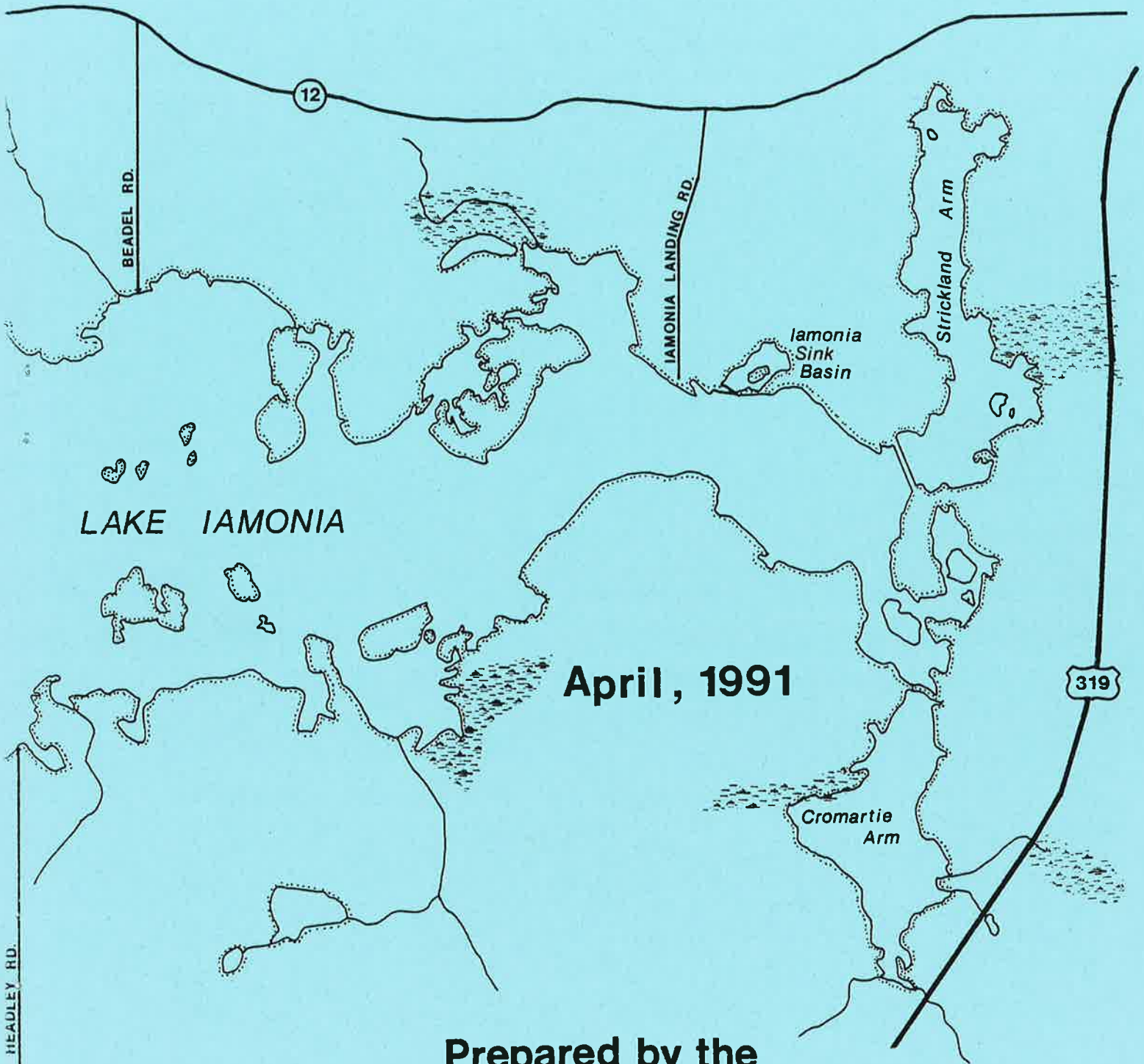
LAKE IAMONIA MANAGEMENT PLAN



April, 1991

Prepared by the

LAKE IAMONIA TASK FORCE

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Table of Contents

List of Figures

List of Tables

List of Appendices

EXECUTIVE SUMMARY

Lake Iamonia (5,757 acres) is the largest waterbody within Leon County and, perhaps, the most natural of the larger lakes in northwest Florida. Nevertheless, previous management practices, especially water-level stabilization and changes in land use, have led to the overabundance of aquatic plants and the accumulation of organic sediment in Lake Iamonia which impede recreational usage and threaten its fish, wildlife, and ecosystem integrity.

The Lake Iamonia Task Force was convened on April 12, 1989, at the request of the Leon County Board of Commissioners, with the goal of developing a management plan that would revitalize this important resource. After two years of study, the Task Force makes the following recommendations:

1. **Promote water level fluctuation by improving the connection with the Ochlockonee River, by leaving open the control structure at the sink, and by enhance flow to and from Stricklands Arm and Cromartie Arm.**
2. **Control exotic, aquatic plants (hydrilla and waterhyacinths) with herbicides. Maintain boat trails with mechanical harvesting.**
3. **Use prescribed burning during low-water periods to reduce surface organic matter.**
4. **Strengthen regulations on development activity in the watershed, especially regarding stormwater.**
5. **Arrange for the preservation of the islands and portions of the shoreline.**
6. **Establish an environmental education program to promote the appreciation and protection of Lake Iamonia.**
7. **Monitor water quality, aquatic plants, fish and waterfowl on a long term basis.**
8. **Improve existing boat ramps to allow access during periods of low water.**
9. **Study the option of mechanically removing organic matter from the lake bottom and investigate methods of increasing the ability of the sink to accept water.**
10. **Maintain the Lake Iamonia Task Force to promote interagency coordination and full implementation of this management plan.**

INTRODUCTION

In the Tallahassee Hills physiographic region of Florida, the rapid development of large sinks in certain streams produced a number of branching, elongated basins (Hutchinson, 1957). Because these lakes are subject to great fluctuations in water level due to sink activity, they are called "the disappearing lakes". Lake Iamonia, an important example of such a solution basin, is 12 miles north of Tallahassee and is 7 miles long and 2 miles wide with an east-west orientation (Hutchinson, 1957; Wagner and Musgrove, 1983). Excluding its sinkhole, Lake Iamonia has a maximum depth of 20 feet but is generally quite shallow. Nearly three-quarters of the lake is less than 6 feet deep (Wagner and Musgrove, 1983). Adjacent and to the east end of Lake Iamonia is the Foshalee Slough, a 1,400 acre marsh.

According to Clifton Paisley's fascinating book From Cotton to Quail, significant impact by man on Lake Iamonia began in the 1830's. In 1832, John Branch, the former Governor of North Carolina, and four Bradford brothers from Enfield, North Carolina, bought extensive acreage on Lake Iamonia. Many cotton planters followed, leaving their worn-out farms in Maryland, Virginia, the Carolinas, and Georgia in search of good agricultural land at a low price. The oak-hickory lands with Orangeburg fine sandy loam surrounding Lake Iamonia certainly filled the bill and were quickly sold at $5 - $10 per acre. By 1851, much of Lake Iamonia's forested watershed had been cleared and cultivated. In 1885, Solon Robinson, an agricultural writer, toured Leon County and noted that "the soil is easily washed away when only plowed an inch and a half deep". He described local farmers as "land destroyers" because of the extent of erosion: "The red uplands of this ... section of Florida has been mercilessly pillaged for the productive resources by the most wasteful and exhaustive processes of cropping" (Paisley, 1981). The sedimentation of Lake Iamonia resulting from these early farming practices must have been massive. Aside from increased sedimentation due to cultivation in the watershed, livestock may have played a role in the reduction of ground cover. Large numbers of livestock were grazed on the extensive marshes exposed when Iamonia "disappeared" during droughts. For instance, Frederick R. Cotton, who owned "land extending for miles along the southern shore", managed over one-thousand swine, as well as numerous horses and cattle. In a later account, "one hundred Jersey cattle ranged the shores of Lake Iamonia feeding on the lush growth of maidencane" (Reese, 1911).

Following the Civil War and the fall of the cotton plantation system, historical accounts suggest that the nutrient and sediment loading of Lake Iamonia must have greatly subsided. Attempts were made to revitalize farming, but in 1913

Rudolph Herold wrote these prophetic words: "I can't see that farming conditions are any better than when I moved here. I think we had all better sell [our land] to northern sportsmen, so they can build high fences around it and raise snakes and birds" (Paisley, 1981). This idea apparently grew in popularity. By the middle of the twentieth century, a complex of 50 hunting preserves totalling 100,000 acres had been formed in the Tallahassee-Thomasville area. Lake Iamonia's watershed was allowed to heal in the era of the "quail plantation", and the "new planter class" returned croplands to woodlands and maintained them in a park-like condition (Paisley, 1981).

Though erosion caused by the early farming practices had a significant sedimentation and nutrient loading impact on Lake Iamonia, the greatest harm to the lake may have resulted from man tinkering with its hydrology. To reach the lucrative markets in the North, early planters of Leon County relied upon mule-drawn wagons and ox-drawn carts to take their products to the southern terminus of the rail system in Thomasville, Georgia (Paisley, 1981). Consequently, the roads to Thomasville were crucial. The improvement of a route to Thomasville across a wetland slough was the beginning of the isolation of Lake Iamonia from the Ochlockonee River, for transportation purposes, culminating in today's causeway on Meridian Road. In 1910, a concrete spillway at 99' NGVD (National Geodetic Vertical Datum) was constructed along this route to prevent the river from entering the lake in order to appease livestock grazing interests wishing to expose more "meadowland adjacent to the lake". According to Sellards (1914), "the view of the party constructing the dam [was] that if the Ochlockonee River could be kept out, the sink would carry off the water from the lake" (Sellards, 1914).

In time, game plantations surrounded the lake and priorities shifted from cattle grazing to maximizing the fish and game potential of Lake Iamonia and its watershed. Lloyd Griscom, an avid duck hunter, established a 4,000-acre winter residence on Lake Iamonia, called Luna Plantation. The hunting was described as "fabulous" with the duck population estimated at 50,000. Henry L. Beadel, an avid naturalist, inherited and enlarged his uncle's plantation on the north shore, called Tall Timbers. He kept a detailed journal on the natural history of the area. (Appendix 1) Perhaps, the most interesting entries describe the natural drawdown of the lake during 1934-35. "Many cars and trucks loaded with ... fish [were] passed on the way [to Lake Iamonia]. Only two pools with water [were present], one near the parking place [and] the other at the end of the basin near the island" (November 8, 1934). "Mud drying in huge cracks" (November 9, 1934). "No fish living in the main pool - sure is a dreadful sight. Pool above the

main basin is dry and literally paved with dead fish" (December 7, 1934). The psychological impact of such a natural drawdown on the game plantation owners must have been profound.

A 20-acre sink basin exists on the northern edge of Lake Iamonia which, during periods of extremely low rainfall, has periodically allowed the entire lake to drain into the aquifer. This phenomenon was viewed as an asset when cattle grazing was a priority. However, when the lake went "bone dry" in the fall of 1934, area landowners who were now interested in abundant fish and waterfowl, considered the sink to be a serious problem. When the lake again "disappeared" in 1938, the Leon County Commissioners and the Florida Game and Fresh Water Fish Commission were determined to isolate th sink in order "to save the fish and fishing, the ducks and duck hunting" (Appendix 2). From January 11 to March 23, 1939, a 1,150 foot earthen dam between the sink and the lake was constructed at a cost of $1,800, and Lake Iamonia was stabilized at 98.64' NGVD.

Tinkering with the lake's hydrology did not stop there. In the 1950's, Cromartie and Strickland arms were diked and impounded. In 1976, concrete-capped, steel weirs were built east of and parallel to Meridian Road to "allow the . . . lake to be drained, cleared of weeds, and refilled from rain runoff" (Warren, 1976). However, after repeated damage caused by the flooding of the Ochlockonee River, this weir was removed in 1980. Finally, a drawdown structure was constructed at the west end of the sink basin's dike in 1977. An entrance and exit channel was also constructed to allow flow from the lake to the sink. Since January of 1982, the gates of the drawdown structure at the sink have remained open because of the poor condition of the dam.

The combination of water level stabilization, nutrient loading, and sedimentation have promoted the proliferation of aquatic plants and the accumulation of organic sediments in Lake Iamonia. Because of the strong pattern of rapid growth in Leon County's northeastern quadrant, we may be experiencing another period of heavy nutrient and sediment loading similar to what occurred during the era of the cotton planters. Of particular note is the massive Killearn Lakes development and its influence on other residential and commercial activity near Lake Iamonia. Aware of the threat of rapid growth to the natural values of Lake Iamonia, a group of lake area property owners and other interested persons formed an organization called the Lake Iamonia Preservationists in 1983. At the request of the "Lake Iamonia Preservationists", the then Leon County Commission Chairperson, Gayle Nelson, convened a task force of citizens, officials, and

technical experts to discuss the feasibility of developing a management plan to improve and maintain Lake Iamonia. This report, prepared by this Lake Iamonia Task Force, is an endeavor to consolidate all pertinent information on Lake Iamonia and to point the way to sound management of this unique natural resource.

CHARACTERISTICS OF THE LAKE AND ITS WATERSHED

THE DRAINAGE BASIN

Lake Iamonia's watershed is a basin with an east-west orientation, located north of the Tallahassee metropolitan area, extending beyond the Florida-Georgia state line, and encompassing an area of approximately 64,000 acres. Large tracts of plantation lands are located throughout the basin. Also several large, low-density suburban areas are located in the southern portion of the watershed. The relatively few severe grades that exist within the basin and are found in the northwest corner in Ander's Flat, Van Brunt Arm, and Meridian Road East watersheds. The entire basin is located within the Tallahassee Red Hills physiographic region and encompasses the Lake Iamonia Lowlands. The basin directly borders the Ochlockonee River Valley Lowlands to the west and frequently interacts with the river at stages above 99' NGVD. Nineteen watersheds and two closed basins have been identified within the Florida portion of the Lake Iamonia drainage basin. Approximately 8,347 acres of surface water have been identified within this basin, with Foshalee Lake, Foshalee Slough, and Lake Iamonia dominating (Table 1).

Lake Iamonia is the most prominent feature of the basin. It is an approximately 5,757-acre shallow, freshwater lake underlain with several sinkholes, most of which are not active. The majority of the lake's surface is covered by aquatic vegetation. On the north shore, the lake has a large, connected sink, called Iamonia Sink, with a structure and weirs. Lake Iamonia and Iamonia Sink were described more fully in a 1983 Northwest Florida Water Management District publication (Wagner and Musgrove, 1983). During spring flooding, the lake exchanges water with the Ochlockonee River through the lowest point in the basin boundary underneath the Meridian Road bridges. Other significant drainage features include earthen causeways with culverts at the mouths of Cromartie Arm, Strickland Arm, and Foshalee Lake; two closed basins in the southeastern portion of the drainage basin (not field verified); and several watersheds north of the lake basin that extend northward into south Georgia. Unfortunately, not all of these boundaries have been mapped. So far, approximately 15,750 acres of flood-prone areas and 4,235 acres of wetlands have been identified and mapped. However, these figures are incomplete, because of limited data available for the Lake Iamonia basin. Most of the identified wetlands are adjacent to Lake Iamonia, Foshalee Slough, and Foshalee Lake, but other substantial wetlands are located throughout the basin. Significant areas of wetlands have also

been drained for agriculture or impounded for suburban ponds in Killearn Lakes Unit I and II, and the Centerville watersheds since the mid-1970s. The wetlands include cypress swamp, bottomland hardwoods, and extensive areas of marsh. Much of Lake Iamonia itself is covered with emersed aquatic vegetation.

Upland vegetation data was available for only the southern half of the basin. Approximately 10,482 acres of native forest have been identified within this part of the basin. The total forested area is approximately 50% of the total basin area. Extensive areas of native forest are still found within this basin because of the current lack of intensive development and the existence of very large parcels of plantation land in relatively low-intensity agriculture. Woodyard Hammock, an outstanding beech-magnolia hammock that is under scientific study, is located on the northern shore of Lake Iamonia in the Anders Flat watershed.

Table 1. Characteristics of the Sub-basins of the Lake Iamonia Drainage Basin

SUB-BASIN/ DRAINAGE AREA	Drainage Area (Acres)	Waterbody Area (Acres)	Ele. of OHW (feet)	Wetlands (Acres)	Flood-Prone Area (acres)	Severe Grades (Acres)	Native Forest (Acres)
Anders Flat	1,444	12	145	235	247	113	n/a
Betholonia	1,983	79	105	205	252	892	955
Brown-Bethel	1,619	16	135	87	110	76	n/a
Carns Basin	701	29	98	67	104	7	81
Centerville	4,157	222	128	724	1,114	37	1,468
Dawkins Pond	1,574	0	-	103	105	0	398
Deputy Dawg	870	29	105	6	4	0	601
Foshalee Lake	4,354	782	115	132	1,002	71	361
Foshalee Slough W.B.	792	593	98	199	810	0	n/a
Foshalee Slough W.S.	3,012	11	135	72	188	7	n/a
Horseshoe	1,710	59	105	87	106	61	674
Killearn Lakes I	3,770	162		538	777	46	1,843
Killearn Lakes II	2,664	163		257	447	22	1,666
Killearn Lakes II/Lake Monkey Business			128				
Killearn Lakes II/Lower Dianne Lake			164				
Killearn Lakes II/Upper Dianne Lake			141				
Killearn Lakes I/Boar Pond			135				
Killearn Lakes I/Petty Gulf Lake			182				
Killearn Lakes I/Pine Hill Lake			182				
Lake Iamonia	6,154	5,749	98	365	8,596	0	n/a
Meridian Road East	796	30	120	21	30	0	n/a
Opus	881	0	-	0	0	0	441
Proctor	1,267	2	115	82	107	30	791
Shady Grove	3,306	187		545	866	37	1,203
Shady Grove/Huggle Pond			148				
Shady Grove/Pickle Pond			118				
Strickland	2,156	0	-	56	54	125	n/a
Thompson Pond	2,332	80	100	90	317	40	n/a
Van Brunt	1,122	9	135	33	43	98	n/a
Van Brunt Ar.	2,456	133	105	311	451	358	n/a
Wyche Ar.	402	0	-	20	20	22	n/a

HYDROLOGY/HYDROGEOLOGY

Lake Iamonia basin was formed by both mechanical erosion by surface waters and erosion by solution of underlying carbonate rock. During Pleistocene times (approximately 1.5 million years before present) surface streams were active in removing the Hawthorn Formation in the area between the coastline and the Tallahassee Hills (Stringfield 1966). As the Hawthorn escarpment retreated to its present position at the south edge of the Tallahassee Hills, streams dissected the Hawthorn Formation sufficiently to permit water to pass into the underlying carbonate unit causing active solution of the carbonate rock.

Rainwater, as it passes through the atmosphere, combines readily with carbon dioxide to form a weak carbonic acid solution. In addition, organic and mineral acids are absorbed as surface water infiltrates the soil. Percolation of the acidic water through soluble material like limestone causes the rock to slowly dissolve. Through geologic time, this dissolution gradually weakens the rock structure. The result is that the rock is no longer able to support sediment overlying the limestone because of an increase in void space. With the collapse of the material, a depression forms. Further dissolution causes the depression to grow and can result in a the progressive lowering of the area. The ultimate karstic feature is a solution basin. Lake Iamonia is an example of this type of basin.

The area where Lake Iamonia presently exists was formerly occupied by a tributary to the Ochlockonee River (Sellards, 1914). Through time, the tributary was engulfed by solution processes. The depression created an elevation change great enough to prevent runoff from flowing toward the Ochlockonee River. Subsequently, Lake Iamonia was formed.

Lake Iamonia is an elongated, irregular lake, oriented in an east-west direction about seven miles in length and about two miles in width. The lake's watershed is about 100 square miles. The eastern portion of the lake basin is commonly referred to as Foshalee Slough and Foshalee Lake. However, historically, the entire lake basin has been called Lake Iamonia. A depth profile survey conducted by the Florida Game & Fresh Water Fish Commission (June, 1978) indicated that the average depth of the lake was less than five feet at a lake elevation of 98.6' NGVD (Figure 1).

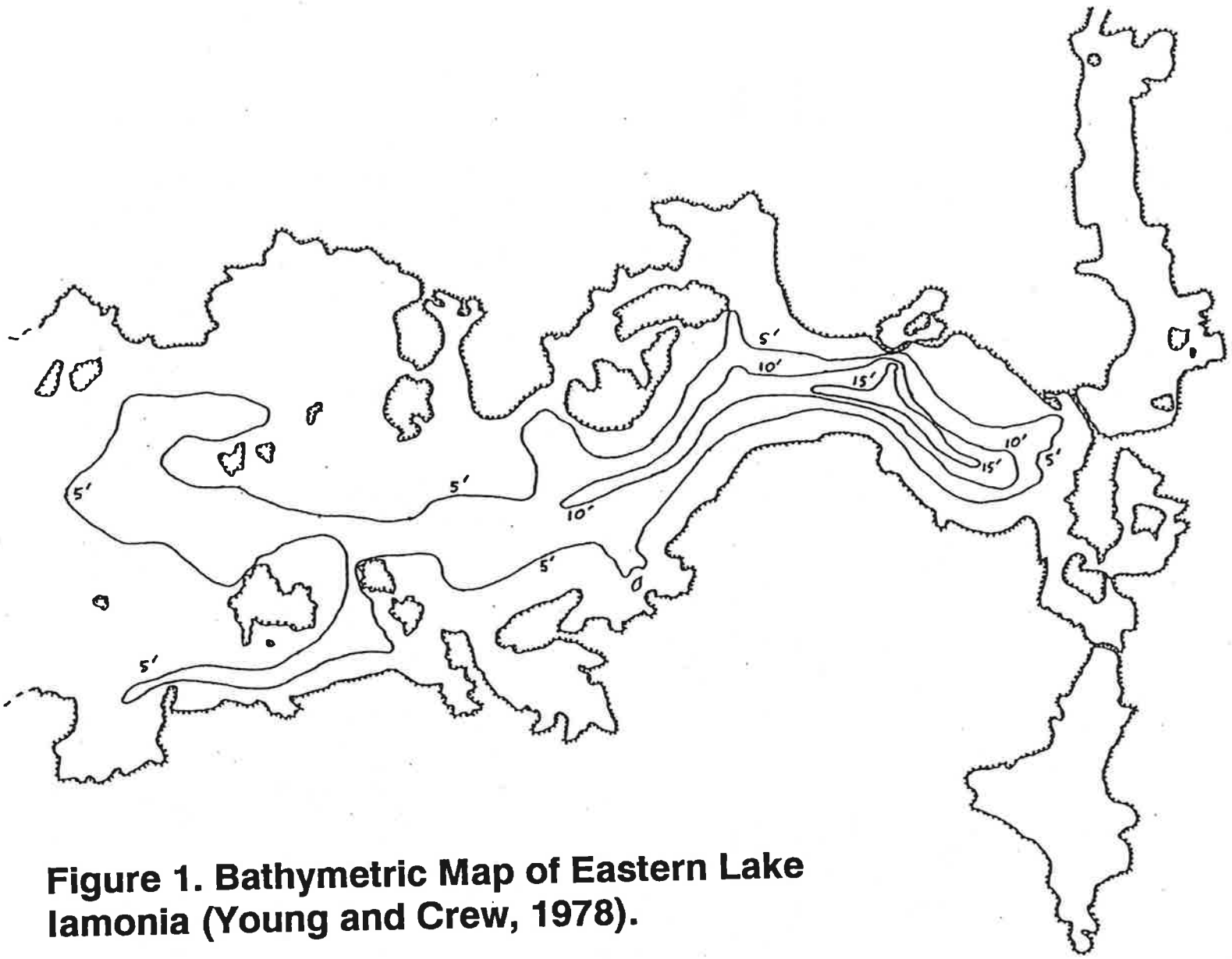


Figure 1. Bathymetric Map of Eastern Lake Iamonia (Young and Crew, 1978).

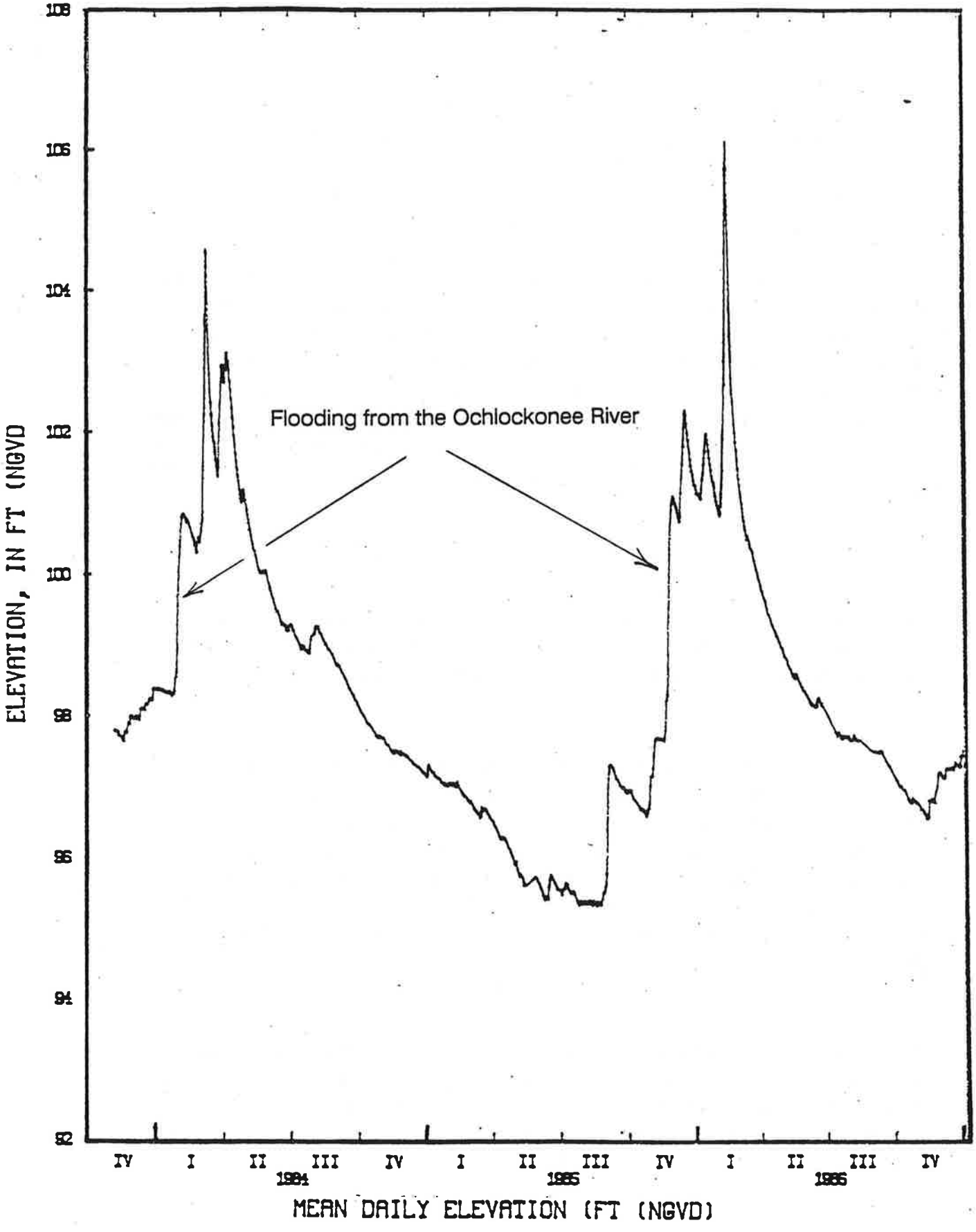
The eastern half of the lake is the deeper, with measured depths of 20 feet within a narrow depression or channel running from the center of the lake adjacent to the sink basin. The entire western half of the lake is generally less than five feet in depth and is characterized by a heavy vegetative cover. At the western extreme of the lake, two notable depressions with depths of 11 to 14 feet were found. A depression was also found at the southern edge of the lake near the old Luna Plantation where the depth was measured at 15 feet. The shallowness of the lake is readily apparent when the lake level declines to about 93' NGVD.

The lake elevation is governed to some extent by local rainfall which averages 59.26 inches annually (Kennedy, 1982). Other factors affecting the elevation of the lake are evaporation from the lake surface, transpiration from the abundant emersed plants, flow into the sink, and to a lesser extent, by water discharging into the lake from the surfacial water-table aquifer. In addition, small, intermittent tributaries contribute to the lake during and after rainfall events. A very important factor, however, is rainfall in the 300 square mile watershed of the Ochlockonee River in Georgia. In winter or early spring, heavy rainfall in association with cold fronts often results in the flooding of the Ochlockonee River (Figure 2). The river's floodwaters enter Lake Iamonia through a series of sloughs at the west end of the lake's basin. As flooding subsides, the lake drains back into the river under the Meridian Road bridges until the lake level reaches 99' NGVD.

A concrete spillway weir still exists under the bridges on Meridian Road which may represent a dam constructed in 1910. The north and south bridges are separated by 1,850 feet of roadfill. Through years of deposition, both natural and from the construction of the bridges, sediment has been deposited on both sides of the weir resulting in the structure being only a few inches above the existing bottom topography. The elevation of the top of the concrete spillway is about 99' NGVD. Hence, water elevations above 99' NGVD are necessary for interactions to occur between the lake and river (Murphy, 1979).

The largest sink basin area exists on the northern edge of the lake about 1.5 miles west of U. S. Highway 319 and 1.25 miles south of County Road 12. The sink basin lies between Van Brunt Arm and Strickland Arm and just east of Iamonia Landing. The surface area of the sink basin is 129.52 acres at 95' NGVD (Figure 3).

Figure 2. An Example of Water Level Fluctuation on Lake Iamonia (USGS Data).



A dike and spillway were constructed in 1940 by Leon County to isolate Iamonia Sink. The earthen dike constructed was 1,150' long, 150' broad at the base, 12' wide at the crest and 20' high. The average elevation of the crest of the dike is about 102' NGVD. The spillway constructed on the east end of the dike allows water to flow into the sink basin when the lake elevation is greater than 98.64' NGVD. The length of the spillway weir is 125' with a height of 2.5' above the weir elevation. The 1940 spillway is in a deteriorated condition with the downstream side of the spillway showing a high degree of erosion and some undermining.

A drawdown structure constructed in 1977 at the west end of the earthen dike contains two 60-inch, corrugated metal pipes with sluice gates. The bottoms of the pipes are at an elevation of 82.2' NGVD. An entrance channel and an exit channel were also constructed to allow flow from the lake to the sink basin. When the water level is at or below an elevation of 91.5' NGVD, the lake cannot flow into the drawdown structure's entrance channel, because its mouth is relatively shallow. On either side of this shallow area, the depths drop progressively to 86.4' NGVD and below. If any discharge did occur below 91.5' NGVD, it would be the result of seepage through the sediment.

Dikes were also built across Cromartie and Strickland Arms prior to 1950. To maintain water within these arms, each pipe has a 5' to 6' dike in height with a culvert pipe extending through it. Otherwise during drought periods, the arms would drain into the main part of the lake causing them to go dry.

Lake Iamonia has been reported dry three times during this century. Because the lake is relatively shallow, much of the lake is exposed periodically during extended below-normal rainfall periods. In the past during periods of low rainfall, the dry areas of the lake were used as open range, with cattle feeding on the grassy bottom. It was common practice to graze yearlings on the grasses during the fall to fatten the beef for market. Other reports indicate that the fertile lake bottom was plowed to grow corn, with great success during extended dry periods.

Prior to the lake going dry in 1910, rainfall was deficient for two years. Adequate rainfall for refilling the lake did not occur until 1912, when the rainfall exceeded the norm by about 15 inches. Following the "wet" period of 1912, another dry period developed for five years. So that in 1917 the lake was again reduced to

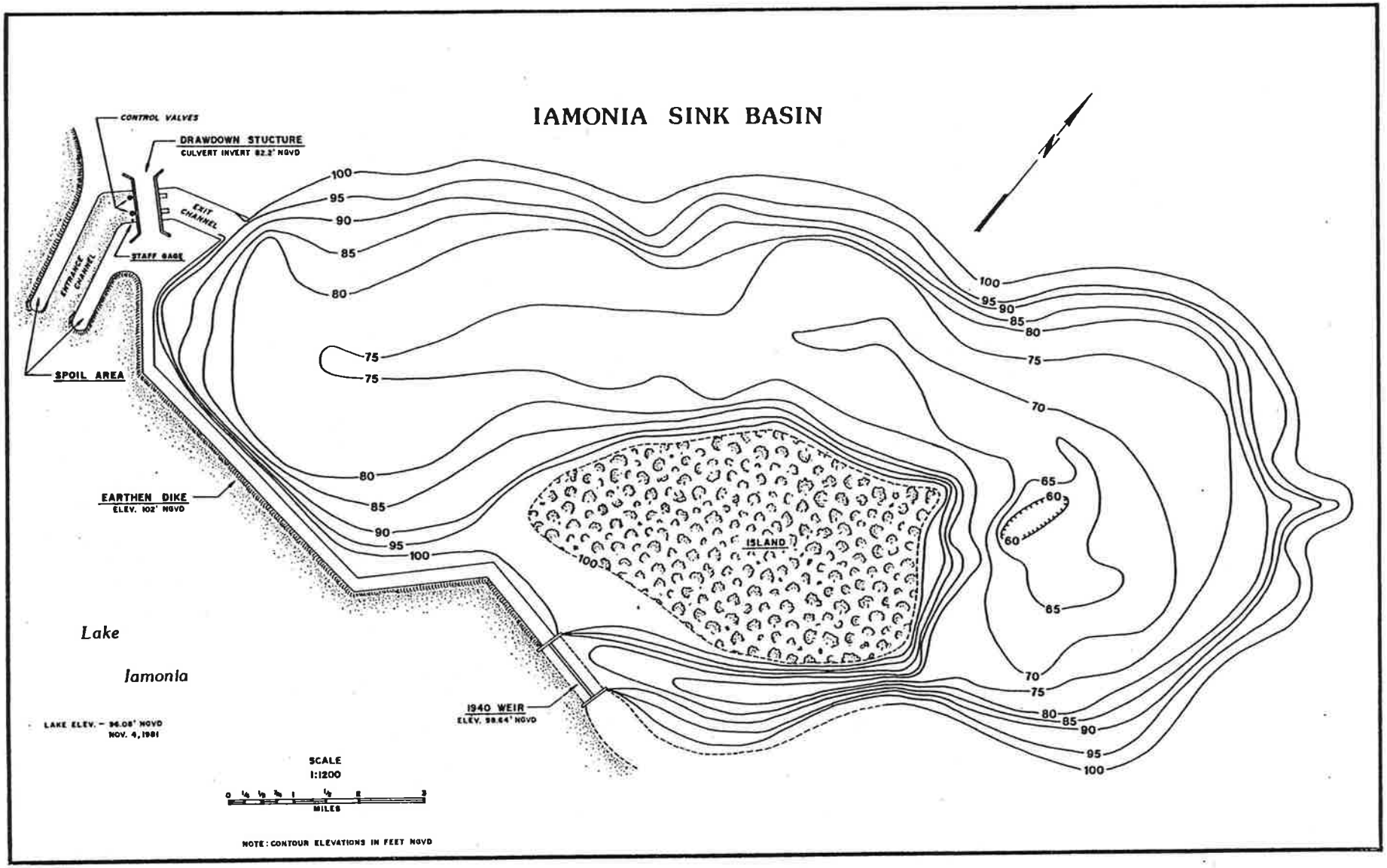


Figure 3. Bathymetric Map of Iamonia Sink (Wagner and Musgrove, 1983).

dry bottom. Based on recorded rainfall amounts, the lake levels probably remained low for the next six years. Then in 1924, above normal rainfall was adequate to bring the lake level to a near normal elevation. There was a net deficiency of about 33 inches of rainfall from 1925 to 1933.

In 1934 the lake was again dry. This event was magnified by the 1931 drought, when that year's rainfall was about 21 inches below normal. Since 1934, the lake has not receded to the point of being dry. One possible reason for the lake not drying up after 1934 may be that the acceptance rate for the sink may have lessened after the control structure was placed at the sink basin. Another reason may be climatic. There has generally been a larger surplus of rain after 1940, compared to a deficit that occurred during the earlier portion of the century. If the period of record for rainfall is divided from 1894 to 1940 and 1941 to 1981, the average annual rainfall for the first period is 55.65 inches. This average is below the normal rainfall of 59.25 inches for the entire period of record. On the other hand, the latter period produces an average of 63.39 inches, which is above normal.

When the lake is at or below 99' NGVD, water loss factors control the lake fluctuations. The losses occur through evapotranspiration, drainage through the Iamonia Sink and by infiltration through the lake bottom. Water lost through infiltration and through Iamonia Sink accounts for only a small percentage of the total volume of water losses.

Iamonia Sink acts as a sediment trap. When the sink basin is dry, sediment is washed into the solution channels by periodic rainfall. As sediments accumulate, the ability of the sink to accept water is reduced. With time, the combined effects of minor solutioning of the sink's conduits and the vertical erosive action within conduits caused by changes in the hydrostatic head difference initiate a process whereby the solution channels become flushed and sediments are removed.

The Iamonia Sink acceptance rate is between 6.7 and 19 acre-feet/day when the solution openings are relatively free of sediment and the potentiometric surface of the Floridan aquifer is 60' NGVD (Wagner and Musgrove, 1983). Greater acceptance rates are achieved when the water level within the sink basin is at a maximum. Based on the acceptance rates of existing conditions during testing,

it is estimated that it would take nearly 2.5 years of extremely dry weather to drop the lake elevation from 98' to 93' NGVD. These results suggest that water losses through Iamonia Sink are not significant in affecting the changes in the water levels of Lake Iamonia.

Laboratory analysis of soil similar to that which underlies the lake indicates that the permeability of the upper confining unit is approximately 10.7 centimeters per second. Thus, infiltration through the bottom of the lake appears to be insignificant. Total infiltration was estimated to be slightly greater than one acre-foot/day.

The amount of evapotranspiration (ET) has a major influence on lake levels. The Penman and Pan Evaporation methods were used to estimate ET on Lake Iamonia and the results of the Penman method closely approximated observed declines in lake levels. The average ET for June-December, 1981, was 0.276 inches per day.

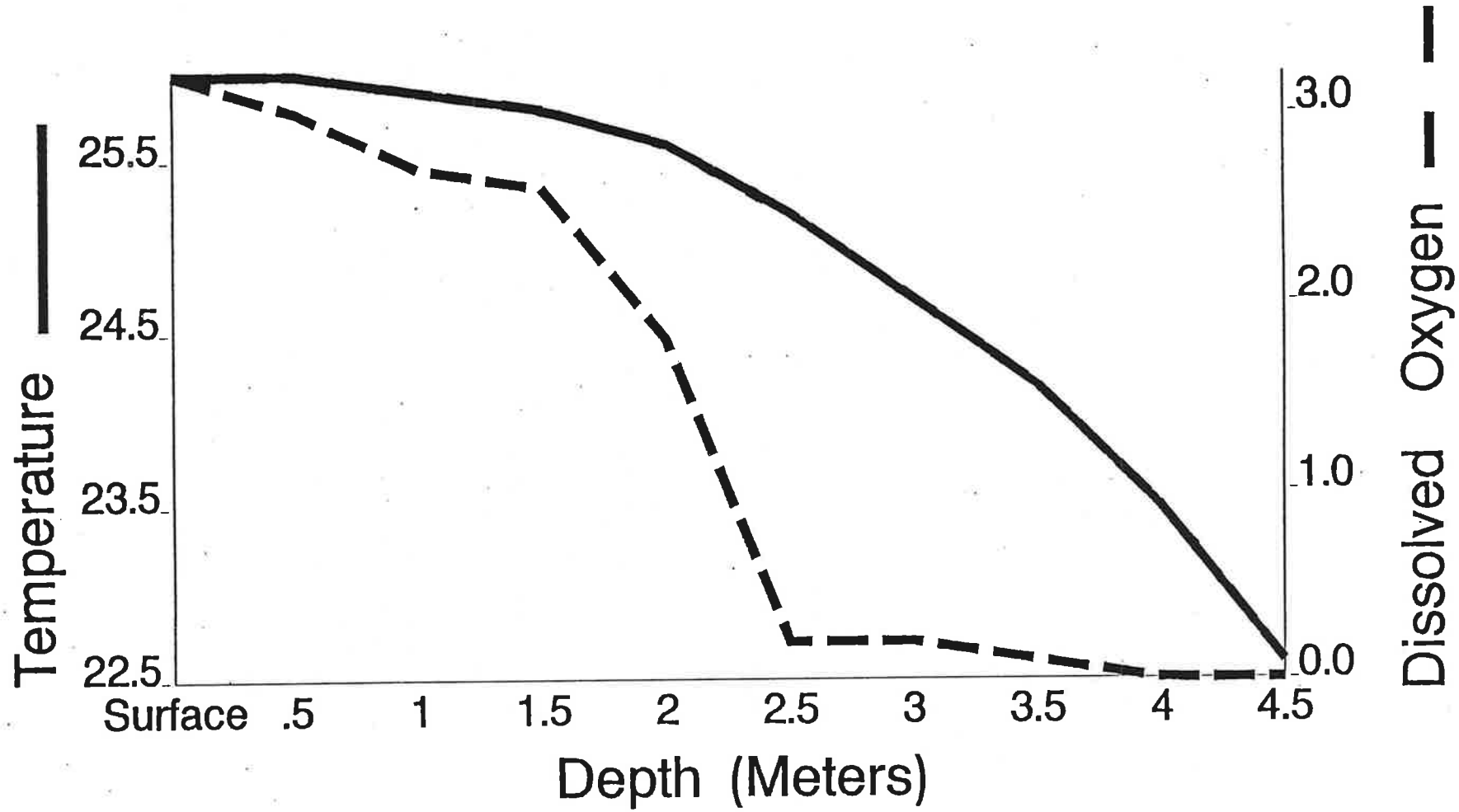
During periods of below-normal rainfall, lake Iamonia will tend to be low. Seasonally, these periods will occur from October through mid-December. If extended below-normal rainfall periods develop, even lower levels can be expected. Periods of above-normal rainfall during the winter, can cause the Ochlockonee River to heavily contribute to the level of Lake Iamonia. For instance, heavy rainfall in the latter half of January, 1991, caused flooding from the Ochlockonee River to raise the level of Lake Iamonia by more than 10 feet.

WATER QUALITY

As a group, the lakes of the Tallahassee Hills physiographic region can be characterized as acidic, softwater lakes of low mineral content (Canfield, 1981). Lake Iamonia is no exception with an average pH of 5.5 and an average alkalinity of 3 mg/L according to EPA STORET data collected in the early 1980's. This lake can be described as rather clear but moderately tannic with an average Secchi depth of 2.2 m and an average color value of 30 PCU. EPA STORET data are similar to those of Canfield (1981) regarding the average values for total nitrogen (450 ug/l) and chlorophyll a (8 ug/l). However, the average value for total phosphorus according to EPA STORET data was 15 ug/l, whereas Canfield (1981) found it to be approximately 7 ug/l (Canfield, 1981). The Florida Trophic State Index computed from these values indicates that Lake Iamonia is oligotrophic to mesotrophic or, in other words, is of low to moderate productivity. All in all, the water quality of Lake Iamonia is typical of lakes in its region.

One characteristic of Lake Iamonia's water quality is low dissolved oxygen levels in the late summer and early fall. Respiration requirements related to the bacterial decomposition of the highly organic substrate can cause anoxic conditions in the deep areas of the lake (Figure 4). Even on sunny days, the surface oxygen levels will reach only about 3 mg/l. To date, no major fish kills have resulted from oxygen depletion, but the prolonged exposure to low dissolved oxygen levels may have retarded fish growth rates in Lake Iamonia.

Figure 4. Temperature and dissolved oxygen versus depth on August 21, 1989 (11:30 a.m.)



AQUATIC PLANTS

The most striking characteristic of Lake Iamonia is the profusion of aquatic flora within its shores (Table 2). Fragrant waterlily (Nymphaea ordorata) is the most common species, covering nearly 70% of the lake. It is the largest population of fragrant waterlily in Florida. Lake Iamonia also has more fanwort (Cabomba caroliniana) and purple bladderwort (Utricularia purpurea) than any other lake in the state. These submersed species grow alone in deeper waters and below lilies in shallower areas. Fanwort and purple bladderwort occupy 1,500 and 950 acres, respectively. The fourth most common species is a small, oval-leafed lily called dollar-bonnet, or water-shield, (Brasenia schreberi), which covers approximately 800 acres of the lake. At least twenty-one other native plants can be found thriving in the relatively stabilized waters of Lake Iamonia. More dramatic fluctuations in lake levels have the potential to reduce the density of these species.

Four exotic species also are present in Lake Iamonia: waterhyacinth (Eichhornia crassipes), Brazilian elodea (Egeria densa), torpedograss (Panicum repens), and hydrilla (Hydrilla verticillata). Waterhyacinth and torpedograss could expand with increased fluctuation. Brazilian elodea would likely decline. Small amounts of hydrilla (Hydrilla verticillata) have been found at Bull Headley Landing and Iamonia Landing and have been repeatedly treated with herbicides. If hydrilla becomes established in Lake Iamonia, it could expand with increased fluctuation.

The Department of Natural Resources manages the aquatic plants in Lake Iamonia. This effort includes mechanical and herbicidal control. Boat trails are maintained using mechanical harvesting. Waterhyacinths, however, require periodic herbicide treatments. The floating waterhyacinth is capable of rapid expansion and is well-established in Lake Iamonia. Maintenance control using herbicides assures that only a small population of waterhyacinth will exist. Because it is one of the most invasive aquatic plants in the world, the Department of Natural Resources must prevent establishment of large populations with the use of herbicides.

Table 2. The Aquatic Plants of Lake Iamonia

Scientific Name	Common Name	Plant Acres
Bacopa caroliniana	Lemon Bacopa	15.0
Bidens spp.	Marsh Beggar-tick	40.0
Brasenia schreberi	Water-shield	800.0
Cabomba caroliniana	Fanwort	1500.0
Cephalanthus occidentalis	Buttonbush	50.0
Decodon verticillatus	Water-willow	45.0
Egeria densa	Brazilian elodea	0.1
Eichhornia crassipes	Waterhyacinth	0.1
Eleocharis	Slender Spikerush	1.5
Eleocharis interstincta	Spikerush	15.0
Hydrilla verticillata	Hydrilla	0.1
Limnobium spongia	Frog's-bit	60.0
Ludwigia spp.	Water primrose	30.0
Nelumbo lutea	American Lotus	50.0
Nuphar luteum	Spatterdock	60.0
Nymphaea odorata	Fragrant Waterlily	4000.0
Nymphoides aquatica	Banana-lily	15.0
Panicum hemitomon	Maidencane	40.0
Panicum repens	Torpedograss	1.0
Polygonum sp.	Smartweed	10.0
Pontederia cordata	Pickerelweed	15.0
Potamogeton pulcher	Pondweed	0.1
Rhynchospora spp.	Beak-rush	40.0
Sagittaria lancifolia	Duck-potato	5.0
Sagittaria latifolia	Arrowhead	0.2
Scirpus sp.	Bulrush	10.0
Utricularia foliosa	Flat-stemmed Bladderwort	35.0
Utricularia purpurea	Purple Bladderwort	950.0

FISHERIES

The rather limited quality of the fisheries of Lake Iamonia is a reflection of this lake's dense vegetation, water level stabilization, and modest nutrient concentrations. Dense vegetation interferes with the feeding of larger sportfish, and water level stabilization tends to reduce the quality of sportfish spawning habitat. According to blocknet samples conducted in October 1982, the standing crop of all 21 fish species found in Lake Iamonia was only 31.4 lbs/acre (Young and Crew, 1983). Golden shiners (Notemigonus crysoleucas) represented 53% of the fish collected by number; by weight, the most abundant species was the lake chubsucker (Erimyzon sucetta) at 24.6%, followed by the spotted gar (Lepistosteus oculatus) at 16.3%. The weight of harvestable sportfish was only 12.5 lbs/acre with the chain pickerel (Esox niger) as the dominant predator sportfish by weight and number. The harvestable largemouth bass (Micropterus salmoides) comprised 3.2 lbs/acre with an average weight of 1.3 lbs. Warmouth (Lepomis gulosus) was the most common panfish by number, but bluegill (Lepomis macrochirus) dominated by weight. The total harvestable panfish population was 5.1 lbs/acre. Because fish biomass is low, the sportfisheries value of Lake Iamonia could be characterized as one of low quality.

Water level fluctuation can effectively rehabilitate a lake's fisheries resources (Wegener and Williams, 1974). A more balanced sportfish population results from the concentration of forage fish with predatory fish during periods of low water. Excellent spawning habitat becomes available upon reflooding because of the compaction and mineralization of the exposed, organic substrate. Some indication of this response in Lake Iamonia may be apparent in change in the fisheries population from 1977 to 1982 in reaction to the construction and operation of a drawdown structure at the sinkhole dam and the removal of a concrete and sheet steel dam along Meridian Road. A comparison of 1982 blocknet data with that of 1977 indicates a large increase in the weight and number of harvestable sportfish (Table 3). Further efforts to restore the natural hydrological regime to Lake Iamonia should improve the quality of its sportfisheries.

Table 3. Comparison of 1977 and 1982 Lake Iamonia fish population data expressed in averages per acre

Parameter	1977	1982	% Change
Standing crop	17.10 lbs.	31.37 lbs.	+83
Total numbers	215.00	965.50	+349
No. harvestable sportfish	8.75	13.50	+54
Wt. harvestable sportfish	5.19 lbs.	12.45 lbs.	+140
No. largemouth bass	8.75	5.50	-37
Wt. largemouth bass	0.07 lbs.	3.29 lbs.	+4600
No. harvestable largemouth bass	-0-	2.50	—
Wt. harvestable largemouth bass	-0- lbs.	3.17 lbs.	—
No. panfish*	66.00	118.00	+79
Wt. panfish	3.41 lbs.	5.89 lbs.	+73
No. harvestable panfish	7.50	8.00	+7
Wt. harvestable panfish	2.75 lbs.	5.12 lbs.	+86
No. sportfish	81.50	148.50	+82
Wt. sportfish	6.02 lbs.	13.89 lbs.	+131
No. nonsportfish	133.50	817.00	+512
Wt. nonsportfish	11.08 lbs.	17.48 lbs.	+58

*Black crappie, bluegill, redear sunfish, warmouth and round flier

WATERFOWL

Waterfowl hunters have been integral in the preservation of most of the large marsh complexes remaining in North America (Good et al., 1978). Likewise, protection and enhancement of waterfowl habitat in Lake Iamonia is a strong public concern. Lake Iamonia provides waterfowl habitat of regional importance as well as significant recreational opportunities for hunting and viewing waterfowl.

Periodic dewatering (drawdown) effectively maintains high productivity in marsh habitats and occurs naturally as a result of drought in wetland systems unaltered by humans. Drawdowns stimulate seed germination of many plant species typical of moist-soil and shallow marsh conditions. The resulting stands of emergent vegetation provide cover and food for wood ducks (Aix sponsa) and other dabbling ducks as these areas gradually become shallowly inundated. Preferred feeding depths range from 3 to 10 inches for dabbling ducks and up to 1.5 feet or more for ring-necked ducks (Aythha collaris) and other diving ducks. Through time and as flooding continues, plant species composition gradually shifts to a larger proportion of floating leaved plants, such as fragrant white water lily and water-shield. These species are abundant in Lake Iamonia and are the primary foods of ring-necked ducks using North Florida lakes. Ring-necked ducks usually are the most abundant duck species on Lake Iamonia during winter; populations on the lake in January average 1,090 (FGFWFC file data, 1980-1989).

In addition to providing habitat for wintering waterfowl, Lake Iamonia also provides important habitat for resident wood ducks throughout the year. Approximately 100 nest boxes are currently available for wood duck use on the lake. Over 60 nests were monitored in 1990. Natural tree cavities are also present on the lake.

ALLIGATORS

The American alligator (Alligator mississippiensis) does well in stabilized systems. The protection given this species since 1962 and the excellent habitat of Lake Iamonia have allowed the present population to reach approximately 1,000 alligators. In 1984, an alligator harvest study was initiated by the Game and Fresh Water Fish Commission with the objectives of developing a demographic profile of the Lake Iamonia alligator population, assessing the impact of selective harvesting, and refining guidelines for hunts on public wetlands. A harvest of 15 percent of the estimated population of alligators exceeding four feet in length was implemented. The harvest from 1984-1989 ranged from 43 to 80 alligators. The harvests for 1987 and 1988 were 43 and 58, with total economic value of $16,500 and $27,280, respectively.

Extended drawdowns on Lake Iamonia may have a negative effect on the alligator population. If aquatic habitat is reduced to a few scattered holes upon complete dewatering, the alligator population will be subjected to stress and cannibalism. Stabilized water levels during the nesting season (mid-June through September) are best for the alligator population.

OTHER WILDLIFE

The structure of an emergent wetland is a product of basin morphology and water regime (Good et al., 1978). The resultant pattern in the plant community strongly influences animal populations. Furthermore, the particular habitat structure provided in a certain part of a marsh, e.g., a stand of full robust emergents, is often more important in influencing animal use than the taxonomy of the plants themselves. Certain plant species however, are more important than others to wildlife because of their food production in the form of seeds, nuts, fleshy fruits or succulent leaves. Habitat heterogeneity is the second major factor influencing wildlife species richness. Wildlife species are most attracted to marsh complexes which include numerous islands and pools interspersed in stands of emersed vegetation.

The restoration of Lake Iamonia from a somewhat stabilized aquatic bed to an intermittently exposed emergent wetland should have a positive impact on most wildlife. In general, a marsh with a dynamic water level will be much more productive in terms of species richness than a stable system. Many species, especially birds, are strongly attracted to marshes because they provide nesting, resting, and feeding sites, as well as protection from predators (Good and Whigham, 1978). Wading birds, which are highly adapted to shallow aquatic habitats, should particularly benefit from water level fluctuation on Lake Iamonia. Since 1930, there has been a major decline in wading birds in Florida resulting from the destruction of marshes or the alteration of their hydrology (Pritchard, 1978). The wood stork (Mycteria americana) has been the most adversely affected wading species. Because of its specialized "grope-feeding" technique, the wood stork requires a greater concentration of fish than other waders. Such high concentrations of small fish can be found in the pools remaining during a drawdown. Shorebirds typically feed on invertebrates in moist organic substrates, especially at the edges of receding water. Drawdowns lasting from mid-winter through spring and fall migrations should attract and provide habitat for shorebirds.

Another group of non-game animals that should particularly benefit from water level fluctuation are the small mammals. An example is the round-tailed muskrat (Neofiber alleni), designated a "species of special concern". The round-tailed muskrat's preferred habitat is a maidencane marsh with a soft substrate and water depths not exceeding 20". A much more common rodent, the marsh rice rat (Oryzomys palustris), also should become quite numerous in Lake Iamonia

during periods of low water. This prolific species will in turn provide an abundant food supply for many predators, such as hawks and owls. In summary, restoration of a more fluctuating water level regime should have a positive impact on overall wildlife species diversity in Lake Iamonia.

METHODS

The Lake Iamonia Task Force was convened on April 12, 1989 at the request of the Leon County Board of Commissioners. This diverse group of concerned citizens, officials, and technical experts shared a common goal: the revitalization of Lake Iamonia. However, it was clear from the onset that a logical, step-by-step method of defining Lake Iamonia's problems and determining solutions was critical. Therefore, the following, systematic approach was implemented, using guidelines from the U.S. Environmental Protection Agency's Lake and Reservoir Restoration Guidance Manual (Moore and Thorton, 1988).

THE LAKE MANAGEMENT PROCESS

1. Form representative group
2. List Problems
3. Refine the problem statement
4. Collect all pertinent information
5. Describe lake and watershed
6. List possible solutions
7. Create "Lake Management Evaluation Matrix"
8. Refine list of solutions
9. Write draft of management plan
10. Seek broad review of draft
11. Conduct a public hearing
12. Write a final management plan
13. Acquire funding
14. Implement management plan
15. Monitor and document results

One of the first tasks of the group was to identify the problems of the lake and to refine those into a concise "problem statement". The key to developing a consensus on Lake Iamonia's problems was listening to each member's perception of what was wrong with the lake without jumping ahead into a discussion of solutions. It was not until our fourth meeting that the following problem statement emerged and was unanimously approved:

"Previous management practices, especially water-level stabilization and changes in land use, have led to the overabundance of aquatic plants and the accumulation of organic matter and sediment in Lake Iamonia which impede recreational usage and threaten its fish, wildlife, and ecosystem integrity."

The next tasks involved the collection of all available information about Lake Iamonia and its consolidation into a written description of the lake and its watershed. Each task force member provided copies of information in his or her possession related to Lake Iamonia. This information was entered into the library at the Northwest Florida Water Management District. Consolidating this information at a single location facilitated its review. From this information, the preceding description of Lake Iamonia's history, hydrology, basin, water quality, aquatic plants, fisheries, and wildlife was developed.

The next step in the lake management process was to list the possible solutions to the problems of Lake Iamonia. In listing solutions, the most important principle was to encourage all ideas, no matter how spontaneous or unrefined, in order to enhance creativity. Nine general topics regarding management options were developed after reviewing the problem statement:

- improve water level fluctuations,
- control aquatic plants,
- reduce organic sediments,
- improve public access,
- moderate development,
- monitor environmental changes,
- create a public information and interpretation program,
- preserve the islands, and
- treat stormwater.

A discussion of each of these major topics follows.

MANAGEMENT ALTERNATIVES

IMPROVE WATER LEVEL FLUCTUATION

Returning a more natural, dynamic, water regime to Lake Iamonia is considered the key to its restoration. The spring flooding from the Ochlockonee River determines the upper extremes of the lake's water level. It is the lower extremes that have been altered by man. To enhance the lower extremes, we explored three avenues:

1) **restore the connection of the lake with the Ochlockonee River;**
2) **improve the acceptance rate of the sink; and**
3) **return all portions of the lake to a condition that would allow natural fluctuation.**

A simple method to help restore the connection of the lake and the river would be to remove the obstructions from under the bridges on Meridian Road. These sills (concrete weirs) which are approximately 1.5' in height, act as dams to an elevation of 99.0' NGVD. These dams under the Meridian Road bridges are overtopped by the flood waters of the Ochlockonee River approximately 8 times per decade, in the late winter or early spring. Though ineffective in their original purpose of keeping the floods out of Lake Iamonia, these dams have been highly effective in preventing much of the floodwater from receding back to the Ochlockonee River. The weir under the northern bridge is in disrepair, while the weir under the southern bridge is intact. By removing a section of the cracked, concrete weir from under the northern bridge, the artificial impoundment of Lake Iamonia would be ended, and any natural drawdowns would be given a 1.5' "head start".

Even if the connection between Lake Iamonia and the Ochlockonee River were partially restored by removing part of the Meridian Road dam, a major obstruction would remain. Eighty years of water level stabilization have allowed the accumulation of a thick layer of organic sediment which impedes the flow of water from the lake to the river. One option to improve the draining of the lake after flooding is to enhance a 3-mile, boat trail in the western end of the lake using a mechanical device called the "cookie cutter" (Figure 5). The "cookie cutter", built by Lantana Boat Yards is a small pontoon barge, weighing over five tons, with a draft of only fourteen inches of water. Two rotating blades that can be adjusted independently in a vertical direction are mounted on the front of the barge. These blades rotate in opposite directions blowing chopped material to the sides. One pass of the "cookie cutter" could create a trail 9.0' wide and

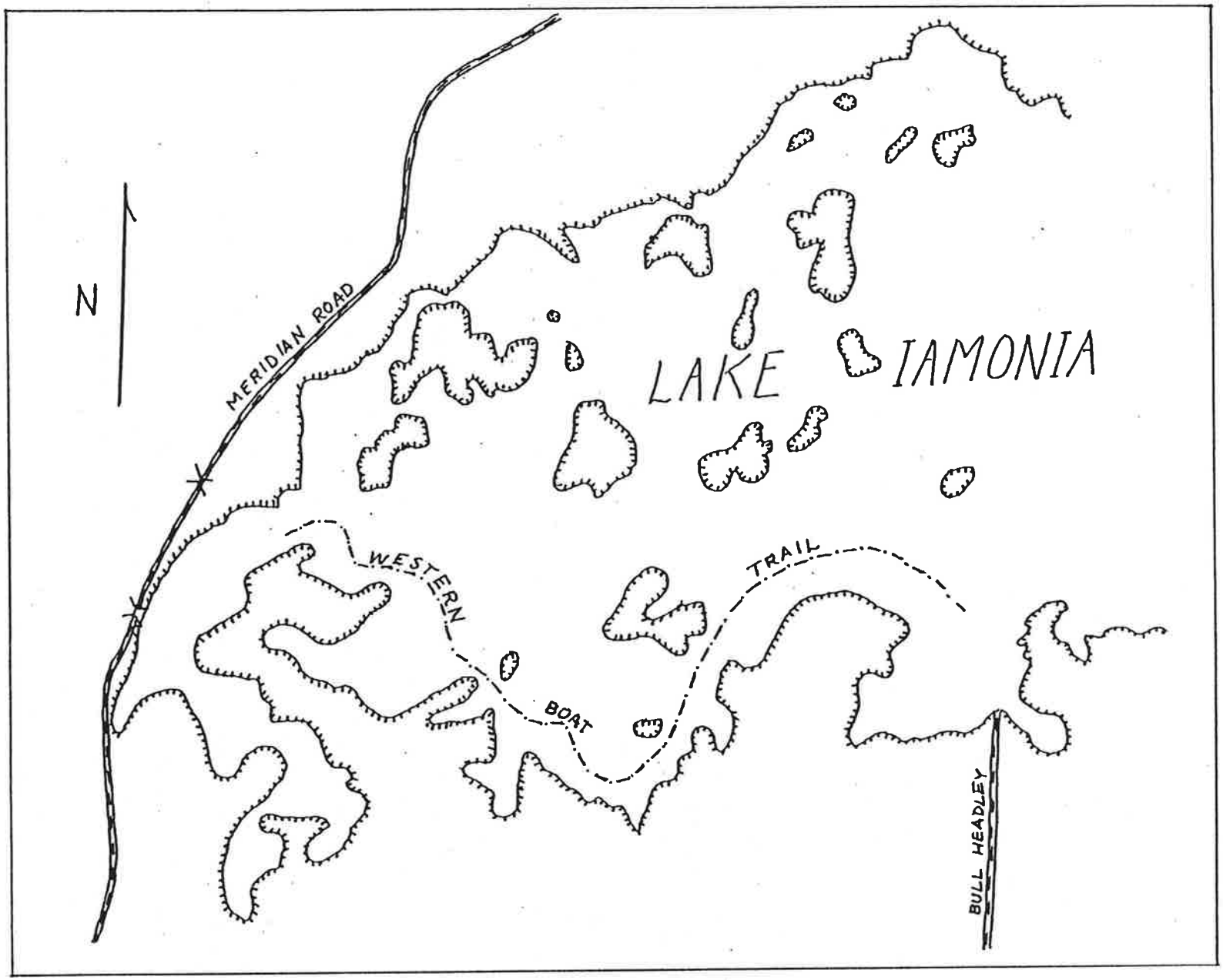


Figure 5. Western Boat Trail on Lake Iamonia.

2.5' deep through dense stands of vegetation, even on floating islands. The greatest advantage of the "cookie cutter" is the reasonable cost, which is estimated to be about $2,000/mile of boat trails. To complete a connection with the slough to the Ochlockonee River at 96' - 97' NGVD it might be necessary to create a short channel from the boat trail to the Meridian Road bridges area. This could be easily accomplished with a backhoe. The flowline through this area was located, surveyed, and mapped for reference and planning purposes. As an alternative to improving the connection of the lake and the river, the use of pumping was considered as a method of circumventing problems related to water obstructions by the dams and the accumulated organic substrate.

In addition to improving the connection of Lake Iamonia to the Ochlockonee River, water level fluctuation could be greatly improved if the acceptance rate of the sink could be increased. A study by the Northwest Florida Water Management District concluded that the acceptance rate of the sink (6.7 - 19.0 acre feet/day) "only accounted for a small percentage of water being lost from the lake basin" (Wagner and Musgrove, 1983). If the acceptance rate of the sink could be elevated and the dam repaired, then excellent water level management capability would result. The Task Force discussed methods of enlarging the conduit by mechanical excavation, explosives, or acid. The Task Force also explored the idea of drilling wells into the sink basin area to improve the connection with the aquifer. Since all of these action are unprecedented and controversial, the Task Force decided that any action to improve the acceptance rate of the sink should be based upon a much more thorough study.

Another technique considered by the Task Force was the removal of a small area of sediment that lies at the mouth of the channel to the control structure at the sink. The concern was that this material may obstruct water from entering the sink and thus prevent an extreme drawdown from the normal lake elevation of 98.6' NGVD. After measuring the bathymetry of the area, the highest elevation of the obstruction was determined to be approximately 91.0' NGVD. The Task Force concluded that a drawdown to 91.0' NGVD was more than sufficient to qualify as an "extreme drawdown". In other words, the sediment in question will not prevent water from flowing into the sink until a drawdown of over 8 1/2' was reached. A six foot drawdown to 93' NGVD would be sufficient to expose 72 percent of the lake bottom. Therefore, the sediment at the mouth of the channel to the sink is not obstructive to an extreme drawdown. In the event this berm was exposed in the future and was determined to be a problem, the removal of the excess sediment in this small area should be an easy and inexpensive task.

A final factor that impedes water level fluctuation in significant portions of Lake Iamonia is the placement of causeways and culvert pipes across Cromartie Arm and Strickland Arm. The dikes are five to six feet in height and each originally had a gated culvert. Built by adjacent landowners before the 1950's, these dikes were designed to maintain water in the arms during droughts and to provide access across the arms. These structures have effectively stabilized Cromartie Arm at or above 98' NGVD and Strickland Arm at or above 94' NGVD. Consistent with water level stabilization, dense aquatic plant growth and floating islands have resulted. The Task Force discussed cooperating with adjacent landowners to completely breach these dikes, replacing them with bridges, or to place culverts at a greater depth in the dikes.

CONTROL AQUATIC PLANTS

Aquatic vegetation is an integral part of the ecosystem of Lake Iamonia. Aquatic plants provide refuge and sustenance to its numerous animals, including the fish and waterfowl prized by sportsmen. In its deliberations, the Task Force recognized the important role of a healthy, native plant community to those animals most favored by recreational users. To address the issue of "the overabundance of aquatic plants" in the problem statement, the Task Force set a goal of creating a more open marsh system with some open water rather than a lake with sparse aquatic vegetation.

Improving water level fluctuation should greatly promote the change of Lake Iamonia to a more open system. However, direct aquatic plant control efforts probably will still be required. Such control efforts can be categorized into three basic techniques: mechanical, herbicidal, and biological. Recognizing the importance of aquatic vegetation, the Task Force concluded that the broad use of herbicides on native plants would be unwise. As an alternative, the mechanical harvesting of vegetation in boat trails was recommended.

The Task Force made a sharp distinction between the control of native and exotic aquatic plants. Certain South American and African plants, such as waterhyacinths (Eichhornia crassipes), Brazilian elodea (Egeria densa), and hydrilla (Hydrilla verticillata), have the propensity for very rapid growth and for the formation of dense monocultures. All three of these plants have been found in Lake Iamonia. Small patches of hydrilla have been located and treated at Bull Headley Landing and Iamonia Landing. Because Brazilian elodea is sensitive to drawdowns, recent low water levels on Lake Iamonia have reduced the range of this species. The waterhyacinth, however, is generally scarce but firmly established along the northern shore from Tall Timbers Research Station eastward and is relatively abundant in the area of the sink. The Lake Iamonia Task Force recommends that the Department of Natural Resources continue its efforts to prevent the encroachment of exotic plants, utilizing herbicides if necessary.

The use of grass carp, an herbivorous, Asian Fish, was discussed in relation to aquatic plant control. Because this fish exhibits strong food preferences, the grass carp is suitable for use in areas with highly preferred target species. Biological control of aquatic vegetation in Lake Iamonia with the voracious grass carp could result in major reductions in vegetation desirable for waterfowl

habitat, such as dollar-bonnet (Brasenia schreberi). Even though the triploid grass carp is sterile, it is very difficult to recapture. Any mistakes on the side of over-stocking would therefore be difficult to remedy and could result in the elimination of submersed plant species for years from Lake Iamonia. Also, containing the grass carp in Lake Iamonia would be impossible during flood periods. Therefore, the grass carp is not suitable for use in Lake Iamonia.

REMOVE ORGANIC SEDIMENTS

Aquatic communities are characterized as highly transitory. Lakes change because of the gradual accumulation of nutrients, increased productivity, and a slow filling of their basins with organic matter and sediments from the watershed. Without human intervention, lakes become marshes and marshes become forests; however, man's activities can speed this process. Through time, people have altered the hydrology of Lake Iamonia and decreased the stability of watershed soils, greatly accelerating the process of lake succession, called eutrophication. Directly addressing "the accumulation of organic matter and sediment in Lake Iamonia" through removal, mentioned in the problem statement, could push back succession from a dense marsh with numerous floating islands to a more open marsh system. The Task Force explored two methods of reducing organic matter in Lake Iamonia:

1) **the use of fire during a drawdown;**
2) **the mechanical removal of organic matter.**

Though fire historically has long been used to control wetland succession, information on the effects of fire in wetlands is sparse (Kirby et al., 1988). Fire is generally recognized as an important tool for recycling the nutrients from relatively unproductive, woody plant tissues and promoting the dominance of herbaceous species. Fire can dramatically reduce accumulated organic matter. There is, however, a major complication. A "peat fire" that reaches deep into the organic matter, can produce a large volume of smoke with a high particle content. Problems related to the production of a dense smoke from peat fires could be substantial. A major concern is the reduction of visibility on highways, possibly resulting traffic accidents. Compounding the problem is the fact that extinguishing a fire in deep organic soils could be very difficult, if not impossible.

Problems inherent in peat fires, prompted the Task Force to focus on using fire only to reduce surface organic matter. The objective of reducing accumulated above-ground organics is to achieve as extensive a surface burn as possible while still minimizing the risk of a peat fire. The extent of a surface burn will be determined largely by the depth of the water table below the surface. The lower the water table is, the greater the risk of a peat fire and the probability of achieving an extensive surface burn. Therefore, burning should be attempted when the water table is just below the substrate surface which will reduce risk of peat fire while allowing a fairly extensive surface burn. Moisture in the peat will tend to put the fire out because fire tends to draw moisture up from below the surface.

This phenomenon may also result in a patchy burn. The time when favorable weather conditions and sufficiently low lake levels occur simultaneously is essentially unpredictable and may occur only at intervals of many years. Ideal conditions existed during December and early January of 1991, and Mark Glisson of the Department of Natural Resources volunteered to be the fire manager. However, as part of its permitting process, the Department of Agriculture and Consumer Services Division of Forestry (DOF) insisted upon written approval of the burning plan by the Leon County Sheriff's Department, the Florida Highway Patrol, the Department of Natural Resources, the Florida Game and Fresh Water Fish Commission, Killearn Lakes Homeowner's Association, Tallahassee Fire Department, Leon County Environmental Management, and the Department of Environmental Regulation (Appendix 2). Before the Task Force could meet the requirements of the permitting process, a record rainfall in late January ended the opportunity. From this experience, it is apparent that the mechanism for prescribed burning, including the permit, should be in place prior to the next period of suitable conditions.

Besides burning, another method that directly addresses the accumulated organic matter is mechanical sediment removal. Sediment removal is highly effective in deepening lakes and can be useful to control internal nutrient cycling and macrophyte growth. Problems associated with this technique are high turbidity levels resulting from resuspension of sediments and algae blooms due to the liberation of nutrients. Also, any existing toxic contaminants may be released into the water and benthic fish food organisms can be temporarily eliminated. Overall, case studies indicate that adverse impacts are generally not as severe or long-term as might be expected (Moore and Thorton, 1988).

There are two major sediment removal techniques:

1) **mechanical or hydraulic dredging when the lake is flooded, and**
2) **excavation by bulldozers and scrapers during a drawdown.**

Mechanical dredging with a "clam shell" or dragline bucket is slow and results in an uneven contour and turbid water conditions. The alternative is hydraulic dredging. The most common variation of which is a cutterhead hydraulic pipeline dredge. The cutterhead is a rotating blade device used to loosen sediments at the mouth of a suction pipe. Turbidity is obviously a serious consideration. Most portable cutterhead dredges were designed for moving clay, sand,

and silt, not soft lake sediments which are commonly 40 - 60% organic matter. The "Mud Cat", a dredge designed for lake sediment removal, is capable of removing a slurry containing 30 - 40% solids, nearly twice that of a conventional cutterhead dredge.

The most common sediment removal technique used in lake restoration in Florida is the use of heavy equipment loaders and scrapers during a drawdown. The organic substrate must be very well-dried with no hidden organic "pocket" for earthmoving equipment. Heavy rainfall during the removal process can be a serious problem. Trucking the material is a major expense, so the cost of this technique is closely related to the distance from the lake to the disposal site. Costs for sediment removal have ranged from $2.00 to $3.75 per cubic yard according to Ed Moyer of the Florida Game and Fresh Water Fish Commission. Peat mining is an industry, and the excavated material has a market value depending on its characteristics.

Before sediments are removed, samples should be analyzed for concentrations of nutrients and toxic substances, and a spoil site located, as part of a management plan. Also, dredging activities on lake bottoms, which are considered state lands, require a permit jointly from the Department of Environmental Regulation, the U.S. Army Corps of Engineers, and the Department of Natural Resources. Rule 18-21 of the Board of Trustees states that use of public lands must be for the public good and requires payment of a fee per volume of sediment removed unless the material has no economic value or it is deposited on state land. Peat has a value and consequently fees probably would be assessed if the peat is sold to offset the expense of excavation and hauling.

IMPROVE PUBLIC ACCESS

To gain access to Lake Iamonia, the general public must rely on three boat ramps at Iamonia Landing, Beadel Landing, and Bull Headley Landing. Iamonia Landing, just west of the sink, has a concrete ramp fifty feet long that was recently upgraded through the efforts of the Florida Game and Fresh Water Fish Commission and provides excellent access at even low water levels. Beadel Landing, an unimproved, sandy-clay ramp 2.5 miles west of Iamonia Landing, provides poor access during periods of low water. Bull Headley Landing, the only boat ramp on the southern shore, is concrete, about 40' long, and in good condition. Access to the lake is difficult when water levels are below 96' NGVD.

Because the Task Force seeks to restore more water level fluctuation, concern was expressed regarding the restriction of public access to the lake during periods of low water. To encourage the public's continued use of the lake, the Task Force discussed improving Lake Iamonia's boat ramps to permit low water access. Possible funding sources include Leon County, the Boating Improvement Trust Fund administered by the Department of Natural Resources, and the Wallop-Breaux Boat Ramp Program administered by the Game and Fresh Water Fish Commission.

The Task Force also discussed increasing the number of boat ramps on Lake Iamonia. A potential site for an additional ramp is Tall Timbers. Also, the ramp at Beadel Landing could be upgraded. However, the construction of additional concrete boat ramps, costing from $40,000 to $100,000 each, does not seem warranted at this time.

REGULATE UPLAND DEVELOPMENT

Recent growth trends in the vicinity of Lake Iamonia indicate the continuation of strong development pressure in Leon County's northeastern quadrant. Of particular note in the Lake Iamonia area is the progression toward completion of the massive Killearn Lakes development and the resulting influence on other residential and commercial activity. Plans to create a commercial activities center at the intersections of Bannerman Road, Bradfordville Road, and Thomasville Highway (U.S. 319) coincide with maturing development within the southern Lake Iamonia watershed. A citizens panel appointed by the County Commission has developed a land use and management plan for this area. This plan places a high premium on preserving existing environmental quality and is entirely consistent with the findings and recommendations of this report. Transportation improvements are in the design stages for both the Bradfordville intersection and the associated Thomasville Highway corridor. Because future urban-level development of this area will have profound implications for Lake Iamonia's future, extra care must be taken not to repeat the mistakes of Lake Jackson (Megginnis Arm) and Lake Lafayette (Upper Basin).

There are environmental constraints for development in the Iamonia watershed and a continuation of the development trend in the southern portion of the basin is a serious threat to the quality of Lake Iamonia. Immediate and decisive action is needed, both in planning and land use regulation, to ensure that densities, intensities, and concentrations of new growth are held at light to moderate levels.

The Task Force's strategy to strengthen regulations protecting Lake Iamonia involves assisting the basin land use policy-making to maintain suitable development densities and pressing for the implementation of special standards for new development in the basin to protect sensitive, surface water features. Continuation of the Task Force as a interagency technical coordinating group could facilitate government protection of the watershed, as well as the implementation of the other aspects of the Task Force's Plan.

MONITOR ENVIRONMENTAL CHANGES

The greatest deficiency in lake management nationwide is the lack of monitoring of environmental changes resulting from restoration projects (Moore and Thorton, 1988). Long term monitoring of water quality and biological parameters can identify trends and detect problems as they develop. Such monitoring is also one of the most cost-effective activities of any lake management program. The cost of a sufficient monitoring effort is, however, significant. The amount of money required for environmental monitoring is related to the number of parameters, the number of monitoring sites, and the frequency of sampling. Public agencies participating in the Task Force could perform portions of the monitoring effort, such as studies of fisheries, waterfowl, and aquatic plant populations. Adequately monitoring the water quality of Lake Iamonia, however, will likely require special funding.

Several sources of funds exist for research and monitoring projects which qualify as beneficial to the protection and conservation of lakes and their watersheds. The Florida Department of Environmental Regulation is responsible for the administration of funds and the management of several research and monitoring programs identified in the Clean Water Act, as amended in 1987, including the Clean Lakes, Nonpoint Source Management and Water Quality Management Planning Programs. The research and monitoring activities funded through these programs include investigating water quality conditions, identifying potential or existing nonpoint pollution sources, and restoring the quality of a lake. The Northwest Florida Water Management District, through its administration of the Surface Water Improvement and Management Act (SWIM) program, is also a potential source of assistance for research and monitoring activities on Lake Iamonia. The STAR (Service Through the Application of Research) program administered by the Florida Institute of Government, is an applied research grant program that is a possible source of funds. Research from the program requires a cooperative effort of a state university, a unit of state or local government and the Florida Institute of Government. STAR grant funding requires participating governmental entities to identify and describe significant problems and research needs. Funds for the STAR project like other funding sources are generally available annually on a competitive basis. The Florida Lake Watch program, conducted through the University of Florida, provides another possible means of monitoring Lake Iamonia's water quality. The program operates through volunteers who collect water quality measurements and provide samples to the university for analysis. The information collected is processed by the university and is available to the Task Force and the public.

CREATE A PUBLIC INFORMATION AND INTERPRETATION PROGRAM

A public information and interpretation program for Lake Iamonia would help citizens appreciate the values and recognize the problems of Lake Iamonia. Better understanding of the lake area could result in behavior changes which would benefit rehabilitation and maintenance of this aquatic ecosystem. Because the greatest benefits of environmental education is achieved by teaching children, the program should be designed for late elementary through high school students. A teaching staff for the aquatic ecology program would be in-service-trained teachers and professional and volunteer specialists, with agencies such as DNR, DER, GFWFC, and the NWFWMD, the local universities, and private entities such as Tall Timbers, Native Plants Society and other conservation organizations cooperating. This ambitious program could include classroom education at a station on the lake, as well as on-site, hands-on experiences such as:

- water quality testing and interpretation of the significance of the results as related to plants, animals, and humans,

- identification and understanding of plants and animals in and around the lake, including their life cycles and function in the ecosystem,

- the significance of native and exotic plants and animals,

- the hydrology/geology of the lake and its basin and the differences from other lake systems,

- the water and nutrient cycles and how they affect the lake,

- ways to protect this and other lakes, as a young person and, later, as an adult

- the wise and careful use of lakes for recreational and conservation purposes, and

- understanding of the inter-relatedness of the water, plants and animals, humans, and the land in the lake basin.

In addition to a formal education program for students, numerous formal and informal opportunities exist outside of school. These could include:

- annual short courses about lake ecology, hydrology, and geology, in cooperation with local adult education programs,

- ranger- or volunteer-led nature tours by canoes or boats powered by small outboard motors,

- use of public print and visual media to interpret the lake,

- technical articles, written for easy understanding, published in the newsletters of the homeowners associations in the lake basin,

- nature and environmental pamphlets distributed to small-craft tour participants, students, and other interested parties,

- educational displays at lake access points encouraging boat and hunting safety, pack-it-in/pack-it-out garbage disposal, and aquatic plant removal from boat trailers, and

- development of one or more of the islands as a nature observation station.

PRESERVE THE ISLANDS

The Task Force discussed methods to protect the wild characteristics of Lake Iamonia from future development. Of particular concern was the preservation of the islands. Means of preserving the islands and shoreline include voluntary sale,conservation easements, and eminent domain. The Department of Natural Resources, the Northwest Florida Water Management District and Leon County have authority to buy property. Each of these governmental bodies has funding limitations based on specific priorities. Each may acquire property from a willing seller. Although each can exercise eminent domain authority, stringent requirements must be met. Private property owners are often reluctant to transfer their property to government entities because public property is generally open to widespread use. Concern about the resulting damage can be a serious impediment to voluntary sale.

An alternative to purchase by government is purchase by a private conservation group. Various private entities, such as the Nature Conservancy, purchase private lands in order to preserve them in a natural state. Sellers can realize federal income tax breaks through sale to one of these entities. Because the lands are held by the non-profit entity and are subject to terms of sale and purchase, which can include restrictions on the land's use, a seller's concerns about widespread use or abuse by the public can be alleviated. Moreover, the lands can remain on the tax roles, albeit at a reduce value. Private owners can opt to impose a statutory conservation easement on their property. The easement is conveyed to a governmental body or charitable organization in perpetuity, although it may be released. The property remains on the tax roles at a low value. The seller retains use and ownership of the land upon which the easement is imposed to the extent use is not inconsistent with or prohibited by the easement. Moreover, the public will not have use of the property unless use by it is authorized in the easement.

The success of any preservation initiative on Lake Iamonia is likely to be dependent on its acceptance by private property owners. Owners willing to sell or donate their island property would make lake preservation projects possible. Acceptance of such a program will only come through proper public relations and education to boost the landowner's and the public's concern for the preservation of the islands in Lake Iamonia. While sellers can place constraints on use to which a purchaser must adhere, the preferred use for lands owned by public entities involves public access. Therefore, true preservation would more likely result from the purchase of the islands by a private conservation organization.

TREAT STORMWATER

Stormwater is the water that flows over the surface of the land during and after a rainfall event. In a natural watershed, stormwater is relatively clean and its volume small. Increases in the density of development in a watershed cause a decline in stormwater quality. This is because stormwater flowing over impervious, urban areas that were altered for the development of roads, parking lots, residential areas, and businesses, transports various pollutants (e.g. oil, grease, lawn fertilizers, metals) that accumulate on the landscape. Stormwater flowing over pervious, non-urban land surfaces that have been altered for agriculture, silviculture, or mining operations also accumulate pollutants (e.g. sediment, organic matter, nutrients, toxins) associated with these lands. In Florida, water from altered watersheds contributes almost all of the sedimentation to surface water. Stormwater also contributes concentrations of nutrients equal to waste water and nine times the oxygen demanding substances of all waste water discharges in Florida (Livingston, 1989).

Since land use determines the quality and quantity of stormwater runoff and since the watershed of Lake Iamonia faces increase alteration, it is necessary that the Lake Iamonia Management Plan consider stormwater management. Any future land alteration activities within the Lake Iamonia watershed should include a stormwater management plan that, at a very minimum, meets the requirements of Florida Administrative Code 17-25, Regulation of Stormwater Discharge. In addition, alteration of stormwater peak discharges and volume controls should be included in the stormwater management plan to prevent flooding in accordance with Leon County regulations. Finally, the restoration and preservation of Lake Iamonia may also require, as part of a watershed plan, the modification of older stormwater (drainage) systems to reduce the pollutant load that they discharge to the lake. These actions should be coordinated with Leon County's new stormwater utility program.

EVALUATION OF MANAGEMENT ALTERNATIVES

The Task Force created an outline of the proposed methods to improve Lake Iamonia (Table 4). An evaluation matrix was prepared using techniques found in the EPA's Lake and Reservoir Guidance Manual (Table 5). In this matrix, the seven parameters that were evaluated for each option were effectiveness, longevity, confidence, applicability, negative impacts, capital cost, and operation/maintenance costs of each option. Determinations were subjective and based upon a consensus of the Task Force. Once the matrix was completed, the various options were ranked according to a total score that encompassed all evaluation parameters (Table 6). The following management plan was prepared from options ranking in the upper three-quarters of the ranked list (Table 6).

Table 4. Management Alternatives

I. **Improve Water Level Fluctuation**
   - A. Enhance connection with Ochlockonee River
     1. Remove obstructions under bridges
     2. Use "Cookie Cutter" on western Boat Trail
     3. Pump water into Ochlockonee River
     4. Use heavy equipment on western end to create channel from boat trail to bridges
   - B. Improve Acceptance Rate of Sink
     1. Enlarge conduit in sink
     2. Leave sink gates open
     3. Drill wells in sink area
     4. Improve entrance to sink
     5. Close sink gates
   - C. Remove culverts and deepen channels to "arms"

II. **Control Aquatic Plants**
   - A. Prevent establishment of hydrilla using herbicides
   - B. Treat waterhyacinth with herbicides
   - C. Mechanically harvest boat trails
   - D. Introduce grass carp to control plants
   - E. Use herbicides on native plants

III. **Reduce Organic Matter in Lake**
   - A. Use fire to reduce surface organic matter
   - B. Remove organic matter mechanically

IV. **Improve Public Access**
   - A. Improve boat ramps for low water usage
   - B. Increase number of boat ramps

V. **Government Action**
   - A. Strengthen regulations protecting watershed
   - B. Create an interagency administrative component
   - C. Begin public information/education program
   - D. Fund research and monitoring program
   - E. Arrange for public acquisition and management of island
   - F. Treat stormwater from all new development
   - G. Establish "Special Taxing District"

Table 5. Lake Management Evaluation Matrix for Lake Iamonia.

ACTIONS	EFFECTIVENESS	LONGEVITY	CONFIDENCE	APPLICABILITY	POTENTIAL NEGATIVE IMPACTS	CAPITAL COST	O & M COST	TOTAL
Leave sink gates open	2	4	2	4	4	4	4	24
Close the gates	1	1	1	1	1	4	1	10
Improve entrance to sink	2	3	1	1	2	3	3	15
Enlarge conduit in sink	4	4	1	4	4	4	4	25
Remove culverts and deepen connections to "arms"	4	3	3	4	4	3	4	25
Remove obstructions under Meridian Road bridges	3	4	3	4	3	3	4	24
Drill wells for dewatering (in sink area)	4	4	4	4	2	2	2	22
Pump into Ochlockonee River	4	2	4	4	4	1	1	20
Mechanically harvest boat trails	4	2	4	4	3	1	2	20
Use cookie cutter on boat trails at western end	3	2	2	3	3	4	3	20
Use dragline on boat trails at western end	4	4	3	3	1	1	3	19
Treat water hyacinths with herbicides	4	2	4	4	3	3	2	22
Prevent establishment of hydrilla with herbicides	4	4	4	4	3	3	3	25
Use herbicides on native plants	1	1	1	1	1	1	1	7
Strengthen regulations protecting watershed	4	4	4	4	3	4	4	27
Introduce grass carp to control plants	2	3	2	1	1	1	1	11
Arrange public acquisition of islands	3	4	2	2	4	2	4	21
Treat stormwater	3	3	2	3	2	2	2	17
Establish "Special Taxing District" for watershed	3	4	3	1	1	4	1	17
Mechanically remove organic matter	4	4	4	2	1	1	4	20
Utilize fire to reduce surface organic matter	4	2	4	4	2	4	4	24
Improve boatramps for low water access	4	4	4	3	2	2	3	22
Increase the number of boat ramps	2	4	2	1	2	1	2	14
Create an interagency administrative component	4	3	3	4	4	4	4	26
Begin public education/information program	4	3	4	4	4	4	3	26
Fund a Lake Iamonia research and monitoring program	4	4	4	4	3	3	2	24

Legend: 4 = Excellent 3 = Good 2 = Fair 1 = Poor

Table 6. Ranking of Options

Score	
27	Strengthen regulation protecting watershed
26	Create an interagency administrative component
26	Begin public education/information program
25	Remove culverts and deepen channels to "arms"
25	Study the feasibility of enlarging conduit in sink
25	Prevent establishment of hydrilla with herbicides
24	Leave sink gates open
24	Utilize fire to reduce surface organic matter
24	Remove obstructions under the bridges
24	Fund a research and monitoring program
22	Study the feasibility of drilling wells in sink area for dewatering
22	Treat waterhyacinth with herbicides
22	Improve boat ramps for low water access
21	Arrange for the preservation of islands
20	Use "cookie-cutter" on boat trails
20	Mechanically harvest boat trails
20	Pump water into the Ochlockonee River
20	Mechanically remove organic matter
19	Use heavy equipment on western boat trails
17	Treat stormwater from all new development
17	Establish a special taxing district
15	Improve entrance to sink
14	Increase number of boat ramps
11	Introduce grass carp to control plants
10	Close sink gates
7	Use herbicides on native plants

MANAGEMENT PLAN

The primary philosophical principle guiding the Lake Iamonia Task Force was that the wild character of the lake should be maintained. Lake Iamonia is and should remain a rather untamed, natural system. This principle encompasses the idea that the natural design of the lake was the best design. If that design is restored and the lake is allowed to function without significant adverse impacts of pollution, exotic flora, and the destruction of its watershed, particularly its islands and shoreline, then a healthy Lake Iamonia will no doubt result. Education is the key to build and maintain a constituency for the protection of Lake Iamonia. To promote and monitor the implementation of this management plan, a continuation of the Lake Iamonia Task Force will be necessary. Our methods have been, in the current vernacular, "pro-active", and our recommendations are specific:

1. Improve water level fluctuation.

- Utilize a device, called a "cookie cutter" to enhance water flow in the western boat trail.
- Employ earthmoving equipment to complete the connection from the western boat trail to the slough leading to the northern Meridian Road Bridge.
- Remove debris under the southern portion of the northern Meridian Road Bridge to reestablish a more natural flow.
- Leave open the control structure at the Iamonia Sink.
- Remove culvert pipes and create channels connecting Stricklands Arm and Cromartie Arm to the main body of the lake or otherwise enhance flow to and from these areas.
- Investigate methods of increasing the ability of Iamonia sink to accept water.

2. Control exotic, aquatic plants.

- Use herbicides to prevent the establishment of the prolific, exotic hydrilla.
- Continue to treat the equally expansive waterhyacinths with herbicides.
- Utilize mechanical harvesting to maintain navigable boat trails.
- Do <u>not</u> use herbicides or grass carp for broad control of native aquatic vegetation, in order to protect waterfowl habitat.

3. Remove organic sediments.

- Use prescribed burning during low-water to reduce surface organic matter.
- Investigate methods and results of mechanically removing organic matter in experimental plots during a drawdown.

4. Improve public access.

- Extend boat ramps to allow boating access during period of low water.

5. Regulate Upland Development.

- Strengthen regulations on development activities within the Lake Iamonia basin and its associated watersheds.
- Implement special development standards for new development in the basin to protect sensitive surface water features.

6. Monitor Environmental Changes.

- Monitor water quality, aquatic plants, fish, and waterfowl on a long term basis.

7. Create a Public Information and Interpretation Program.

- Establish an environmental education program for children and adults to increase understanding of aquatic ecology and to promote the appreciation and protection of Lake Iamonia.

8. Preserve the Islands.

- Arrange for the preservation of the islands and portions of the shoreline of Lake Iamonia via direct purchase by public or conservation-minded private entities or by the creation of conservation easements.

9. Treat Stormwater.

- For new construction in the watershed, require a stormwater management plan that meets or exceeds Florida Administrative Code 17-25, Regulation of Stormwater Discharge, and the Leon County Environmental Management Act.
- Modify present stormwater systems to reduce pollutant loading.

10. Maintain the Lake Iamonia Task Force.

- In order to promote the implementation of this plan, to maintain interagency coordination, to monitor changes in Lake Iamonia, and to properly adjust the lake's management in the future, the Lake Iamonia Task Force should exist indefinitely.

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APPENDIX

Appendix 1.

From the Diary of Henry L. Beadel

Nov. 8, 1934 Left for Lake Iamonia about 4:30 - many cars and trucks loaded with dead and living fish passed on the way. Hundreds of darkies and some whites hauling catfish, suckers, eels, etc. away by every conceivable way of carrying them - sacks, bushels, tubs, strings, etc. Only two pools with water - one near parking place the other at the end of basin - near island.

First pool - Chain gang was seining this pool for the county and hauling the fish to nearby ponds - taking only various species of "brim" - hundreds and hundreds of them. Many suckers and some catfish at this pond but largely brim. Pool about 50 ft. in diameter.

Second pool - Literally alive with fish, hundreds of catfish about 18 inches long, hundreds of suckers, few bass, and hundreds of gars. The fish were so thick that they were bumping each other - in places they formed rafts with just he heads near the surface - pool about 40 feet wide and 75 long. Darkies were hauling tow sacks full of catfish away - hundreds of tons must been taken away as several told me that they have been hauling fish since yesterday morning. First took the bass and brim now the cats. I saw about two dozen eels all told. Hundreds of small fry (?) in schools along shore - very few fish of intermediate size - that is the cats and suckers were all over a foot, all the gars seemed over a foot, up to over three feet. About 75 turtles largely terrapins but several leathernecks. Saw pair of grebes (pied-billed) on this pond.

shore section just a little to west of parking ground burned

Nov. 9, 1934 Got to the lake about 1 p.m. - ponds down just a little lower - first pond - few darkies around catching a few brim, suckers, not much or many fish left.

second pool - turtles still here - floating rafts of dead suckers over about 1/3 of pool - many dead fish up on eastern and southern shores - water alive with gars - seem to be two kinds - narrow nosed and wider nosed - saw about a dozen eels - collected a few small fish and turtles. The later largely terrapins with ridges or furrows running longitudinally on carapace - streaks of yellow on head. Hundreds of small minnows around shore -

darkies keep the gars stirred up - found a few dead jack, bass, on shore. Buzzards sailing around overhead - people probably keep them away - fish starting to smell - darkies still hauling a few away. Saw one osprey around - heard an redshouldered hawk. Crossed over burned area to west of parking place - found over a dozen turtles that had been killed by the fire both terrapins and Trionyx - small, muckyist rivulet running through middle of lake bed. Many turtles just barely able to plough through the muck - freed some that within a few hours would have been imprisoned in the mud. Some places mud drying in huge cracks.

Nov. 10 Visited the lake for about three hours with scouts - Much the same as yesterday - not much life except a few turtles in first pool - second pool still full of gars and turtles. Water about a foot lower

Nov. 17 Visited with Stoddard - hardly any life left in first pool - few turtles. Gars very abundant - largely sharp nosed type - the bowfins come to the top in spurts for air - and have a spot cleared of dead fish by their activities. The gars are laying about of the surface without much activity not lively and vicious as they were last week. H. L. and I took a few of the gars. Lots of turtles - about 200 hundred mostly Chrysonomys but about 20 Trionyx. The pool is getting to stink pretty bad. They little one just above the main one is alive with small gars - the main basin was gone down about two feet since last Sat. Pool number one little life, but the water is not much lower, no small fish living.

Nov. 18 Took Sprunt over to the pool - about the same as yesterday.

Nov. 20 Stoddard and revisited it for more gars for quivers. Found very few of the long nosed living - about fifty of the short nose ones alive and slowly moving about. The greatest difference in the pool is that the bowfins are staying at the top of the water and just laying there though they still have quite some vitality in them. They occasionally thrash about stirring up the water. Stoddard and I estimated that there were at least 1000 bowfins in the pool. About 200 turtles still remain and about 25 of them are large soft shells.

Nov. 25 Bowfins still on top of water and all congregated about the drain from upper pool. The gars in the upper pool about dead - nothing but bowfins and turtles seem to be alive in the main pool - gars all

dead. Water level is down about a foot since the last time - the 1st pool is also going down and only turtles and a few small minnows seem to be alive in it. Hogs and buzzards cleaning up the dead fish rapidly. Saw about ten killdeers.

Dec. 7 Visited the lake with Eloise, Betty and Happy - after absence in the Okeefenokee Swamp. No fish living in the main pool - sure is a dreadful sight - turtles still abundant - 1st pool down until there's only about a foot or two or watery muck - few turtles and many small minnows. Maggots in the fish in main pool. The little drain or pool above the main basin is dry and literally paved with dead fish. The hogs have just about cleaned up all the dead fish on shore - about 200 pipits and 100 killdeers feeding on the areas where the hogs have rooted. A little rain formed a fresh water pool near the neck. A green algae or protozoan is growing heavily over the cracked mud and in the tiny pool near the main basin.

Dec. 8 Spent several hours getting specimens for Emory - We had a cold snap last night which apparently killed many of the maggots in the fish as the water in between the dead rotten fish is one solid mass of maggots. The boat I used had several quarts of them in it and I literally walked on them all afternoon. About 150 turtles are still in the pool - all Chrysonomys - about fifty dead ones are around on the water as well as three Trionyx. The deep little pool is devoid of anything it seems - all the dead fish have apparently sunk - in all the pools the gas is constantly bubbling out.

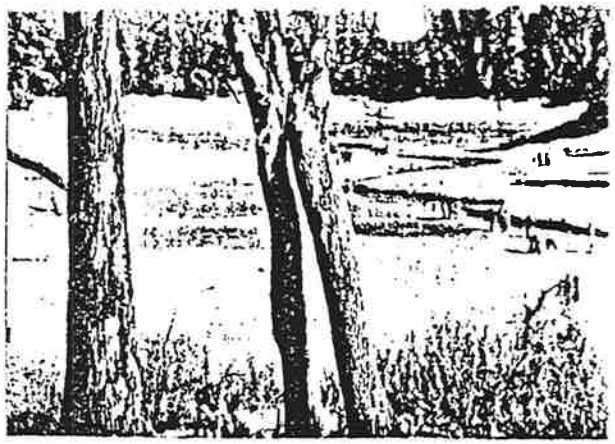
The 1st pool has about a foot and a half of watery mud in which there are about two dozen Trionyx, as well as several hundred small minnows. It also seems as if there are several larger fish in this pool. The hogs have cleaned it up very well around this pool. The pipits (150) and about 200 killdeer are feeding on these areas were the hogs have rooted up the ground.

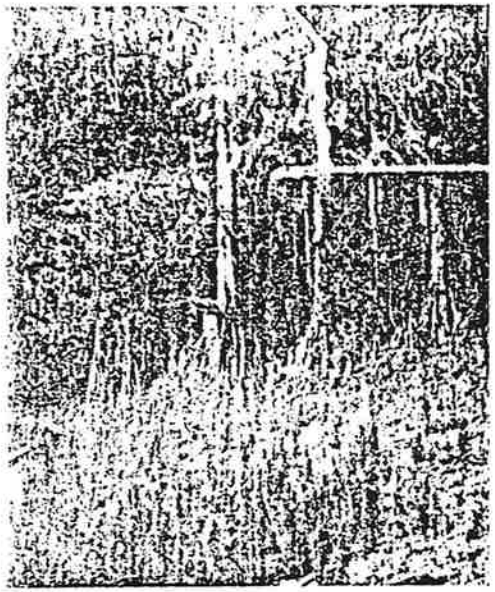
Lake Iamonia

— All It —

Is Back Tether Again

(FEBRUARY 1942)





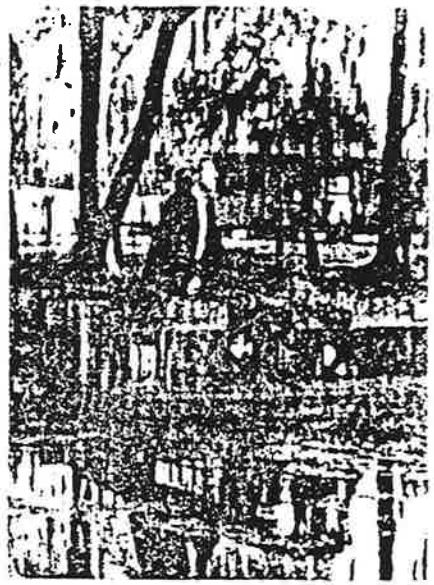
AS MYSTERIOUSLY as things happen in a "who-dun-it" movie, North Florida's weird lake—now you see it, now you don't—is back again in all 100 per cent of its glory.

And a perfectly good, solid, substantial earthen dam, 1150 feet long, 20 feet high, is as invisible as political dissension in war-time America. You know it's there, but it's not obvious.

Yep, Lake Iamonia, in Leon County, has returned again, with the aid of the Ochlocknee River, to claim its own. And the cattle that grazed peacefully on its bottom but a few months ago, had to scramble to safety as the floods descended and the rains came.

It all started this way. Lake Iamonia, one of Leon County's—yes sir, one of North Florida's—favorite fishing and duck-hunting spots, from time immemorial has had the baffling habit of disappearing every now and then. Finally, in 1939, it was believed that man, in the form of the Leon County Commissioners and the State Commission of Game and Fresh Water Fish, had solved the problem, and by erecting a large dam, 1150 feet long, 150 feet broad at the base, 12 feet wide at the top, and 20 feet high, had cut off the part of the lake containing the sink-holes which caused all the trouble, and provided a permanent lake in the remainder of the Iamonia area. The small section of the lake thus left dry furnished fine grazing land for cattle.

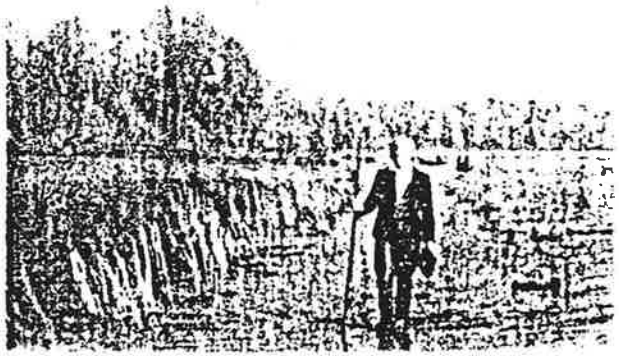
But early this year much water fell during heavy rains, and the usually good-tempered Ochlocknee ran over—ran over into the empty portion of Iamonia—until that lake's surface completely covered the dam, and fish



Appendix 2.

At left above is shown the Basin of Lake Iamonia in December, 1933; and at is the view from the same spot in November, 1934. At left a Tallahassee youngster in 1941 poises long the old springboard above the dry basin; and at right, Dr. Ezda Deviney of the Florida State College faculty sits on the same springboard in January, 1942, water again where it should be; below, left, is the earth dam constructed in 1939 to hold the lake away from basin with the "drain," and below at the right, Dr. walks along the same dam in 1942 to show that the struction didn't mean a dam!

(Upper Photos by State Land Survey; 1942 photos by



skipped merrily over the fence which had been erected to keep them back should the waters rise.

At this time of writing, Lake Iamonia is like the proverbial cup—full and running over. What will happen when next the sink hole yawns and gulps up the water remains to be seen.

Nearly two years ago, FLORIDA GAME AND FISH printed the story of Lake Iamonia under the heading of "Foiled Is Lake Iamonia's Disappearing Act." Major portions of that article are herewith reprinted, together with pictures showing Lake Iamonia before it attracted more than local attention; after the whole lake went dry, after the dam was built, and its present state of fullness. The next set of pictures will probably show deep sea fishermen trolling in Lake Iamonia from the stern of an ocean-going yacht! Who knows?

The May, 1940, story:

Now, however, it is believed that the disappearing act has been foiled, and a trip to Lake Iamonia can be planned with the expectation of finding the lake there when you arrive. Not all of the lake, mind you, but most of it.

An earthen dam, 1150 feet long, 150 feet broad at the base, 12 feet wide at the top, and 20 feet high stands between Lake Iamonia and oblivion. It was erected between January 11 and March 23, 1939, and shows that man can do something with Nature, after all.

Lake Iamonia is about 10 miles long, and from half to three miles wide. Irregular in outline, it has several "fingers," and at the tip of one of these fingers are—or were—deep sinkholes. Sometimes the bottom of these sinkholes seemed "to fall out," and away went the water.

State Geologist Herman Gunter says that these "disappearing" lakes are not unusual where the topography is rolling or hilly. Limestone underlying the ground is worn away by erosion by solution, until overlying soil materials fall into the cavities thus left. Then the depression, or sink-hole, fills with water—and it's a lake. That is, it's a lake until it disappears.

In times of drought the water level of the locality falls—and the lake water apparently disappears, but actually joins the sub-surface streams.

Every now and then an additional sink hole may be formed; old ones may become free of debris and unclogged. Then the water flows out faster than it flows in.

The lake refills when the rainfall is increased or trash puts a stopper in the bathtub-like bowl.

Lake Iamonia is typical of these lakes. Most of its area is shallow and weed-filled, fine for bass and ducks. The deep sinkhole portion was a favorite swimminghole for Florida and Georgia folks.

Records show that it "went out" in 1910, in 1917 and in 1934. Geologists scoff at statements that it "goes out with a roar," and that a marked fence-rail dropped in the disappearing water came up in the St. Johns River, 200 miles away. But it does go.

When it became apparent in December, 1938, that Lake Iamonia, tired anew of this world, was taking its departure, County Commissioners of Leon County determined to isolate the sinkhole portion—to cut off the offending finger, so to speak.

With the assistance of the Commission of Game and Fresh Water Fish, which wanted to save the fish and the fishing, the ducks and duck hunting, the dam was planned and constructed. Now Lake Iamonia, foiled in its plan to go wandering, rests contently on one side of the dam, and on the other side, there's a big, dry hole—some 45 feet deep.

As the water continued to escape from the sinkhole, the fish which remained had to be removed. Conservation Officers of the Commission constantly seined the dropping waters, and removed about 40,000 bass and bream to be replaced in that part of

Continued on Page 14

Florida
GAME AND FISH

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VOL. III FEBRUARY, 1942 NO. 2

LAKE IAMONIA GETS IN NEWS AGAIN

Continued from Page 10

Lake Iamonia which was stable, or in nearby lakes and streams.

Should the waters in Lake Iamonia rise excessively—from heavy rainfall or overflow from the nearby Ochlocknee River, water will flow over and around the dam into the sinkhole. But the fish won't.

Wherever there is a chance for an adventurous fish to attempt such a trip, the same fish will find its way blocked by a fish-fence, through which the water can pass, but the fish can't.

Maybe the diving-board, now 45 feet in the air above a dry pit, will be used again should the sinkhole refill, but there still won't be any fishing in that part of the lake.

All the rest of the lake—about 99 and 44/100 of the total area, is still swell for bass and ducks. You can fish there starting May 20. We hope it will still be there!

STATE OF FLORIDA

FLORIDA DEPARTMENT OF AGRICULTURE & CONSUMER SERVICES

DOYLE CONNER, COMMISSIONER * 3125 CONNER BLVD. TALLAHASSEE 32399-1650

December 13, 1990

Pennington, Wilkinson, Dunlap, Batemond and Camp, P.A.
Attorneys at Law
Post Office Box 13527
Tallahassee, Florida 32317-3527

Dear Byron:

I received your letter requesting necessary procedures to secure a permit to prescribe burn in the area generally defined as the western end of Lake Iamonia.

We applaud your effort to try to prescribe burn this area as we see the reduction in fuel as an assist to our wildfire reduction efforts. Unfortunately, as I am sure you are well aware that any fire of this magnitude close to large populations can cause negative public reaction as well as safety hazard. We, and I am sure yourself, would like to avoid this. Our greatest concern is smoke, which can travel far beyond the confines of a fire. An excellent example was this summer's Okefenokee fire which inundated the residents of Leon County with smoke and caused much concern by the public. We do not question the desire to burn it for ecological reasons, but our agency is concerned that by assisting you in this burn we do not enter into another agency's jurisdictional responsibilities. Therefore, due to the above stated concerns, we ask that the following agencies, groups and associations be contacted and that written permission, when appropriate, be received before prescribed burning authorization is approved by the Division of Forestry.

Department of Environmental Regulations
Department of Natural Resources
Leon County Environmental Management
Tallahassee Fire Department
Leon County Sheriff's Department
Florida Highway Patrol
Florida Game Commission
Killearn Lakes Homeowner's Association (contact person John Folks)
Other affected Homeowner's Associations and adjacent landowners

We would be glad to do presuppression plowing for you if landowners and the appropriate agencies agree and payment is made for our services. Please contact me if you have further questions.

Sincerely,

Larry Wood
District Manager
(904) 488-1871

cc: Mike Long, Chief, Fire Control Bureau
Ray Geiger, Regional Forester
T-3, T-4, T-5, T-15

RED • HILLS
CONSERVATION
ASSOCIATION

Route 1, Box 678
Tallahassee, FL 32312
904/893-4153
904/668-7781 (FAX)

February 6, 1991

Mr. Jess Van Dyke, Biological Scientist III
Bureau of Aquatic Plant Management
Department of Natural Resources
3917 Commonwealth Building
Room 120
Tallahassee, Florida 32399

Dear Jess:

Sorry it has taken me so long to accomplish the task of reviewing and commenting on the Lake Iamonia Management Plan. I also received comments from Sonny Stoddard, who has monitored this lake all of his life. Those comments are attached as well.

The report is thorough and well done. I found several typos but am sure "others" have already noted these.

I think Sonny's comments about returning to normal water fluctuation cycles are the most pertinent. His view is that this crucial factor **plus time** will heal the entire system. Regarding the burning section, I would also recommend being more positive than "discouraged by this ponderous process". Sonny hit the nail on the head; burn as the water goes down and you will have smaller fires with less chance of muck fires. In addition, in the "Basic Prescribed Fire Interagency Course" the point is emphasized that fire in this instance is an ecological necessity to maintain this natural system and its fragile resources, and therefore one must be willing to go to any lengths to accomplish the task. Otherwise, this section reads well. I would emphasize that the exposed bottom must be burned **every single time** the water starts down. Over a period of time, this will show dramatic results.

You and your committee have done an excellent job. Be assured that the Red Hills Conservation Association is ready and willing to assist this committee in its planning and the resulting implementation efforts.

Sincerely yours,

Lane Green
Director

LG/dss

Attachments

Comments from Sonny Stoddard

Re: Lake Iamonia Management Plan

1. The lake is choking to death; strangling as it struggles to breathe.

2. The organics must be oxidized -- but don't mechanically remove the organics -- these organics are the life-blood of the lake. They must oxidized instead of removed.

3. Normal fluctuation of water levels will control the organics. Fire and exposure of the bottom will help cure the organic problem. Fire and exposure of the bottom traditionally occurred with fluctuating water levels.

4. The lake was last dry in 1934/35. It naturally went dry every 8-10 years, **however**, in between these dry periods, various parts of the bottom was dry and exposed with the normal fluctuation of water levels. The lake was **never** completely full, there were always places where the bottom was exposed. These exposed areas were always disturbed either naturally or manually i.e., fire, grazing livestock, harrowing to plant crops, etc.

5. The most important part of the Management Plan is to **let the extra water out.** It must be able to run back in the river freely. It may require forcing it out somehow. There is more water running into the lake than ever before - unnaturally running in from paved roads (U.S. 319 in 1930), improved ditches that carry water, developments around the lake. Therefore, the lake must get rid of more water to balance out the natural fluctuation cycles. The key to management is maintaining this inflow - outflow balance. If this were achieved, the lake would cure itself naturally over time. How long would it take? About the same length of time it has been out of balance --- **50 years!**

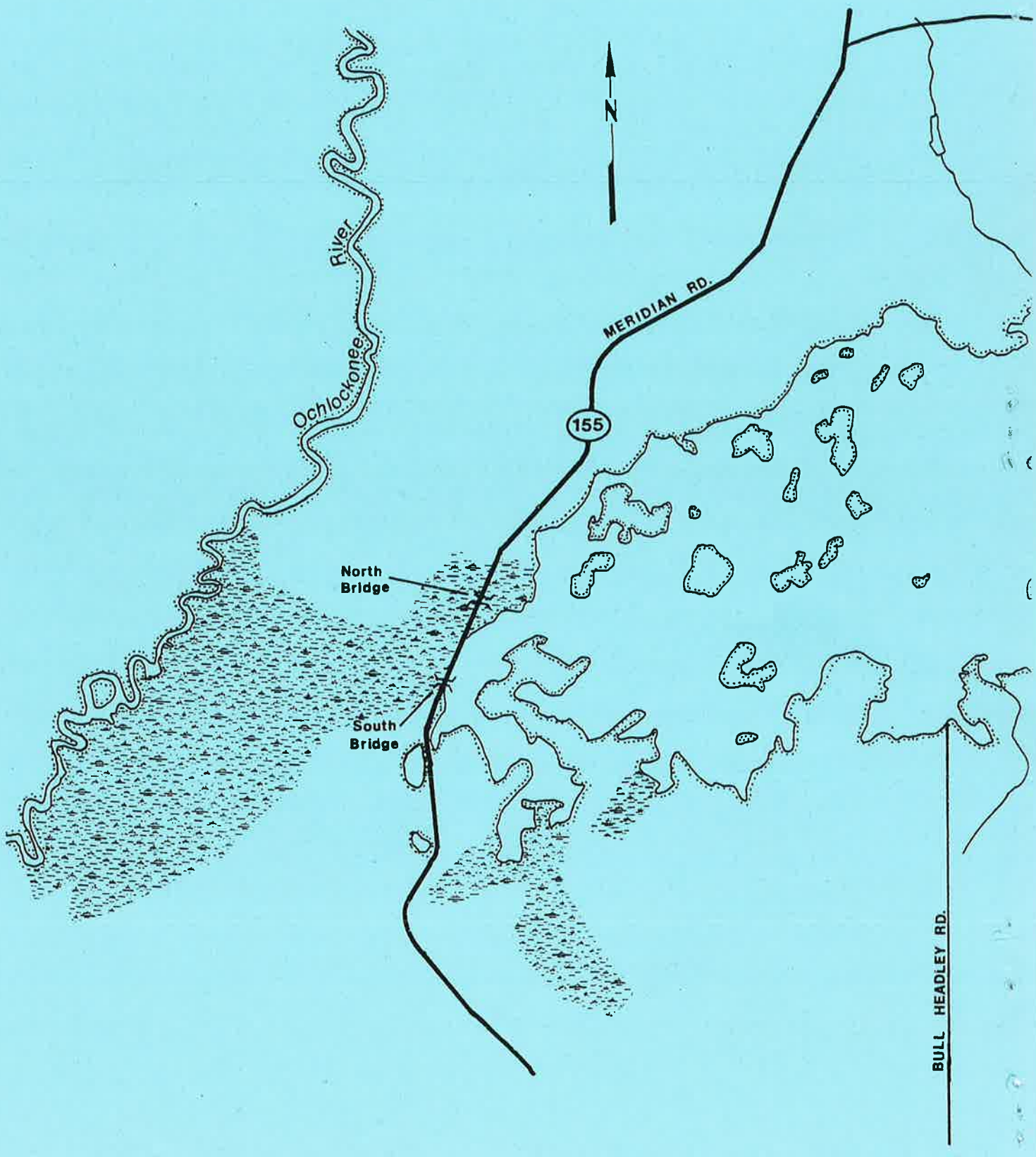
6. The Ochlockonee River has carried a tremendous amount of sediment over time into the lake. Natural levies have been formed in the channels between the lake and river. These may have to be removed to encourage outflow.

7. The basin sink has this same sediment problem. With a natural fluctuation of water levels, the sink will clean itself naturally, with periodic blow outs. As the aquifer level falls, air is trapped between the aquifer and the lake bottom. As the aquifer rises it compresses this trapped air and blows it out through the sink. It may even blow out in another nearby sink if the basin sink is too clogged.

8. There is another smaller sink off the Northern edge of the lake 50 yards from the basin. This sink will also take water and could be used to pump water, to help get water out of the lake, if necessary. Must work out getting water to flow out of the lake in every way possible.

9. Controlling Vegetation - Use herbicides only on exotics. The natural vegetation will be controlled naturally by the normal fluctuation of water levels.

10. Burning - The most important point here is to burn the parts of the bottom exposed by fluctuating water levels **at every opportunity**. That means having everything ready to go when the time is right. Following the lake down with fire. This will mean smaller burns and no muck fire possibilities. After the burn, do something to break up the surface muck so air can penetrate the muck and speed up oxidation. Light harrowing will accomplish this as will feeding hogs on it. The muck has a tendency to seal itself back over, so surface disturbances may have to be frequent to maximum oxidation when the bottom is exposed.


N
Ochlockonee River
MERIDIAN RD.
155
North Bridge
South Bridge
BULL HEADLEY RD.