. *The Wilson Bulletin* XXV:167-169.

This article gives some anecdotal information on the foods of herons and egrets in Orange Lake.

Baynard, Oscar E. 1913. Home life of the glossy ibis. *The Wilson Bulletin* XXV(3):103-117.

This article describes in detail glossy ibis breeding and feeding on Orange Lake. Baynard, the warden of Bird Island in Orange Lake, states that common foods of the ibis include grasshoppers, crayfish, and snakes with moccasins accounting for 95% of the snakes caught by ibis.

Belding, George T. 1895. *Florida Railroad Gazetteer and State Business Directory*. Cotton States Publishing and Advertising Co., Atlanta, GA. (University of Florida P.K. Yonge Library)

This book contains a short paragraph on the Ocklawaha River and the St. Johns River. There are entries on Citra, Island Grove and McIntosh and an advertisement for the Florida Central and Peninsular Railroad, but no mention of the trestle bridge across Orange Lake.

Bray, Sybil. 1987. *Marion County Remembers :Salty Crackers”* Number 5. Sybil Browne Bray, Ocala, Fla.

The first chapter of this volume is “Memories of Orange Lake.” In it, Bray discusses the drought of the 1950s and the sinkhole of Orange Lake. She also mentions the floating islands and Don McKay. She says there were boat tours called “McKay’s floating island scenic cruises.” Ms. Bray says many fishermen got lost as a result of the floating islands blowing around. She also includes a diary of a British girl giving her account of her family’s move from England to Orange Lake. The diary reads “...While we were going through a creek [Cross Creek] we saw such a lot of water lillies; more than I have ever seen in all of my life. We saw a lot of fire flies while we were crossing the lake. We got across Orange Lake at night...”

Bryan, J.C. and K.R. Warr. 1998. Vegetative Communities of Orange Lake. Draft Report. St. Johns River Water Management District, Palatka, Fla.

Buchholz, F.W. 1929. History of Alachua County. The Record Company, St. Augustine, Fla.

In the chapter on Micanopy, Buchholz mentions wild oranges from Orange Lake and a freeze of 1886 which wiped out groves in Micanopy. There is nothing on Orange Lake itself.

Carter, W.H. Date ?. Creatures and Chronicles from Cross Creek, Atlantic Publishing Company, Tabor City, N.C

Chapter titled "Bottom Dropped Out and We Burned the Creek" describes the drought of the 1955-1956 period. He describes a long-time resident's retelling of a story when a sinkhole in Orange Lake opened up and pulled his homemade cypress boat down into the sinkhole. He also tells of residents burning the vegetation in Cross Creek when the water was so low that the entire creek was dry.

Cash, W.T. 1938. Story of Florida. American Historical Society Inc., New York, N.Y.

According to this book, about 90 miles of Railroad were built between 1876 and 1881, connecting the St. Johns River with inland points. The main roads constructed were: Jacksonville to Harts Road, Waldo to Orange Lake, and Astoria to Lake Eustis. (p. 497)

There is a section on the History of Alachua County which discusses the history back to 1700s, including information on DeSoto, the Timucuan Indians, the Seminole Creek Indians, the Arrendondo Grant (Arrendondo received a large acreage of land if he agreed to get 200 families to move to Florida); the civil war (Alachua Co. was one of the main secession centers); and orange groves. The area of Alachua Co. used to be much bigger including areas of 16 other current counties. There is no mention of Orange Lake.

Clark, M.M. 1947. The development of the citrus industry in Florida before 1895. M.S. Thesis, Florida State University, Tallahassee, Fla.

This book contains no mention of the Citra to Island Grove Railroad and no mention of the Orange Lake area.

Davis, J.G. 1969. History of Alachua County 1824-1969. Alachua County Historical Commission, Gainesville, Fla.

This book includes a lot about the people of Alachua County. Page 98 mentions Orange and Lochloosa Lakes and says at one time they were connected by a navigable stream. Steamboats operated on the lakes. Page 133 states that Mr. Shands owns considerable acreage of the bed of Orange Lake which is drained and planted with celery in season.

Dement, J.D. 1985. Orange lake vineyards. Masters of Architecture thesis, University of Florida, Gainesville, Fla.

This thesis does not have any relevant information on Orange Lake. It states that due to freezes of orange groves, vineyards may become important in Florida. This thesis then discusses architecture of vineyards in the world.

East Florida Banner, Ocala, Florida. (University of Florida, P.K. Yonge Library had the following issues and they were checked: July 3, 1880; August 26 - December 1882; December 1, 1883; and July 20, 1887)

No mention of Citra to Island Grove Railroad or a trestle bridge was found in the above mentioned issues.

Florida Central and Peninsular Railroad. 1890-1899. Travel Schedules and Brochures 1890-1899.

These brochures do not contain anything on the Citra to Island Grove Railroad or the trestle bridge.

Florida Railroad Commission. 1891. Florida Railroad Commission Report 1887-1891.

-This report does not contain anything on the Citra to Island Grove Railroad or the trestle bridge.

Florida Railway and Navigation Company. 1888. Information Folder. Matthews, Northrup and Co., Buffalo, NY. - Collection of Dr. Seth H. Bramson, Miami, FL.

This information folder was given to travelers describing their trip. The description of the trip from Hawthorne to Ocala included the following: "...and onward towards the eastern arm of Orange Lake which it crosses over a long trestle on pilings..."

Florida Southern Railway Company. Date? Land Grant of the Florida Southern Railway.

This report contains no mention of the Citra area or a trestle bridge across Orange Lake.

Florida Southern Railway Company. ? Orange Belt Route of Florida.

This pamphlet does not include the Citra to Island Grove route.

Florida Southern Railway Company. Papers relating to Alachua County 1881, 1883 with plats (University of Florida P.K. Yonge Library, Box 32)

These are land contracts. There is no mention of Orange Lake area.

Foss, James. 1891. Florida facts, found after a 6 years' search. Round Avery Company, Boston, Mass.

This is an advertisement for Florida. It states that people should move to Florida for health reasons (It includes a picture of Silver Springs). There is no mention of the Orange Lake area

Freeman, O.W. 1960. Florida's lake of floating islands. Ford Times 22(3):40-43.

This article describes the floating islands of Orange Lake and the work of Don McKay. This article states that Orange Lake recovered after the worst drought in twenty years. During the drought, the floating islands were resting on dry ground. The article states that the Game and Freshwater Fish Commission wildlife officer thinks that the drought actually may be the reason the fishing is now better than ever. The wildlife officer is quoted as saying "I've never seen the fish population increase so rapidly. The fish are big and fat..."

Gainesville Daily Sun. 1911. Audubon Society Making Fight for Birds. Gainesville Daily Sun: Dec. 28, 1911, Gainesville, Fla.

Describes the Audubon Society's protection of Bird Island, mentions the birds breeding on Bird Island, Saw Grass Island and Redbird Island. Article also states "...Scattered about in the lake, which here is very marshy, with many patches of lillies and rushes, are several large nameless "tussocks" of grassy, floating islands, all rich in bird life."

Gainesville Daily Sun. 1937. Visitors Spend Night on Floating Island as Rowboat Overtums. Gainesville Daily Sun 4/11/1937, Gainesville, Fla.

Gainesville Sun. 1961. Orange Lake's floating islands gain prominence. Gainesville Sun article Feb. 19, 1961, Gainesville, Fla.

Gainesville Sun. 1968. Floating Islands' Featured. Gainesville Sun article June 12, 1968, Gainesville, Fla.

Gainesville Weekly Sun and Bee, Gainesville, Florida. (University of Florida, P.K. Yonge Library had the following issues and they were reviewed: March 5, 1881 and May 12- December 22, 1882)

I did not find any mention of the Citra to Island Grove Railroad, a trestle bridge across Orange Lake, or the floating islands across Orange Lake..

Gardiner, R.S. 1872. A guide to Florida "the land of Flowers." Cushing, Bardua and Company, New York, N.Y.

This book does not contain any information on Orange Lake, Paynes Prairie or other relevant places. It does mention Gainesville and steamboats on the St. Johns and Ocklawaha Rivers.

Hill, R.G. and J.H. Pledger. 1939. Railroads of Florida. Florida Railroad Commission, Tallahassee, Fla. (at University of Florida, P.K. Yonge Library,??)

This book contains no mention of the Citra to Island Grove Railroad route or the trestle bridge across Orange Lake.

Jessen, E. 1972. Land use of the Orange Lake area of Central Florida. Masters Thesis, University of Florida, Gainesville, Fla.

This thesis states that the railroad across the eastern end of Orange Lake from Citra to Island Grove was opened to Ocala in 1881. Jessen states another road was built on a fill across Orange Creek approximately 6 miles downstream. A few decades later the highway was built to the west of the railroad. Jessen states "...these structures undoubtedly contributed to flood problems" but, he does not explain how he knows this. Jessen states that the muckland (formerly part of Orange Lake) was acquired by Shands in the 1930s and in turn, Shands built and maintained a dike across the marshes about 1/2 miles to the east of the railroad. Shands canal was dredged from the dike to the northeastern side of the muckland area. During the 1948 flood, the spillway of the dike had to be dynamited. More history of water levels of Orange Lake, sinkhole activities, and other information is included.

Johnson, C. 1918. Highways and Byways of Florida. Macmillan Company, New York, N.Y.

Chapter III is titled "The Stately St. Johns and the Beautiful Ocklawaha." It discusses steamboat trips on the Ocklawaha. There is nothing on the Orange Lake area.

Johnson, D. S. 1965. The Railroads of Florida. Ph.D. Dissertation, Florida State University, Tallahassee, Fla.

This book does not mention the trestle bridge across Orange Lake. It states that the 1880s was a period of new construction with many short lines constructed; and the 1890s was a time of bankruptcy with many small companies merging. It discusses the Central and Peninsular Railroad and says they constructed a line from Waldo to Ocala and that they were absorbed by the Seaboard Air Line Railroad Company in 1900.

Johnson, J. 1966. Floating islands offer haven for birds. Gainesville Sun: May 29, 1966.

Knetsch, J. 1989. Orange lake: enchantment, development, and near demise. Division of State Lands, Tallahassee, Fla.

*Knetsch describes attempts to change Orange Lake through the past 100 years and more. On page 4 he mentions an Engineer's description of Orange Lake (looking at Orange Lake as part of potential CFBC route). The Engineer said "...half of the surface of the lake presents to the eye a fine sheet of water, but the remainder exhibits a luxuriant growth of aquatic grass..." On page 5 Knetsch states that an 1837 document states that "... **when this lake is rendered navigable** from its head to the Ocklawaha and thence into the St. Johns River, it will be the depot of the produce of the Alachua County. (Knetsch points out that this may have been referring to the Orange Creek outlet being clogged). Knetsch also describes Camp's proposal to drain a portion of the lake. He also says that the railline between Citra and Lochloosa existed in 1885 (not constructed then).*

Lanier, Sidney. 1875. Florida: its scenery climate and history. A facsimile reproduction of the 1875 edition with introduction and index by Jeffrey Shofner. 1976. University Presses of Florida, Gainesville, Fla.

The book does not contain any information on Orange Lake, but it does contain a description of the Ocklawaha River.

Lauter, F. 1950. Steamboating in Alachua County. Class Report for History 352 - Mr. Edward C. Williamson (teacher), University of Florida, Gainesville, Fla.

This report describes steamboating on Paynes Prairie - Alachua Lake, Lake Santa Fe, a canal from Melrose to Waldo, and Orange and Lochloosa Lakes. A steamer capsized in 1870 on Orange Lake. There are no pictures of Orange Lake and no information on floating islands.

Marcus, R.B. 1953. Tourism in Marion County, Fla.: a geographic study. M.A. thesis, University of Florida, Gainesville, Fla.

This thesis states that one of the unique features of Orange Lake is its floating islands. It states that the Bird Island Sanctuary and egret rookery was once a floating island, but, says for many years it has been anchored. The book says there are two groups of people attracted to Orange Lake: "...those who come to see the floating islands and those who come to fish." (also includes two pages on the Ocklawaha River, and pictures of Silver Springs. There are no pictures of Orange Lake)

Martin, Richard A. 1966. Eternal Spring, Man's 10,000 years of history at Florida's Silver Springs. Great outdoors publishing Co., St. Petersburg, Fla.

This book contains interesting information on Ocklawaha River steamboating but nothing on the Orange Lake area.

Matthews, J.O. 1876. A new enterprise: the Florida orange grove company. Sun Printing office.

This brochure describes plans for an orange grove on the southern side of Orange Lake. It says a railroad is already graded from Waldo to Cedar Keys Road and a telegraph station will be established in 1876. There is no description of the lake itself.

McCall, G.A. 1868. Letters from the Frontiers - written during a period of thirty years' service in the Army of the United States - by General George A. McCall, Late Commander of the Pennsylvania Reserve Corps. A facsimile reproduction of the 1868 edition with an introduction and index by John. K. Mahon. The University Presses of Florida, Gainesville, Fla.

*This collection of letters by an Army General, includes a description of floating islands in Orange Lake and floating plants. A note at the end of the work indicates that the General corresponded with a Professor Rothrock of Philadelphia who believed the floating aquatic plants forming the floating islands were water lettuce (*Pistia spathulata*). The letter from Professor Rothrock*

includes excerpts from Bartram's Travels regarding floating plants and islands. General McCall also mentions limestone sinks in the area.

McDonald, F. (post 1904). Hawthorne, Alachua County, Florida. Peninsular Printing Co., Gainesville, FL.

This is a very interesting book with lots of historical pictures. There is no mention of Orange Lake and no pictures of Orange Lake.

Melton, F.P. 1987. Citra: home of the pineapple orange. F.P. Melton, Citra, Fla.

This booklet contains a history of the Railroad. Melton mentions that the Railroad across Orange Lake used to be a trestle bridge and that Mr. W.J. Crossby (Sr.) built a special bicycle for riding on the trestle bridge. There is not a picture of the trestle bridge.

Miles, G. (ed). 1977. Voices from the countryside. Banyan Books, Miami, Fla. (F.2 A31 V889)

This book does not contain any relevant information on the Orange Lake area.

Murriel, W.A. 1937. Flora of Alachua County, Gainesville, Fla.

This book contains keys to different groups of plants and plant descriptions. There is no information on Orange Lake.

Myers, O.A. 1882. Alachua County, her attractive features and public improvement. Cannon and McCreary, Gainesville, Fla.

This book states that the Florida Southern Railroad crosses Lochloosa Creek about 12 miles East of Gainesville. It mentions orange groves, "Arrendondo" area, "the Lake Region," Orange Lake; and "the island" (land between Orange and Lochloosa Lakes). There is no mention of the Railroad between Citra and Island Grove.

This book states that there were steamers on Orange and Lochloosa Lakes and that these lakes are "connected by a deep stream..." It mentions a steamer called Alpha and discusses rich hammocks in the area. It states that the prairie [Paynes] is now a "vast sheet of water...."

Nelson, Jonathan. 1975. Florida's Ghost Railroads. History Paper for Dr. Cox HY 499, University of Florida, Gainesville, Fla..

This report does not contain information on the Citra to Island Grove Route or the trestle bridge crossing Orange Creek. The report does mention a Railroad at Orange Springs and that trestle pilings are still present there.

Opdyke, John B. 1974. Alachua County: a sesquicentennial tribute. The Alachua County Historical Commission 1974., Gainesville, Fla.

This report does not contain any information on the Orange Lake area.

Ott, E.R. and L.H. Chazal. 1966. Ocali Country, Kingdom of the sun, a history of Marion County, Florida. Perry Printing Company, Ocala, Fla.

This booklet does not contain any mention of the trestle bridge or vegetation around Orange Lake.

Palmer and Orleman. 1884. Orange high lands at Palmer, Alachua County, Florida with description of soil, production, climate, resources and c. E. Waldecker, Washington, D.C.

This booklet is an advertisement for the town of Palmer in Alachua County. It does not mention the Orange Lake area. It discusses land, farming, oranges and weather.

Patterson, M.C. 1972. Don McKay's Magic Isles Float. Gainesville Sun: April 9, 1972.

Pearson, T.Gilbert. 1941. Orange Lake -- an inspiration. The Florida Naturalist XV(1):1-6.

This article gives the history of Audubon's early attempts to protect bird rookeries including Bird Island in Orange Lake. Bird Island was the first bird reservation to be owned by the Audubon Association. Pearson also states that "...it was the rookery at Orange Lake that definately inspired the Audubon Society workers to revive the egret campaign at a time when many regarded such efforts as a hopeless waste of energy."

People's Homestead Company. 1888. Leroy, Marion County, Florida, the land of flowers, of orange groves, of perpetual summer, wealthy, prosperous, delightful, the garden spot of the western world. People's Homestead Company, New York, N.Y.

This pamphlet is about the town of Leroy, Marion County (S. of Gainesville). It does not have any information on the Orange Lake area.

Pettingale, G.W. 1952. The story of Florida Railroads 1834-1903. Railway and Locomotive Historical Society, Boston, Mass.

Pettingale mentions the Railroad crossing Orange Lake but he did not mention a trestle bridge. He does mention a long trestle to Cedar Key and one over the St. Johns River in Palatka. He says that in 1881 the Railroad title for the Railroad crossing Orange Lake changed to the Florida Transit Railroad.

Philipp, P.B. 1911. Report of P.B. Philipp on Bird Island, Orange Lake, Florida, 1911. Bird Lore 1911:358-362.

This article says that Bird Island covered about 36 acres, nine of which were ordinarily dry and the rest of which are marsh. Saw Grass Island of 25 acres and Red Bird Island of 5 acres are adjacent to Bird Island. Tussocks are scattered about the lake and are rich in bird life. A list of nesting birds is given as well as estimates of their numbers.

Pickard, J.B. 1994. Florida's Eden: illustrated history of Alachua County. Maupin House, Gainesville, Fla.

This is a great book which discusses the orange groves around Orange Lake, and mentions the big freeze of 1894. It does not include any pictures of Orange Lake.

Rambler. 1875. Guide to Florida. A 1964 Facsimile reproduction of the 1875 edition with additional illustrations. University of Florida Press, Gainesville, Fla.

In the section on Palatka, the author discusses steamboat trips that were most likely on the St. Johns River and or Ocklawaha River. He states "...what appeared to have been the solid earth was but a floating island, which went dancing and torn in the wake behind us, its long roots thrown up to the troubled surface of the water..."

Rawlings, M.K. 1942. Cross Creek. C. Scribner's And Sons, New York.

This novel is based on experiences that the author had and people that the author knew while living at Cross Creek. The author describes the floating tussocks in Orange Lake.

Reid, G.K., Jr. 1950. The fishes of Orange Lake, Florida. Quarterly Journal of the Florida Academy of Sciences 12(3):173-183.

This paper describes the fish using Orange Lake habitats.

Reid, G.K., Jr. 1952. Some considerations and problems in the ecology of floating islands. Quarterly Journal of the Florida Academy of Sciences 15(1):63-66.

Reid states that the marsh in Orange Lake, much of which is floating, may be over a mile wide in some places. He states that floating islands are impressive features of Orange Lake and that they range in size from a few feet to several acres. Reid describes the plants that dominate the floating islands and also lists some of the mammals, amphibians, reptiles, birds, and invertebrates using the islands. Reid says there are 36 species of fish using Orange Lake and several show affinities for floating islands. He also describes several theories for the development of floating islands.

Romans, Bearnard. 1775. A concise natural history of east and west Florida. (A Facsimile reproduction of the 1775 edition with introduction by Rembert W. Patrick 1962). Floridian Facsimile and Reprint Series, University of Florida Press, Gainesville, Fla.

No information on Orange Lake area

Simpson, F. 1882. A trip through northern and central Florida, March and April 1882. East Orange Gazette Printers, East Orange, N.J.

This book discusses a trip down the Ocklawaha River: "... reached Silver Springs, where commenced a day of beauty such as I never saw before, and fear I shall never see again. Nothing which I ever saw in Europe, not even in far famed Italy, could compare for beauty with what I viewed that day. How my trip down

the Ocklawaha river impressed me, and what I saw, I shall endeavor to portray..." (continues with several pages). There is no other information on the Orange Lake area.

Smith, James Calvert. 1942. Micanopy. Report in the P.K. Yonge Special Collections Library at the University of Florida, Gainesville, Fla.

James Smith was a famous painter who lived in Florida. His report on Micanopy is a collection of his memories about the town. He describes the Railroads. There is nothing on Orange Lake. This report is very difficult to read as it is hand written and the writing is fading.

Southern Living. 1968. *The floating islands of Orange Lake.* Southern Living May 1968:34-35.

This articles discusses the floating islands of Orange Lake and says "even Ripley had to see these phenomenal islands before he was convinced of their authenticity." It discusses the popping up of masses of earth and the plants that inhabit the muck. It states that water maples that reach heights of 25 to 30 feet occur in the islands.

Taylor, A.E. 1954. Soil survey, Alachua County, Florida. U.S. Government Printing Office. Washington D.C.

The soil survey does not contain a map and there is no mention of the Orange Lake area.

Teal, E.W. 1951. North with the Spring. Dodd, Mead and Company, New York.

Chapter nine "Lake of Floating Islands" describes the floating islands of Orange Lake and the work of Don McKay. Teal also discusses other reports of floating islands from various parts of the world and says that the "Seminole Indians, in the early days, believed that the souls of the dead buried on the floating islands of Orange Lake went to the "Land of the Sure" when the islands sank." Teal gives several explanations for floating island development. He says McKay tried anchoring floating islands on several occasions, but storms always tore cables away and the floating islands would move on. He says on his visit they passed one floating island that resembled an atoll because its center sunk and the depression was filled with water.

Teal, E.W. 1948. One-man nature center. Nature Magazine :69-72.

Edwin Way Teal describes a visit to Don McKay's one-man nature center along the shores of Orange Lake. He describes the tour boat that Don McKay made, the birdlife and other wildlife of the lake and the floating islands. He also describes how McKay would cut through the floating mats with a saw and how the floating islands move around, sink and rise and sometime topple over. He says one cypress tree on a floating island was at least 12 feet high and a maple tree was even higher.

Trumbull, S. 1958. "State's disappearing lake reappears - fish and all." Miami Herald: November 2, 1958.

This article describes how Orange Lake had recovered after several years of drought. During the drought all but a portion of the lake on the northern end known as "the clear" was bone dry, the article says. Fish camps were closed and "...the floating islands which had brought the lake nation-wide attention were floating no more" The article says that local people do not all agree as to whether plugging the sinkhole or rainfall caused the lake to recover. The article stated "...the floating islands, some of them more than 150 feet long and complete with small trees and nesting birds are floating again. These are really showpieces." The article also says "...the way the fish came back has astounded local fishermen..."

U.S. Geological Survey. 1893. Topographic sheet for Citra, Florida. U.S. Geological Survey, Government Printing Office, Washington, D.C.. (at University of Florida Map Library)

Shows marsh vegetation in the P.G. area of Orange Lake.

Warren, B and F. Clark, Jr. 1985. Seaboard Coast Line: SCL in Florida, a pictorial history. Carstens Publications, Inc., Newton, N.J.

This book has lots of pictures of railroads and trains, but no pictures of the railline between Citra and Island Grove. It does contain a photo of a long trestle bridge across the Manatee River near Ruskin, Florida.

Webb, J. 1980. *Orange Lake: A Haven for Lovers of the Outdoors*. Gainesville Sun: Nov. 9, 1980, Gainesville, Fla.

This photo story shows photos of Orange Lake and states that William Bartram's paragraph on the "vast sedgy marsh" was referring to Orange Lake.

Webb, Watson S. 1885. Webb's Historical, industrial and biographical Florida. W.S. Webb and Company, Publishers, New York, NY.

This book states that the Orange Lake town began in 1881. Four years later it had 2 churches, a school, a land office, a post office and 50 families. By 1885, Citra had 250 people. There is no picture or mention of a trestle bridge over Orange Lake. In the Alachua County section there is a drawing of "floating islands" but there is no mention of Orange Lake. Webb does not state where the picture of the floating islands is from.

Webber, C. 1883. The Eden of the South. University of Florida, Gainesville, Fla.

There is no mention of floating islands or other relevant information on Orange Lake.

Wessener, D. 1990. We might could...and we did. Darlend, Ocala, Fla.

This book gives the history of Ocala and Marion County including a small paragraph on the history of the town of Citra. However, there is no

information on the railroad bridge crossing Orange Lake or on Orange Lake itself.

Williams, J.L. 1837. Territory of Florida. A.T. Goodrich, New York, N.Y. A facsimile reproduction of the 1837 edition with introduction by Herbert Doherty, University of Florida Press, Gainesville, Fla., 1962.

This book includes sections on the St. Johns River, reptiles, birds, insects, shells, Everglades, springs, rivers, lakes and towns. It mentions Pithlachucco Lake within the Arrendondo Grant in the center of Alachua County. It says the lake is nine miles long and three wide. Its outlet, called the River Styx, falls into the great sink of Alachua Savanna. It also mentions Orange Lake in the same grant and states Orange Lake is eleven miles long and from one to five miles wide. "... When this lake is rendered navigable from its head to the Ocklawaha, and thence into the St. Johns River, it will be the depot of the produce of Alachua County." Williams does not explain why the lake was not navigable.

Yulee, David Levy. Files, letters and papers of David Levy Yulee. mid to late 1800s.. (P.K. Yonge Library at the University of Florida, Gainesville, Fla)

Agreement between Peninsular Railroad Company and Wilson Peek Tompkins.

States that the Railroad Company agreed to buy lumber and other supplies for construction of a trestle bridge of approximately 4,690 feet long across Orange Lake.

Letter from H.S. Duval, Engineer, to Hon. Hugh A. Hasley, Commissioner of Lands and Immigration, State of Florida. July 12, 1881.

Letter states that as requested, the engineer has inspected the Waldo to Ocala line of the Peninsular Railroad and it receives his approval. He describes general information such as the grade, width of banks and maximum curve, but there is no mention of the trestle bridge over Orange Lake.

Letter from Chas Lewis, Florida Land and Immigration Company to Hon. J. Yulee, President of the Florida Peninsular Railroad. May 19, 1881.

Reviewed for information on the trestle crossing Orange Lake, but there was no information on it.

Receipt from James Hugh, Atlantic Gulf and West India Transit Rail Road for \$1000 for payroll for the extension of the Peninsular Railroad to the south side of Orange Lake signed by John Hedges of the Peninsular Railroad. May 7, 1880.

This receipt shows that Yulee's company was planning to build a trestle bridge all the way across Orange Lake. However, there is no official confirmation in the files that they actually built the trestle all the way across.

MAPS

Florida Department of Transportation. Tallahassee, Fla.

Official road map of Florida 1927 - indicates Hwy. 301 used to be Highway 31. (extending from Ocala to Waldo via Citra, Island Grove and Hawthorne).

Moorhead, J.R. 1892. Map of Marion County, 1892. Ocala Banner 1892, Ocala, Fla. (at University of Florida, P.K. Yonge Library)

This map shows that the Railroad between Citra and Island Grove is the Florida Central and Peninsular Railroad. There is no lake vegetation shown on the map.

Ocala Banner. 1892. Map of Marion County. Ocala Banner, Ocala, Fla.

Available at P.K. Yonge Special Collections Library at the University of Florida. This map shows that the Railroad from Island Grove to Citra to Ocala was the Florida Central and Peninsular Railroad in 1892. Orange Lake is shown, but the vegetation is not indicated.

U.S. Geological Survey. 1893 Citra Topo Map. Located in University of Florida Map Library, University of Florida, Gainesville, Fla.

This Topo Map shows vegetation within the entire P.G. area of Orange Lake. The type or density of the vegetation is unknown.

U.S. National Archives Cartographic Branch. Maps, etc. relating to the seat of war in Florida... 1836-1842 (Seminole War), Copies at University of Florida, P.K. Yonge Special Collections Library, Gainesville, Fla.

The University of Florida has a large number of these maps. These maps were produced by soldiers in the field during the Seminole War in Florida. There is one map dated 1839 that shows Orange Lake, Orange Creek and the Ocklawaha River. Within the boundaries of Orange Lake, along the eastern and western edges beginning about midway down the lake, there is a band of vegetation shown. The northern half of the lake does not have this band of vegetation along the edge. The map does not appear to be to scale.

Sanborn Maps. late 1800s. (Insurance Maps for urban areas and small towns), University of Florida Map Library, Gainesville, Fla.

These maps do not show natural landmarks like lakes. Citra and other small towns around Orange Lake were not included.

Appendix B
Summary of Newspaper Articles and Photos
Related to Orange Lake

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- 05-13-1903** **Orange Lake is Private Property - Gainesville Daily Sun**
Orange Lake itself is part of the Arrendondo Grant - not public property - Fishermen have been leasing Orange Lake grounds for fishing. Locals say that it is not navigable waters because there is no navigable outlet to Orange Lake and the law defines "navigable water" as having a "navigable outlet."
- 12-28-1911** **Audubon Society Making Fight for Birds - Gainesville Daily Sun**
Describes Audubon's purchase of Bird Island for \$250.20 - Bird Island was 36 acres, Saw Grass Island was 25 acres, and RedBird was 5 acres.
- 06-12-1912** **Orange Lake- Water Line is Highest in 40 years - Gainesville Daily Sun**
"Oldest settlers say that not since 1871 has there been so much water"
- 04-11-1937** **Visitors Spend Night on Floating Island As Rowboat Overturns - Gainesville Daily Sun**
Describes boating accident where 4 men had to spend the night on a floating island in Orange Lake.
- 11-20-1938** **Cross Creek Cleared By Engineers: Now Accessible For Use By Hunters, Fisherman - Gainesville Daily Sun**
U.S. engineers clear Cross Creek so recreationists can get through. Heavy growth of water lillies and other vegetation prevented even a small rowboat from getting through. Cross Creek was a main artery for water traffic in the 1880s and steamers would carry oranges and freight from Orange Lake station to Lochloosa Lake station.
- 12-11-1945** **Public Hearing Set on Drainage - Gainesville Daily Sun**
Meeting to be held by the U.S. Army Corps of engineers regarding Orange Lake Basin flood control.
- 09-16-1948** **Public Hearing Set Friday on Orange Lake Basin - Gainesville Daily Sun**
There are flood conditions in Orange lake Basin - and water hyacinths. "Hyacinths have caused virtual dams..." Because of the hyacinths, fishing... is being harmed..."
- 02-06-1949** **Letter of 1871 Recalls Tragedy on Orange Lake - Gainesville Daily Sun**
Describes a letter which described an 1871 boat wreck on Orange Lake where 6 people lost their lives
- *Fall 1955** **Three Camps Quit: Continued Dry Weather Is Causing Economic Crisis - Gainesville Daily Sun**
Three fish camps close while others try to maintain lake access by dredging and using drag lines. Situation at Cross Creek is critical due to airboat only access to the lake and loss of tourist revenue. Many feel that a dam across Orange Creek is only solution and an appeal was made by the locals to the Legislature for aid in its construction
- *October 1955** **Meeting Set to Discuss Lake Project - Source Unknown**
Landowners interested in water control project at Orange Lake invited to attend meeting held by the Orange Lake Sportsman's Assoc. and McIntosh-Orange Lake Chamber of Commerce. Landowners would agree on a lake level in order to avoid drought and alleviate flooding of valuable crop land.

- *October 1955 Water Shed Association Formed: Orange Lake Group is Organized to Push Program to Alleviate Drought - *Source Unknown***
The Orange Lake Water Shed Association, headed by owner of the Orange Lake Fishing Camp, Tom Dubose, is formed Association hopes to alleviate critical drought situation in lake area. Soil Conservation Service can only offer technical assistance and financial assistance must come through the state water shed group. Landowners feel water control would have a direct benefit to citrus, cattle, trucking, and timber interests in the water shed area.
- 10-08-1955 Lake Landowners to Discuss Water Control Friday - *Gainesville Daily Sun***
Landowners will meet to discuss possibilities of a water control program. Public Meeting on Proposal to dam Orange Lake to keep level within 2 feet of normal (prevent flooding of orange groves) The Sportsman's Assn. has been given permission by SCS to apply for federal aid for a program to control lake levels. SCS will discuss what is needed to get the work accomplished.
- 10-14-1955 Orange Lake Water Control Meeting Set - Groups Seeking Ways to Keep Levels Normal - *Source Unknown***
Landowners and residents will meet to discuss what can be done about low water levels in Orange Lake. Staff from USGS and USCS will meet with residents to discuss options.
- 10-14-1955 Water Saving Meet Set for Orange Lake - *Florida Times Union***
Landowners and Residents to meet to discuss options for dealing with low water. Representatives of the USGS and the USCS are expected to attend.
- 10-14-1955 Lake Landowners Urged to Attend Friday Meet - *Source Unknown***
Landowners and Resident to meet to discuss options for dealing with low water and discuss possibility of building a dam at the outlet.
- 10-15-1955 Orange Lake Water Saving Body Formed - *Florida Times Union***
The Orange Lake Watershed Association was formed to deal with the low water problem in Orange Lake.
- 10-20-1955 Group to Fight Subnormal Levels in Orange Lake - *Marion County Sun***
The Orange Lake Watershed Association was formed Friday to explore remedies for subnormal water levels in Orange Lake. "Level in Orange Lake steadily declining since 1953..." "...no flow out of lake...since May of this year..."
- 12-06-1955 County Approves Lake Plan - *Gainesville Daily Sun***
Alachua County Commission approves application for Federal Aid by the Orange Lake Watershed Association for a control project on Orange Lake.
- * 1956 Last Bound Up On South End & Heagy's High and Dry (photos) - *Source Unknown***
Photos show fishing hole on south shore of Orange Lake which has yielded 100,000 lbs. of fish. Heagy's boat ramp is completely dry and floating islands now rest on ground.
- 01-06-1956 1955's December driest of its kind since '08; crops, cattle suffering - *Gainesville Daily Sun***
Article describes drought and mentions that the Orange Lake Watershed Association formed to request federal aid to build a dam in order to maintain water levels in the lake.
- 03-26-1956 Forest fires hit Waldo area, state - *Gainesville Daily Sun***
Forest fires occurring in Alachua County and "smoke still obscures visibility in Island Grove area from mucklands which have been burning a week over several hundred acres.."

- 03-31-1956** **Fish Bag Limit Suspended on Drought-Stricken Lake - *Orlando Sentinel***
Large assemblage of bluegills and catfish have congregated in northwest corner of Orange Lake and fishermen are hauling in bluegills and catfish at a record clip. "...between 100 and 200 fishermen daily drop hooks in the spot.." All available boats are rented and more than 40 boats are there all of the time.
- 04-01-1956** **Fishermen's Paradise - *Source Unknown***
Nearly 200 fishermen concentrated on one corner of Orange Lake as water levels reach extreme lows. State Game Commission declare state of emergency and removed bags limits for fear of fish die off as water levels plummet. Fishermen are catching 3,000-5,000 lbs. of fish daily.
- 04-08-1956** **No Relief In Sight: Prolonged Drought Brings Serious Damages to State - *Florida Times Union***
Drought appears to be Florida's worst since records were began in 1891. Crops and citrus are hard hit. Forest fire situation has been critical state wide. At Orange Lake, all fishing bag limits were removed when the water dropped 8 feet below normal and fish began dying from lack of oxygen. Many fish camps in the state are closed.
- 04-26-1956** **Orange Lake Will Get Help From U.S. on Water Control - *Ocala Star Banner***
Discusses other droughts..."In 1896 it was very dry, again in 1906 it was so dry... again in 1916,1917,1931, and 1932.
- 05-27-1956** **Orange Lake fish camps close as water recedes, \$120,000 losses are estimated - *Gainesville Sun***
Two of the 13 major fish camps on Orange Lake are open (Mike's Fish Camp which has a long dock and one at Cow Hammock which required the dredging of a 200-foot channel leading to lake). Don McKay's Floating Island tour business has been closed due to low water.
- *Early Sum. 1956** **Despite Rains, Water in Northeast End Recedes: Residents Wonder Whether Famed Orange Lake Fishing Spot Becoming Like Payne's Prairie - *Source Unknown***
Rainfall still far below normal. Comparisons between Orange Lake and Payne's Prairie are made concerning sinks, water outflow rates, and early reports of lake are presented. Many feel sinkholes should be plugged however author points out that there are many sinkholes and they often act as a source rather than a sink under some conditions.
- *Early Sum. 1956** **How a Florida Top-Fishing Lake Looks, Left Low and Dry by Drought -(*Tampa Morning*) *Tribune***
Seven fish camps closed and over half of lake bottom is dry. GFC removed fishing restrictions when isolated puddles would dry up so residents could take the fish which would otherwise perish.
- *Summer 1956** **Crews at Work: SCS Schedules Study of Orange Watershed - *Orlando Sentinel***
The Watershed Planning Party of the SCS will make surveys of the Orange Lake watershed in order to develop a water control plan.
- *Summer 1956** **No Water (photo) - (*Tampa Morning*) *Tribune***
Photo depicts extreme low lake levels which have left Heagy fish camp and boat ramp completely dry.
- June 1956** **Water Control Project Planned on Orange Lake - *Florida County Official***

Alachua County Commission endorsed application for federal aid by the Orange Lake Watershed Association for a water control project on Orange Lake.

- June 1956** **Former Fishing Haven Now Mere Trickle - *Florida Times Union***
What was once one of Florida's best known fishing lakes has been reduced to a mere trickle. Shows two photos - south end of Orange Lake and a fish camp with boats on dry ground.
- June 1956** **Soil Conservation Service Plans to Make Surveys - *Source Unknown***
Federal government has approved the Orange Lake water level control project for future study and planning. Soil Conservation Service (SCS) met with landowners to survey requests. The SCS will insist project is safe, right, and the possible benefits must amount to at least \$1.20 for every dollar spent.
- June-1956** **Water Control Project Planned on Orange Lake - *Florida County Official***
Alachua county Commission approved plan to Orange Lake Watershed Association to receive Federal Aid for water control project.
[date questionable]
- 06-04-1956** **Former Fishing Haven Now Mere Trickle - *Florida Times Union***
Photos during the drought - photo of Heagy Burrey and another photo of a fish camp left high and dry.
- 06-07-1956** **What is going to happen to Orange Lake ? - *The Marion Sun***
Describes controversy over the sinkhole. Many want to build a dam and USGS is concerned about this. Flooding has often been the problem at Orange Lake.
- 06-07-1956** **.....Drought, Flood, Drainage problems Presented at Hearing - *Gainesville Daily Sun***
Florida Water Resources Study Commission to hear water conservation and use problems. Irrigation will also be discussed. Orange Lake residents complained about diversion of water from Orange Lake into Payne's Prairie.
- 06-17-1956** **Sun and Sinkhole Shrink Orange Lake to Half Its Normal Size - *Florida Times Union***
Lake shrunk to half its normal size. Water receded 3 miles from the shoreline. The sinkhole is 70 feet deep and 40 feet in diameter. Fishing is great but a dozen fish camps have closed. There are persistent stories that Orange Lake went dry about 100 years ago and a diary by Dixon Irvine details the occurrence. The diary could not be found. Residents said a steamer named Ella used to run Orange Lake.
- 06-25-1956** **Over 3 Inches of Rain Falls in Gainesville - *Source Unknown***
Badly needed rains come to Gainesville area.
- *July 1956 ?** **Can You Believe It? (photo) - *Marion Sun?***
Photo depicts severe drought conditions at Orange Lake. One photo shows anglers intensely fishing isolated fishing holes that are concentrating fish.
- 07-04-1956** **Aid for Orange Lake Residents Studied - *Gainesville Daily Sun***
Alachua County Commission voted to consult the SCS regarding a request by the Orange Lake Watershed Association that the County open a 3 to 4 foot ditch allowing water from Newnans Lake to flow to Orange Lake.
- 07-05-1956** **Better Farming Better living - *Marion County Sun***
Orange Lake Watershed Association's application for Orange Lake dam has been approved by SCS for further study.

- 08-15-1956** **Orange Lake Group to Meet on Water Problem - Gainesville Daily Sun**
Orange Lake Watershed Association to hold meeting with the SCS.
- 08-23-1956** **Orange Lake Watershed Gets Heaviest '56 Rain - Source Unknown**
- 10-07-1956** **Orange Lake Water Level Rises Over Six Inches - Gainesville Daily Sun**
Since torrential rain on August 22, lake has risen more than 6 inches
- 10-25-1956** **Orange Lake Coming Back - Many Interested Persons Watch Rising Waters - Ocala Star Banner**
Water levels are coming back up. In the meantime, SCS is completing a study on what action should be done - a sinkhole dam and a dam at the outlet for the future of the lake. The article discusses floating islands: "...only spots of open water can be seen because of the tall growth that was established while the lake bottom was dry. Some of these plaits already are floating on beds of silt, and observers are wondering how much will remain afloat as the water deepens. The floating islands in the lake, shifting with the winds have for years been considered nuisances by the fishing camp operators, although at one time they caused many tourists to be attracted to the lake. These big islands have now attached themselves to the bottom of the lake bed, and there is a question as to whether or not they will again rise with the rising water."
- 12-09-1956** **U.S. Aid Possible in Hiking Orange Lake Level: Huge Sink Cause of Trouble - Gainesville Daily Sun**
Lake will return to normal size if sinkhole in southwest corner of lake can be isolated. Feel that sink is enlarging and is the main cause of the lowered lake level. Six lake sections were bored to determined substrate type. Schematics of control structures and sink are presented as well as watershed figures.
- *1957** **Define Boundaries of Lake - Ocala Star Banner**
Editorial calling for complete study of Orange Lake and discussion of the Marion County border.
- 01-12-1957** **About Dried Up: Sinkhole Dam Sought to Save Orange Lake Fishing - (Tampa Morning) Tribune**
Tom DuBose, president of the Orange Lake Sportsman's Association and chairman of the Orange Lake Watershed Association raises awareness over the "critical need" for the damming of the sinkhole. Dubose states that the \$10,000,000 citrus industry is in jeopardy as well as recreational/sport fishing. Dubose presents the need for rapid county level funding for this project.
- *Jan/Feb 1957** **Engineers Put Large Estimate On Cost of Orange Lake Project - Source Unknown**
Federal technicians estimate a million dollars will be needed locally to put adequate water controls on Orange Lake. Orange Lake Watershed Association instructed to contact county commissioners to secure engineering help to block sinkhole. D. H. Esry from the SCS presented two alternatives for water controls arising from the survey he completed.
- *Feb. 1957** **Orange Lake Sink Survey Wins Okay - Orlando Sentinel**
County Commissioners say they are "ready to go" on a preliminary survey of possibly damming sinkhole. County surveyor Jack Jernigan told the board the two counties could conduct a surface exploration to where the proper place would be to locate a dam. Survey also includes plans for Lochloosa and other waterways in the watershed.
- 02-08-1957** **Said Under Control: Prairie Ravaged By Fire - Gainesville Daily Sun**

Fires that have burned more than 2,000 acres of muckland on Orange Lake and are now under control. Eastern edge of lake is extremely dry. The peat-like muck, with depths more than 20 feet, has dried out like never before in 50 years. Old-timers say they can't remember the prairie burning before last years fire.

- 02-10-1957** **Projects on Orange Lake Water Level to be Discussed - *Source Unknown***
Orange Lake Watershed Assn. will hold a meeting to discuss progress made on the Orange Lake project. Will also discuss plans for immediate action on a dam around a sinkhole. Officials of the association feel many people have been misinformed concerning the lake, believing the lake had gone dry, and that is not the case.
- 02-12-1957** **State to Help Dam Sinkhole Draining Big Orange Lake - *Tampa Morning Tribune***
State Internal Improvement Fund Trustees directed Engineering Study for sinkhole dam.
- 02-13-1957** **State Promises Aid: Progress Report Set on Orange Lake Level - *Gainesville Daily Sun***
Orange Lake Watershed Assn. will hold a meeting to discuss progress made on the Orange Lake project. Will also discuss plans for immediate action on a dam around a sinkhole. State has agreed to assist.
- *02-14-1957** **Engineers Put Large Estimate on Cost of Orange Lake Project - *Unknown Source***
The State agreed to give aid if the counties would assemble data. 80 to 90 % of money would have to come from local sources.
- 02-15-1957** **Orange Lake Assn. Favors Cost Survey of Dike to Control Water - *Gainesville Daily Sun***
A cost survey to make an estimate of a dike to stop the outflow was favored by landowners. The bulk of the cost for non-agriculture work would be paid by local and state interests. GFC states that 50% of fish might be lost if immediate action isn't taken. Alachua County said it would be necessary to make soundings and borings as well.
- 02-21-1957** **County Officials Handed Problem at Orange Lake - *Marion County Sun***
Counties to get engineering information to State IIF Trustees so that decision can be made...
- *02-23-1957** **Disappearance of Orange Lake imperils vast citrus acreage - *Times Union***
Orange Lake is now a prairie with only 2 feet of water is deepest point. Declining lake levels have robbed Citra citrus farmers of valuable cold protection. Forced to use fires to keep groves warm. Lake level fluctuations are causing citrus and timber industry to lose crops due to excessively high or low lake levels. Plugging of the sinkhole is proposed.
- 02-28-1957** **Orange Lake Dike to Be Constructed , Joint Effort Set to Restore Water Level - *Gainesville Daily Sun***
Alachua and Marion Counties decided to build an earthen dike around the sinkhole as a temporary measure while they wait for Federal aid for a more permanent measure. It will extend 1,300 feet across the old lake bed and require 50,000 cubic yards of fill for a cost of about \$30,000.
- 02-28-1957** **Two Counties Agree on Dam Project - *Florida Times Union***
Both counties will participate on building sand dam 1,300 feet long around sinkhole to begin immediately.
- *02-28-1957** **Immediate Start On Dam at Orange Lake Ordered By Boards - *Source Unknown***
Marion and Alachua Counties will begin work immediately in an attempt to dam sinkhole. Two plans of action considered. Counties would contribute several trucks and

Marion County would throw in a dragline. Work could be completed in 88 days if all the equipment counties can provide is used. Counties went ahead on their own due to critical nature of the situation and the inability to wait for state action.

- *March 1957** **Orange Lake Project Off to Slow Start - Source Unknown**
Residents and others are concerned about the lack of progress during the first few days of dike construction around the sinkhole. Dirt placed the day before on two or three occasions had disappeared. Project will continue for 10 days and then stopped if it appeared impractical.
- *March 1957** **Alachua, Marion Boards to Meet at Orange Lake for Dam Project Study - Unknown Source**
County Commissioners will meet with an engineer from the Internal Improvement Fund to discuss ways of damming the sinkhole at Orange Lake. Meanwhile the two counties have been attempting to dam the sinkhole with sand but progress has been slow.
- *March 1957** **State Will Finance Engineering Survey On Orange Lake Dam - Ocala Star Banner**
Trustees of the Internal Improvement Fund will pay for engineering survey to plug sink hole. Marion County commissioners warned Trustees that counties would need help in the construction of the dike, but his comments were not approved.
- *March 1957** **Lake Must be Preserved - Ocala Star Banner**
- Editorial calling for State Internal Improvement Fund Trustees to take the lead in seeking a solution for Orange Lake. The trustees recently approved engineering studies to be completed.
- 03-02-1957** **Work Starts Tuesday on Orange Lake Dam - Source Unknown**
Dam Construction to Begin...
- 03-04-1957** **We Are About to Lose a Lake - Jacksonville Journal**
Immediate action needed before lake dries up.
- 03-06-1957** **Dike Work Started at Lake - Orlando Sentinel**
Work started on temporary dike around sinkhole.
- 03-06-1957** **Lake Dike Work May be Shelved - Gainesville Daily Sun**
"The possibility of stopping work at Orange lake, where a dike is to be constructed with the assistance of Marion County, was discussed here yesterday...the dike is to be thrown across the southwestern corner of the lake to isolate a 70-foot wide sinkhole in an outcropping of Ocala limestone which has swallowed a large portion of the lake....Surveyor..McGriff.. expressed the opinion the Orange Lake project "is not feasible"..."
- 03-13-1957** **Operation Runs into Difficulty: Fill Into Place & Smoothing Operation (Photos) - Gainesville Daily Sun**
Alachua county dump truck releases fill for sinkhole dam. Dock in photo, which normally sits in 6 ft. of water, is high and dry. Marion County tractor grades fill in the dam construction. Trouble has arisen as the fill settles into the soft muck of the lake bottom. Local interests cant wait for federal financial assistance. The proposed dike will continue in a large semi-circle around the sinkhole. Eleven camps are "high and dry." Photographs show earth moving equipment working on the dike construction.
[Note -this was first earthen dike attempt at sinkhole]
- 03-13-1957** **Work May Stop on Dam Project - Ocala Star Banner**

They can't dam the sinkhole without blocking off Taylor Heagy's property. Also a state auditor said that the Counties did not have any authority to build a dam.

- 03-19-1957** **Orange Lake Dike Work Suspended - *Gainesville Daily Sun***
Alachua and Marion County Commissioners decide to suspend dike construction after on site review. They requested clarification of an attorneys' opinions that no authority exists for county governments to spend money for the construction of the dam.
- 03-21-1957** **Route Altered: Progress Reported on Orange Lake Dike - *Gainesville Daily Sun***
Construction of sinkhole earthen dam is proceeding "much better" after the route was altered slightly. 375 truck loads of fill have been poured to this point. No legislation exists under which county commissions may expend general revenue funds for dikes or dams.
- 03-27-1957** **Commissions Map Plans for Dike Work- *Gainesville Daily Sun***
Counties will seek special Legislation to enable completion of dike around sinkhole - Permitting Counties to spend funds for dike construction. A State Geologist, Dr. Herman Gunter pointed out that the lake fill may settle after construction and that there is no assurance that another sinkhole will not form.
- 03-27-1957** **Sinkhole Study Find Approved - *Ft. Myers News Press***
State voted to assist Alachua and Marion Counties to conduct engineering survey of lake bottom in preparation for building dikes around sinkhole. Senator Shands behind the assistance - He will seek to pass a bill that will allow counties to build the dikes. State is losing "thousands of dollars" in fishing licenses because of low water...
- 03-27-1957** **To Restore Water Level - Orange Lake Given \$8,000 - *Orlando Sentinel***
Internal Improvement Fund Cabinet Trustees gave \$8,000 to Marion and Alachua Counties for engineering surveys - led by Senator Shands, Gainesville.
- 03-27-1957** **Orange Lake Dike Survey Cost to be Paid by State - *Gainesville Daily Sun***
Internal Improvement Fund agreed to pay up to \$8,000 for survey for proposed dam.
- 03-31-1957** **Orange Lake Troubled by Sinkhole - *Gainesville Daily Sun***
Photos during drought - statement made that the sinkhole opened up suddenly in "recent years"
- Early Spring 1957** **Alachua, Marion Boards to Meet at Orange Lake for Dam Project Study - *Gainesville Daily Sun***
Alachua and Marion county boards come together for a meeting called by the ITF to discuss ways to block sinkhole. The two counties agreed several weeks ago to go ahead on their own in attempts to dam sinkhole. Attempts now are to fill it with sand but progress has been slow. Dam must now block off a larger than predicted portion of the waterfront at Heagy's Fish Camp.
- 04-17-1957** **Orange Lake Dike Survey May Start Within 2 Weeks - *Gainesville Daily Sun***
A surveyor from both Alachua and Marion Counties may begin sink hole survey within the next two weeks. On Feb. 27 both counties began work on an earthen dike to isolate the sink, but work was halted as the "fill was devoured by the treacherous lake bottom" and no authority existed for the expenditure of county funds on the dike. Work will now proceed under \$8,000 from the Internal Improvement Fund of the state.
- *May 1957** **Marion Countians Back Canal, Seek State Aid for Orange Lake Project - *Unknown Source*** - Eighteen Marion Contains, citizens and public officials appeared before the Internal Improvement Board trustees to show their interest in the

Cross FL Barge Canal and the Orange Lake watershed. A delegation of Orange Lake citizens, led by Tom Dubose, asked the ITF for assistance in preventing further drainage of Orange Lake. Governor states that the ITF engineer will take data supplied by Marion and Alachua counties to design a structure to prevent drainage.

- 05-02-1957** **Orange Lake Tax Levy Approved by Senate - *Gainesville Daily Sun***
A bill introduced by State Senator bill Shands of Gainesville permits the levy of up to a one-million .ad valorum tax for the purpose of building and maintaining an earthen dike at Orange Lake
- 05-07-1957** **Orange Lake dike tax levy draws opposition - *Gainesville Daily Sun***
Individual complained to the Alachua County Commissioners said the tax would go to support a dike with no public access.
- 05-10-1957** **Duplicate Bill on Orange Lake Dike Shelved - *Gainesville Daily Sun***
Orange Lake dike bill postponed because it duplicates another bill.
- 05-17-1957** **Four Local Bills for Marion Introduced - *Orlando Sentinel***
Bill introduced allowing Marion county to spend money on sinkhole dike.
- June 1957** **Joint Engineer Plan for Marion and Alachua County - *Source Unknown***
To Survey the area - survey paid by State
- 06-01-1957** **Work to Start on Dike Survey at Orange Lake - *Gainesville Daily Sun***
Alachua and Marion County surveyors get ready to drill below lake bottom to see if it is appropriate for the earthen dam to be laid upon it.
- 06-12-1957** **Rising Water May Solve Problem at Orange Lake - *Florida Times Union***
Rising Water Table May make it unnecessary to continue survey and work on the dike.
- 06-18-1957** **Recent Rains Check Drop in Lake Levels - *Gainesville Daily Sun***
Heavy rains stabilize Orange Lake at 50.5'. Highest lake level for 15-year period since 1942 has been 60.9', while the lowest was 50.1.
- 06-26-1957** **Sandbag Dam Proposed Around Orange Lake Sink - *Gainesville Daily Sun***
Local engineers recommend sandbag dam to be placed around sinkhole. Awaits approval by Alachua county Commissioners and Internal Improvement Fund engineers.
- *July 1957** **Diver Hired for Sink Hole Report - *Unknown Source***
Orange Lake watershed Association hired professional diver to look at sinkhole and make report. Diver hired by citrus growers for sink hole report to be presented to officials in an effort to investigate means of stopping the water flow into the sink. Report will be made by William Kidd.
- 07-11-1957** **Orange Lake Work Starts - *Gainesville Daily Sun***
Work on Temporary Dam to start following week - Temporary structure will be built on rocky ledge on edge of sinkhole and they will determine if all water is flowing over the ledge or if some is moving underground. If the main source of flow into sinkhole is over ledge, then dam will be made permanent. Divers will put sandbags out.
- 07-14-1957** **Diver Busy at Orange Lake Sinkhole, Deep Diving at Orange Lake - *Gainesville Daily Sun***
Skin diver clears away mud around sinkhole in preparation for sandbag dam construction.

- *August 1957 To Push Plea at IIF Meet: Marion-Alachua Group Ask Water Control Aid - Orlando Sentinel**
Representatives from Marion and Alachua Counties meet before IIF for a \$12,000 request to complete water control project. IIF approved \$8,000 earlier in year for engineering costs to run a survey on the proposed temporary dam.
- *August 1957 Marion, Alachua to Seek \$12,000 for Dam Project - Source Unknown**
Representatives from Marion and Alachua Counties meet before IIF for a \$12,000 request to complete water control project. Assistant Chief engineer H.T. Wallace of IIF expressed the need for the counties to develop a long range program for the Orange Lake area. Wallace also felt damming the outflow at Highway 301 was a sound objective.
- 08-07-1957 Geologists Say Water Level Up in Orange Lake - Ocala Star Banner**
Orange Lake stage was up to 51.10 feet (a rise of .30 feet) since previous month.
- 08-11-1957 Orange Lake Dam Started as Water, Fed by Heavy Rains, Starts up Again - Gainesville Daily Sun**
Construction of temporary sinkhole dam began yesterday. More camps may reopen due to a two foot rise in lake level in the past three weeks. Present plan is to try to maintain lake level at 54-55 feet.
- 08-13-1957 For Orange Lake Work; Marion, Alachua Units to Ask New Dam Funds - Florida Times Union**
Will request additional \$10,000 from Internal Improvement Fund so they can finish the dam - need to finish the vertical wall. Water levels have risen 2 feet in the past 2 months.
- 08-14-1957 More Funds Needed in Job Damming Orange Lake Sink - Gainesville Daily Sun**
Alachua and Marion Counties need \$10,000 more from Internal Improvement Fund.
- 08-25-1957 Orange Lake Dike Funds to be Sought - Gainesville Daily Sun**
Counties will seek additional \$12,000 for dam around sinkhole. Nine of the 12 fish camps forced to close due to low water levels.
- 08-27-1957 County Officials in Tallahassee - Ocala Star Banner**
Marion County Commissioners met with Internal Improvement Fund to ask for additional money
- 08-29-1957 State Approves Loan for Orange Lake - Gainesville Daily Sun**
Internal Improvement Fund (IIF) trustees refused a \$12,000 grant for the sinkhole dam construction but accepted a joint Alachua, Marion county \$12,000 loan.
- *08-29-1957 State Refuses to Pay Dam Sum - Tallahassee Democrat**
State refuses to pay for the costs to construct sinkhole dam but agreed to lend the money to the counties. IIF gave counties \$8,000 for engineering work which determined dam specifics. An agreement between the two counties stating that state would pay for engineering costs while counties pay for the construction led to state refusal.
- *Sept 1957 ?... Alachua On Lake Project - Source Unknown**
Marion County board seeks a meeting with the Alachua County Board to iron out difficulties in the financing of sinkhole dam after Alachua County refuses state loan from IIF. Marion County has not received its \$6,000 loan and is \$3,929.17 in the red. Property owners agree to provide extra labor at the dam site to cut costs.
- *Sept. 1957 Board Still Hopeful of Alachua's Financial Aid on Orange Lake Project - Ocala Star Banner**

Marion County wants Alachua County Water Conservation District to assist with money for sinkhole - State loaned \$6,000 to Marion County and would have loaned \$6,000 to Alachua County for the project but Alachua County decided not to take the loan. They will consider spending money from the Water District to assist.

- *Sept 1957** **Dam Project Hits Snag - Source Unknown**
Dam construction around sinkhole has been stalled because Alachua County is unwilling to continue the joint project with Marion County. Future of project is in doubt unless Marion County votes to undertake the task alone. Federal government survey estimates water control for all of Orange Lake to exceed one million dollars exclusive of engineering costs.
- 09-04-1957** **Orange Lake Dike Project Hits Snag - Source Unknown**
Alachua county commissioners voted against borrowing \$6,000 offered by the state to finance sinkhole dam construction. This withdrawal leaves the entire status of the project in the air.
- 09-08-1957** **Federal Agency Halts Plans for Watershed in Orange Lake Area - Gainesville Daily Sun**
The Soil Conservation Service (SCS) notified Alachua and Marion Counties that it was terminating further investigations leading toward preparation of a work plan for the Orange Lake Watershed. However, they offered each county a \$6,000 loan.
- 09-11-1957** **Marion Supports Orange Lake Dike - Gainesville Daily Sun**
Marion county will go ahead with or without Alachua County. Orange Lake property owners offered to work on the project to help.
- *Sept or Oct 1957** **Work on Dam Stopped: Water Returns to Orange Lake as Engineers Wait for Cement - Source Unknown**
Surface drainage from recent rains resulted in water level increase. Work on dam has been held up by shortage of cement due to a recent strike. Purpose of dam is to record water levels on each side of the dam and determine if possible how far the lake is affected by the sink. Question is raised if Orange Lake could ever become a vast savanna like Payne's Prairie. The article states that it could become a prairie and has been so in times past but the water always came back in the end.
- *Sept 1957** **Work Crews Plug Gap Caused By Cave-In of Dam at Orange Lake - Source Unknown.** About six feet of the Orange Lake sinkhole dam collapsed, but was reconstructed the next morning. About two-thirds of the dam is completed but financing of dam is still in question. Grant from the Internal Improvement Fund has run out and Marion County accepted a \$6,000 loan while Alachua County later turned down its share of the loan. Marion County board seeks a meeting with Alachua board in order "to reach an understanding about finances and if possible, secure financial aid from the Alachua water conservation group." Since work began on dam, lake levels have risen about 4 feet.
- * Sept. 1957** **Given Orange Lake...County water...to hold first... - Gainesville Sun**
The first meeting of the Alachua County Board of Water Conservation will hold its first meeting. The County commissioners voted to give the Orange Lake dike project to this board, recommending they proceed in cooperation with Marion County.
- 09-16-1957** **Orange Lake Project Given to Water Board - Gainesville Daily Sun**
Alachua County Commissioners voted to turn over the Orange Lake Watershed Project to the new Board of Water Conservation and Recreation
- 09-20-1957** **Dam Takes Shape - Photo - Marion County Sun**

Photo of dam - says that there was a collapse of dam earlier that week but they still felt it would work - Says recent rains have raised water levels 3 to 4 feet.

- *Oct. 1957 Financial Report Given on Dam - Source Unknown**
County Surveyor reports to County Commissioners that through Sept. 30, \$14,662.64 has been spent on dam project, more than \$6,000 over the original \$8,000 grant from IIB. Progress has been slowed by shortage of cement.
- *Oct. 1957 Orange Lake Rises 3.4 Feet in 2-Month Period - Ocala Star Banner**
Water level rose 1.6 feet in Sept. and 3.4 feet in two month period
- *Oct 1957 At Orange Lake: Dam Termed Flow of Water - Ocala Star Banner**
Temporary dam completed at Orange Lake. County surveyor states dam proved that "a minimum of 2.5 million gallons of water a day" are lost through sinkhole.
- 10-05-1957 Orange Lake Level Rises Over 3 FT. - Gainesville Daily Sun**
Orange Lake rose over 1.6 ft. during Sept. and 3.4 ft during August and September. Lake level is still 3.3 ft below normal stage.
- 10-10-1957 Water Rising at Orange Lake - Williston Sun**
Orange Lake rose 3.4 feet during two month period Ending Sept. 30.
- 10-24-1957 Orange Lake Watershed One of Seven Best**
Orange Lake Watershed has been named one of seven water conservation projects.
- 10-25-1957 Finishing Touches Being Put on Dam at Orange Lake Today - Ocala Star Banner**
Cement and Sand bag dam to be completed.
- 10-28-1957 Orange Lake Dam Project Completed - Gainesville Daily Sun**
The temporary dike was completed as a test to prove the worth of a permanent dike to be constructed later.
- 10-29-1957 Orange Lake Dam Completed (Photos) - Gainesville Daily Sun**
Temporary Dike Completed - Bottom photo
- 10-30-1957 Permanent Action at Orange Lake Advocated by Engineer - Ocala Star Banner**
County Surveyor says that temporary dam has proved that the sinkhole does not recharge the lake and thus a permanent structure should be constructed. He suggested that the sinkhole be filled in but not plugged because it could act as a safety valve against flood conditions.
- *Nov. 1957 Diver Hired for Sink Hole Report - Unknown Source**
Orange Lake Watershed Association hired professional diver to look at sinkhole and make a report.
- *Nov. 1957 At Property Owners' Expense: County Board Agrees For Diver to Check Orange Lake Sinkhole - Ocala Star Banner**
County agrees for a diver to go down and survey sinkhole in order to present a report to representatives of federal, state, and local water conservation agencies slated to meet at Orange Lake Nov. 25th. The purpose of the meeting is to determine the next steps to be taken in an effort to raise the water level of the lake. Local property owners pay for dive survey.
- 12-04-1957 Marion Body Told Alachua County Lukewarm to Orange Lake Project**

Consulting engineer on the Orange Lake flood control project received only lukewarm response from Alachua County toward participation in the project. He proposed four recommendations to the officials concerning the sinkhole.

- 12-20-1957** **Floating Islands Atop Steel; New Orange Lake Plan Gains Support - Gainesville Daily Sun**
Tom Dubose, chairman of the Orange Lake Watershed Assn., proposes to the Alachua and Marion county commissioners to plug sink hole with steel mesh and floating islands to supplement the action of the dike in reducing outflow. Dubose described scuba divers near fatal dive at sink hole last summer
- * 1958** **Waters Up at Orange Lake - Photo - Unknown Source**
Water level is back to normal after 3 years of drought and vegetation has grown up in a sinkhole which the county attempted to dam last year. Most of the temporary dam is now under water but part of it is used for fishing.
- x*1958?** **Water Conservation District Urged for Orange Lake Section - Ocala Star Banner**
In recent weeks local engineers recommend "that a water conservation district be established in the Orange Lake area" to "develop, control, and conserve water in the drought-ridden north Marion area." Two ways are proposed in which the county can go about setting up such a district which would levy taxes on property holders on a district by district basis rather than by county.
- 1958** **A Lake That Went is Back Again**
Water Levels Back Up - Orange Lake is "famous for more than perch, bream and shell-crackers. The big lake used to be known, too, for its floating islands- rafts of brush covered with grass, bushes and even trees - which moved slowly with the breeze."
- *1958** **Citrus Men as Well as Fishing Camp Owners Hail Orange Lake's Return - Ocala Star Banner**
Local business owners hail normal lake levels. Study concludes that Orange Lake does have a tendency to affect the weather by increasing local temperatures and it serves to prevent the occurrence of three to four nights of 32-degree or lower temperatures during an average year.
- Feb. 1958** **Orange Lake Water Level Near Normal - Photo - Florida Times Union**
Photo from Sinkhole area looking towards Bird Island and McCormick Islands
- April 1958** **Orange Lake Reaches Normal Stage for 1st Time Since '54 - Ocala Star Banner**
- 02-23-1958** **Long-Range Program Seen as Final Answer to Solving Water Problem at Orange Lake - Ocala Star Banner**
Mentions concern that Orange Lake will become another Paynes Prairie and discusses how Paynes has changed back and forth from lake to prairie. It states that Orange Lake has had its ups and downs but "...during the past 50 years, the biggest problem has usually been too much water, not the reverse. Several times before 1900, it was reported completely dry, and on a number of times since it has been almost dry, notably in 1906, 1916-17 and 1931-32."
- 03-13-1958** **Orange Lake Up Five Feet From Low Level of Last Year - Gainesville Daily Sun**
Level is 56.5 feet and is still rising
- 06-19-1958** **Orange Lake Remains at 10-year Level - Gainesville Daily Sun**
Level is at 57.7 feet.

- 07-09-1958 Meeting Planned at Orange Lake to Map Publicity - Gainesville Daily Sun**
Tom DuBose urges all business owners affiliated with Orange Lake to meet and discuss organizing a public relations program to renourish fishing interest in Orange Lake.
- 07-13-1958 Orange Lake Water Level Up; Fish Biting Better Than Ever (Photos) Gainesville Daily Sun**
Big Publicity campaign to let people know fish are biting again
- 07-18-1958 Orange Lake Back to Normal With Water, Fish... (Photo) - Gainesville Daily Sun**
Large wide angle view of the lake
- 07-31-1958 The Lake That Came Back After Three Years of Drought; Orange Lake Is Back to Normal - Ocala Star Banner**
- 11-02-1958 States Disappearing Lake Reappears - Fish and All - Miami Herald**
The "floating islands which had brought the lake nationwide attention were floating no more. They were just part of the bottom mud....The lake came back. The floating islands, some of them more than 150 feet long and complete with small trees and nesting birds, are floating again. There are really show pieces..."
- 11-22-1958 Members of Watershed Planning Party Continue Orange Lake Study**
Determining need for high and low water needs
- *1959 Orange Lake Water Level Aired at Meet of County Officials - Source Unknown**
Members of the Board of County Commissioners met with Alachua County officials to discuss joint efforts to stabilize water levels.
- * -1959 Alachua Requests Support - Source Unknown**
Alachua County commissioner urges Marion County to join in the construction of a dam at Highway 301. Financial assistance from Marion County was urged and in return Alachua might be willing to deed part of the lake to Marion County.
- *01-28-1959 Water Level at Orange Lake up for Discussion - Ocala Star Banner**
The Board of County Commissioners meets with the Alachua Board and a State Road Board member at Wheeler's Fish Camp in an attempt to reach an agreement concerning water levels at Orange Lake. One solution, that was passed in the form of a resolution, is to have each county contribute \$500 toward construction of the temporary dam or equipment and manpower.
- *Jan/Feb 1959 Ask Limit Lowered - Orlando Sentinel**
Board of County Commissioners received a request for immediate action on the Orange Lake problem, specifically, to rebuild the dike at Highway 301. The commission agreed last week for the construction of a permanent dam and spillway with secondary gas tax moneys.
- 02-15-1959 In Alachua County; Lake Chain Dam Project Proposed - Florida Times Union**
Proposed three Low-level dams to control water levels in Orange, Lochloosa and Newnans Lakes.
- *March-1959 Board Puts Approval on Zoning Change to Open Way for Plant - Source Unknown**
The Board of County Commissioners "delayed any action on a request for funds or the provision of county equipment for the construction of a temporary dam where Orange

Lake goes under U.S. 301." Board members will meet with the Alachua Board and members of the State Road Dept. to discuss the question of a dam.

- 03-03-1959** **Alachua Seeks Marion's Help on Project for Orange Lake - Ocala Star Banner**
Asking for help on building the dam at highway 301
- 03-04-1959** **Marion Unit Pledges to Assist In Orange Lake Water...Florida Times Union**
Marion County Commissioners pledged to cooperate with Alachua County on water control project for Orange Lake.
- 03-12-1959** **Ask for Help - Marion Sun**
Alachua County asked Marion Co. for help.
- 08-04-1959** **Marion asked to Join in Project at Orange Lake - Ocala Star Banner**
Alachua County asked Marion Co. for help.
- 08-05-1959** **N. Marion C of C Endorses Dam - Ocala Star Banner**
North Marion County commissioners pledge to assist Alachua County with dam at highway 301
- 08-11-1959** **County Seriously Considers Orange Lake Dam Project - Ocala Star Banner**
Marion County Commissioners considering helping Alachua County build dam and spillway at Orange Lake.
- *Jan. 1960** **To Help Control Water Level: Roadside Park, Dam Sought For Lake - Source Unknown**
Marion and Alachua County Commissioners ask the State Road Dept. to construct a roadside park and dam on U.S. 301 to help control water level at Orange Lake. Expenditure of secondary gas tax money will finance the project.
- *Jan. 1960** **Marion, Alachua Join Effort - Orlando Sentinel**
Alachua and Marion County Commissioners to meet with District 2 road board to work out immediate solution to Orange Lake dam controversy. Two county boards hope to get cooperation from the State Road Dept. to build a permanent dam and spillway combined with a roadside park and boat launching ramps.
- 01-13-1960** **Marion, Alachua Commissions Set Session on Lake - Orlando Sentinel**
Will discuss building a dam
- 01-19-1960** **Orange Lake Water 'Crisis' Reviewed With County Heads - Gainesville Daily Sun**
Orange Lake land and business owners call meeting to investigate what "immediate and temporary" help interested parties could get in order to stabilize lake level. Due to the opening of the Orange Creek dam in order to widen 301, lake levels have dropped to below normal. The dam was built in 1957 by locals headed by Tom DuBoise during drought. Locals wanted water control while County heads were hesitant to allocate aid.
- 01-20-1960** **Orange Lake Dam Discussion (photos) - Gainesville Daily Sun**
Commission chairman discusses plan for proposed dam.
- 01-20-1960** **With Marion County; Alachua Board Agrees on Joint Lake Project - Florida Times Union**
Alachua County agreed to join Marion County to plug the Orange Lake outlet.
- 01-20-1960** **Counties to Split Dam Work Cost at Orange Lake - Gainesville Daily Sun**

Alachua County agreed to share the expense with Marion County for the replacement of the Highway 301 dam. "A temporary earthen dam built by Marion County residents will now be replaced by a rock barrier below the bridge...."

- 01-24-1960** **It Happened in Florida - Florida Times Union**
Alachua County agreed to join Marion County to plug the Orange Lake outlet.
- 01-27-1960** **Orange Lake Meet Set by Two Boards - Florida Times Union**
Two Counties will meet to decide what control structure to use at Highway 301.
- 01-28-1960** **Water Level at Orange Lake up for Discussion - Ocala Star Banner**
Property owners claiming water levels are going down. Two Counties will meet to decide what control structure to use at Highway 301.
- *01-30-1960** **Rock Barrier to Raise Level of Orange Lake - Gainesville Daily Sun**
A rock barrier will be placed near the 301 bridge. Project will be a joint effort by Alachua and Marion County with Marion furnishing the materials and Alachua \$500 for expenses. Earthen dam that was built previously by DuBois (fish camp operator) was removed when Highway 301 was widened. Counties will build the temporary dam. Objection came from Citrus owners.
- 01-30-1960** **Alachua and Marion Boards Agree to Dam Orange Lake - Tampa Tribune**
-They agreed to construct a temporary rock dam at outlet
- *Jan./ Feb. -'60** **Board Agrees on Orange Lake Dam, with Certain Provisions - Ocala Star Banner**
Board of County Commissioners agree to provide the machines and manpower to do the dam work if permission is granted by the State Road Dept. work could be done in one day by utilizing 8 trucks, two drag lines and possibly a bulldozer.
- *Feb 1960** **Orange Lake Dam Approved - Gainesville Daily Sun**
Marion county OK's construction of a temporary dam at Orange Lake. Marion board wants assurance Alachua county will assume responsibility for taking out the dam if high water occurred.
- *02-02-1960** **Orange Lake Work: Marion's Board Delays Dam Job Confirmation - Florida Times Union**
Marion County delayed confirmation of a tentative agreement with Alachua County to construct temporary dam at Highway 301. Counties met earlier and entered into an informal agreement whereby Alachua County would appropriate \$500 in cash and Marion County would furnish materials, machinery and manpower for the project. County Engineer tells Marion Board project cost estimates could run well above the estimate.
- *02-08-1960** **Orange Lake Continues Losing Water - Gainesville Daily Sun**
Lake levels continued to decline for the month of January. Alachua and Marion County Commissions last month agreed to share the cost of restoring a temporary dam which was removed during 301 construction work. However, Marion Commissioners tabled the project until they can get further cost estimates
- 02-11-1960** **Work on Dam Related - Orlando Sentinel**
Work delayed until April
- 02-11-1960** **Work on Dam at US 301 Delayed - Orlando Sentinel**
Delayed Until April or later

- 02-24-1960** **Orange Lake Dam Approved - Gainesville Daily Sun**
Marion County agreed to go ahead with dam
- March 1960** **Florida's Lake of Floating Islands - Ford Times Magazine**
Has a section called "Florida's Lake of Floating Islands" which talks about their presence and characteristics at Orange Lake.
- 06-09-1960** **Orange Lake level drops - Gainesville Daily Sun**
Level lowered by .74 feet in May but still .47 above its normal stage.
- 06-14-1960** **Orange Lake Dam Action Delayed - Ocala Star Banner**
Marion County Commissioners refused to meet with Alachua County to discuss the dam
- 08-03-1960** **Citrus Growers Fearful of Dam on Orange Lake - Gainesville Daily Sun**
Citrus growers expressed concern that dam might be disastrous to their business because they need high water to warm their groves
- 08-10-1960** **Orange Lake Dam Protest Given Study - Florida Times Union**
Citrus growers expressed concern that dam be disastrous to their business because they need high water to warm their groves
- 09-14-1960** **Second Dam OK'd for Orange Lake - Gainesville Daily Sun**
Alachua County Water Control Authority decided 2 dams will be needed at O.L. - 1 at the Hwy 301 outlet and 1 farther upstream to retain water in that section
- 01-19-1961** **Orange Lake's Floating Islands Gain Prominence - Gainesville Daily Sun**
States that there is a feature article in Coronet Magazine regarding the floating islands of Orange Lake.
- 01-19-1961** **Hurricane Donna changed face of Orange Lake floating islands, some sank, others split and still others merged. Gainesville Daily Sun**
- *03/09/1961** **Orange Lake Problem - Control of Lake Level to be Aired at Meeting - Ocala Star Banner**
Meeting of Alachua County Water Control Authority - dam at Highway 301 will be discussed. Lake level has been dropping over last several months. Water Conservation Tax in Alachua County has raised money for project. There is controversy over what type of dam to build. Citrus farmers want a controllable dam.
- 06-14-1961** **Work on Dam at Orange Lake to Begin Soon - Gainesville Daily Sun**
May start within 60 days - as soon as permits are granted. Dam will be at 58 feet with a notch down to 57 foot elevation.
- * July 1961** **Commissioners Meet: Legal Ruling Sought on Halt of Orange Lake Dam Work - Source Unknown**
Alachua County's Recreation and Water Control Authority requests advisement on whether trustees of the Internal Improvement Fund acted legally in stopping construction of the Orange Lake dam. Boards also discussed the progress on the proposed
- 01-25-1962** **Alachua Due to Renew Efforts for Orange Lake Control Dam - Florida Times Union**
Alachua County Water Control Authority will renew efforts for dam - last year the Internal Improvement Fund Trustees refused to grant land for the dam recommending that the design be modified to allow flow of water at all water levels. Orange Grove farmers had complained that the dam as designed would cause the area on the east side to dry up,

causing lower Temps. which would affect orange groves. IIF wanted a gate to release water whenever it was necessary.

- 03-12-1962** **Water Level in Orange Lake Continues to Decline in February, Survey Shows -**
Ocala Star Banner
Levels of 57.08 at the end of Feb.
- 03-16-1962** **Next Step Studied in Fight to Put Dam at Orange Lake - Tampa Tribune**
Will meet to decide whether or not to test the IIF' refusal to allow land for the dam. Tom DuBose recommends they go with a temporary dam of rocks.
- 04-04-1962** **Plan to Control Orange Lake Level Due Study - Gainesville Daily Sun**
Marion County Committee to study the plan proposed by Orange Lake businessmen to construct two dams and to clear obstructions in Orange Creek. Citrus growers oppose a fixed level dam.
- 04-04-1962** **Citrus, Campers Solve Orange Lake Dam Mix - Orlando Sentinel**
Plan proposed by fish camp owners and put forth to Marion County Commissioners to 1) build a dam at Hwy 301, 2) rebuild the Shand's Dike 3/4 mile east of Hwy 301, and 3) Clear row and debris out of Orange Creek.
- 05-01-1962** **County Board Briefed on Flood Control Plan - Ocala Star Banner**
- Briefed by County Engineer
- 05-03-1962** **Orange Lake Dam Stymied at State Level - Gainesville Daily Sun**
Still waiting for approval from the Internal Improvement Fund Trustees to build a fixed low level dam. Fish Camp Owners are worried current drought will continue and the lake will dry up.
- 05-09-1962** **Two Members of Alachua Board Stick to Low-Level Dam Idea for Orange Lake -**
Ocala Star Banner
Two of the 3 members stick to the proposal for a fixed dam, 1 member was absent. Fish camp owners getting upset about the delay.
- 05-10-1962** **New Water Level Studies Ordered - Orlando Sentinel**
Survey crews will look for potential spillway site in Old Shand Dam - citrus Farmers have said they can stand a level of 56 feet without injury to orange groves.
- 06-14-1962** **Hassle Over Type of Dam at Lake Orange Unsettled - Tampa Tribune**
Controversy over whether to build a dam with a notch or a control dam
- 08-09-1962** **Commission Okays Final Dam Plans - Orlando Sentinel**
Marion County approved dam - Top of dam will be at 58 ft. with a 3 ft. 8 in. weir to allow water to flow from the lake. The weir will be 1 foot in height.
- 09-09-1962** **Orange Lake Dam Approved - Gainesville Daily Sun**
Trustees of the IIF approved the dam due to change in design. Alachua County to pay for costs of dam
- 10-24-1962** **Contract Let For Orange Lake Dam - Tampa Tribune**
\$53,829 bid accepted
- 10-24-1962** **Contract for Orange Lake Goes to Leesburg Firm - Ocala Star Banner**
Over \$53,000 awarded for dam construction.

- *Nov 1962** **Mid-December Work Start Eyed for \$53,829 Dam - Source Unknown**
Dam construction should begin in mid-December, however, lack of pilings has delayed start of the project.
- 11-18-1962** **Orange Lake Dam Project to Start Soon - Gainesville Sun**
Work scheduled to start Dec. 1.
- 12-21-1962** **Firm Begins Work on Dam to Control Flow of Lake**
Work began on 12-20-1962
- *12-21-1962** **\$53,829 Marion Project: Work is Under Way on Dam to Control Orange Lake Level - Tampa Tribune**
Dam is scheduled to be completed in March of 1963 and is one of three dams on the Alachua County Recreation and Water Conservation and Control Authority's priority list for controlling the level of Alachua County Lakes. Dam will hold water level at approximately 58 feet.
- 12-27-1962** **Dam Construction - Photo - Gainesville Daily Sun**
- 01-06-1963** **Orange Lake Keeps Dropping - Gainesville Daily Sun**
Orange Lake declined .16 feet in December and at the end of the month was 2.29 feet below its normal stage.
- 02-07-1963** **Orange Lake Level Drops Still Further - Gainesville Daily Sun**
At the end of January Orange Lake fell to 2.9 feet below its normal stage. The lake has experienced a gradual drop of nearly 3.5 feet since Sept. 1961.
- 03-08-1963** **Orange Lake Water Level Sharply Up - Gainesville Daily Sun**
- 04-10-1963** **Orange Lake Dam Hassle Comes to Official End - Gainesville Daily Sun**
Dam was constructed and formally accepted by the Alachua Co. Recreation and Water Conservation and Control Authority. The dam has a notch in it which allows water to flow through to a level 2.5 feet below the top of the dam.
- 04-10-1963** **Orange Lake Dam Delivered - Photo - Gainesville Daily Sun**
- 08-03-1963** **Orange Lake Level Rises - Gainesville Daily Sun**
Level came up .5 ft. in July
- *Fall 1963** **To Match Funds on Two-For-One Basis: Board to Allocate Funds for Filling Orange Lake Sinkhole - Gainesville Daily Sun**
Marion County Commissioners today agreed to match funds raised by Orange Lake businessmen on a two-for-one basis and to use this money to hire a contractor to fill the sinkhole.
- 09-20-1963** **Self-Help at.... Ocala Star Banner**
Sinkhole intervention came up recently and this article stated that in the past many articles had been written about water levels in the lake.
- 09-25-1963** **Authority Asked to Fill Up Sinkhole at Lake with Rocks - Ocala Star Banner**
Tom DuBose proposed to Marion Co. Commission that sinkhole be filled . They want to throw rocks into the hole with boulders from a rock quarry.
- 09-27-1963** **Rock, Equipment Sought for Filling Orange Lake Sinkhole - Ocala Star Banner**

Tom DuBose issued an appeal for contributions of rock and use of heavy equipment for moving it so that he can fill the sinkhole. States that sinkhole is 50 feet in width and 80 to 90 feet in depth.

- 10-09-1963** **Study Set on Plan to Plug Sinkhole - Ocala Star Banner**
Marion County Commissioners call for more study regarding the sinkhole - Local businessmen donated \$1,400 for the filling in of the sinkhole with rocks
- 11-13-1963** **Marion Proceeding with Sinkhole Job - Florida Times Union**
Work on filling sinkhole proceeds satisfactorily. Seventy-five automobiles, a school bus, and a 12,000 gallon storage tank have been placed in the sink. Sink has been filled from approximately 80' to 25'.
- *Dec. 1963** **Operation Sinkhole (photo) - Ocala Star Banner**
Photo shows heavy equipment filling in sinkhole with concrete slabs, cars, etc.
- Dec. 1963** **Odd Items to Fill Sinkhole - Orlando Sentinel**
County commissioners authorized the plugging of the sinkhole with a 12,000 gallon tank, a schoolbus, and old cars.
- 12-08-1963** **Lake Level Dips Despite Sinkhole-Plugging Work - Ocala Star Banner**
\$4,200 sinkhole plugging occurred in November but water level still dropped .23 feet down to 55.3 feet. They had dumped 2,800 cubic yards of boulders in to the sinkhole. Also dumped into the sinkhole were 75 old automobile bodies, a big scrapped asphalt tank and an old school bus today.
- 12-16-1963** **Resident Expresses Concern - Will Plugging ... Orange Lake...Source Unknown - Ocala Star Banner**
Resident expressed concern that plugging the sinkhole would affect wells in the area.
- Dec. or Jan '63** **Orange Lake Leak's To Get \$4,200 Patching - St. Petersburg Times**
Orange Lake residents hope to raise more money for plugging sinkhole. Describes the plugging with a schoolbus, an asphalt tank, and 75 old car bodies.
- 01-09-1964** **Orange Lake Level Up By 4.08 inches in December - Ocala Star Banner**
Water levels rose to 4.08 inches to 55.64 feet.
- 01-14-1964** **Board Votes \$500 More For Plugging Sinkhole - Ocala Star Banner**
Marion Co. Board agreed to \$500 more to take care of balance
- 02-1964** **Orange Lake Level Drops Still Further - Gainesville Sun**
At the end of January Orange Lake fell to 2.9 feet below its normal stage. The lake has experienced a gradual drop of nearly 3.5 feet since Sept. 1961.
- 02-06-1964** **Orange Lake Shows Big Gain in Its Water Level - Ocala Star Banner**
\$7,700 was spent to plug sinkhole - Water Levels up to 57.08 feet
- 02-07-1964** **Rains Swell Orange Lake to 2-Year High Point - Gainesville Sun**
Jan. rains pushed levels to highest level in 2 years - 57.08 feet -
- 02-16-1964** **USGS Keeps Water Watch - Gainesville Sun**
USGS watches mineral content and stages of Orange and other lakes.
- 03-10-1964** **Orange Lake Water Level Rise Study - Gainesville Sun**
Lake has risen 3 feet since December due to heavy rainfall.

- 04-05-1964** **Lake Levels in County Up, Springs Streamflow Down - *Ocala Star Banner***
Orange Lake Level of 58.85 feet in March.
- 04-07-1964** **Lake Levels Show Gains - *Tampa Tribune***
Lake levels rose at Oklawaha, Orange, and Kerr Lake during March. Flow from Silver Springs was below normal.
- 04-07-1964** **Near Record Flow for Suwannee - *Gainesville Sun***
Orange Lake was 1.08 feet above normal stage at end of March
- 04-09-1964** **Area Lakes Water Levels Increased - *Orlando Sentinel***
Orange Lake to 58.04 feet by end of March
- *06-07-1964** **Orange Lake Down .51 Feet - *Gainesville Sun***
Lake level declined .51 feet despite unusually heavy rainfall. Lake now stands at 1.48 feet above its normal stage. Florida streamflow rose sharply during the latter half of May.
- *Sept 1964** **Orange Lake Level Continues Slow Decline - *Gainesville Sun***
Orange Lake levels continued to decline during the month of August, down .76 feet. Streams in Florida flow at well above normal rates.
- 10-22-1964** **Three County Plan Backed - *Ocala Star Banner***
Discussed idea that the Orange Lake system be connected by navigable waters to the Oklawaha River through Orange Creek.
- *Dec 1964** **Orange Lake Continues to Rise - *Source Unknown***
According to US Geological survey for the month of November, Orange Lake continues to rise to its normal level of 57.9 feet above sea level. Lake rose .03 feet during November.
- *Jan 1965** **Orange Lake Level Rises in December - *Source Unknown***
Orange Lake rose .22 feet in December putting it within .37 feet of its normal stage. Streamflow below normal for state.
- 03-24-1965** **Marion Joins Call for Study of Orange Lake's Watershed - *Florida Times Union***
Marion Co. joined Alachua and Putnam regarding the study of the development of the Orange Lake watershed.
- 05-29-1966** **Floating Islands Offer Haven for Birds. *Gainesville Sun***
Discusses floating islands - their formation, their use by wildlife, Don McKay, Bird Island and large number of birds nesting on Bird Island.
- 05-12-1968** **"Floating Islands" Featured - *Gainesville Sun***
Orange Lake floating islands are featured in May 1968 Southern Living Magazine.
- 04-09-1972** **Don McKay's Magic Isles Float - *Gainesville Sun***
Discusses Don McKay's tourist business and his interest in and knowledge about the floating islands of Orange Lake.
- 08-08-1975** **County commissioner seeks funds to control hydrilla in Orange Lake - *Gainesville Sun***

- 06-02-1976 County to work with State, residents and fish camp owners to control hydrilla on Orange Lake - *Gainesville Sun*
- 06-27-1976 Hydrilla has choked 90% of Orange Lake - *Gainesville Sun*
- 07-07-1976 12,000 acres of Orange Lake choked by hydrilla. FGFWFC waiting for studies on grass carp - *Gainesville Sun*
- 07-17-1976 Letter from fishcamp owner regarding concern over FGFWFC's dealing with hydrilla problem in Orange Lake - *Gainesville Sun*
- 07-22-1976 Letter of objection to using grass carp for hydrilla in Orange Lake - *Gainesville Sun*
- 07-24-1976 FGFWFC to begin using chemicals to control hydrilla in Orange Lake - *Gainesville Sun*
- 08-18-1976 USACOE to mechanically harvest hydrilla in Orange Lake - *Gainesville Sun*
- 09-18-1976 USACOE tested paddlewheel powered barge for scooping up hydrilla in Orange Lake - *Gainesville Sun*
- 10-14-1976 Rumors that someone stocked Orange Lake with 5,000 illegal grass carp - *Gainesville Sun*
- 03-15-1977 Angry Orange Lake residents blame Paynes Prairie for low water in lake - *Gainesville Sun*
- 03-29-1977 Experts believe weather is cause of low water in Orange Lake - not draining into Paynes Prairie - *Gainesville Sun*
- 12-12-1976 Don McKay Has Created a Floating Paradise - *Gainesville Sun*
Article discussing McKay's interest in the floating islands and the attraction they were for visitors.
- 11-09-1980 Orange Lake: A Haven for Lovers of the Outdoors - *Gainesville Sun*
Quotes Bartram and says he described Orange Lake as containing a "...vast sedgy marsh..."
- *Fall 1990 Fish Camp a Misnomer in this Region (editorial) - *Gainesville Sun*
Droughts have plagued fish camp owners with no business, causing Cross Creek camps to go out of business. However, recent creel surveys indicate fishing has improved this summer. Fish camp owner Jerry Harris expresses interest in doing something about water loss at the sinkhole and the diversion of water to Paynes Prairie since his primary concern is low-water access.
- 06-23-1991 Drought May Leave Many High and Dry - *Ocala Star Banner*
Fish camps are suffering - drought not as bad as in the 1950s, - gives history of pursuit to drain Orange Lake -
- 06-08-1992 Fish Tales Grow as Lake Shrinks - *Ocala Star Banner*
Mentions the "diversion" of water from Prairie Creek to Paynes Prairie
- 06-19-1992 Watch Wishes For Lake Waters - *Gainesville Sun*
letter to Editor regarding Orange Lake residents wish to prevent reflow of water to Paynes Prairie

- 08-19-1992** **Where is the Water? - Gainesville Sun**
Photo of McIntosh fish camp - boats on dry ground-argument regarding redirection of water to Paynes Prairie
- 08-13-1992** **Allow Prairie to Dry Up, Officials Told .. Gainesville Sun**
Fish camp owners and others told state officials to allow Paynes Prairie to dry up.
- 08-22-1992** **Diver to See Whether Lake is Draining into Sinkhole - Gainesville Sun**
Diver will try to determine if there is major flow into the sinkhole.
- 08-22-1992** **Orange, Lochloosa Lakes Sacrificed to Paynes Prairie - Gainesville Sun**
Letter to Editor from Ed Tanner, Save Our Lakes Association.
- 08-22-1992** **Orange Lake Siphoned Off By "Tax-Paid Leeches" - Gainesville Sun**
Letter from Mr. Horace Carter complaining about redirection of water to Paynes Prairie from Orange Lake.
- 08-23-1992** **Divers Find a Cave Drains Orange Lake - Gainesville Sun**
USGS Divers found water is being sucked through a sinkhole. The divers saw no signs of debris in the hole although in the 1960s locals had pushed a bus, over 100 car bodies, etc. in the hole. It was difficult to see 1 foot in front of your face.
- 08-23-1992** **Water Levels Problem for Orange Lake - Florida Times Union**
Article about the drought.
- 09-17-1992** **Residents Want Sinkhole in Orange Lake Plugged; County to Support Lake Area Residents - The Gainesville Sun**
Alachua County Commissioners agreed to help residents plead to District to plug sinkhole.
- 09-22-1992** **Sinkholes in Orange Lake - Star Banner**
Letter to Editor stating District should do something about sinkholes rather than do studies.
- 10-03-1992** **Divers to Study Sinkhole in Lake - Source Unknown**
Divers working with SJRWMD will inspect the sinkhole and measure the flow. On August 28th, divers discovered that the sinkhole which had been clogged 28 years before had reopened.
- 10-03-1992** **Divers to Measure Flow Through Orange Lake - Florida Times Union**
Scuba divers will measure flow going out of the lake through the sinkholes.
- 10-04-1992** **Lake Problems not new - Gainesville Sun**
Mentions past droughts in Orange Lake and studies by Pirkle and Deevey on sinkhole discharge.
- 05-30-1994** **Trouble Afloat? - Gainesville Sun**
Article discusses the perceived increase in floating islands on Orange Lake, how they form, and possible solutions.
- *1996** **Our Water Ties - Gainesville Sun**
Summary: "Gainesville is part of the Orange Creek Basin, which is a patchwork of creeks, wetlands, and lakes. Now there is an effort to get residents to understand the watery region as a whole rather than adjust its individual parts."

- 08-08-1996** **Orange Lake's Challenge: Kill Some Plants, Save Others - Gainesville Sun**
Discusses controversy over herbiciding plants, mainly hydrilla, in Orange Lake and the detrimental effect it has on spatterdock
- 08-22-1996** **Orange Creek Basin Plan Approved - Gainesville Sun**
Discusses the plan to study the Orange Creek Basin in terms of habitat, water quality, and stormwater management.
- 08-23-1996** **Their Logic on Orange Creek Just Won't Hold Water - Gainesville Sun**
Editorial discussing the weirs at Newnans and Orange Lake and the role of SJRWMD.
- 08-27-1996** **Harvesting the Best Way to Rid Lakes of Weeds - Gainesville Sun**
Editorial discussing weed problem in local lakes, how herbiciding and grass carp is not a solution. Author proposes that harvesting is the only long term solution.
- 05-06-1997** **Getting People into the Water; State Tries to Keep Lakes Lively - Gainesville Sun**
GFC plans for increased community involvement in lake management along with a large management plan to address concerns on Orange, Newnans, and Lochloosa Lakes.
- 01-31-1998** **Lake Deserves Cleanup - Gainesville Sun**
Author presents view that the best solution to cleaning up our weed infested ponds is through the use of sterilized carp.
- *02-1998** **Getting a Scoop on Orange Lake's Islands; A Floating Dilemma - Gainesville Sun**
Tussock background information on Orange Lake, removal project by GFC and the creation of wildlife islands with the vegetation. Also discusses the perceived problems with tussocks on the lake.
- *03-1998** **The Tussle For Tussocks - Gainesville Sun**
Editorial expressing concern regarding GFC's "Habitat Enhancement" project.

**Exact dates of article not known.*

Appendix C
People and Agencies Contacted Regarding
the History of Orange Lake

Appendix C: People and Agencies Contacted Regarding the History of Orange Lake

Agency Contacts

Agency or Group	Name of Contact and Title	Date
Alachua Co. Planning and Development Department, Gainesville, Fla.	-	7/17/95
Alachua County Public Works, Gainesville, Fla.	<i>Ms. Anita Beasley</i>	6/3/95 7/14/95 7/17/95
Atlantic Coastline and Seaboard Airline Historical Society, Valrico, Fla.	<i>Joseph Oates, President</i>	3/4/96
CSX Transportation, Jacksonville, Fla.	<i>Mr. Dick Bussard, Director Communications</i>	7/3/95 7/5/95 7/17/95 7/18/95
CSX Transportation, Jacksonville, Fla.	<i>Ms. Melinda Dirs, Public Information Representative</i>	10/6/95
CSX Transportation, Jacksonville, Fla.	<i>Mr. Frank Edmonds, Bridge Design</i>	7/18/95 8/28/95
Everglades National Park	<i>Mr. Walter Meshaka</i>	2/6/96
Florida Audubon Society,	<i>Ms. Jody Rosier, Public Information/Conservation Specialist</i>	6/23/95 6/27/95
Florida Department of Environmental Protection, Tallahassee, Fla.	<i>Dr. Joe Knetsch, Historian</i>	5/11/95 6/26/95 7/18/95
Florida Department of Environmental Protection, Archives, Tallahassee, Fla.	<i>Ms. Irene Rudolph Ms. Lisa Wilson</i>	
Florida Department of State Archives, Tallahassee, Fla.	<i>Ms. Jodie Norman</i>	5/11/95 6/26/95 7/17/95

Florida Department of Transportation, Tallahassee, Fla.	<i>Ms. Leslie Mami</i> , Statistics Department	6/14/95
Florida Department of Transportation, Tallahassee, Fla.	<i>Mr. Roy Jackson</i> , historian who works with cultural resource assessment.	10/3/95
Florida Department of Transportation, Tallahassee, Fla.	<i>Mr. Alan Shopneyer</i>	7/18/95
Florida Historical Society, Gainesville, Fla.	<i>Dr. Marinus Latour</i> , President	6/95
Florida Museum of Natural History, University of Florida, Gainesville, Fla.	<i>Dr. Gerald Milanich</i> , expert on Florida Indians	10/95
Highsprings Railroad Museum, Highsprings, Fla.	<i>Manager</i>	7/10/95
Matheson Historical Society, Gainesville, Fla.	<i>Ms. Patty Bartlett</i> , Historian	5/5/95 7/17/95
Micanopy Historical Trust, Micanopy, Fla.	<i>Ms. Diana Cohen</i> , President	
National Railway Historical Society, North Florida and Central Florida Chapters, Jacksonville and Winter Garden, Fla.	<i>Robert K. Murdock</i> , Central Florida Chapter Historian,	2/26/96
Palatka Railroad Museum, Palatka, Fla.	<i>Ms. Janice Browning</i> , Founder	10/4/95
State of Florida Library, Tallahassee, Fla.	<i>Ms. Margaret Pugh</i>	7/18/95
University of Florida, Gainesville, Fla.	<i>Mr. Dan Ward</i> , Professor of Botany	6/6/95
University of Florida Herbarium, Gainesville, Fla.	<i>Mr. Kent Perkins</i> , Curator	10/3/95
University of North Florida, Jacksonville, Fla.	<i>Mr. Dan Schaeffer</i> , Professor of History	7/17/95
U.S. Army Corps of Engineers, Jacksonville, Fla.	<i>Mr. Chris Smith</i>	8/25/95

Other Contacts - Local Individuals and Experts

Name	Description	Date
Mr. John Henry Balknight	<i>Life-long resident of Cross Creek (86 years); used to fish in the lake every day</i>	7/05/95
Dr. Seth H. Bramson	<i>Florida Railroad Expert and University Professor</i>	4/8/97
Ms. Sybil Bray	<i>Author and historian, Marion County, Fla.</i>	6/14/95
Mr. Don Chapman	<i>Railroad Buff, Orange Springs, Fla.</i>	10/06/95
Mr. W. J. Crossby	<i>Retired Orange Grove Farmer of Citra; long- time resident of the area.</i>	6/20/95 6/26/95
Mr. Horace Drew	<i>Long- time resident of the Orange Lake area; fished in Orange Lake for many years and was an orange grove farmer.</i>	7/08/95
Mr. George Drury	<i>Railroad Expert and Researcher for Kalmbach Publishing Company</i>	2/9/96
Mr. Bert Ergle	<i>Long-time resident of Citra; currently lives in Ocala.</i>	10/06/95
Mr. Harry Evans	<i>Long-time resident of Island Grove</i>	11/95
Mr. John Gilliland	<i>Retired Pastor of church in town of Orange Lake,(located Frank McKay).</i>	6/26/95
Mr. Jim Glisson	<i>Railroad Buff who grew up in the Cross Creek area; Vice-President of Seminole Feed, Ocala, Fla.</i>	7/06/95
Mr. J.T. Glisson	<i>Long-time resident of Cross Creek and Evinston Area</i>	6/14/95 6/20/95 7/3/95 7/5/95
Ms. Irene Haskitt	<i>Retired Postmaster, town of Orange Lake (helped find Don McKay's family).</i>	6/06/95
Mr. Milton Hilcox	<i>Long-time Resident of the Island grove area; lives in Hawthorne, Fla. currently.</i>	11/01/96

Ms. Marjorie Karowe	<i>Long-time resident of the area; lives in McIntosh, Fla.</i>	6/23/95 7/3/95
Mr. Frank McKay	<i>Son of the late Don McKay, naturalist who had a business showing people the floating islands and giving tours of Orange Lake.</i>	7/21/95 7/26/95
Ms. Janice Mehafey	<i>Archivist for Putnam County - working on starting the Railroad Museum in Palatka.</i>	10/04/95
Ms. Faye Perry Melton	<i>Long-time resident of Citra and the author of several historical books on the area.</i>	5/11/95 6/14/95
Dr. Charlotte Porter	<i>Anthropologist and Expert on William Bartram</i>	5/27/97
Ms. Nancy Richardson	<i>Long time resident of Cross Creek Area - Evinston</i>	6/6/97
Mr. George Schulz	<i>Railroad Buff and employee of Railstation - Orange Park, Fla.</i>	11/95
Dr. Shands	<i>Former owner of muck farm to the east of Orange Lake - east of Highway 301</i>	10/03/95
Ms. Karen Sims	<i>Postmaster of Citra, Fla.</i>	8/25/95
Mr. Snow Slater	<i>Resident of Cross Creek Area for over 80 years; Fished Orange Lake daily for many years</i>	7/05/95
Mr. Crawford Solomon	<i>Resident of Orange Lake, Naturalist</i>	05/08/95 05/11/95 01/29/97 4/08/97
Mr. Dorsey Townsend	<i>Resident of Cross Creek Area for over 70 years</i>	07/05/95
Mr. Wallace Wimberly	<i>Long-time local resident of Citra</i>	10/04/95
Mr. Jim Williams	<i>Resident of area - currently realtor in Ocala and SJRWMD Board Member</i>	10/04/95

Monthly Average Water Levels 1942-1998

Month	Monthly Average Water Level (ft. NGVD)	Month	Monthly Average Water Level (ft. NGVD)	Month	Monthly Average Water Level (ft. NGVD)
Oct-42	57.80	Sep-46	60.55	Aug-50	57.36
Nov-42	57.49	Oct-46	60.49	Sep-50	58.83
Dec-42	57.39	Nov-46	59.90	Oct-50	59.20
Jan-43	57.29	Dec-46	59.21	Nov-50	58.99
Feb-43	57.05	Jan-47	58.70	Dec-50	58.33
Mar-43	56.85	Feb-47	58.47	Jan-51	58.05
Apr-43	56.46	Mar-47	58.81	Feb-51	57.71
May-43	56.09	Apr-47	59.14	Mar-51	57.37
Jun-43	55.72	May-47	58.76	Apr-51	57.11
Jul-43	55.43	Jun-47	58.42	May-51	56.64
Aug-43	55.52	Jul-47	58.23	Jun-51	56.34
Sep-43	55.81	Aug-47	58.32	Jul-51	56.40
Oct-43	56.12	Sep-47	58.64	Aug-51	56.45
Nov-43	55.90	Oct-47	59.67	Sep-51	56.72
Dec-43	55.72	Nov-47	60.32	Oct-51	57.84
Jan-44	55.75	Dec-47	59.94	Nov-51	57.96
Feb-44	55.71	Jan-48	59.69	Dec-51	58.25
Mar-44	55.83	Feb-48	60.18	Jan-52	58.19
Apr-44	56.93	Mar-48	60.77	Feb-52	58.25
May-44	57.47	Apr-48	60.45	Mar-52	58.74
Jun-44	57.28	May-48	59.47	Apr-52	58.59
Jul-44	57.33	Jun-48	58.95	May-52	58.23
Aug-44	57.57	Jul-48	58.76	Jun-52	57.94
Sep-44	57.56	Aug-48	59.33	Jul-52	57.51
Oct-44	57.65	Sep-48	59.52	Aug-52	57.16
Nov-44	58.29	Oct-48	59.66	Sep-52	57.06
Dec-44	58.16	Nov-48	59.13	Oct-52	56.91
Jan-45	58.14	Dec-48	58.84	Nov-52	56.75
Feb-45	58.02	Jan-49	58.54	Dec-52	56.56
Mar-45	57.73	Feb-49	58.60	Jan-53	56.63
Apr-45	57.26	Mar-49	58.45	Feb-53	56.68
May-45	56.79	Apr-49	58.73	Mar-53	56.63
Jun-45	56.38	May-49	58.61	Apr-53	57.34
Jul-45	56.91	Jun-49	58.26	May-53	57.76
Aug-45	57.95	Jul-49	58.22	Jun-53	57.47
Sep-45	58.82	Aug-49	58.10	Jul-53	57.37
Oct-45	58.70	Sep-49	58.64	Aug-53	57.56
Nov-45	58.34	Oct-49	58.94	Sep-53	58.87
Dec-45	58.29	Nov-49	58.81	Oct-53	59.47
Jan-46	59.04	Dec-49	58.54	Nov-53	58.95
Feb-46	59.05	Jan-50	58.18	Dec-53	58.93
Mar-46	58.94	Feb-50	57.73	Jan-54	59.37
Apr-46	58.72	Mar-50	57.46	Feb-54	58.86
May-46	58.71	Apr-50	57.22	Mar-54	58.40
Jun-46	58.93	May-50	57.01	Apr-54	58.15
Jul-46	59.36	Jun-50	56.74	May-54	57.77
Aug-46	60.53	Jul-50	57.14	Jun-54	57.46

Monthly Average Water Levels 1942-1998

Monthly Average Water Level (ft. NGVD)		Monthly Average Water Level (ft. NGVD)		Monthly Average Water Level (ft. NGVD)	
Month	NGVD)	Month	NGVD)	Month	NGVD)
Jul-54	57.06	Jun-58	57.35	May-62	56.16
Aug-54	56.70	Jul-58	57.36	Jun-62	55.89
Sep-54	56.37	Aug-58	57.36	Jul-62	55.77
Oct-54	56.29	Sep-58	57.16	Aug-62	55.79
Nov-54	56.04	Oct-58	57.05	Sep-62	55.87
Dec-54	55.92	Nov-58	57.13	Oct-62	55.86
Jan-55	55.81	Dec-58	57.20	Nov-62	55.60
Feb-55	55.88	Jan-59	57.60	Dec-62	55.39
Mar-55	55.73	Feb-59	57.78	Jan-63	55.26
Apr-55	55.41	Mar-59	58.85	Feb-63	55.55
May-55	54.89	Apr-59	59.99	Mar-63	56.23
Jun-55	54.52	May-59	59.21	Apr-63	56.04
Jul-55	54.55	Jun-59	59.12	May-63	55.60
Aug-55	54.29	Jul-59	59.25	Jun-63	55.20
Sep-55	54.32	Aug-59	58.69	Jul-63	55.42
Oct-55	53.85	Sep-59	58.47	Aug-63	55.74
Nov-55	53.42	Oct-59	58.21	Sep-63	55.86
Dec-55	52.99	Nov-59	58.00	Oct-63	55.80
Jan-56	52.51	Dec-59	57.70	Nov-63	55.51
Feb-56	52.28	Jan-60	57.50	Dec-63	55.30
Mar-56	51.68	Feb-60	57.37	Jan-64	56.00
Apr-56	51.25	Mar-60	58.27	Feb-64	58.06
May-56	51.04	Apr-60	59.09	Mar-64	58.91
Jun-56	50.55	May-60	58.46	Apr-64	58.59
Jul-56	50.53	Jun-60	58.22	May-64	58.57
Aug-56	50.64	Jul-60	58.85	Jun-64	58.05
Sep-56	51.19	Aug-60	59.62	Jul-64	58.01
Oct-56	51.69	Sep-60	59.92	Aug-64	58.71
Nov-56	52.12	Oct-60	60.03	Sep-64	60.13
Dec-56	52.02	Nov-60	59.56	Oct-64	59.93
Jan-57	51.78	Dec-60	58.88	Nov-64	59.10
Feb-57	51.49	Jan-61	58.45	Dec-64	58.95
Mar-57	51.25	Feb-61	58.35	Jan-65	59.06
Apr-57	51.12	Mar-61	58.15	Feb-65	59.08
May-57	50.87	Apr-61	57.98	Mar-65	59.37
Jun-57	50.97	May-61	57.61	Apr-65	58.94
Jul-57	51.22	Jun-61	57.26	May-65	58.37
Aug-57	52.38	Jul-61	57.32	Jun-65	58.43
Sep-57	53.96	Aug-61	58.01	Jul-65	58.97
Oct-57	55.50	Sep-61	58.87	Aug-65	59.93
Nov-57	55.83	Oct-61	58.44	Sep-65	59.48
Dec-57	55.96	Nov-61	58.09	Oct-65	59.16
Jan-58	56.07	Dec-61	57.75	Nov-65	58.78
Feb-58	56.21	Jan-62	57.50	Dec-65	58.62
Mar-58	57.19	Feb-62	57.23	Jan-66	58.64
Apr-58	57.94	Mar-62	56.90	Feb-66	58.82
May-58	57.78	Apr-62	56.73	Mar-66	59.37

Monthly Average Water Levels 1942-1998

Monthly Average Water Level (ft. NGVD)		Monthly Average Water Level (ft. NGVD)		Monthly Average Water Level (ft. NGVD)	
Month	NGVD)	Month	NGVD)	Month	NGVD)
Apr-66	58.91	Mar-70	59.80	Feb-74	57.73
May-66	58.55	Apr-70	60.02	Mar-74	57.59
Jun-66	58.57	May-70	59.10	Apr-74	57.48
Jul-66	58.53	Jun-70	58.61	May-74	57.11
Aug-66	58.93	Jul-70	58.40	Jun-74	57.32
Sep-66	59.02	Aug-70	58.53	Jul-74	58.22
Oct-66	59.21	Sep-70	58.90	Aug-74	58.89
Nov-66	58.58	Oct-70	58.43	Sep-74	59.12
Dec-66	58.37	Nov-70	58.10	Oct-74	58.52
Jan-67	58.50	Dec-70	57.87	Nov-74	58.02
Feb-67	58.77	Jan-71	57.95	Dec-74	57.85
Mar-67	58.80	Feb-71	58.17	Jan-75	57.88
Apr-67	58.26	Mar-71	58.26	Feb-75	58.02
May-67	57.85	Apr-71	58.26	Mar-75	58.13
Jun-67	57.70	May-71	57.95	Apr-75	57.98
Jul-67	57.97	Jun-71	57.48	May-75	57.60
Aug-67	58.54	Jul-71	57.31	Jun-75	57.23
Sep-67	58.89	Aug-71	57.34	Jul-75	57.09
Oct-67	58.35	Sep-71	57.57	Aug-75	57.10
Nov-67	57.92	Oct-71	57.62	Sep-75	57.01
Dec-67	57.93	Nov-71	57.53	Oct-75	57.38
Jan-68	57.87	Dec-71	57.83	Nov-75	57.37
Feb-68	57.64	Jan-72	58.13	Dec-75	57.18
Mar-68	57.54	Feb-72	58.70	Jan-76	57.45
Apr-68	57.17	Mar-72	58.71	Feb-76	57.52
May-68	56.75	Apr-72	58.84	Mar-76	57.35
Jun-68	56.97	May-72	58.64	Apr-76	57.08
Jul-68	57.07	Jun-72	58.79	May-76	56.89
Aug-68	57.12	Jul-72	59.44	Jun-76	56.92
Sep-68	58.12	Aug-72	59.03	Jul-76	56.98
Oct-68	58.65	Sep-72	59.47	Aug-76	56.62
Nov-68	58.70	Oct-72	58.81	Sep-76	56.50
Dec-68	58.39	Nov-72	58.52	Oct-76	56.24
Jan-69	58.28	Dec-72	58.76	Nov-76	55.90
Feb-69	58.28	Jan-73	59.04	Dec-76	55.95
Mar-69	58.57	Feb-73	59.35	Jan-77	56.52
Apr-69	58.62	Mar-73	59.36	Feb-77	56.89
May-69	58.28	Apr-73	59.95	Mar-77	57.00
Jun-69	58.13	May-73	59.12	Apr-77	56.60
Jul-69	57.78	Jun-73	58.62	May-77	56.01
Aug-69	57.88	Jul-73	58.27	Jun-77	55.54
Sep-69	58.45	Aug-73	58.37	Jul-77	55.12
Oct-69	58.97	Sep-73	58.72	Aug-77	54.95
Nov-69	58.97	Oct-73	58.44	Sep-77	54.91
Dec-69	58.96	Nov-73	57.99	Oct-77	54.65
Jan-70	59.47	Dec-73	57.90	Nov-77	54.26
Feb-70	60.23	Jan-74	57.99	Dec-77	54.48

Monthly Average Water Levels 1942-1998

Monthly Average Water Level (ft. NGVD)		Monthly Average Water Level (ft. NGVD)		Monthly Average Water Level (ft. NGVD)	
Month	NGVD)	Month	NGVD)	Month	NGVD)
Jan-78	55.02	Dec-81	55.79	Nov-85	58.49
Feb-78	56.49	Jan-82	55.83	Dec-85	58.31
Mar-78	58.09	Feb-82	55.81	Jan-86	58.29
Apr-78	58.22	Mar-82	55.90	Feb-86	58.42
May-78	58.04	Apr-82	57.30	Mar-86	58.67
Jun-78	58.06	May-82	57.95	Apr-86	58.56
Jul-78	58.09	Jun-82	58.48	May-86	57.85
Aug-78	59.61	Jul-82	58.82	Jun-86	57.56
Sep-78	58.98	Aug-82	58.66	Jul-86	57.48
Oct-78	58.33	Sep-82	58.68	Aug-86	57.46
Nov-78	57.95	Oct-82	58.31	Sep-86	57.49
Dec-78	57.72	Nov-82	58.06	Oct-86	57.34
Jan-79	57.93	Dec-82	57.97	Nov-86	57.15
Feb-79	58.31	Jan-83	57.96	Dec-86	57.53
Mar-79	58.43	Feb-83	58.26	Jan-87	57.82
Apr-79	58.24	Mar-83	58.73	Feb-87	58.38
May-79	58.46	Apr-83	59.20	Mar-87	59.17
Jun-79	58.15	May-83	59.31	Apr-87	59.85
Jul-79	57.98	Jun-83	59.00	May-87	59.16
Aug-79	57.94	Jul-83	58.58	Jun-87	58.56
Sep-79	58.26	Aug-83	58.35	Jul-87	58.29
Oct-79	58.50	Sep-83	58.61	Aug-87	57.84
Nov-79	58.15	Oct-83	58.70	Sep-87	57.54
Dec-79	58.21	Nov-83	58.49	Oct-87	57.10
Jan-80	58.37	Dec-83	58.63	Nov-87	56.91
Feb-80	58.70	Jan-84	59.02	Dec-87	56.72
Mar-80	58.68	Feb-84	59.01	Jan-88	56.65
Apr-80	58.71	Mar-84	59.17	Feb-88	56.78
May-80	58.54	Apr-84	59.10	Mar-88	57.45
Jun-80	58.22	May-84	58.78	Apr-88	57.58
Jul-80	58.18	Jun-84	58.66	May-88	57.22
Aug-80	58.54	Jul-84	58.68	Jun-88	56.69
Sep-80	58.46	Aug-84	58.66	Jul-88	56.28
Oct-80	58.22	Sep-84	58.35	Aug-88	56.08
Nov-80	58.07	Oct-84	58.17	Sep-88	58.16
Dec-80	57.92	Nov-84	57.93	Oct-88	58.74
Jan-81	57.67	Dec-84	57.78	Nov-88	58.32
Feb-81	57.86	Jan-85	57.53	Dec-88	58.23
Mar-81	58.08	Feb-85	57.36	Jan-89	58.01
Apr-81	57.84	Mar-85	57.20	Feb-89	57.78
May-81	57.20	Apr-85	56.95	Mar-89	57.65
Jun-81	56.85	May-85	56.45	Apr-89	57.34
Jul-81	56.63	Jun-85	55.93	May-89	56.85
Aug-81	56.67	Jul-85	55.87	Jun-89	56.59
Sep-81	56.50	Aug-85	56.03	Jul-89	56.55
Oct-81	56.14	Sep-85	57.70	Aug-89	56.50
Nov-81	56.00	Oct-85	58.42	Sep-89	56.25

Monthly Average Water Levels 1942-1998

Monthly Average Water Level (ft. NGVD)		Monthly Average Water Level (ft. NGVD)		Monthly Average Water Level (ft. NGVD)	
Month	NGVD)	Month	NGVD)	Month	NGVD)
Oct-89	55.92	Dec-93	55.16	Nov-97	57.00
Nov-89	55.59	Jan-94	55.43	Dec-97	57.94
Dec-89	55.46	Feb-94	56.43	Jan-98	59.11
Jan-90	55.36	Mar-94	56.66	Feb-98	59.64
Feb-90	55.17	Apr-94	56.45	Mar-98	60.07
Mar-90	55.05	May-94	56.07	Apr-98	59.15
Apr-90	54.84	Jun-94	55.88	May-98	58.45
May-90	54.23	Jul-94	56.00	Jun-98	57.91
Jun-90	53.82	Aug-94	56.24	Jul-98	57.72
Jul-90	53.89	Sep-94	56.62	Aug-98	57.82
Aug-90	53.74	Oct-94	57.24	Sep-98	58.00
Sep-90	53.64	Nov-94	57.45		
Jan-91	52.03	Dec-94	57.43		
Feb-91	52.02	Jan-95	57.49		
Mar-91	52.34	Feb-95	57.49		
Apr-91	52.56	Mar-95	57.43		
May-91	52.97	Apr-95	57.78		
Jun-91	54.50	May-95	57.71		
Jul-91	55.34	Jun-95	57.81		
Aug-91	55.83	Jul-95	58.07		
Sep-91	55.80	Aug-95	58.02		
Oct-91	55.64	Sep-95	58.00		
Nov-91	55.29	Oct-95	58.37		
Dec-91	54.99	Nov-95	58.36		
Jan-92	54.74	Dec-95	58.16		
Feb-92	54.81	Jan-96	58.23		
Mar-92	54.89	Feb-96	57.96		
Apr-92	54.72	Mar-96	58.20		
May-92	54.32	Apr-96	58.47		
Jun-92	54.05	May-96	58.13		
Jul-92	53.97	Jun-96	57.88		
Aug-92	53.90	Jul-96	58.11		
Sep-92	54.18	Aug-96	58.10		
Oct-92	55.25	Sep-96	57.96		
Nov-92	55.95	Oct-96	57.99		
Dec-92	55.96	Nov-96	57.80		
Jan-93	55.98	Dec-96	57.92		
Feb-93	56.15	Jan-97	57.91		
Mar-93	56.70	Feb-97	57.89		
Apr-93	57.09	Mar-97	57.69		
May-93	56.74	Apr-97	57.40		
Jun-93	56.32	May-97	57.50		
Jul-93	56.26	Jun-97	57.59		
Aug-93	55.82	Jul-97	57.50		
Sep-93	55.57	Aug-97	57.39		
Oct-93	55.22	Sep-97	56.82		
Nov-93	55.39	Oct-97	56.60		

Appendix E
Chronology of Important Events
Related to Orange Lake

Appendix E: **Chronology of Important Events Related to Orange Lake**

- 1880 - 1892 Steamboat running on Orange and Lochloosa Lakes
- 1881 Railroad across the eastern end of Orange Lake from Island Grove to Citra was opened to Ocala (Jessen 1972). Railroad Co. was the Florida Peninsular Railroad (Yulee Files late 1800s), later known as the Florida Central and Peninsular Railroad (Ocala Banner 1892).
- 1881 Plans for the town of Citra were developed and the town of Orange Lake began about this time (*from Knetsch 1989 and Webb 1885*)
- 1903 - W.N. Camp proposed to drain a portion of Orange Lake (defining it as swamp land). The U.S. Department of the Interior agent denied Mr. Camp the right to drain the land because the area "... ***had anywhere from 3 to 8 feet of water and certain portions were covered with floating islands of vegetation and sawgrass...***" and it did not meet the definition of swamp land (*from Knetsch 1989*)
- 1910 Bird Island on Orange Lake was purchased by the Audubon Society and protected as a waterbird sanctuary (Pearson 1941)
- 1916-1917 Locals state there was a drought at this time - no documentation found.
- 1926 Single lane highway (now 301) was constructed across Orange Lake between Citra and Island Grove (Leslie Mami, Florida Department of Transportation, personal communication, June 1995)
- 1927 Dike and canal built at east end of Paynes Prairie to divert flow of Prairie Creek away from Alachua Sink and into River Styx and Orange Lake (Jessen 1972).
- 1930's Mr. Shands acquired land from the State of Florida for muck farm and agreed to build a dike (Jessen 1972).
- 1930's Shands' dike was built 1.5 miles to east of Railroad bridge. Shands' canal was dug along the side of marsh from the dike to the northeast end of muckland area. Muckland area is drained. (Canal itself is often referred to as Orange Creek) (Jessen 1972). [Note:

- Dike was built prior to 1937 but farming was not occurring at this time as indicated by 1937 aerial photos].
- 1941 A severe flood prompted the U.S. Army Corps of Engineers to do flood control survey of Orange Creek Basin in 1946, but no measures were taken.
 - 1948 During flood, the spillway of Shands' dike had to be dynamited (Jessen 1972).
 - 1948 Hyacinths a problem in Orange Lake Basin
 - Jan. 1954-Aug. 1956 Water levels dropped continuously. By the fall of 1955, Cross Creek had ceased to flow.
 - 1955 Orange Lake Watershed Association was organized to explore remedies for low water levels in Orange Lake (Jessen 1972).
 - 1956 - Many fish camps close on Orange Lake due to drought.
 - 1956 Orange Lake Watershed Association decided that Orange and Lochloosa Lakes should be held at a "normal" level and a control device be built at Cross Creek (Jessen 1972). No such structure was built at Cross Creek.
 - 1956 Sinkhole had become visible (200 feet across and 70 feet deep) The sinkhole was separate from the lake because lake levels were so low, but water was still flowing into the sinkhole (Jessen 1972).
 - March 1956 Record that mucklands in Orange Lake burned.
 - Feb. 1957 Over 2,000 acres of muckland in Orange Lake burned.
 - Feb-March 1957 Alachua and Marion Counties attempt to build an earthen dam around sinkhole, dumping several hundred truck loads of fill in an attempt to encircle the sink. Material began slumping into the sink, so the counties began excavating a channel and building a dam in a slightly different route, but work was suspended (Jessen 1972).
 - March 1957 Alachua County Recreation and Water Conservation and Control Authority was created replacing the Orange Lake Watershed Association (Jessen 1972).
 - July 1957 Alachua County Recreation and Water Conservation and Control Authority's flood prevention plan called for enlarging and

- reversing the flow of Cross Creek, and constructing a dike and control structure on Lake Lochloosa, increasing the capacity of Lochloosa Slough. Flow of water would be from Orange Lake to Lake Lochloosa, then through Lochloosa slough to Orange Creek. This plan was not implemented (Jessen 1972).
- Aug. 1957 Construction of a temporary dike began around the sinkhole (35,000 bags of sand and cement placed on dike) (Jessen 1972). By October 1957 the temporary dike was complete.
- 1957 A temporary dam of earth and concrete rubble was placed across the Orange Lake outlet at U.S. Highway 301 by local individuals. (Jessen 1972).
- 1957 A June tropical storm caused the lake to begin to rise. Clumps of the dike slumped into the sink. By March 1958, the dike was under water (Jessen 1972).
- March 1958 - The sinkhole was no longer isolated from the lake due to rising waters.
- 1959 Highway 301 was replaced and the dam at Highway 301 was removed in the process (Jessen 1972).
- 1960 Alachua County Recreation and Water Conservation and Control Authority proposed construction of a dam at Orange Lake outlet (supported by fish camp owners). Citrus owners objected because they desired a flow of water at all times, to insure adequate level of water in marshes during the winter frost season (Jessen 1972).
- Fall 1960 -1963 Water levels falling in Orange Lake
- 1960-1963 Controversy over whether to replace dam at Orange Lake outlet and if so what kind of dam to build.
- 1962 It was agreed that a dam with a notch down to 55.5 feet elevation would be constructed at the outlet to Orange Lake at Highway 301 to satisfy both the fish camp owners and the orange grove owners (Jessen 1972).
- April 1963 A fixed crest weir was completed at the Orange Lake outlet at Highway 301 (Jessen 1972). The weir was constructed with a 3 foot, 8 inch wide low flow notch at 55.5 ft. NGVD.
- Sept. 1963 Hurricane Dora caused lake levels to begin to rise (Jessen 1972).

Nov. 1963	Local residents made an effort to plug the sinkhole with an estimated: 70 automobile bodies, a school bus, a 13,000 gallon steel storage tank, 3 truckloads of old fence wire, over 3,000 tons of rock, 10,000 cubic yards of dirt, and 250 tons of concrete rip-rap (Jessen 1972 and Ocala Star Banner 1963).
1989	Orange Lake Dam Task Force formed to address lake levels in Orange Lake (Robison et al. 1995).
1990	Low-flow notch in Orange Lake dam was illegally obstructed during drought (Robison et al. 1995). This increased the outflow elevation to 57.1 ft. NGVD.
1990-1994	Low water levels in Orange Lake. In January 1991 water levels fell below 52 ft. NGVD.
1994	St. Johns River Water Management District established Orange Creek Basin Advisory Council (Robison et al. 1995).
	Orange Creek Basin Scientific Advisory Council Formed
1994	SJRWMD Governing Board passed Rule 40C-2.302, FAC, Reservation of Water Form Use for Paynes Prairie Preserve (Robison et al. 1995). This allowed a percentage of the flow from Prairie Creek to be rediverted back into Paynes Prairie instead of into Orange Lake.
June 1995	Water levels back up to over 58 ft. NGVD

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Appendix F
Analysis of Orange Lake Wetland Coverage
from Historical Photos

APPENDIX F

OPEN WATER AND WETLANDS IN ORANGE LAKE OVER THE LAST 60 YEARS

There have been a number of beliefs and hypotheses regarding changes in open water and wetlands in Orange Lake over the last half century. While some believe that there has been little change in the areal coverage (acreage) of wetlands in Orange Lake, others believe that they have been increasing in coverage. Some have stated that wetlands have been increasing through the years, and that this increase has been caused by construction of the railroad and US 301 highway berms across the southeastern part of Orange Lake.

It is not clear whether wetlands have increased, and open water has therefore decreased, in Orange Lake over the last half century. In order to provide some data to answer this question, District scientists examined aerial photographs for eight years between 1937 and 1995 (Table F-1). The area of open water in Orange Lake was determined on each aerial photograph through stereoscopic interpretation; the interpreted coverages were then digitized, and analyzed using geographical information systems (GIS) software (Kinser et al., unpublished data).

In this analysis, the area of wetlands in Orange Lake was determined by subtracting the area of open water from the total lake area. It should be pointed out that open water includes areas inhabited by submersed aquatic vegetation such as hydrilla. The following analysis and discussion will focus on the area of open water in Orange Lake.

Open Water Acreages

The acreage of open water in Orange Lake on these eight dates between 1937 and 1995 varied from a low of 3,487 acres in 1956 to a high of 7,748 acres in 1975 (Table F-1). The variability in

open water acreage is apparent in Figure F-1. It is obvious that there is no linear trend in open water from 1937 to 1995 ($P = 0.87$; linear regression analysis). However, lake levels varied considerably on these eight dates, from a low of 52.1 ft NGVD in 1956 to a high of 59.2 ft NGVD in 1937 (Table F-1).

Influence of Lake Level on Open Water Acreages

The relationship between open water acreage and lake level on these eight dates was significant ($P < 0.007$; linear regression analysis; Figure F-2). This means that, across the data set, the area of open water is greater at higher lake levels. This positive linear relationship explains about 73 percent of the variability in open water over these eight dates ($R^2 = 0.73$; Figure F-2).

Conversely, there still remains about 27 percent of the variability in open water acreage which is not explained by lake levels. This unexplained variability in open water acreage is referred to as residual variability.

Other Influences on Open Water Acreages

We examined the characteristics of this residual variability in open water acreage. If we can understand what additional environmental factors explain this residual variability, then we can better predict how much open water there is in Orange Lake - based upon lake level and these additional environmental factors.

The residual variability (the distance that data points are above and below the regression line in Figure F-2) is plotted in Figure F-3 for the eight years in which open water acreages were determined from aerial photographs. The residual values were clustered into two groups. Group 1 (shown in blue) had three positive residual values that were over 200 acres. These positive residual values mean that there was more open water (and therefore fewer wetlands) observed in Orange Lake on these three dates than predicted solely by lake levels. Group 2 (shown in red) had four negative residual values that were over 200 acres. These negative residual values mean

that there was less open water (and therefore more wetlands) observed in Orange Lake than predicted solely by lake levels.

Close examination of the four dates comprising the group 2 residuals (1937, 1956, 1991, and 1995; Figure F-3) suggests that these dates occurred during or shortly after extreme low water events in Orange Lake. Conversely, the three dates comprising the group 1 residuals (1975, 1982, and 1988; Figure F-3) all occurred a large number of years after an extreme low water event. The years since an extreme low water event are shown in Table F-2 and in parentheses in Figure F-3. There have been three extreme low water events since 1930: 1931-1932, 1955-1957, and 1990-1991 (Table F-3). Hydrologic characteristics of these extreme low water periods are provided in Table F-3. These three droughts formed the basis for determining "the number of years since an extreme low water event" for each of the eight aerial photo dates.

The pattern of residual values shown in Figure F-3 suggest that negative residual values (less open water - more wetlands observed in Orange Lake than predicted from lake level) are associated with dates which are only a few years after an extreme low water event. Positive residual values (more open water - fewer wetlands observed in Orange Lake than predicted from lake level) appear to be associated with dates which were a large number of years since an extreme low water event. This relationship is shown in Figure F-4, where there is a significant positive linear relationship between the residual values and the number of years since an extreme low water event ($P < 0.005$; linear regression analysis). Over 75 percent of the variability in the residual values was explained by the environmental factor of years since an extreme low water event.

Influence of Lake Level and Extreme Low Water Periods on Open Water

The combined influence of "lake level" and "the number of years since an extreme low water event" are both significant predictors of the amount of open water (and hence wetlands) in Orange Lake. The effects of both these variables are significant ($P < 0.001$ and $P < 0.006$

respectively) in predicting open water acreage in Orange Lake (multiple linear regression analysis; Figure F-5). The following is the regression equation from this analysis:

$$\text{open water} = -19,767.1 + (445.2 \times \text{lake level}) + (55.2 \times \text{years since an extreme low}),$$

where: (1) "lake level" is in ft NGVD,

(2) "years since extreme low" are counted since the start of an extreme low water event.

The actual and predicted open water acreages for Orange Lake are quite close for most of the eight dates analyzed when using these two environmental factors as predictors ($R^2 = 0.95$; Figure F-5). This means that we can explain 95 percent of the variability in open water acreage observed on these eight dates between 1937 and 1995.

Regression Model Validation and Recent Open Water Changes

Additional data on the acreage of open water in Orange Lake, from 1994 to 1996, was available from Clark and Reddy (1999). This data allowed us to examine the validity of the open water regression model we had developed for Orange Lake.

Aerial photographs of Orange Lake were used for January 22, 1994 (lake level of 55.43 ft NGVD) and September 24, 1996 (lake level of 57.96 ft NGVD). Total lake area increased from 9,547 acres in 1994 to 13,044 acres in 1996. The area of open water was measured by Mark Clark (ibid.) for the two aerial photography dates. We also utilized the open water regression model (as shown on page F-4) to predict the open water acreage for these two dates. In this manner, we could validate the model by comparing the predictions to the actual open water acreage.

The open water acreage in 1994 was very close to that predicted by the regression model (Figure F-6; 91-acre difference). Open water acreage in Orange Lake increased from 1994 to 1996.

There was, however, a larger discrepancy (669 acres) between the actual open water acreage and that predicted by the regression model (Figure F-6). This discrepancy in 1996 is almost identical to that observed in 1975 (see Figure F-5). The use of the 1994 and 1996 aerial photographs serves to provide acceptable validation to the open water regression model for Orange Lake.

The data gathered by Clark (*ibid.*) also show that the acreage of open water in Orange Lake increased by about 14 percent from 1994 to 1996.

Relationships Between Open Water, Wetlands and Lake Area

The relationship between open water area and total lake area is presented graphically in Figure F-7. It is apparent from these two lines that increasing lake levels result in a more rapid increase in total lake area than in the area of open water. The acreage of wetlands in Orange Lake (calculated as the difference between total lake area and open water area) also increases as lake level rises (Figure F-7), and at a faster rate than does open water (regression slopes are 620 for wetlands vs. 525 for open water). Rising lake levels in Orange Lake result in greater areas of open water and greater areas of wetlands.

Presented another way, the percentage of the total lake area that is open water decreases as lake level rises, while the percentage of the total lake area that is wetlands increases as lake level rises (Figure F-8). At a lake level of 55 ft NGVD, we would expect about 60 percent of the lake to be open water and 40 percent to be wetlands. At a lake level of 60 ft NGVD, we would expect about 53 percent of the lake to be open water and 47 percent to be wetlands. These expectations in wetland and open water acreages shown in Figure F-8 are derived from the regression analysis of open water acreages observed in Orange Lake on the eight dates between 1937 and 1995.

What ecological processes occur which lead to increases in open water and wetlands as lake levels rise? Wetlands increase primarily because dry or exposed areas become inundated as lake levels rise, and these inundated areas become emergent marsh. It is also possible that emergent marsh and deep marsh areas can detach from the lake bottom with rising lake levels and become

floating wetlands. If these newly created floating wetlands move into open water areas and the detachment areas are filled in by adjacent plants, then wetland acreage increases while open water decreases. Floating and emergent wetlands can also expand laterally (toward the center of the lake) during low water periods and the subsequent refill period, thereby transforming formerly open water areas into floating and emergent wetlands. Floating wetlands can also increase by lateral detachment, forming floating islands. If these floating islands move into open water areas and the detachment areas are replaced by adjacent plants, then wetland acreage increases while open water decreases.

Open water increases primarily because areas of the lake that were formerly emergent wetlands and deep marsh become open water as lake levels rise, becoming too deep for the survival of the plants. In this instance, open water increases while wetlands decrease in acreage. Floating wetlands may sink as lake levels rise, and thereby create new areas of open water. Floating wetlands can also move or be blown shoreward and lodge over emergent wetlands, resulting in new areas of open water.

There are other factors which likely influence floating wetlands in Orange Lake. Cold weather, for instance, can lead to a decrease in buoyancy to the extent that the floating wetlands will sink to the lake bottom. Wind storms can detach floating wetlands and move them into new areas over open water or emergent wetlands.

Relationships Between Extreme Low Water Events and Wetlands in Orange Lake

In the regression analysis developed here, we found a positive relationship between “years since an extreme low water event” and the area of open water. In the years immediately following an extreme low water event, there are more wetlands (less open water) than predicted simply from lake levels (Figure F-4). This relationship with “years since an extreme low water event” was highly significant ($P < 0.006$; Figure F-5). These statistical results are supported by the observations of biologists, made during the 1990-1991 extreme low water event and subsequent

refill period, that wetlands in Orange Lake increased during and after the extreme low water period.

This relationship between wetlands and extreme low water events suggests that during the refill period after an extreme low water event, either (1) the normal mechanisms which lead to increases in open water acreage are occurring at a slower rate than expected, or (2) the processes that lead to an increase in wetlands are occurring at a higher rate than expected.

The most likely possibilities for this greater-than-expected increase in wetlands after an extreme low water event are (1) that emergent wetlands present during the low water period detach during refill and become floating wetlands (pop-ups), and (2) that emergent and floating wetlands expand laterally toward the center of the lake before and during refill (lateral vegetative expansion). In both cases, the newly-formed wetlands would occupy areas that were either previously open water or areas that would become open water with increasing lake levels.

Pop-ups would occur because of buoyancy changes in the plant/sediment matrix (Clark and Reddy, 1999). Lateral vegetative expansion of emergent and floating wetlands would be enhanced by increases in nutrients in the lake during and after extreme low water events (Clark and Reddy, 1999). Lasi (1999) found a significant increase in total phosphorus ($P < 0.004$) and total nitrogen ($P < 0.001$) concentrations in the water column with decreases in water levels in Orange Lake from October 1988 to February 1991 and from June 1994 and October 1995.

Wetland and Open Water Trends Through Time

The combination of "lake level" and "years since an extreme low water event" explain over 95 percent of the variability in open water acreages observed in Orange Lake over the eight dates spanning from 1937 to 1995. Once you account for these two environmental factors, there is no linear decrease in open water since 1937 ($P = 0.92$).

If we calculate the wetland acreage for the eight dates by subtracting the measured open water acreage from the total lake area on that date, we find that wetlands are positively related to "lake

level" ($P < 0.001$) and negatively related to "years since an extreme low water event" ($P < 0.016$). After accounting for these two environmental factors, there is no linear increase or decrease in wetlands since 1937 ($P = 0.52$).

Wetlands are not increasing in coverage in Orange Lake. The observed differences in wetland coverage across dates are related to changes in lake levels and years since an extreme low water event. However, there may have been changes in the character of the wetlands in Orange Lake over the last 60 years. Finding evidence for this is problematic because it is difficult to ascertain species identifications and growth habits from black and white aerial photographs.

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- Kinser, P., D. Reed, and G. Dambek. unpublished data. St. Johns River Water Management District, Palatka, Florida.
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Table F-1. Year, month, lake elevation (ft) and open water (acres) for the eight dates used in the open water analysis. Source: Kinser et al. (unpublished data).

<i>Year</i>	<i>Month</i>	<i>Lake Elevation (ft)</i>	<i>Open Water (acres)</i>
1937	December	59.2	6730
1949	February	58.7	7410
1956	December	52.1	3487
1975	January	57.9	7748
1982	January	55.9	6487
1988	January	56.6	6971
1991	November	55.3	5054
1995	February	57.5	5784
	<i>MEDIAN:</i>	57.0	6609

Table F-2. Years since an extreme low water event for each of the eight dates used in the open water analysis.[†]

<i>Year</i>	<i>Lake Elevation (ft)</i>	<i>Open Water (acres)</i>	<i>Years Since Extreme Low Water Event**</i>
1937	59.2	6730	6 (1931)
1949	58.7	7410	18 (1931)
1956	52.1	3487	1 (1955)
1975	57.9	7748	20 (1955)
1982	55.9	6487	27 (1955)
1988	56.6	6971	33 (1955)
1991	55.3	5054	1 (1990)
1995	57.5	5784	5 (1990)

[†] for the purposes of this analysis, an *extreme low water event* is defined here as a time period having at least three months when the mean monthly lake level is below 54.0 ft NGVD.

** the years since an extreme low water event are counted from the start of the extreme low water event.

Table F-3. Minimum lake levels and mean monthly lake level characteristics for past extreme low water events in Orange Lake.

<i>Period of Extreme Low Water Event</i> ‡	<i>Minimum Lake Level During Event</i>	<i>Number of Months Mean Lake Level was below 54.0 ft</i>	<i>Number of Months Mean Lake Level was below 53.0 ft</i>
1931 - 1932**	**	**	**
1955 - 1957	50.38	24	21
1990 - 1991	51.86	9 - 12†	5 - 8†

‡ The period of the extreme low water event is defined here as the time period during which mean monthly lake levels were always less than 55.0 ft NGVD. The lake must have had at least three months during this time period when the mean monthly lake level was below 54.0 ft NGVD.

** USGS lake level data are not available for this extreme low water event. Newspaper accounts verify that the lake was extremely low (Ocala Star Banner: April 26, 1956; Ocala Star Banner: February 23, 1958).

† No USGS lake level data available for the 3-month period from October to December 1990. The number of months is likely the higher value in the range, given the trend in lake levels before and after the missing data period.

Figure F-1. Open water in Orange Lake on the eight dates between 1937 and 1995 that were analyzed.

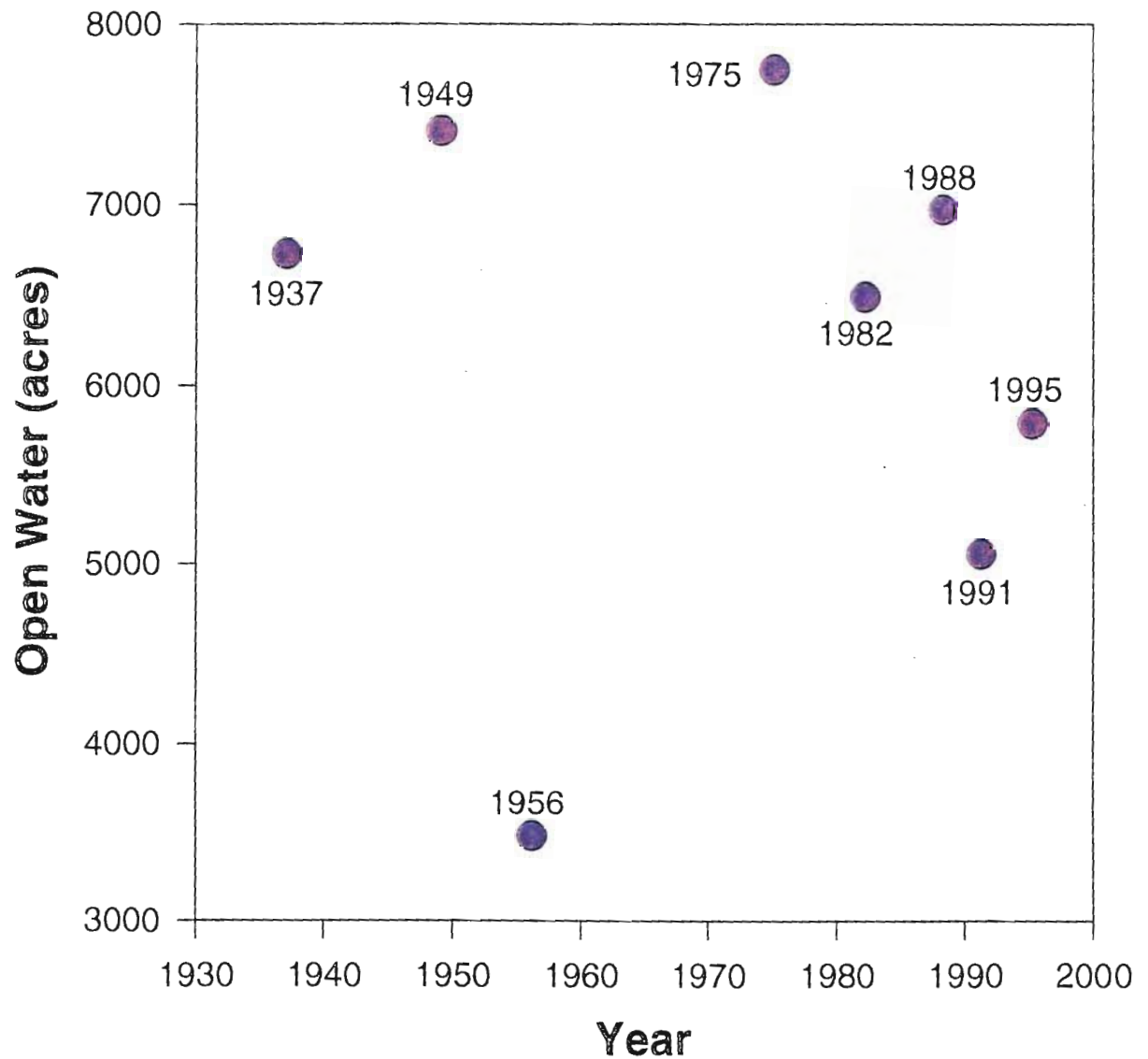


Figure F-2. Relationship between open water area and lake level on eight dates between 1937 and 1995. Regression line is significant: $P < 0.007$; $r^2 = 0.73$.

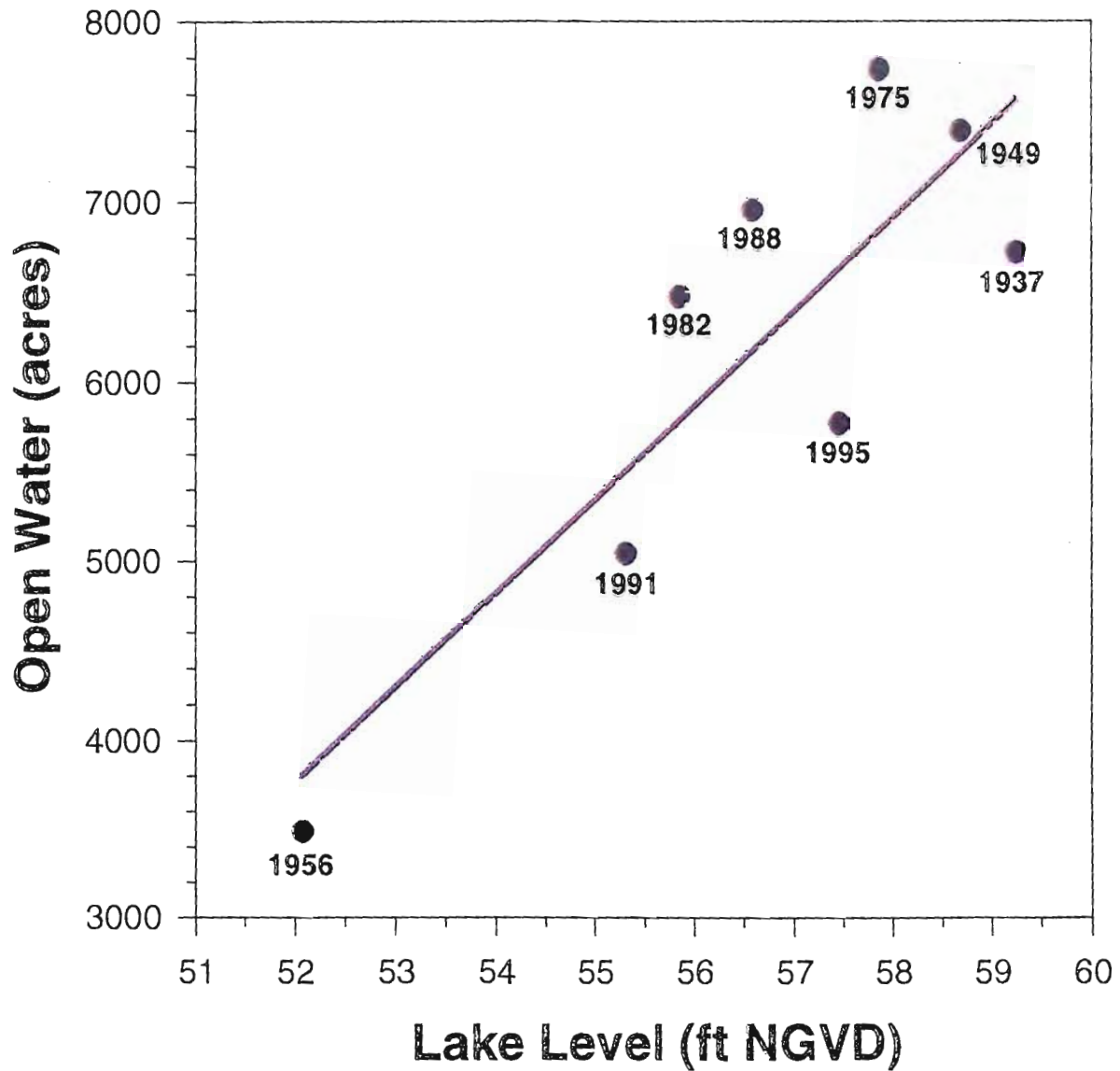


Figure F-3. Residual variability for open water acreage predictions using lake level as an independent variable. Years since an extreme low water event shown in parentheses.

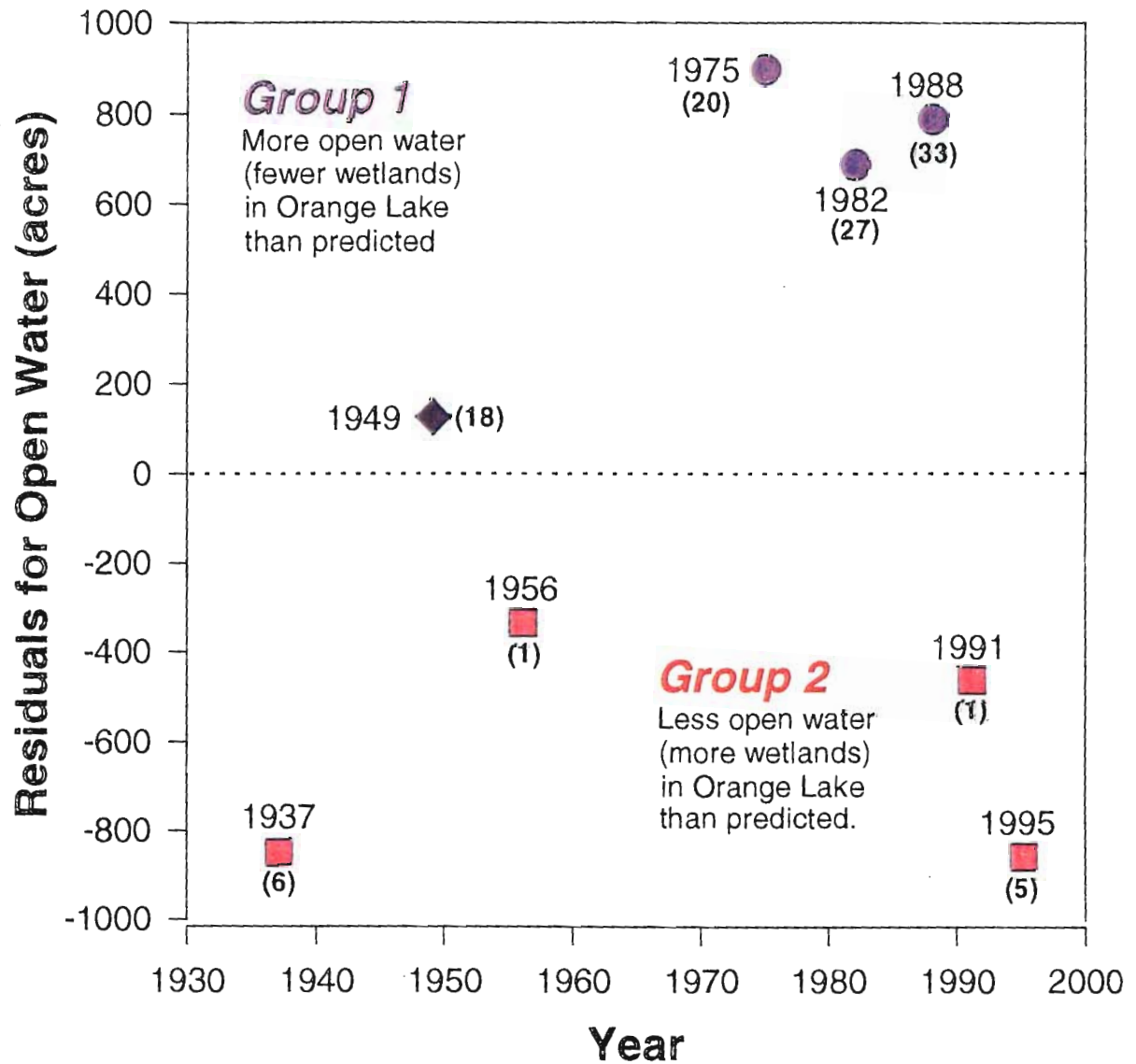


Figure F-4. Residual values for open water predictions using lake level as an independent variable, as a function of the number of years since an extreme low water event. Regression line is significant at $P < 0.005$; $r^2 = 0.76$.

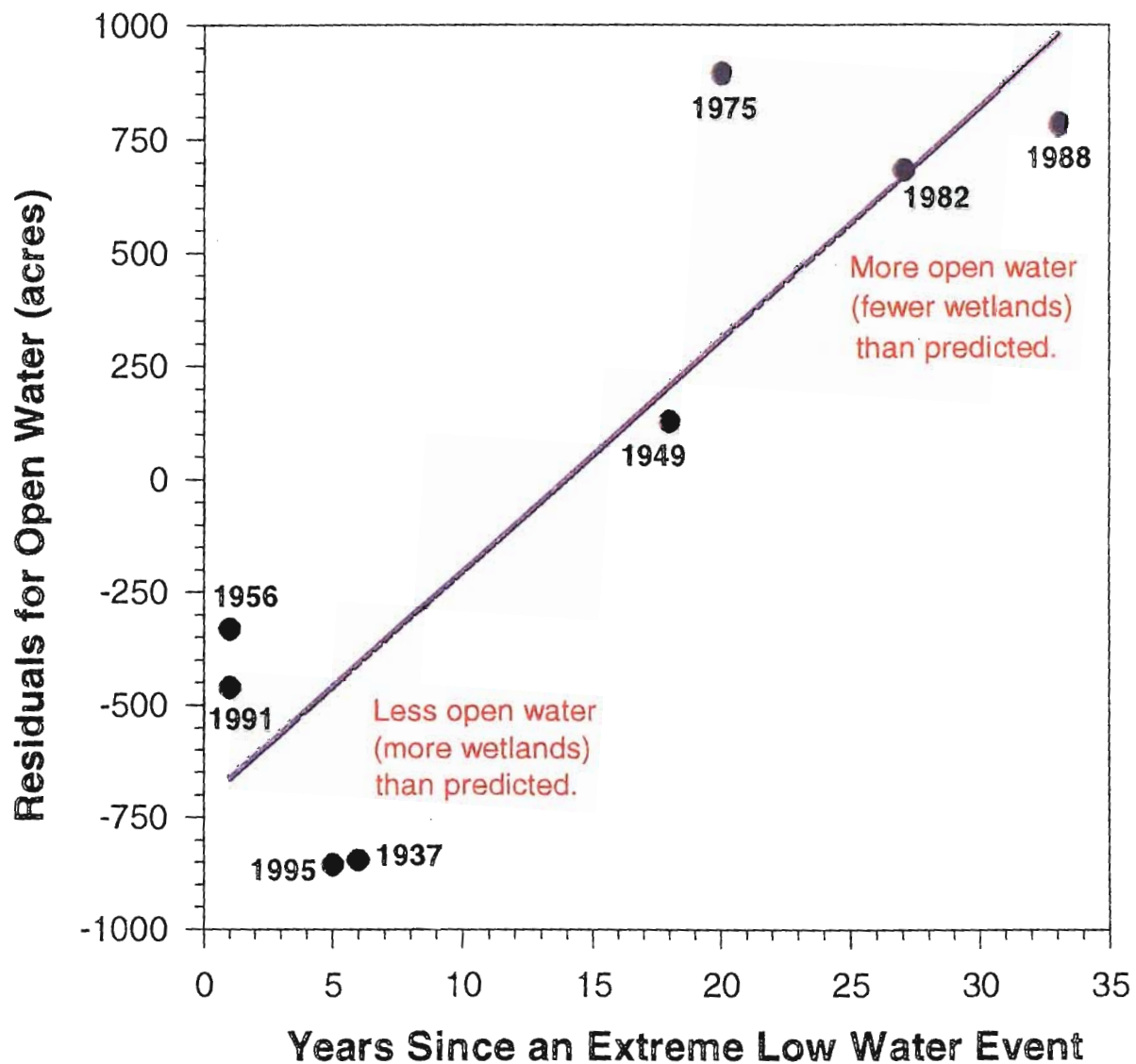


Figure F-5. Actual and predicted open water acreages for Orange Lake using lake level ($P < 0.001$) and years since an extreme low water event ($P < 0.006$) as independent variables (R^2 for model = 0.95).

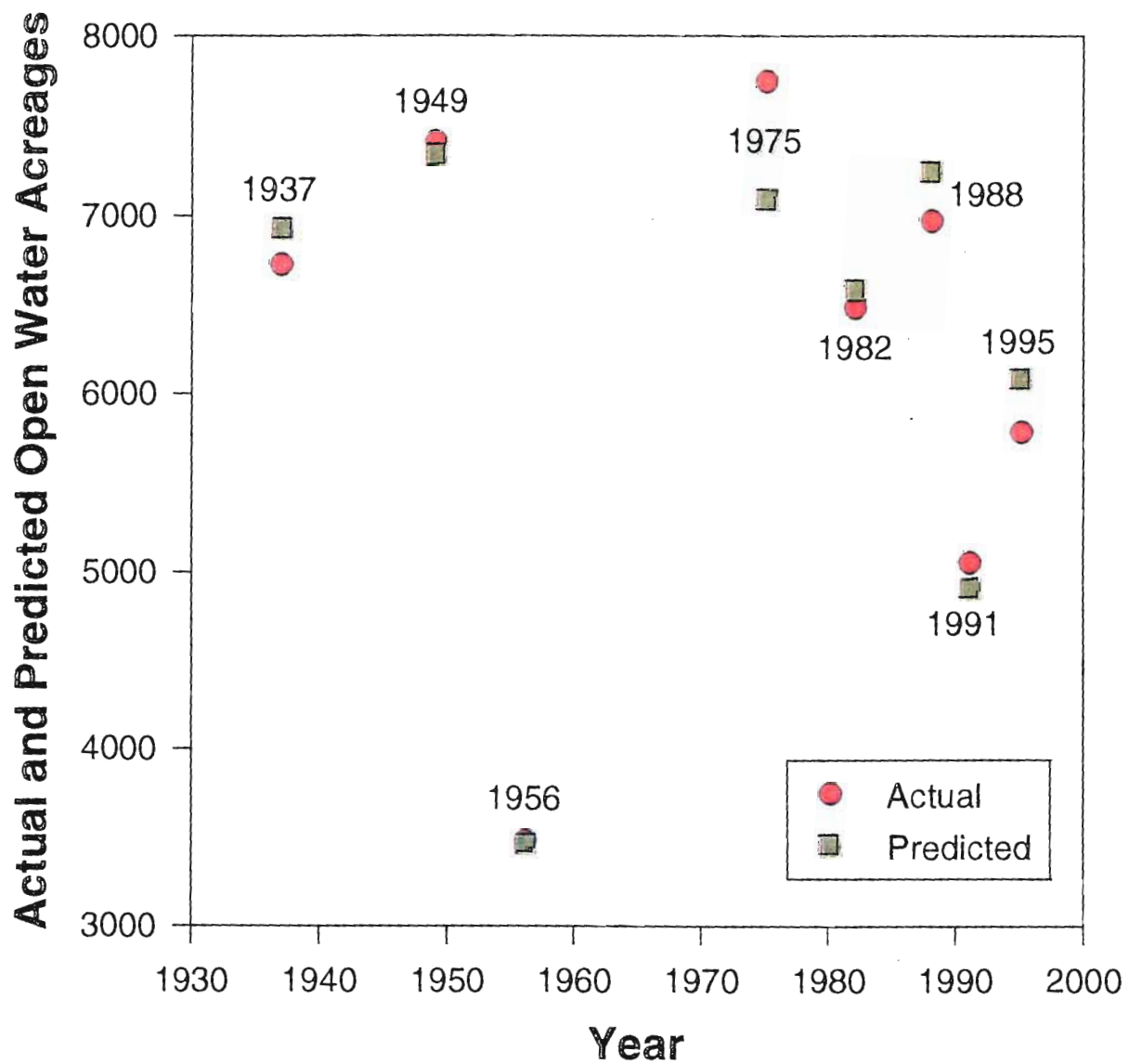


Figure F-6. Actual and predicted open water area for Orange Lake in 1994 and 1996.
Actual data from Clark and Reddy (1999) and predictions from regression model
shown on page F-4.

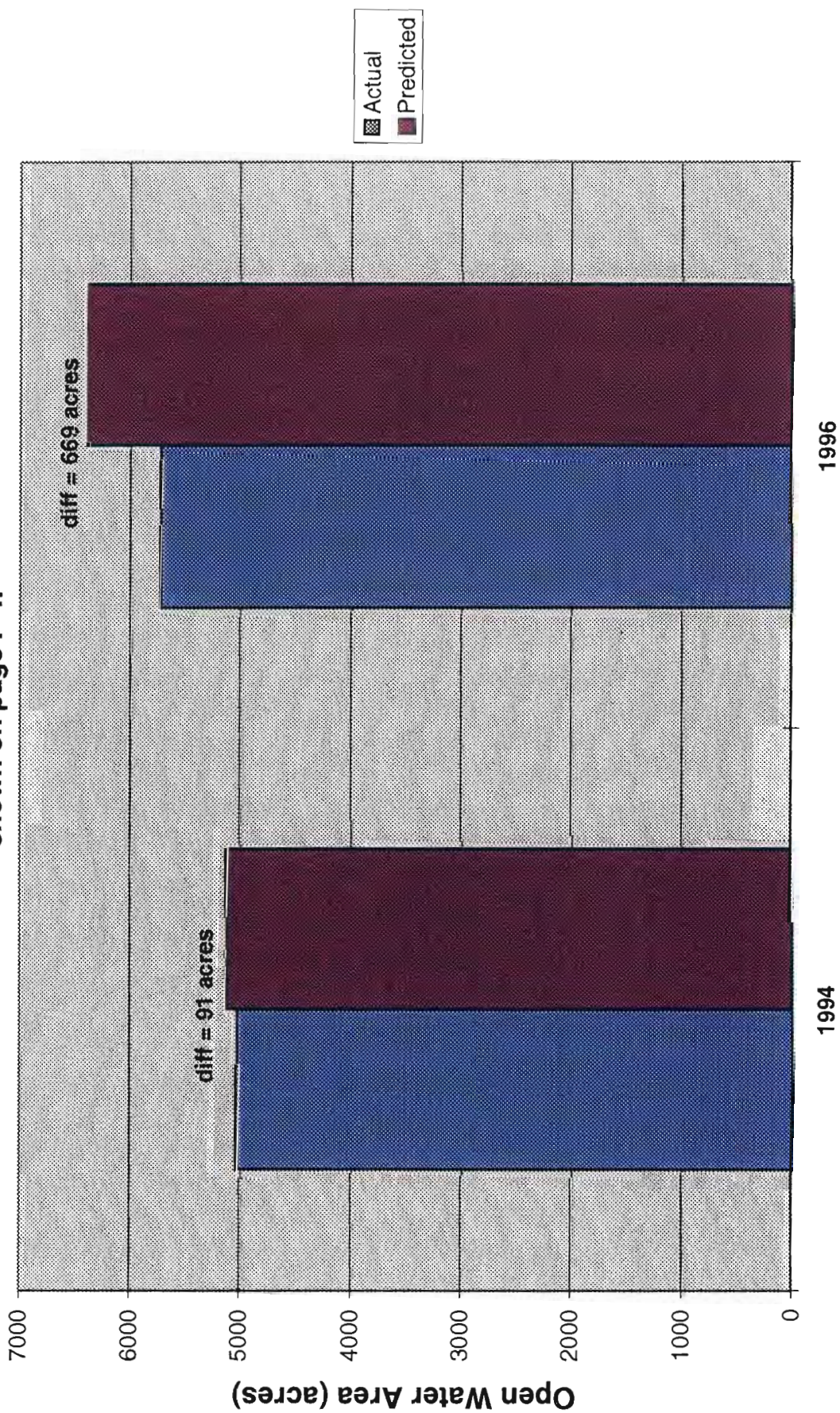


Figure F-7. Predicted open water and wetland acreages in Orange Lake. Lake area is based on bathymetry (Danek et al. 1997). Open water predictions are based on the regression equation shown in Figure F-2. Wetland acreages are calculated as the difference between lake area and predicted open water.

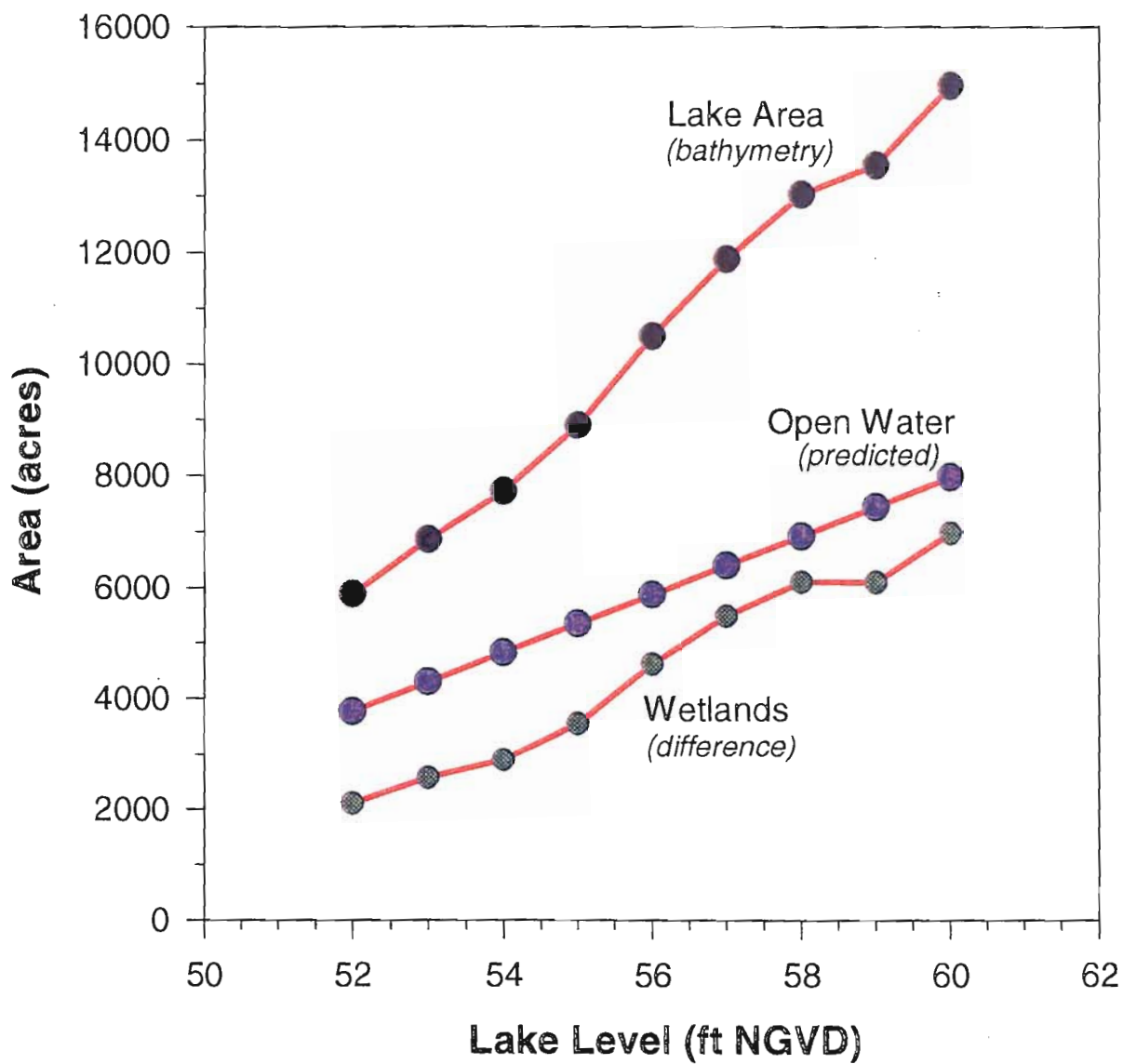
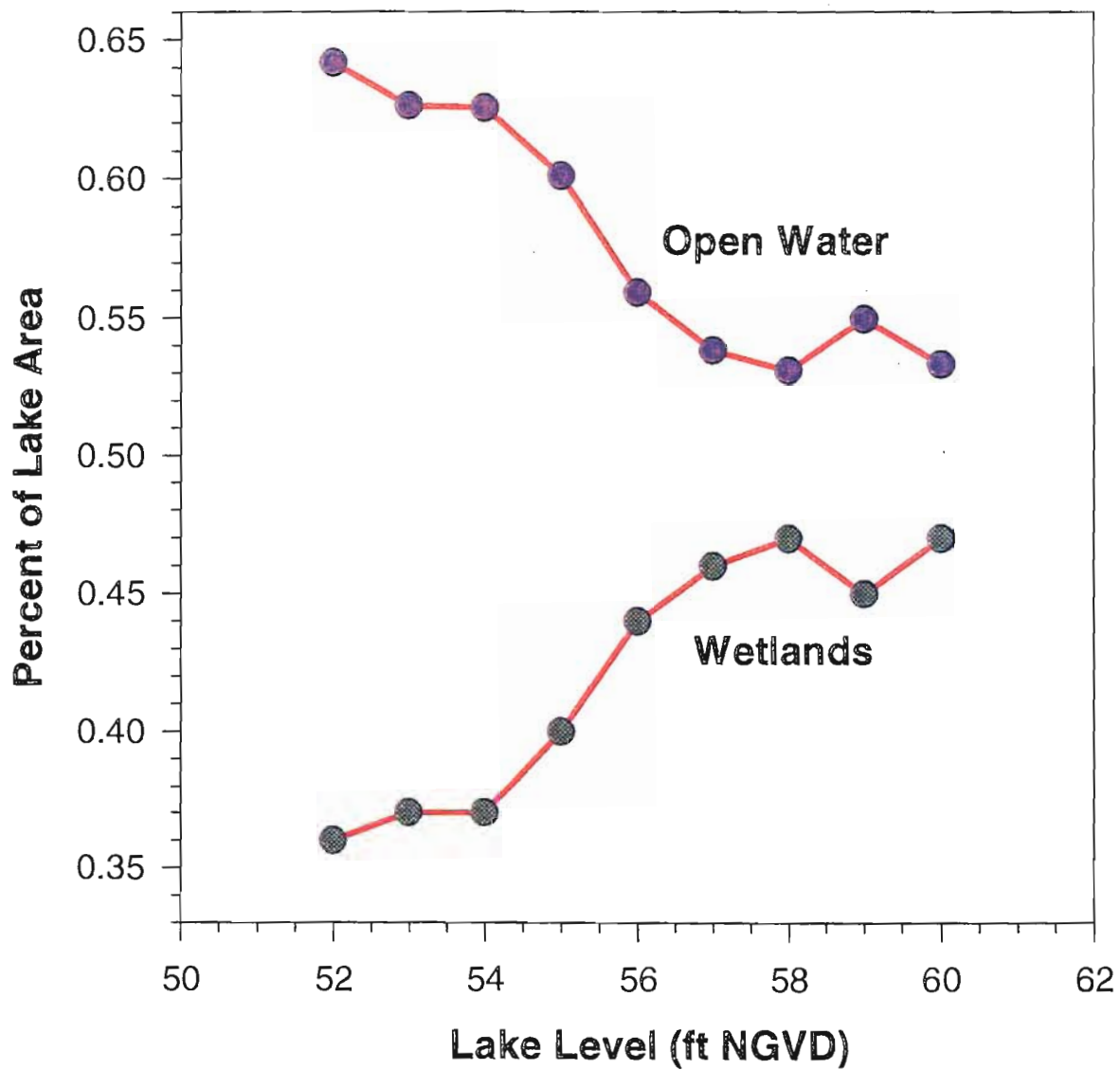


Figure F-8. Percentage of the total lake area of Orange Lake that is predicted to be open water and wetlands, as a function of lake level. Percentages derived from Figure F-7.



Appendix G
Plant Species Recorded in Orange Lake
During Past Surveys

Table: G-1 - Plant species recorded in Orange Lake during past surveys.

SPECIES		Reid (1949)	GFC (1974)	FDEP Surveys (1983-1998)										Bryan and Warr (1999) -	
Scientific Name	Common Name			83	84	86	88	90	92	94	95	96	97	98	Surveys - 95 & 96
<i>Acer rubrum</i> ¹	Red Maple	X	X												X
<i>Alternanthera philoxeroides</i> ⁴	Alligatorweed		X	X	X	X	X	X	X	X	X	X	X	X	X
<i>Amaranthus australis</i>	Pigweed		X				X								X
<i>Egeria densa</i> (<i>Anacharis densa</i>) ²	Brazilian Waterweed	X													
<i>Andropogon</i> sp.	Broom Sedge		X												
<i>Azolla caroliniana</i>	Mosquito Fern	X	X	X	X	X	X	X	X	X	X	X	X	X	
<i>Baccharis glomerulifolia</i>	Groundsel Tree														X
<i>Bacopa caroliniana</i> (<i>Hydrotrida caroliniana</i>) ²	Blue Hyssop	X										X	X	X	X
<i>Bidens</i> spp. ³	Bur Marigolds					X	X	X	X	X	X	X	X	X	X
<i>Brachiaria mutica</i>	Para Grass			X	X								X	X	
<i>Brasenia schraberi</i>	Water Shield			X									X	X	
<i>Cabomba caroliniana</i>	Fanwort		X	X	X	X	X	X	X	X	X	X	X	X	
<i>Canna</i> spp.	Canna												X	X	
<i>Carex</i> spp.	Sedge							X	X	X					
<i>Cephalanthus occidentalis</i>	Buttonbush	X	X	X	X	X	X	X	X	X	X	X	X	X	X
<i>Ceratophyllum demersum</i>	Coontail	X	X	X	X	X	X	X	X	X	X	X	X	X	
<i>Cicuta mexicana</i> (<i>C.curtisii</i>) ²	Water Hemlock	X					X	X	X	X	X	X	X	X	X
<i>Cladium jamaicense</i> (<i>Mariscus jamaicensis</i>) ²	Sawgrass	X	X	X	X	X	X	X	X	X	X	X	X	X	X
<i>Colocasia esculenta</i>	Wild Taro			X	X	X	X	X	X	X	X	X	X	X	X
<i>Crinum americanum</i> ¹	Swamp Lily												X	X	
<i>Cyperus</i> spp.	Flat Sedge			X	X	X	X	X	X	X			X	X	X
<i>Cyperus elegans</i>	Flat Sedge					X	X			X	X	X			
<i>Cyperus haspan</i>	Sheathed Flat Sedge														X

SPECIES		Reid (1949)	GFC (1974)	FDEP Surveys (1983-1998)										Bryan and Warr (1999) -	
Scientific Name	Common Name			83	84	86	88	90	92	94	95	96	97	98	95 & 96 Surveys -
Cyperus odoratus	Umbrella Sedge														X
Cyperus strigosus	Umbrella Sedge														X
Cuscutta gronovii	Dodder														X
Decodon verticillatus ³	Water Loosestrife						X	X	X	X	X	X	X	X	X
Echinochloa spp.	Water Grass					X	X	X							
Eichhornia crassipes (Piaropsus crassipes) ^{2, 4}	Water Hyacinth		X	X	X	X	X	X	X	X	X	X	X	X	X
Eleocharis interstincta	Jointed Spikerush			X	X		X								X
Eleocharis spp.	Spikerush	X	X	X	X	X	X	X		X		X	X	X	X
Eupatorium capillifolium ³	Dog Fennel		X												X
Filamentous algae (Chara) ²	Algae	X		X	X	X	X	X	X	X	X	X	X	X	
Fraxinus caroliniana ¹	Water Ash														X
Habenaria repens ³	Water Spider Orchid						X	X		X		X	X	X	X
Hydrilla verticillata	Hydrilla		X	X	X	X	X	X	X	X	X	X	X	X	X
Hydrocotyle umbellata ⁴	Marsh pennywort	X													X
Hydrocotyle spp. ⁴	Pennywort	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Ilex cassine ¹	Dahoon Holly														X
Itea virginica ¹	Virginia Willow	X													
Juncus effusus	Soft Rush	X		X	X	X	X	X	X	X	X	X	X	X	X
Juncus spp.	Rush						X	X	X	X					
Juniperus virginiana ¹	Red Cedar		X												
Kosteletzkya virginica	Saltmarsh Mallow														X
Lachnanthes caroliniana	Redroot											X	X	X	
Leersia hexandra	Southern Cutgrass											X	X	X	
Lemna sp.	Duckweed	X	X	X	X	X	X	X	X	X	X	X	X	X	X

SPECIES		Reid (1949)	GFC (1974)	FDEP Surveys (1983-1998)										Bryan and Warr (1999) - Surveys -
Scientific Name	Common Name			83	84	86	88	90	92	94	95	96	97	98
<i>Limnium spongia</i> ⁴	Frog's-bit			X	X	X	X	X	X	X	X	X	X	X
<i>Liquidambar styraciflua</i> ¹	Sweetgum	X												
<i>Lobelia</i> sp. ¹	Lobelia	X												
<i>Ludwigia arcuata</i>	Primrose	X												X
<i>Ludwigia leptocarpa</i>	"													X
<i>Ludwigia microcarpa</i>	"													X
<i>Ludwigia octovalvis/peruviana</i>	Primrose willow		X	X	X	X	X	X	X	X	X	X	X	X
<i>Luziola fluitans</i>	Water grass			X	X	X	X	X	X	X	X	X	X	X
<i>Mikania scandens</i>	Climbing Hemp Weed	X					X	X	X	X	X	X	X	X
<i>Myrica cerifera</i>	Wax Myrtle													X
<i>Myriophyllum aquaticum</i>	Parrot-feather		X					X	X	X	X	X	X	X
<i>Myriophyllum heterophyllum</i>	Water Milfoil												X	X
<i>Najas guadalupensis</i>	Southern Naiad	X	X	X	X	X	X	X	X	X	X	X	X	X
<i>Nelumbo lutea</i>	Lotus-lily		X	X	X	X	X	X	X	X	X	X	X	X
<i>Nuphar luteum</i> ⁴	Spatterdock													
<i>Nymphaea</i> sp.	Water lilly	X												
<i>Nymphaea mexicana</i>	Yellow-water lilly				X	X	X	X	X	X	X	X	X	X
<i>Nymphaea odorata</i>	White-water lilly		X	X	X	X	X	X	X	X	X	X	X	X
<i>Nymphoides aquatica</i>	Floating heart		X										X	X
<i>Nyssa biflora</i> ¹	Black Gum													X
<i>Orontium aquaticum</i>	Golden Club												X	X
<i>Panicum hemitomon</i>	Maidencane		X	X	X	X	X	X	X	X	X	X	X	X
<i>Panicum repens</i>	Torpedo Grass			X	X			X			X	X	X	X
<i>Panicum</i> sp.	Panic Grass	X												
<i>Paspalidium geminatum</i>	Egyptian Paspalidium			X	X	X	X	X	X	X	X	X	X	X
<i>Peltandra virginica</i>	Spoon Flower	X				X	X	X	X	X	X	X	X	X

SPECIES		Reid (1949)	GFC (1974)	FDEP Surveys (1983-1998)											Bryan and Warr (1999) - Surveys -
Scientific Name	Common Name			83	84	86	88	90	92	94	95	96	97	98	95 & 96
<i>Pinus</i> sp.	Pine	X	X												
<i>Pistia stratiotes</i> ⁴	Water Lettuce	X	X	X	X	X	X	X	X	X	X	X	X	X	
<i>Pluchea</i> sp.	Marsh Fleabane													X	
<i>Pluchea odorata</i>	Saltmarsh Fleabane														X
<i>Polygonum</i> sp. (<i>Persicaria</i> sp.) ²	Smartweed	X													
<i>Polygonum hydropiperoides</i>	Wild Water-Pepper								X		X		X		
<i>Polygonum densiflorum</i>	Smartweed			X	X	X	X	X	X	X	X	X	X	X	X
<i>Polygonum punctatum</i>	Dotted Smartweed														X
<i>Pontederia cordata</i>	Pickersweed	X	X	X	X	X	X	X	X	X	X	X	X	X	X
<i>Potamogeton illinoensis</i>	Illinois Pondweed		X								X	X	X	X	
<i>Prunus caroliniana</i>	Laurel Cherry														X
<i>Quercus virginiana</i> ¹	Live Oak		X												
<i>Sabal palmetto</i> ¹	Cabbage Palm	X	X												
<i>Sacciolepis striata</i> (<i>Sacciolepis</i> sp.)	American Cupscale	X					X	X	X	X	X	X	X	X	X
<i>Sagittaria</i> sp.	Arrowhead	X								X		X	X		
<i>Sagittaria subulata</i>	Water Arrowhead														
<i>Sagittaria kurziana</i>	Spring Tape				X						X	X			
<i>Sagittaria lancifolia</i>	Lance Leaf Arrowhead	X	X	X	X	X	X	X	X	X	X	X	X	X	X
<i>Sagittaria latifolia</i>	Duck Potato	X					X	X	X	X	X	X	X	X	X
<i>Salix</i> spp.	Willow	X	X	X	X	X	X	X	X	X	X	X	X	X	X
<i>Salvinia minima</i>	Water Fern		X	X	X	X	X	X	X	X	X	X	X	X	X
<i>Sambucus canadensis</i> (<i>S. simpsonii</i>) ²	Elderberry	X	X												X
<i>Sapum sebiferum</i>	Popcorn tree													X	
<i>Saururus cernuus</i>	Lizard's Tail												X	X	
<i>Scirpus cubensis</i> ⁴	Cuban Bullrush				X		X	X	X	X	X	X	X	X	X

SPECIES		Reid (1949)	GFC (1974)	FDEP Surveys (1983-1998)											Bryan and Warr (1999) -
<i>Scientific Name</i>	<i>Common Name</i>			83	84	86	88	90	92	94	95	96	97	98	Surveys - 95 & 96
<i>Scripus californicus/validus</i>	Great Bulrush			X	X		X	X	X	X	X	X	X	X	X
<i>Solidago fistulosa</i>	Goldenrod														X
<i>Spartina bakerii</i>	Sand Cordgrass														X
<i>Spirodela polyrhiza</i>	Duckmeat														X
<i>Taxodium sp.</i> ¹	Cypress	X	X												
<i>Thyلةpteris kunthii</i> ¹	Southern Shield Fern														X
<i>Thyلةpteris palustris</i> ³	Marsh Fern														X
<i>Typha spp.</i>	Cataill	X	X		X	X	X	X	X	X	X	X	X	X	X
<i>Utricularia biflora/gibba</i>	Bladderwort			X	X				X			X		X	
<i>Utricularia foliosa</i>	Bladderwort			X	X		X		X	X	X	X	X	X	
<i>Utricularia inflata</i>	Floating Bladderwort		X			X		X			X	X	X	X	X
<i>Utricularia purpurea</i>	Purple Bladderwort					X	X	X	X	X	X	X			
<i>Vallisneria americana</i>	Eelgrass		X	X	X	X	X	X			X	X	X	X	
<i>Wolffia spp.</i>	Water Meal													X	
<i>Xyris sp.</i>	Yellow-eyed Grass											X	X	X	X
<i>Zizaniopsis miliacea</i>	Water Millet								X	X	X	X	X	X	X
<i>Zizania aquatica</i>	Indian Rice												X	X	

X= Plant Present

☐ Exotic Species - As Determined by FDEP (1999)

Note: Common names are taken from Clewell (1985), Dressler *et al.* (1987), and Hall (1993).

1 - Species occurring in swamp forests, tree islands, or upland borders of lake. They were likely not recorded during many of the surveys because these habitats were probably not included in the survey boundary.

2 - Name used by Reid (1949) is shown in parentheses.

3 - Species that in Orange Lake occurs primarily on floating mats, although they do not likely play a role in the formation of the mats.

4 - Floating mat forming species.

Table G-2 - Acreage estimates of plant species during past surveys. Data are from the Florida Department of Environmental Protection.

SPECIES	83	84	86	88	90	92	95
=Exotic Species							
Alternanthera philoxeroides	150.0	90.0	50.0	4.0	1.0	0.2	25.0
Amaranthus australis					70.0		
Azolla caroliniana	85.0	1.0	2.0	3.0	2.0	10.0	
Bidens spp.			5.0	5.0	4.0	50.0	75.0
Brachiaria mutica	40.0	30.0	15.0				
Brasenia schraberi	18.0	18.0					
Cabomba caroliniana	30.0	45.0	25.0	35.0	10.0	0.5	5.0
Carex spp.					0.2	0.1	
Cephalanthus occidentalis				8.0	8.0	10.0	10.0
Ceratophyllum demersum	850.0	950.0	150.0	140.0	52.0	80.0	30.0
Cicuta mexicana				1.0	0.5	0.3	0.5
Cladium jamaicense	75.0	375.0	500.0	450.0	450.0	450.0	900.0
Colocasia esculenta	30.0	30.0	5.0	2.0	2.0	5.0	25.0
Cyperus spp.	20.0	5.0	25.0	20.0	30.0	30.0	
Decodon verticillatus			5.0	50.0	50.0	50.0	150.0
Eichhornia crassipes	2150.0	250.0	50.0	100.0	45.0	90.0	50.0
Eleocharis interstincta	40.0	30.0		2.0			
Eleocharis spp.	10.0	10.0	50.0	5.0		3.0	
Filamentous algae	55.0	180.0	75.0	2.0	6.0	5.0	20.0
Habenaria repens			1.0	1.0			
Hydrilla verticillata	1150.0	645.0	3945.0	2850.0	1750.0	6000.0	3100.0
Hydrocotyle spp.	180.0	85.0	50.0	25.0	36.0	8.0	150.0
Juncus effusus	30.0	35.0	25.0	10.0	10.0	5.0	30.0
Juncus spp.			25.0	5.0	6.0	4.0	
Lemna sp.	125.0	60.0	10.0	1.0	0.5	3.0	2.0
Limnobium spongia	45.0	2.0	1.0	2.0	2.0	100.0	300.0
Ludwigia octovalvis/peruvian	80.0	80.0	10.0	15.0	38.0	45.0	50.0
Luziola fluitans	125.0	35.0	2.0	1.0	0.5	0.2	
Mikania scandens				1.5		5.0	2.0
Myriophyllum aquaticum	18.0	15.0				0.5	1.0
Najas guadalupensis		350.0	25.0	10.0	40.0	10.0	5.0
Nelumbo lutea	65.0	18.0	10.0	5.0	7.0	2.0	2.0
Nuphar luteum	800.0	480.0	950.0	700.0	800.0	850.0	1300.0
Nymphaea mexicana			0.5	0.3	0.1		1.0
Nymphaea odorata	45.0	55.0	20.0	3.0	1.0	1.0	3.0
Panicum hemitomon	55.0	40.0	40.0	60.0	60.0	70.0	40.0
Panicum repens	20.0	12.0	5.0		0.1		0.5
Paspalidium geminatum	190.0	30.0	40.0	40.0	40.0	40.0	35.0

SPECIES	83	84	86	88	90	92	95
=Exotic Species							
Peltandra virginica			1.0	1.0	0.5	0.2	3.0
Pistia stratiotes	45.0	95.0	2.0	10.0	6.0	75.0	5.0
Polygonum densiflorum	550.0	350.0	200.0	150.0	200.0	125.0	20.0
Pontederia cordata	180.0	180.0	100.0	125.0	130.0	70.0	750.0
Sacciolepis striata				15.0	10.0	15.0	2.0
Sagittaria kurizana		12.0					0.3
Sagittaria lancifolia	140.0	100.0		80.0	4.0	5.0	750.0
Sagittaria latifolia				4.0	27.0	35.0	150.0
Salix spp.				5.0	5.0	40.0	150.0
Salvinia minima	150.0	75.0	5.0	2.0	1.0	15.0	5.0
Scirpus cubensis				4.0			400.0
Scirpus californicus/validus	45.0	65.0		35.0	35.0	5.0	100.0
Spirodela polyrhiza		12.0	1.0	0.1			
Typha spp.	180.0	165.0	100.0	50.0	55.0	700.0	50.0
Utricularia biflora/gibba	15.0	15.0				20.0	
Utricularia foliosa	75.0	95.0	10.0	15.0		30.0	20.0
Utricularia inflata					60.0		5.0
Utricularia purpurca				30.0	120.0	40.0	50.0
Vallisneria americana	25.0	28.0	10.0	2.0	5.0		2.0
Zianiopsis millicea						0.2	75.0

Total Acres of Wetlands	7886.0	5148.0	6545.5	5084.9	4180.4	9103.2	8849.3
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Table G-3 - Percent coverage by plant species in wetlands for various years. Hydrilla and hyacinth coverages were subtracted from the total wetland coverage for determining percent coverage of plant species.

SPECIES	83	84	86	88	90	92	95
=Exotic Species							
Alternanthera philoxeroides	3.27%	2.12%	1.96%	0.19%	0.04%	0.01%	0.44%
Amaranthus australis	0.00%	0.00%	0.00%	0.00%	2.93%	0.00%	0.00%
Azolla caroliniana	1.85%	0.02%	0.08%	0.14%	0.08%	0.33%	0.00%
Bidens spp.	0.00%	0.00%	0.20%	0.23%	0.17%	1.66%	1.32%
Brachiaria mutica	0.87%	0.71%	0.59%	0.00%	0.00%	0.00%	0.00%
Brasenia schraberi	0.39%	0.42%	0.00%	0.00%	0.00%	0.00%	0.00%
Cabomba caroliniana	0.65%	1.06%	0.98%	1.64%	0.42%	0.02%	0.09%
Carex spp.	0.00%	0.00%	0.00%	0.00%	0.01%	0.00%	0.00%
Cephalanthus occidentalis	0.00%	0.00%	0.00%	0.37%	0.34%	0.33%	0.18%
Ceratophyllum demersum	18.53%	22.34%	5.88%	6.56%	2.18%	2.65%	0.53%
Cicuta mexicana	0.00%	0.00%	0.00%	0.05%	0.02%	0.01%	0.01%
Cladium jamaicense	1.64%	8.82%	19.60%	21.08%	18.86%	14.93%	15.79%
Colocasia esculenta	0.65%	0.71%	0.20%	0.09%	0.08%	0.17%	0.44%
Cyperus spp.	0.44%	0.12%	0.98%	0.94%	1.26%	1.00%	0.00%
Decodon verticillatus	0.00%	0.00%	0.20%	2.34%	2.10%	1.66%	2.63%
Eleocharis interstincta	0.87%	0.71%	0.00%	0.09%	0.00%	0.00%	0.00%
Eleocharis spp.	0.22%	0.24%	1.96%	0.23%	0.00%	0.10%	0.00%
Filamentous algae	1.20%	4.23%	2.94%	0.09%	0.25%	0.17%	0.35%
Habenaria repens	0.00%	0.00%	0.04%	0.05%	0.00%	0.00%	0.00%
Hydrocotyle spp.	3.92%	2.00%	1.96%	1.17%	1.51%	0.27%	2.63%
Juncus effusus	0.65%	0.82%	0.98%	0.47%	0.42%	0.17%	0.53%
Juncus spp.	0.00%	0.00%	0.98%	0.23%	0.25%	0.13%	0.00%
Lemna sp.	2.73%	1.41%	0.39%	0.05%	0.02%	0.10%	0.04%
Limnobium spongia	0.98%	0.05%	0.04%	0.09%	0.08%	3.32%	5.26%
Ludwigia octovalvis/peruvian	1.74%	1.88%	0.39%	0.70%	1.59%	1.49%	0.88%
Luziola fluitans	2.73%	0.82%	0.08%	0.05%	0.02%	0.01%	0.00%
Mikania scandens	0.00%	0.00%	0.00%	0.07%	0.00%	0.17%	0.04%
Myriophyllum aquaticum	0.39%	0.35%	0.00%	0.00%	0.00%	0.02%	0.02%
Najas guadalupensis	0.00%	8.23%	0.98%	0.47%	1.68%	0.33%	0.09%
Nelumbo lutea	1.42%	0.42%	0.39%	0.23%	0.29%	0.07%	0.04%
Nuphar luteum	17.44%	11.29%	37.25%	32.79%	33.54%	28.21%	22.81%
Nymphaea mexicana	0.00%	0.00%	0.02%	0.01%	0.00%	0.00%	0.02%
Nymphaea odorata	0.98%	1.29%	0.78%	0.14%	0.04%	0.03%	0.05%
Panicum hemitomom	1.20%	0.94%	1.57%	2.81%	2.52%	2.32%	0.70%
Panicum repens	0.44%	0.28%	0.20%	0.00%	0.00%	0.00%	0.01%
Paspalidium geminatum	4.14%	0.71%	1.57%	1.87%	1.68%	1.33%	0.61%

SPECIES	83	84	86	88	90	92	95
=Exotic Species							
Peltandra virginica	0.00%	0.00%	0.04%	0.05%	0.02%	0.01%	0.05%
Pistia stratiotes	0.98%	2.23%	0.08%	0.47%	0.25%	2.49%	0.09%
Polygonum densiflorum	11.99%	8.23%	7.84%	7.03%	8.38%	4.15%	0.35%
Pontederia cordata	3.92%	4.23%	3.92%	5.86%	5.45%	2.32%	13.16%
Sacciolepis striata	0.00%	0.00%	0.00%	0.70%	0.42%	0.50%	0.04%
Sagittaria kurizana	0.00%	0.28%	0.00%	0.00%	0.00%	0.00%	0.01%
Sagittaria lancifolia	3.05%	2.35%	0.00%	3.75%	0.17%	0.17%	13.16%
Sagittaria latifolia	0.00%	0.00%	0.00%	0.19%	1.13%	1.16%	2.63%
Salix spp.	0.00%	0.00%	0.00%	0.23%	0.21%	1.33%	2.63%
Salvinia minima	3.27%	1.76%	0.20%	0.09%	0.04%	0.50%	0.09%
Scirpus cubensis	0.00%	0.00%	0.00%	0.19%	0.00%	0.00%	7.02%
Scirpus californicus/validus	0.98%	1.53%	0.00%	1.64%	1.47%	0.17%	1.75%
Spirodela polyrhiza	0.00%	0.28%	0.04%	0.00%	0.00%	0.00%	0.00%
Typha spp.	3.92%	3.88%	3.92%	2.34%	2.31%	23.23%	0.88%
Utricularia biflora/gibba	0.33%	0.35%	0.00%	0.00%	0.00%	0.66%	0.00%
Utricularia foliosa	1.64%	2.23%	0.39%	0.70%	0.00%	1.00%	0.35%
Utricularia inflata	0.00%	0.00%	0.00%	0.00%	2.52%	0.00%	0.09%
Utricularia purpurca	0.00%	0.00%	0.00%	1.41%	5.03%	1.33%	0.88%
Vallisneria americana	0.55%	0.66%	0.39%	0.09%	0.21%	0.00%	0.04%
Zianiopsis millicea	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%	1.32%

Table G - 4 - Changes in the percent coverage by plant species in wetlands. Hydrilla and hyacinth coverages were subtracted from the total wetland coverage for determining percent coverage of plant species. Only plant species with significant changes through time ($P < 0.05$) are shown. Three species which showed large increases in percent coverage in 1995 are also shown, even though there was not a linear increase in their percent coverage over time.

<u>Plant Species</u>	<u>1983</u>	<u>1984</u>	<u>1986</u>	<u>1988</u>	<u>1990</u>	<u>1992</u>	<u>1995</u>	<u>change thru time</u>	<u>linear regression probability</u>
<i>Polygonum densiflorum</i>	11.99%	8.23%	7.84%	7.03%	8.38%	4.15%	0.35%	decreasing	0.006
<i>Vallisneria americana</i>	0.55%	0.66%	0.39%	0.09%	0.21%	0.00%	0.04%	decreasing	0.008
<i>Brachiaria mutica</i>	0.87%	0.71%	0.59%	0.00%	0.00%	0.00%	0.00%	decreasing	0.010
<i>Nymphaea odorata</i>	0.98%	1.29%	0.78%	0.14%	0.04%	0.03%	0.05%	decreasing	0.011
<i>Ceratophyllum demersum</i>	18.53%	22.34%	5.88%	6.56%	2.18%	2.65%	0.53%	decreasing	0.013
<i>Panicum repens</i>	0.44%	0.28%	0.20%	0.00%	0.00%	0.00%	0.01%	decreasing	0.016
<i>Alternanthera philoxeroides</i>	3.27%	2.12%	1.96%	0.19%	0.04%	0.01%	0.44%	decreasing	0.022
<i>Eleocharis interstincta</i>	0.87%	0.71%	0.00%	0.09%	0.00%	0.00%	0.00%	decreasing	0.042
<i>Lemna</i> sp.	2.73%	1.41%	0.39%	0.05%	0.02%	0.10%	0.04%	decreasing	0.043
<i>Nelumbo lutea</i>	0.39%	0.35%	0.00%	0.00%	0.00%	0.02%	0.02%	decreasing	0.049
<i>Sagittaria latifolia</i>	0.00%	0.00%	0.00%	0.19%	1.13%	1.16%	2.63%	increasing	0.003
<i>Salix</i> spp.	0.00%	0.00%	0.00%	0.23%	0.21%	1.33%	2.63%	increasing	0.010
<i>Decodon verticillatus</i>	0.00%	0.00%	0.20%	2.34%	2.10%	1.66%	2.63%	increasing	0.013
<i>Bidens</i> spp.	0.00%	0.00%	0.20%	0.23%	0.17%	1.66%	1.32%	increasing	0.020
<i>Limnóbium spongia</i>	0.98%	0.05%	0.04%	0.09%	0.08%	3.32%	5.26%	increasing	0.039
<i>Scirpus cubensis</i>	0.00%	0.00%	0.00%	0.19%	0.00%	0.00%	7.02%	no change	0.091
<i>Pontederia cordata</i>	3.92%	4.23%	3.92%	5.86%	5.45%	2.32%	13.16%	no change	0.142
<i>Sagittaria lancifolia</i>	3.05%	2.35%	0.00%	3.75%	0.17%	0.17%	13.16%	no change	0.239

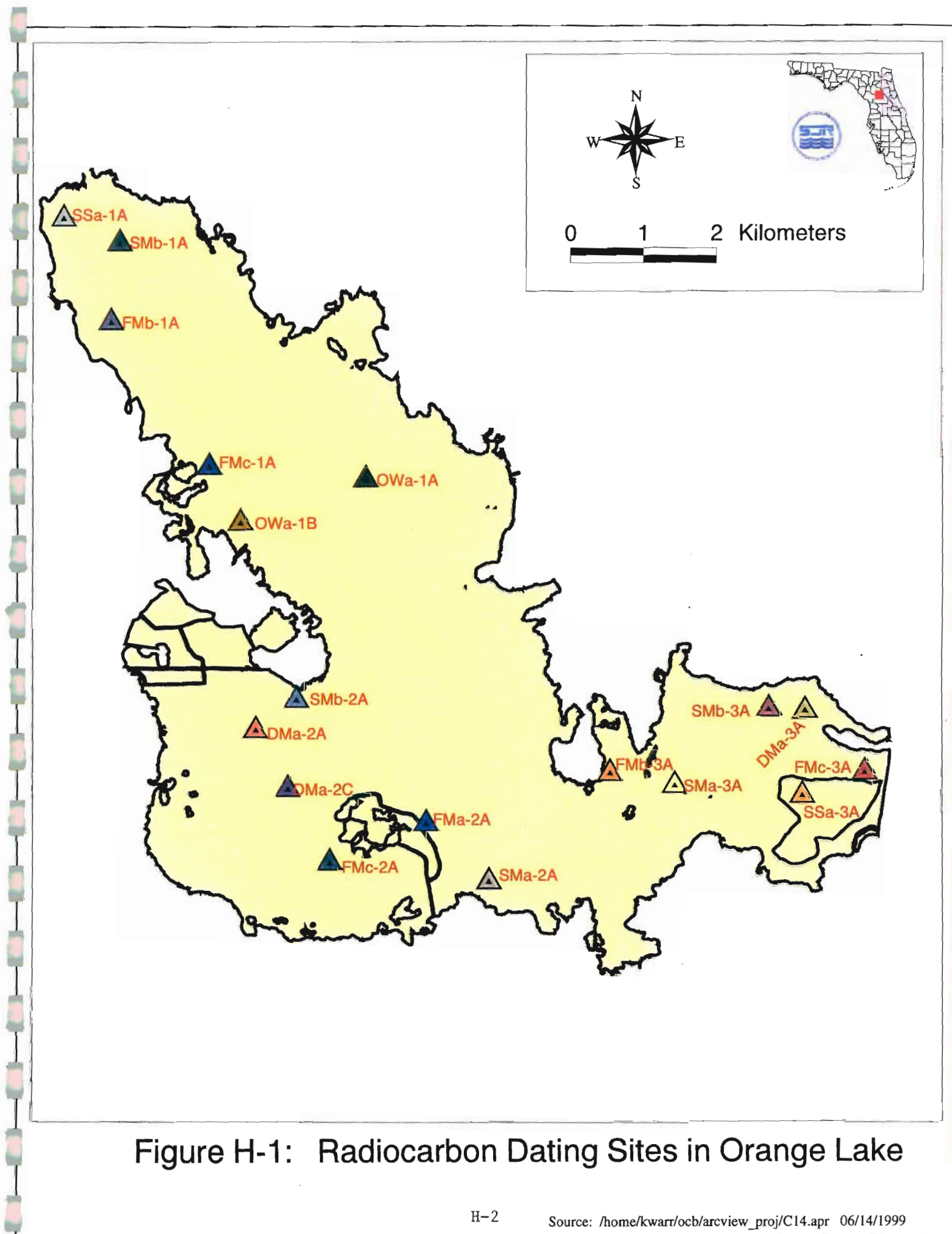
Appendix H
Results of Plant Fragment Analysis and
Radiocarbon (^{14}C) Dating of Peat Horizons
from Orange Lake

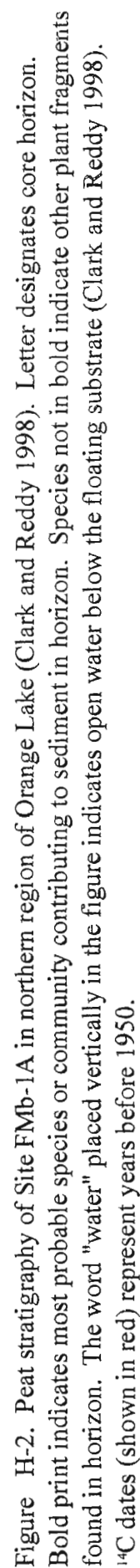
Notes on Peat Stratigraphy and Carbon 14 Dating Figures

Figures H-2 through H-17 represent the peat stratigraphy of sediment cores taken from Orange Lake by Clark and Reddy (1998). Carbon 14 dates of select sediment horizons have been added in red. Sediment samples used for dating were taken from the middle of horizons. All dates are reported in years before 1950 with uncertainty of 1 standard deviation confidence level (68%). Dates have been corrected with regard to the variation of carbon isotope ratios that exists in different naturally forming materials. Samples exhibiting radiocarbon activity in excess of the 1950 modern ^{14}C activity levels (13.56 disintegration's per minute per gram Carbon (DPM/gC)) are reported as "MC" (Modern Carbon). These samples are considered less than 200 years old. A more precise date is not obtainable for these samples.

Carbon 14 dating conducted by the University of Georgia, Center for Applied Isotope Studies, Athens, GA.

Clark, M.W. and K.R. Reddy. 1998. Analysis of Floating and Emergent Vegetation Formation in Orange Lake. Final Report for St. Johns River Water Management District, November 1998, Palatka, Fla.





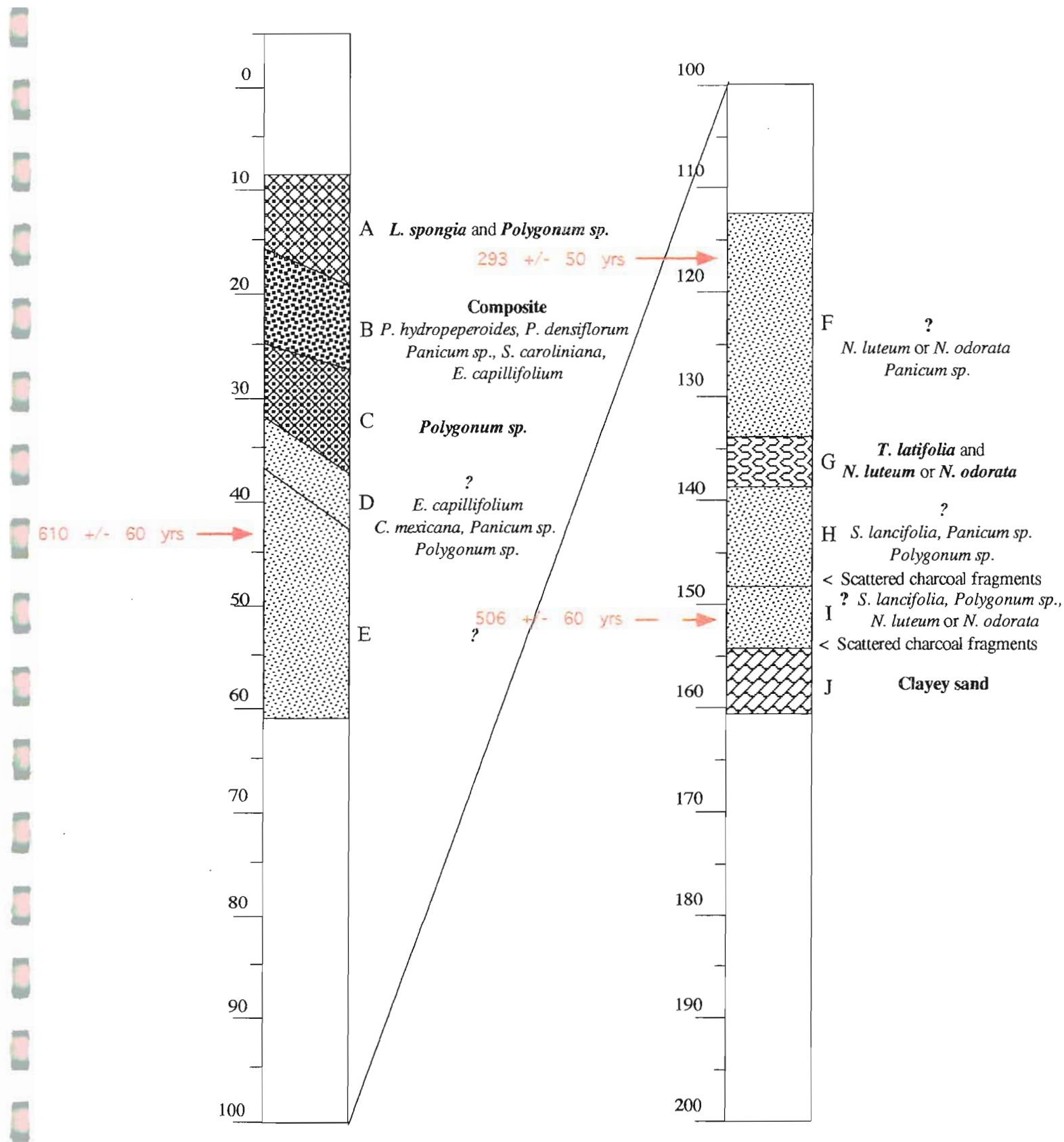


Figure H-3. Peat stratigraphy of Site FMc-1A in northwestern region of Orange Lake (Clark and Reddy 1988). Letter designates core horizon. Bold print indicates most probable species or community contributing to sediment in horizon. Species not in bold indicate other plant fragments found in horizon. The word "water" placed vertically in the figure indicates open water below the floating substrate (Clark and Reddy 1998). ¹⁴C dates (shown in red) represent years before 1950.

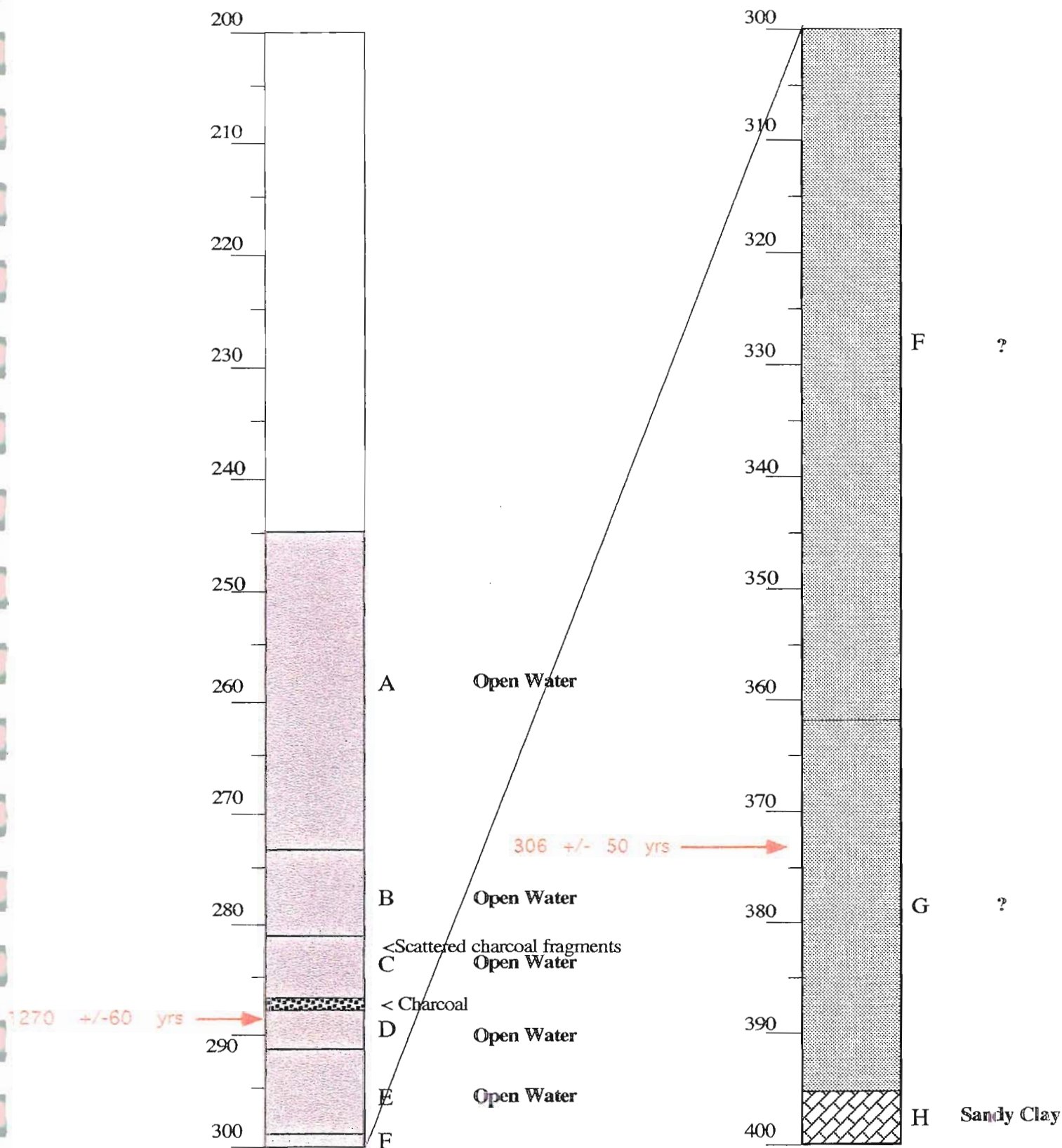


Figure H-4. Peat stratigraphy of Site Owa-1B in northwestern region of Orange Lake (Clark and Reddy 1998). Letter designates core horizon. Bold print indicates most probable species or community contributing to sediment in horizon. Species not in bold indicate other plant fragments found in horizon. The word "water" placed vertically in the figure indicates open water below the floating substrate (Clark and Reddy 1998). ¹⁴C dates (shown in red) represent years before 1950.

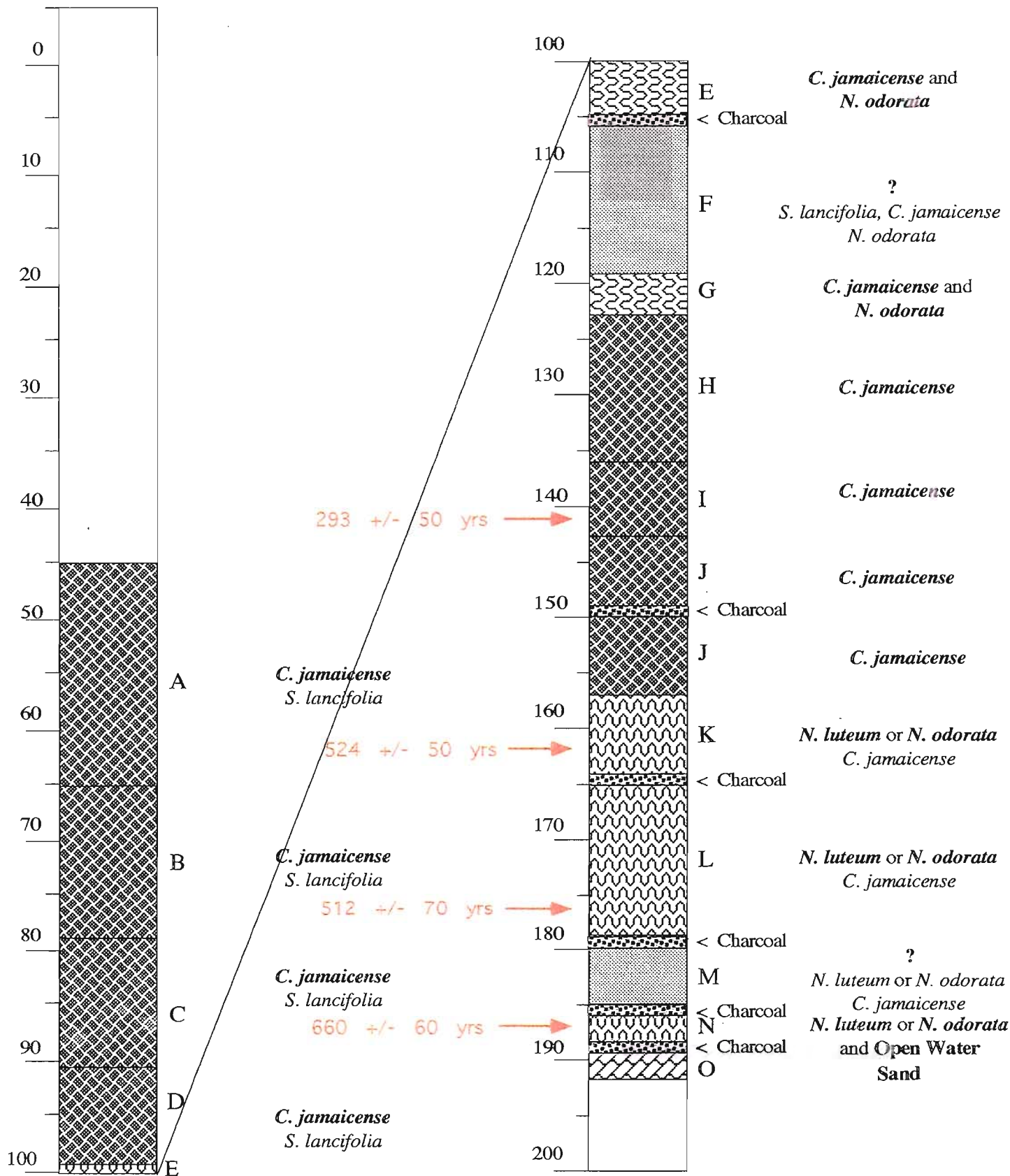


Figure H-5. Peat stratigraphy of Site SMB-1A in northern region of Orange Lake (Clark and Reddy 1998). Letter designates core horizon. Bold print indicates most probable species or community contributing to sediment in horizon. Species not in bold indicate other plant fragments found in horizon. The word "water" placed vertically in the figure indicates open water below the floating substrate (Clark and Reddy 1998).

¹⁴C dates (shown in red) represent years before 1950.

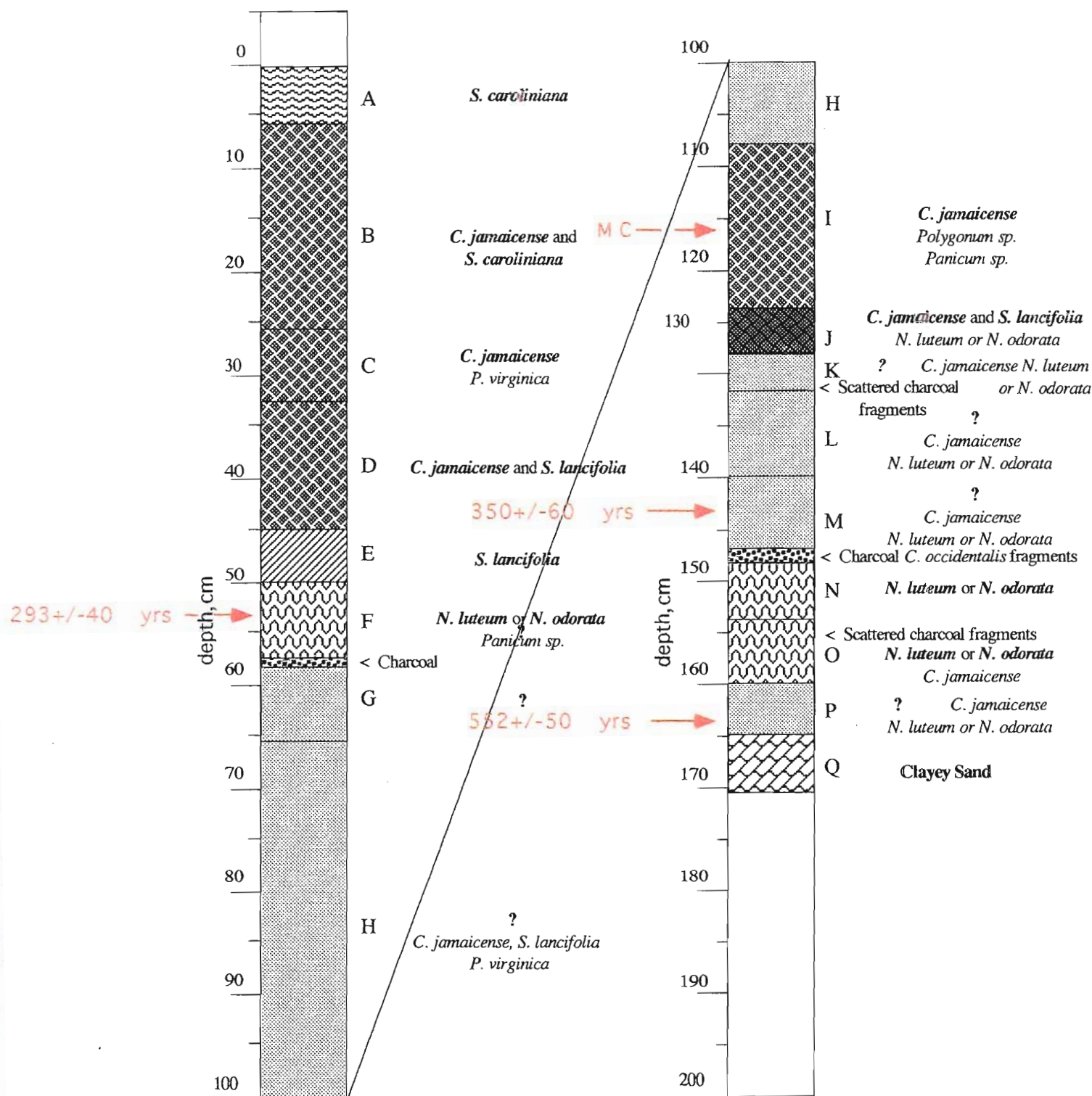


Figure H-6. Peat stratigraphy of Site SSa-1A in northern region of Orange Lake (Clark and Reddy 1998). Letter designates core horizon. Bold print indicates most probable species or community contributing to sediment in horizon. Species not in bold indicate other plant fragments found in horizon. The word "water" placed vertically in the figure indicates open water below the floating substrate (Clark and Reddy 1998). ¹⁴C dates (shown in red) represent years before 1950.

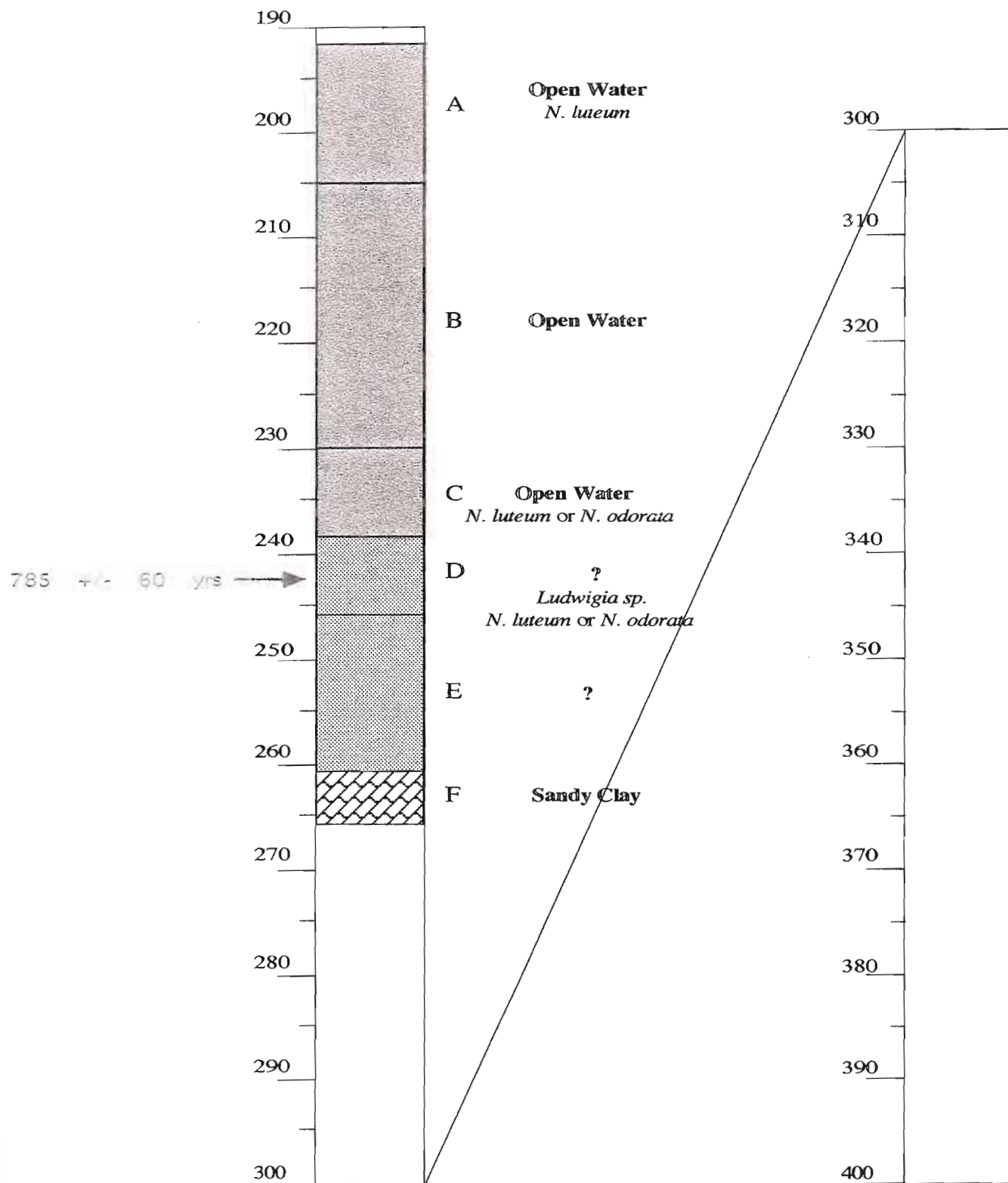


Figure H-7. Peat stratigraphy of Site DMA-2A in southwestern region of Orange Lake (Clark and Reddy 1998). Letter designates core horizon. Bold print indicates most probable species or community contributing to sediment in horizon. Species not in bold indicate other plant fragments found in horizon. The word "water" placed vertically in the figure indicates open water below the floating substrate (Clark and Reddy 1998). ¹⁴C dates (shown in red) represent years before 1950.

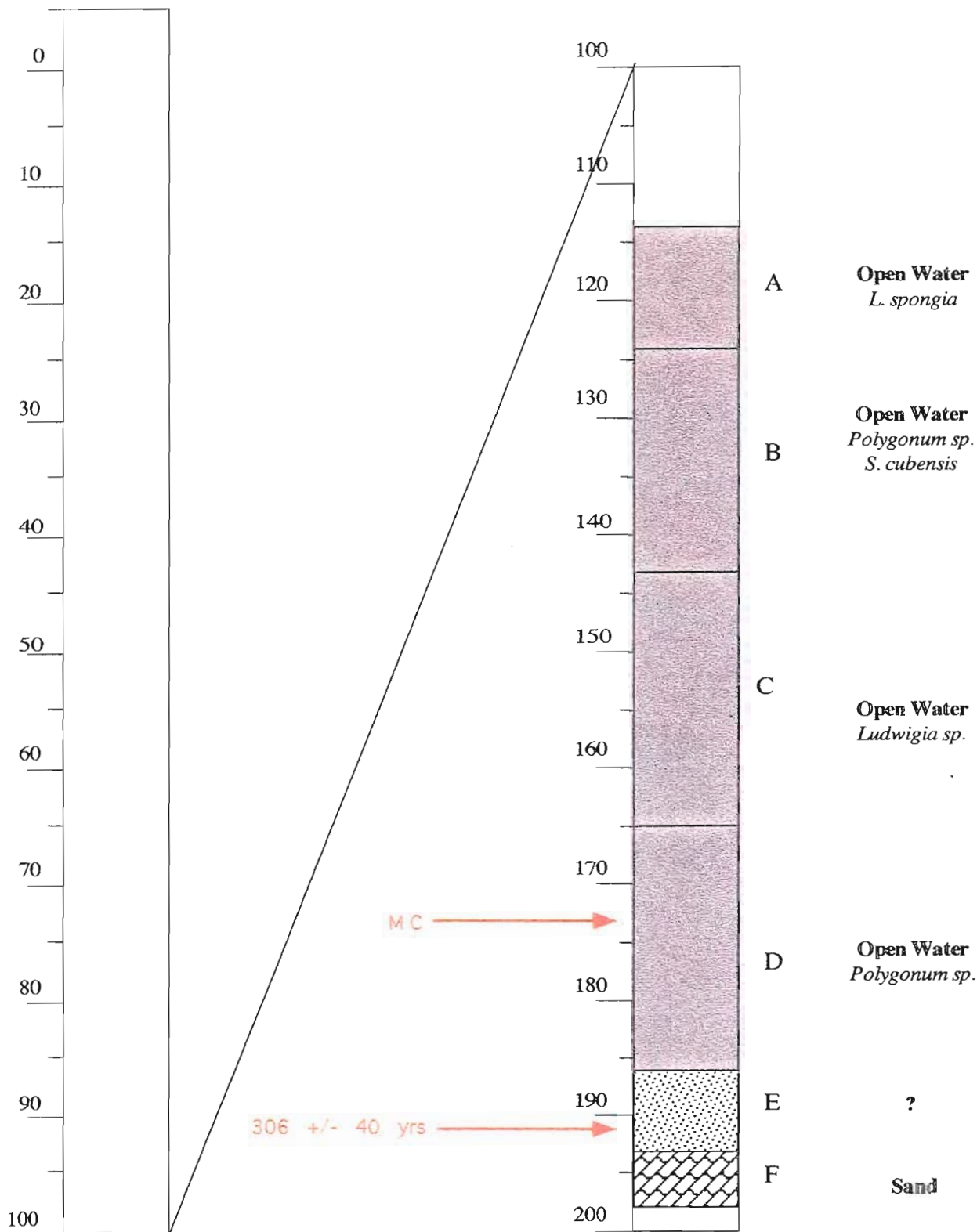


Figure H-8. Peat stratigraphy of Site FMa-2A in southern region of Orange Lake (Clark and Reddy 1998). Letter designates core horizon. Bold print indicates most probable species or community contributing to sediment in horizon. Species not in bold indicate other plant fragments found in horizon. The word "water" placed vertically in the figure indicates open water below the floating substrate (Clark and Reddy 1998). ¹⁴C dates (shown in red) represent years before 1950.

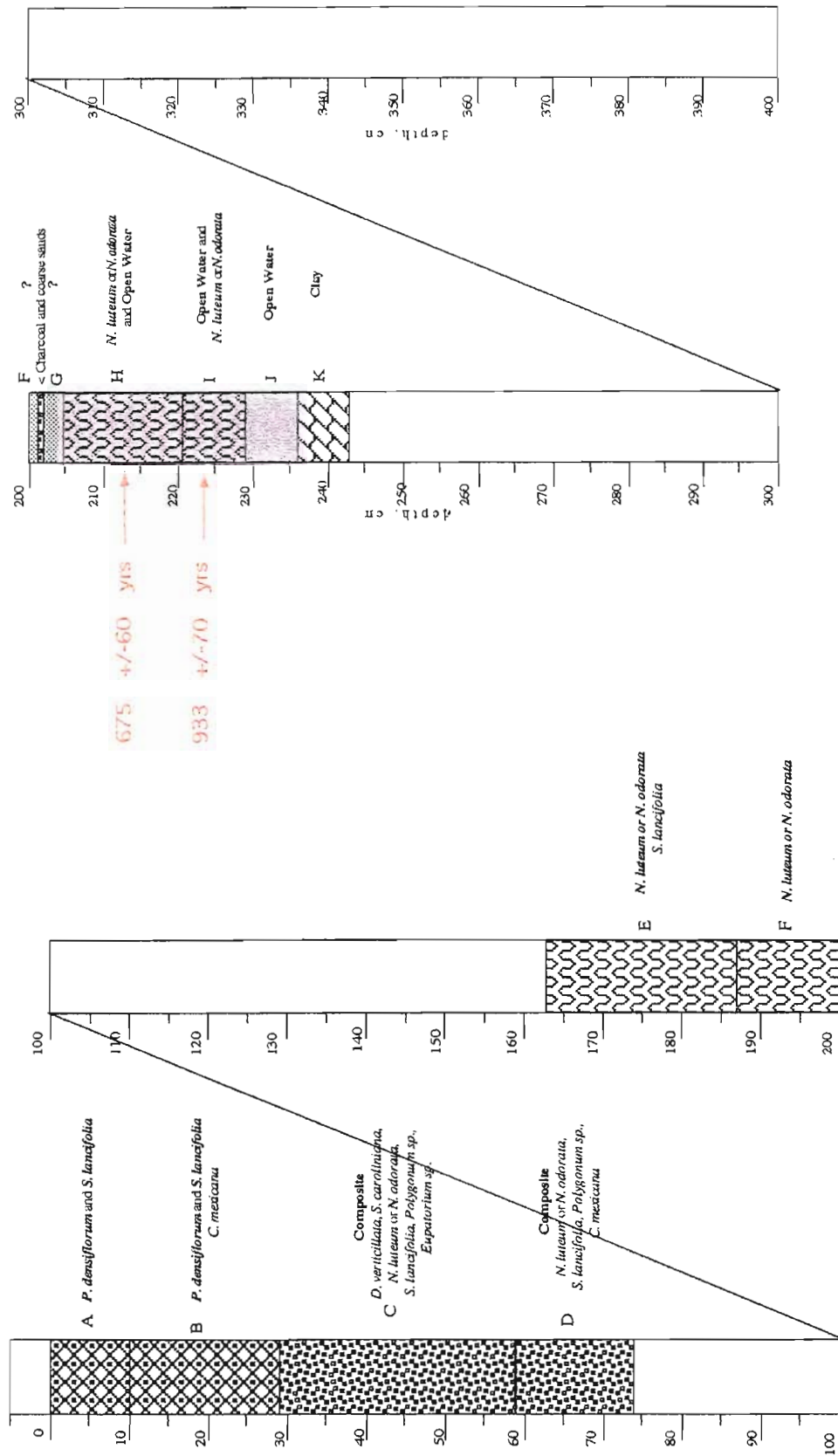


Figure H-9. Peat stratigraphy of Site FMc-2A in southwestern region of Orange Lake (Clark and Reddy 1998). Letter designates core horizon. Bold print indicates most probable species or community contributing to sediment in horizon. Species not in bold indicate other plant fragments found in horizon. The word "water" placed vertically in the figure indicates open water below the floating substrate (Clark and Reddy 1998). ¹⁴C dates (shown in red) represent years before 1950.

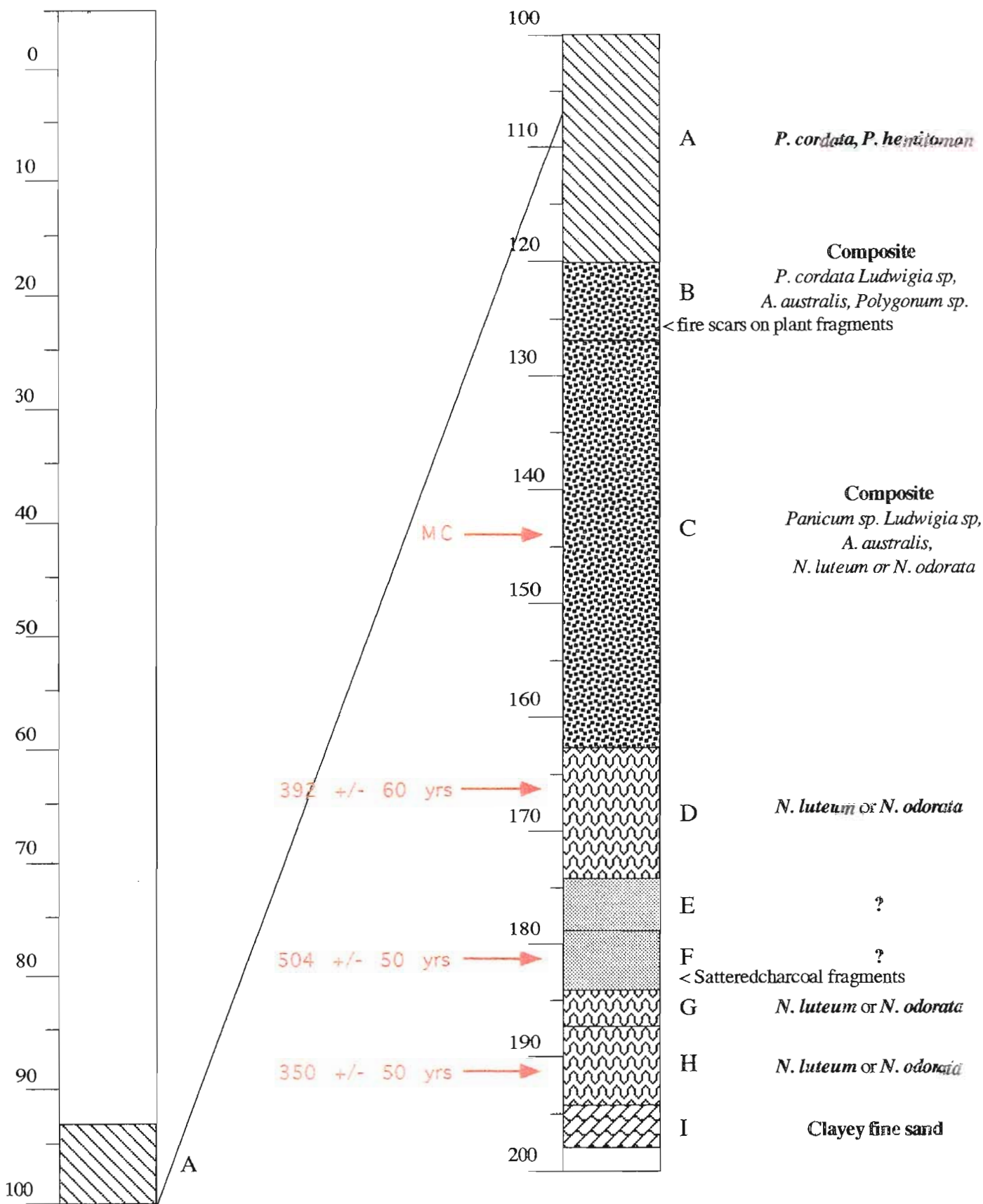


Figure H-10. Peat stratigraphy of Site SMA-2A in southern region of Orange Lake (Clark and Reddy 1998). Letter designates core horizon. Bold print indicates most probable species or community contributing to sediment in horizon. Species not in bold indicate other plant fragments found in horizon. The word "water" placed vertically in the figure indicates open water below the floating substrate (Clark and Reddy 1998). ¹⁴C dates (shown in red) represent years before 1950.

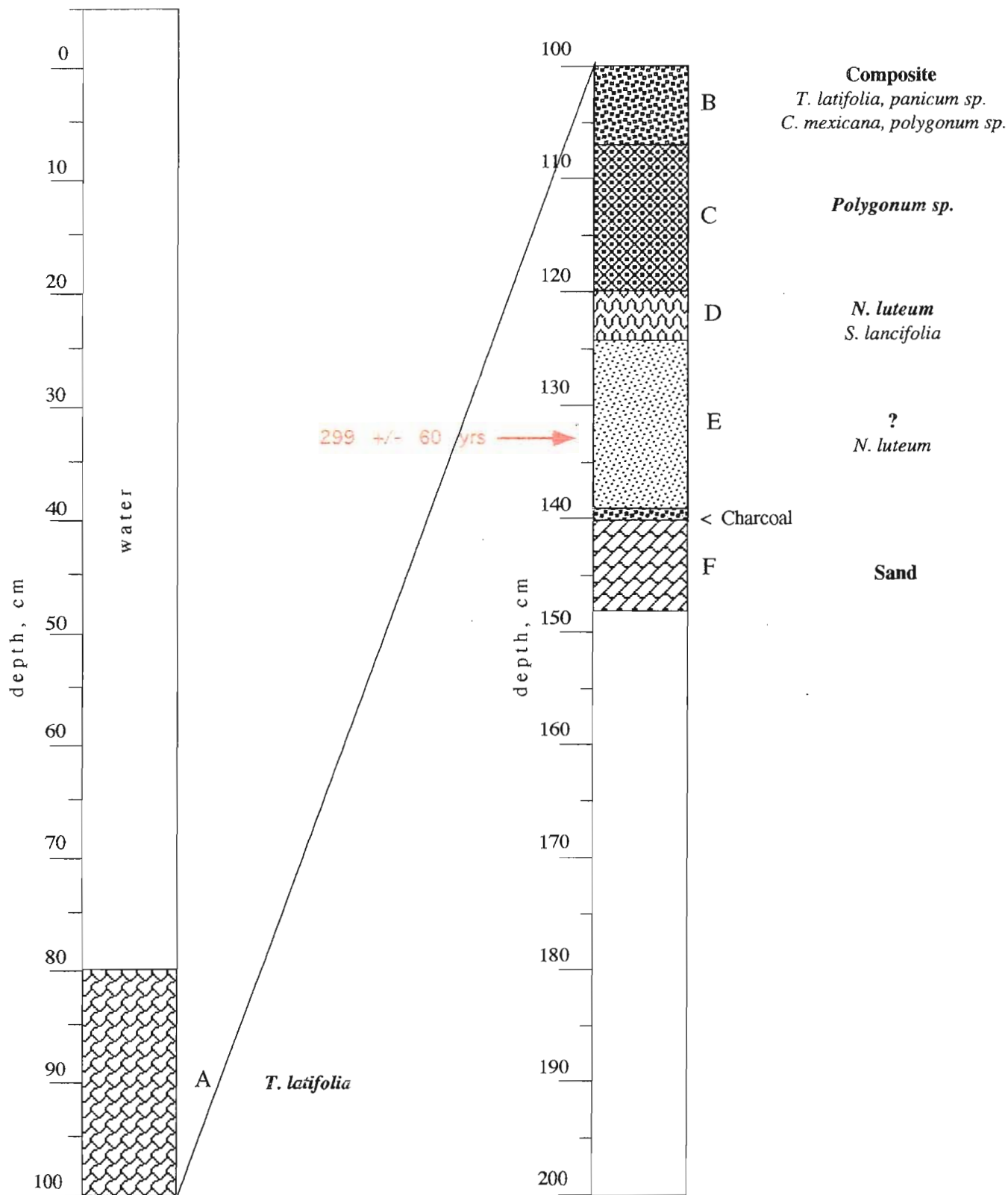


Figure H-11. Peat stratigraphy of Site SMb-2A in southwestern region of Orange Lake (Clark and Reddy 1998). Letter designates core horizon. Bold print indicates most probable species or community contributing to sediment in horizon. Species not in bold indicate other plant fragments found in horizon. The word "water" placed vertically in the figure indicates open water below the floating substrate (Clark and Reddy 1998). ¹⁴C dates (shown in red) represent years before 1950.

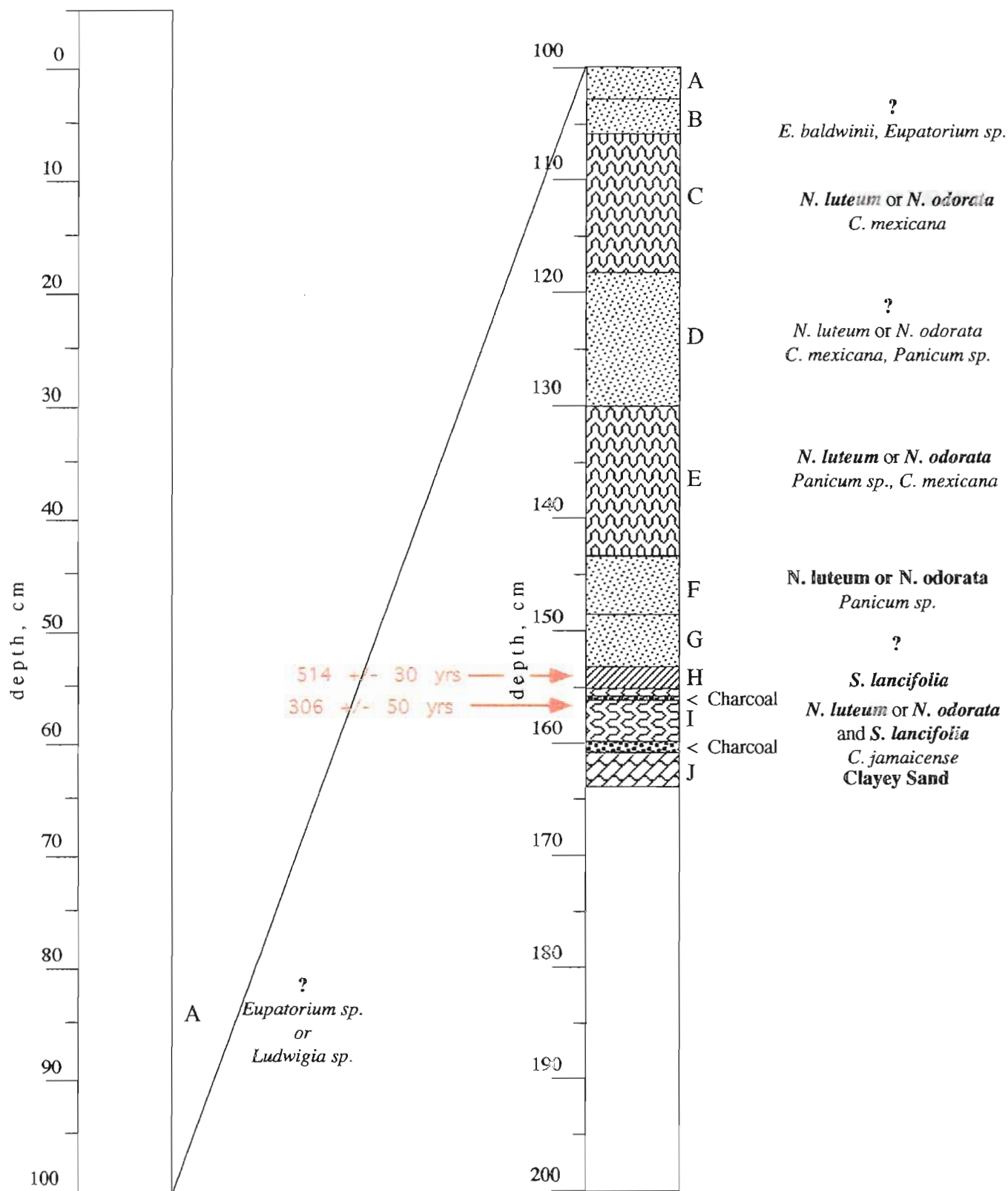


Figure H-12. Peat stratigraphy of Site DMA-3A in P.G. region of Orange Lake (Clark and Reddy 1998). Letter designates core horizon. Bold print indicates most probable species or community contributing to sediment in horizon. Species not in bold indicate other plant fragments found in horizon. The word "water" placed vertically in the figure indicates open water below the floating substrate (Clark and Reddy 1998). ¹⁴C dates (shown in red) represent years before 1950.

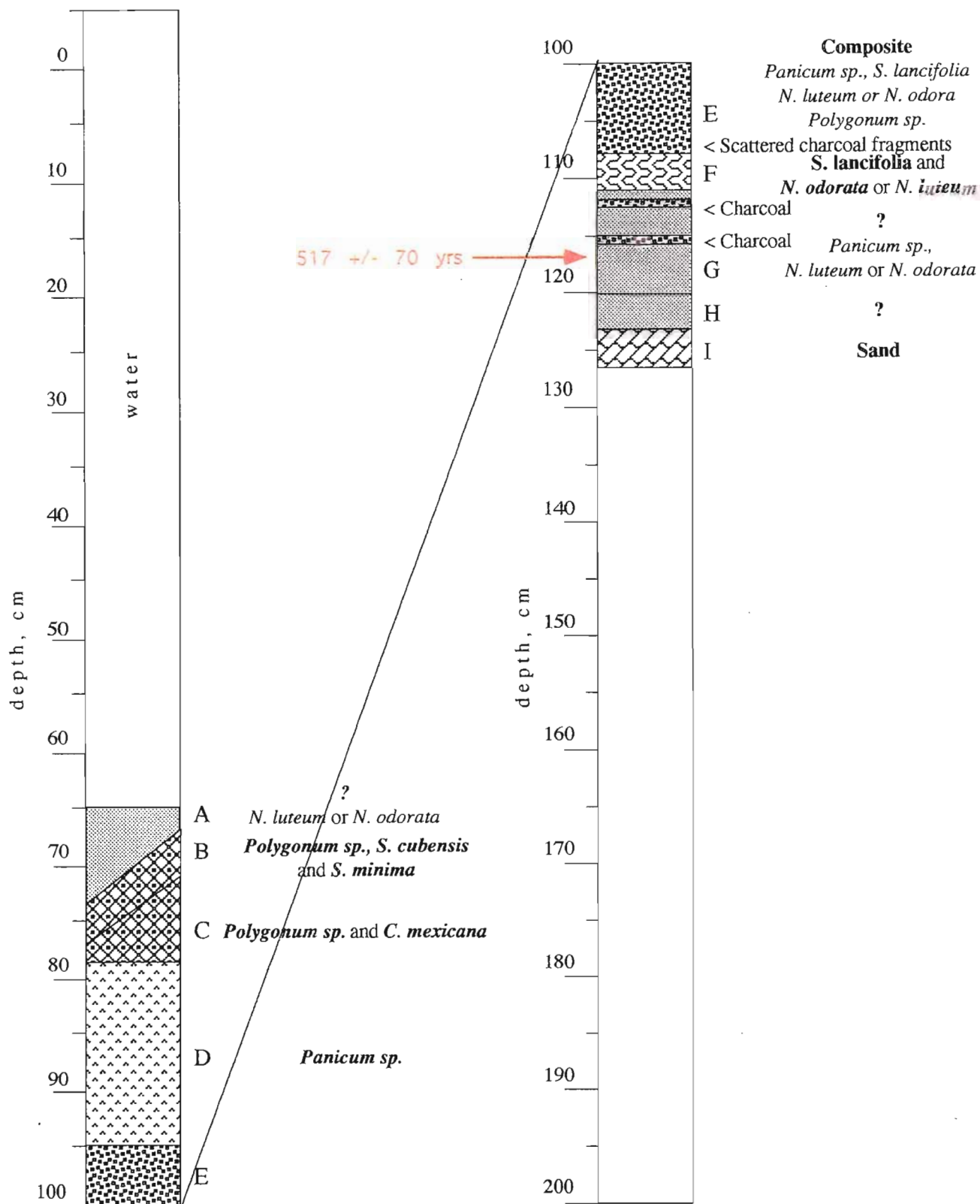


Figure H-13. Peat stratigraphy of Site FMb-3A in P.G. region of Orange Lake (Clark and Reddy 1998). Letter designates core horizon. Bold print indicates most probable species or community contributing to sediment in horizon. Species not in bold indicate other plant fragments found in horizon. The word "water" placed vertically in the figure indicates open water below the floating substrate (Clark and Reddy 1998). ¹⁴C dates (shown in red) represent years before 1950.

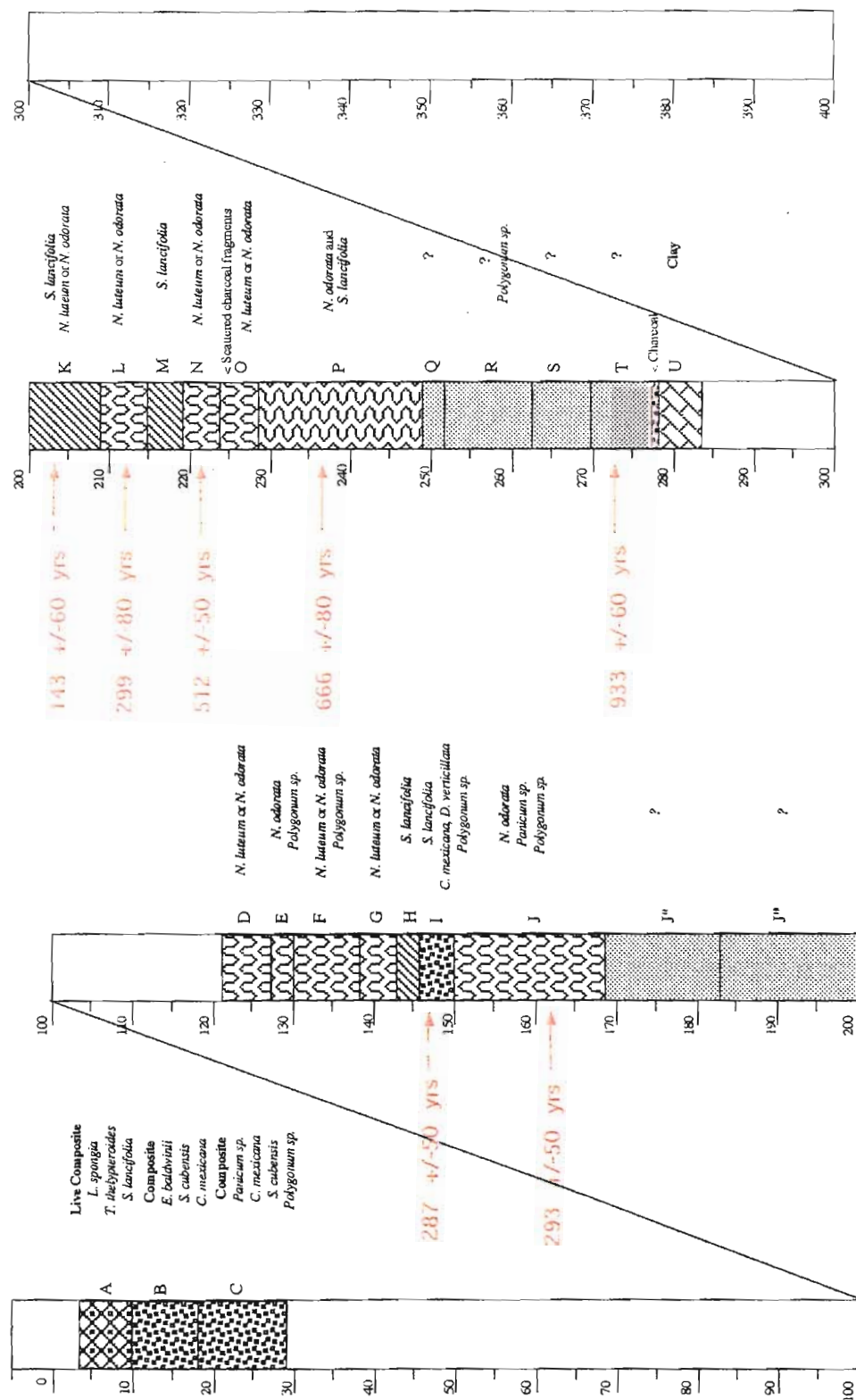


Figure H-14. Peat stratigraphy of Site FMc-3A in P.G. region of Orange Lake (Clark and Reddy 1998). Letter designates core horizon. Bold print indicates most probable species or community contributing to sediment in horizon. Species not in bold indicate other plant fragments found in horizon. The word "water" placed vertically in the figure indicates open water below the floating substrate (Clark and Reddy 1998). ¹⁴C dates (shown in red) represent years before 1950.

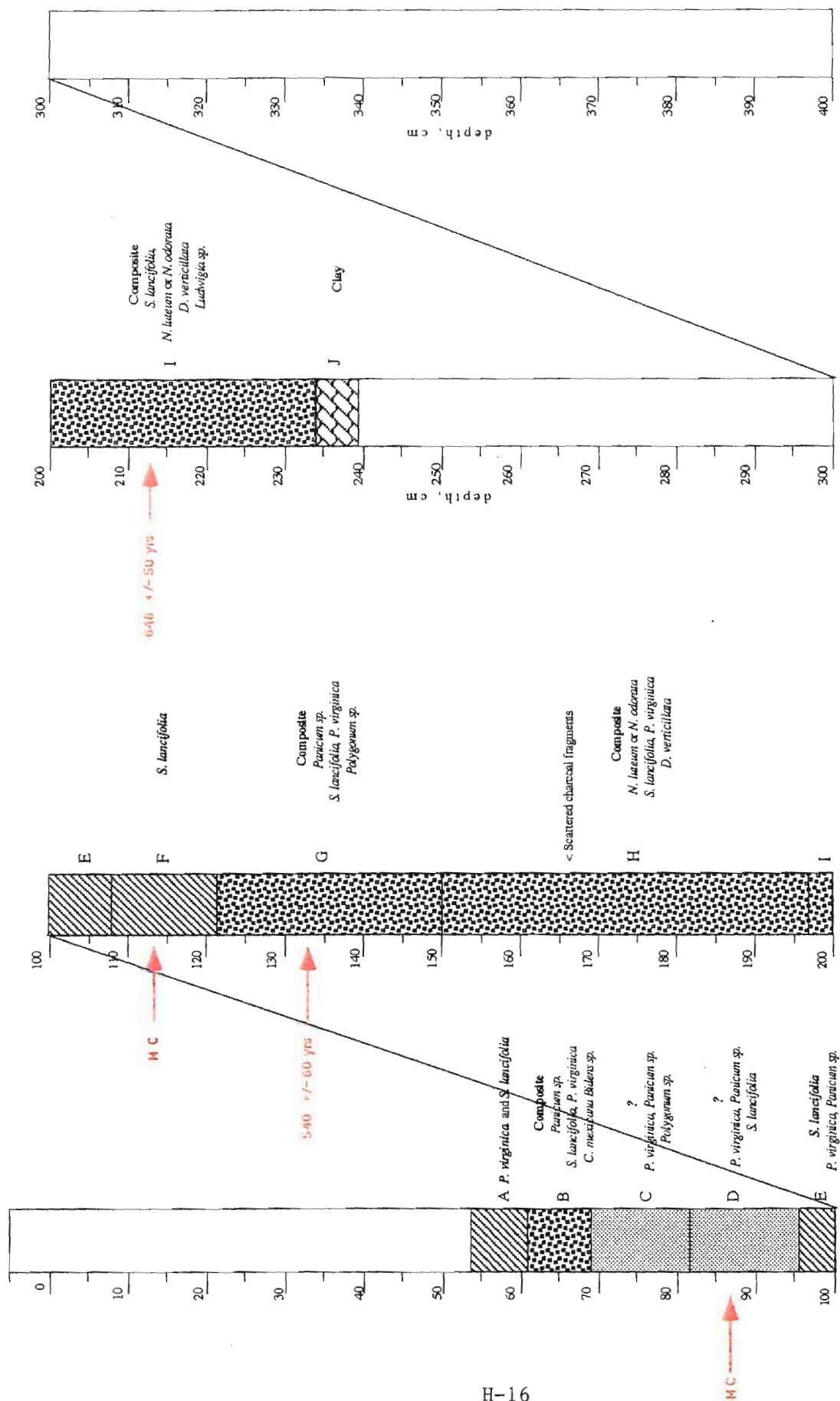


Figure H-15. Peat stratigraphy of Site SMA-3A in P.G. region of Orange Lake (Clark and Reddy 1998). Letter designates core horizon. Bold print indicates most probable species or community contributing to sediment in horizon. Species not in bold indicate other plant fragments found in horizon. The word "water" placed vertically in the figure indicates open water below the floating substrate (Clark and Reddy 1998). ¹⁴C dates (shown in red) represent years before 1950.

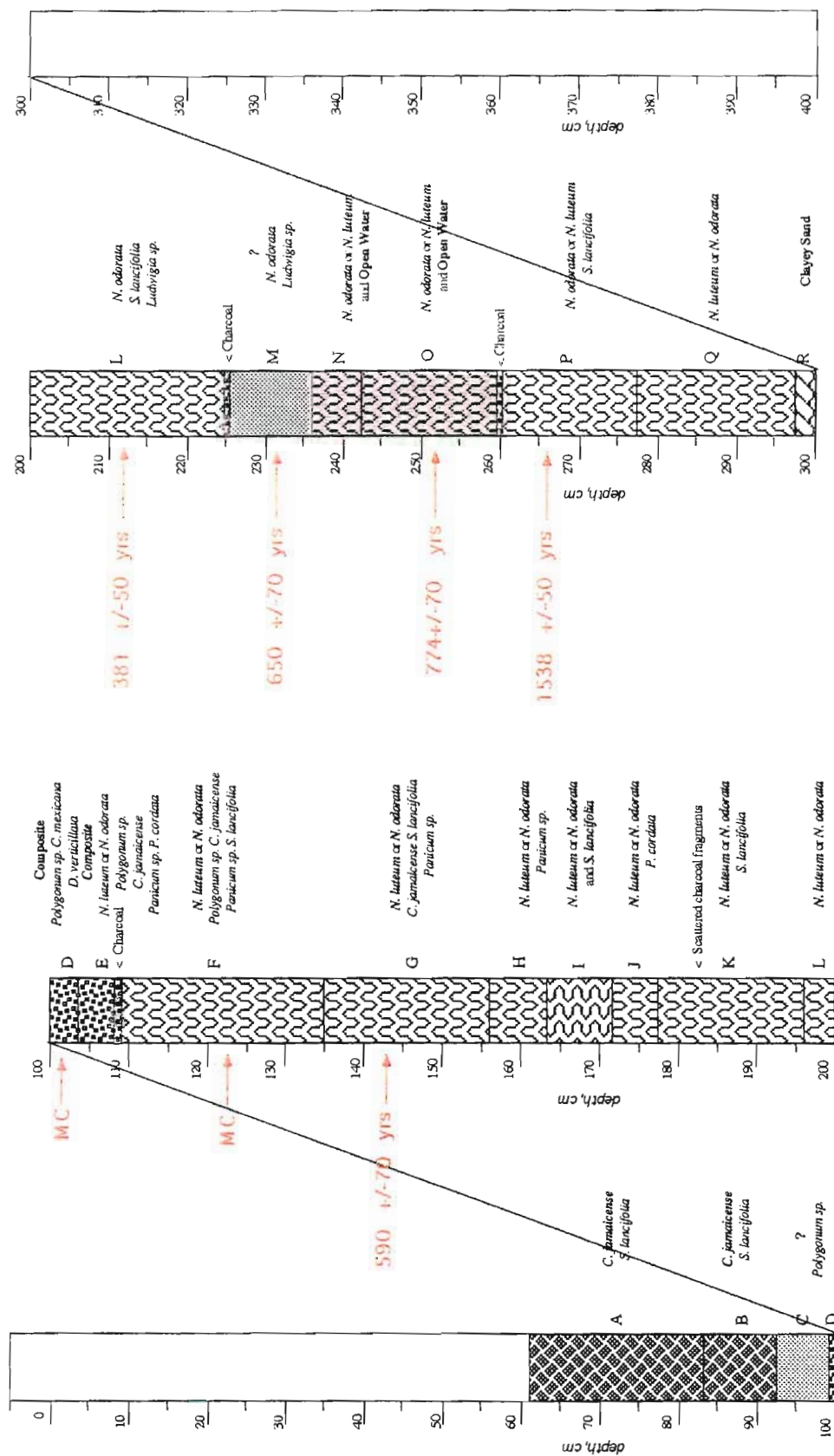


Figure H-16. Peat stratigraphy of Site SMB-3A in P.G. region of Orange Lake (Clark and Reddy 1998). Letter designates core horizon. Bold print indicates most probable species or community contributing to sediment in horizon. Species not in bold indicate other plant fragments found in horizon. The word "water" placed vertically in the figure indicates open water below the floating substrate (Clark and Reddy 1998). ¹⁴C dates (shown in red) represent years before 1950.

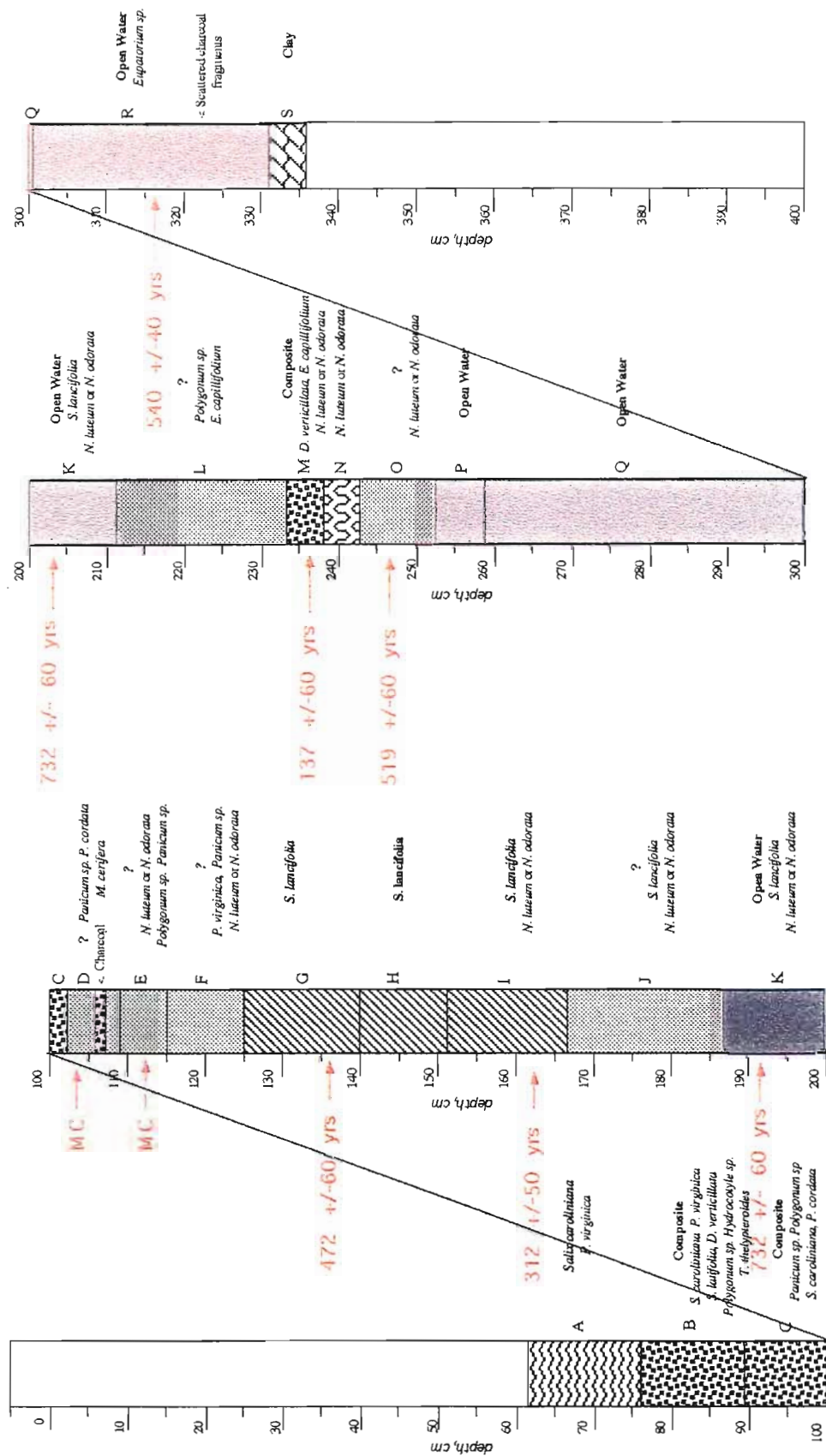


Figure H-17. Peat stratigraphy of Site SSa-3A in P.G. region of Orange Lake (Clark and Reddy 1998). Letter designates core horizon. Bold print indicates most probable species or community contributing to sediment in horizon. Species not in bold indicate other plant fragments found in horizon. The word "water" placed vertically in the figure indicates open water below the floating substrate (Clark and Reddy 1998). ¹⁴C dates (shown in red) represent years before 1950.