Pros and Cons of Issues Identified by Citizens and Professionals Regarding the Future Management of Lake Wailes.

Sponsored by:

City of Lake Wales
and
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Introduction

Dear Participant:

LAKE MANAGEMENT is part science and part politics. Science is generally practiced by those individuals called "professionals," although science in some form is also practiced everyday by the lay citizen. Politics is often thought to be practiced solely by elected officials, but politics is also practiced by virtually everyone. Science and politics are prevalent in virtually every form of human interaction and they are how the compromises of life are reached. For many individuals, however, the scientific and political processes are considered to be very different. There are indeed many differences, but there is one commonalty -- people!

The importance of people in lake management rests on the singular fact that all people regardless of whether they are directly involved in the scientific or political processes have opinions. When beginning the formulation of a lake management plan, all opinions must be considered valid. Overtime, as facts become better known, opinions will change. The importance level of individual problems may also change over time, depending on the social, economic and political attitudes of the day. Consequently, any lake management plan must be considered a "living document," just like the constitution of United States.

On January 12, 2002, a representative group of citizens was assembled to advance their concerns (opinions) regarding potential problems at Lake Wailes (see Appendix I). This effort yielded a report listing and prioritizing the following six major issues that the citizens felt where most important to the management of Lake Wailes:

1) Water quality that is good for both fish and people
    —Stormwater—deltas/muck

2) Water levels
    —no water no lake

3) Vegetation

—shoreline

—aquatics

4) Recreation

—boat ramp access

—side walks

—access for swimming

—riparian rights

5) Wildlife Issues

—fish: Mercury

—fish population

—Great Birding Trail: encouraging native bird habitat and food

—alligator numbers

6) Economics and Management Team

—needs a "go" to person

—work with existing lake advisory committee

We subsequently gathered existing data, collected some new data, and assembled in April 2002 scientists and other professionals with direct knowledge of the major issues advanced to discuss the facts as best known.

The document that you are receiving represents a compilation of the available information. We recognize that there is a tremendous amount of reading material. **Please do not be discouraged or frightened by the amount of material**. You have been given a summary of the available information related to each issue. Following this information, some viable options are given for the management of Lake Wailes. On October 5, 2002, you will again be meeting with your fellow citizens to discuss the options and advance your ideas about how to manage Lake Wailes.

You should remember that it is not always possible for science to give absolute answers at a given time, especially considering the large natural variability accompanying most ecological processes involved with lake management. Sometimes scientific answers even take centuries to evolve. Given this uncertainty, you will be trying to provide the best available approaches known at this time. This does not mean that there will not be opposing views regarding the right approach. Your job will be to find out where the compromises exist.

When there are opposing views as to the approach that should be taken, it should be remembered that these concerns could be monitored in the future to determine if they are correct. Lakes are very resilient and corrections in the management plan can be made in the future if need be. Even at this time, there are scientific studies underway to provide better information on certain issues. Do not allow yourself to become trapped in the "Do Nothing" option for fear that you do not have enough information to manage your lake. You will never have all of the information. There are, of course, times when doing nothing is a correct choice. However, it is generally best to consider different views as hypotheses that can be tested in the future. If a particular view is correct then changes in the management plan can be made at a later date. This allows all opinions to remain valid until the facts convince the community that the opinions or concerns are no longer valid. Again, it is extremely important to remember that a lake management plan is a "living document".

Section 1: Who is in Charge Here?

The citizens involved in Phase 1 of developing the Lake Wailes Management Plan prioritized the organization of a management team last in their list of issues. We, however, are addressing this issue first because we felt an organized group needs to shepherd the plan in order for it to work and be effective.

When controversies arise regarding the management of lakes and citizens become intimately involved in the issues, the most frequently asked question is: "Who is in charge here"? This question gets asked because there are a myriad of federal, state, and local public agencies that have statutory responsibilities in the arena of lake management. To the everyday citizen, the interaction among agencies seems to be similar to a giant bowl of spaghetti. There seems to be no beginning and no end, and there certainly seems to be no timely answer to their questions.

The agencies are doing nothing wrong and they do not have a lack of caring. Committed public employees staff the agencies, but the agencies are also following the statutory requirements. Unfortunately, the bureaucracy can lead to intense citizen frustration. Consequently, it is very important for the involved citizen to understand history as it relates to lake management.

Who is in charge here and how did they get in charge? Water played the dominant role in the settlement of the western United States and Florida. Water was a liquid highway for transporting people and goods. At the federal level, involvement in water resource management essentially began with the U.S. Army Corps of Engineers. In the mid-1820s, the U.S. Army Corps of Engineers under the guise of improving national defense began digging canals and deepening river channels. While these efforts were important to national defense, they were the keys to economic development. By the 1890s, the Corps had assumed additional responsibilities, including the control of aquatic plants (primarily water hyacinth) in the waters of the Southeast. Since then, water development projects have been a dominant feature in U.S. domestic policy and the Corps oversees many of these projects. As a result of these efforts and passage of federal statutes such as the National Environmental Policy Act and the Fish and Wildlife Coordination Act, the Corps has been given immense regulatory responsibilities.

In the late 19th century, the conservation movement was born. The federal government in 1871 created the U.S. Fish Commission, a forerunner of the U.S. Department of Interior' s Fish and Wildlife Service. The Commission was originally created for the purpose of investigating the decline in commercial fisheries. After short time, the Commission was charged with the task of raising fish and distributing them throughout the United States for the promotion of commercial fisheries. While conservation was a concern, economic development and sustainability were very important. With the rise of the U.S. Fish and Wildlife Service, considerable research was done on fish and wildlife. Ideas on how to manage these animal populations emerged and the States began to create their own fish and wildlife agencies. This allowed the U.S. Fish and Wildlife Service to transition into a more regulatory role.

By the 1960s, concern for the environment began to emerge as a political concern. Numerous federal statutes were created including the Endangered Species Act, the Clean Water Act, the National Environmental Policy Act, and the Fish and Wildlife Coordination Act. The U.S. Environmental Protection Agency was also formed in the 1970s. All these actions brought greater protection to the environment, but also brought more rules and regulations at the federal level. The States to a large degree have to abide by these rules and regulations too and nearly all lake management programs require some type of federal permit or oversight.

At the state level, economic development was the primary concern in the 19th and early 20th centuries. For example, Florida's government prior to 1850 sought to encourage settlement by offering land to anyone who would establish a homestead and defend it for five years. Transportation, however, was the great problem of early farmers and how to get their products to market became a major concern for many of Florida's communities. Florida responded by creating the Board of Trustees of the Florida Internal Improvement Fund. The Board of Trustees implemented programs to create canals and drain wetlands, including lands around lakes. They also helped sell the drained lands. It is important to remember that Florida was an extremely poor state at that time and economic development was needed for the betterment of all Floridians.

By the early 20th century, states like Florida began establishing their own fisheries and wildlife agencies for the purpose of research, management, and regulating the take of fish and wildlife. Regulations by agencies such as the Florida Fish and Wildlife Conservation Commission

(formerly the Florida Game and Fresh Water Fish Commission) increased dramatically. Regulations of fish-catching methods, however, were usually politically motivated and designed to restrict the effectiveness of some people while enhancing that of others. Therefore, political involvement caused many state fish and wildlife agencies to become constitutional agencies.

Despite increased regulatory power and federal funding, state fish and wildlife agencies continued to be embroiled in controversies that affected the economic well being of many people. One of the most controversial issues involved the take of fish by commercial fishermen and recreational anglers. Overtime, commercial fishermen in states like Florida were largely displaced from the freshwater lakes by recreational anglers. Society had determined that fish in lakes were more valuable to the developing recreational interests. This change by itself might not have seemed important to many individuals but began to effect the common property principal. States as the public trustee of fish and wildlife could now allocate resources to specific groups.

Concern about the environment influenced federal law after the 1960s. The states responded too. For example, Florida with its increased economic wealth developed many environmental regulation organizations. These included the Department of Natural Resources and the Department Environmental Regulation (both agencies are now the Florida Department of Environmental Protection). Florida further created five water management districts, including the Southwest Florida Water Management District. Local governments that had sufficient economic resources also created environmental departments with their own regulations. Given these developments and the passage of so many new environmental laws with their associated rules and regulations, many individuals thought environmental issues would go away. Unfortunately, this has not been the case because there are many conflicts yet to be resolved.

Many natural resource managers and the public believe the law is the law and it remains static unless a new law is passed. They also believe the many rules and regulations passed by agencies are also static law. Agencies, therefore, are considered to be the enforcers of clear rules. Thus, any legal problem must be seen as cut and dried, but this is seldom the case!

The police power of the federal and state governments means that they can abridge the rights of private property owners in order to protect natural resources, but only under certain

circumstances. The government of Florida takes the seriousness of abridging the rights of any individual very seriously (the Burt Harris Private Property Bill) and the judicial system. Consequently, the law is not a set of static principles. It is dynamic and sets the rules for resolving conflicts. The courts provide a formal remedy only when conflicts cannot be resolved outside the judicial system.

It is the conflict-resolution processes that most natural resource managers and the everyday citizen find most uncomfortable. When serious situations arise, the conflict-resolution process is generally passed to lawyers. The lawyers recognize that the law is dynamic and arguments can be made within the judicial system to change the law. However, most lawyers will try to negotiate a settlement outside of the courts.

There are many ways in which law impacts lake management. Four of the most important, as described by Berton Lamb and Beth Coughlan in their article "Legal Considerations in Inland Fisheries Management," are: (1) prescribing rules of conflict, (2) balancing the powers of government branches, (3) finding the powers of central government, and (4) describing the boundary between legal and political issues. For many public employees and concerned citizens, they will not end up in court when conflicts arise. They will participate in negotiations and enforcement actions outside the courtroom. The law does more than just guide conflict into the judicial system. It helps set the behavior of agencies, their missions, and their powers, as well as constrained their actions. The law also balances power between the legislative and executive branches of government. These two branches of government have a dynamic equilibrium that works itself out over time and which branch has the most power at any given time may be hard to determine until court action takes place. The third major impact of law defines the power given to the central government versus the states. Here the Constitution defines basic government powers, but again there is always the struggle between the states and the federal government. The fourth major impact is deciding what is a legal question and what is political. In the United States, everything is open to debate, but some things are regarded to be beyond partisan politics. For example, there is no longer any serious debate that fish and wildlife populations are largely under the control of state governments.

There are some important legal doctrines that need to be considered when developing the lake management plan. One of these doctrines is the Riparian Doctrine. This doctrine simply states that persons owning land that abuts a body of water have the right to use the water. Persons whose land does not abut the waterbody have no right and typically must rely on groundwater. During times of scarcity, however, there must be reasonable use. Another important doctrine is the Public Trust Doctrine. The government has trust responsibilities for the management of natural resources. In some jurisdictions, these responsibilities include the protection of fish and wildlife habitat, access, and aesthetic characteristics. Failure to consider the Public Trust Doctrine may result in a court reversing a management decision even after the decision was made years ago. One of the most important doctrines is “The Taking of Private Property.” The Constitution of United States provides that the government without just compensation under due process of law cannot take private property. Property rights stand for a host of legal doctrines and policies that essentially tell landowners what they can or cannot do with their property. In as much as legislation protecting wetlands, rivers, and other environmental values are becoming commonplace, the principal of private property rights remains in the state of flux.

A final concern for individuals trying to develop a lake management plan is an understanding of politics. In the 1990s, politics was often not viewed in a favorable light. Politics, however, is an honorable pursuit. It is often remarked that "politics is the art of possible." Learning what can be done and how to accomplish management goals is a key to the political art. Working with elected leaders is perhaps one of the most important things concerned citizens can do!

One of the first tasks for the concerned citizen is becoming involved in the process of selecting good leaders. This means becoming involved in electoral politics. Once a person is elected to office, they still need the help of concerned citizens and natural resource managers. It is extremely important to work with legislators to help them understand the issues. It is also extremely important to remember that the implementation of politics requires a unique skill. The political arena deals with the process of working out how statutes will be administered by the executive branch. Because a law is passed (even what appears to be a clearly stated law), there still may be considerable interagency bargaining to implement the law. The bottom line is that the establishment of a lake management plan does not end citizen involvement. Concerned

citizens must remain actively involved and always remember a lake management plan is a "living doctrine."

Summary of Options to be Considered for Who is in Charge of the Lake Wailes Management Plan

Option 1 - Select for Lake Wailes a Lead Lake Management Agency from Existing Public Resource Agencies with Responsibilities in the Arena of Lake Management

When a lake management plan is developed for Lake Wailes, there will be a strong need for a lead agency to implement the plan. Despite perceptions, the federal, state, and local agencies involved at Lake Wailes have reasonably good to excellent working relations. Each agency, however, focuses on its own regulatory or work responsibilities. Without citizen guidance as to who should lead, no one agency can be expected to step out to provide the necessary leadership.

Federal agencies working at Lake Wailes are probably not a good choice to be the lead agency. These agencies have responsibilities beyond Lake Wailes and cannot provide the intense local involvement necessary. The choice must be made between a state agency and a local agency.

Among the state agencies, the choice seems to be between the Florida Department of Environmental Protection, the Florida Fish and Wildlife Conservation Commission, and the Southwest Florida Water Management District. The Department of Environmental Protection is involved most intensely in the management of aquatic vegetation. The Florida Fish and Wildlife Conservation Commission has limited involvement at Lake Wailes because fish and game populations do not seem to be in bad shape and the Commission has very limited staff and financial resources to commit to the management of Lake Wailes. The Southwest Florida Water Management District at this time is primarily involved in setting minimum lake levels for Lake Wailes and also has this responsibility for all of the lakes in their region. While all three of these agencies can be worked with to accomplish lake management activities that the citizens discussed in phase one of the development of a lake management plan for Lake Wailes, it is unlikely that they would have the resources to lead and shepherd the plan. During the April

meeting of professionals, representatives from these agencies also stated that they did not foresee their agencies agreeing to take a lead role at Lake Wailes.

Another approach may be selecting Polk County Natural Resources as the lead agency. The County does not have the sizable staff, but with some modifications and additional funding the County could deal with many lake management issues. However, Polk County Natural Resources is responsible for many lakes throughout Polk County and it is unlikely that they would have the resources to lead and shepherd the Lake Wailes plan.

Among all existing public resource agencies with responsibilities in the arena of Lake Management the City of Lake Wales is the most likely governmental group to shepherd the lake management plan. The City of Lake Wales has many of the appropriate resources, qualified staff and the responsibility to manage infrastructure needs within the City of Lake Wales. By selecting the City of Lake Wales, the city could provide the necessary political leadership and advance lake management issues through cooperative agreements with other federal, state and local agencies charged with lake management responsibilities.

Option 2 - Use Existing Lakes Advisory Commission

The primary advantage of selecting the existing Lakes Advisory Board (with some modifications) as the lead lake management group would be that the Board could channel the agreements towards getting something done through the City of Lake Wales and Polk County. Establishing a Board as a leader for the management of Lake Wailes would also help focus the political leadership at the local and state levels into doing what is necessary.

The Advisory Board would probably be most effective in today's political climate at Lake Wailes if it was constituted as either a five-member or seven-member board. The members should reflect the diversity of users at Lake Wailes and be directly appointed by the elected leaders of the City of Lake Wales. Ideally, one member should be from the City Manager’s office as the City Manager will likely be the member of city staff working most closely with the Lake Wailes Advisory Board. The Board must select its own chairperson.

Operation of the Advisory Board will require some budgetary commitments from the City of Lake Wales. At this time, the City could probably provide basic operational support. The financial commitment will probably involve secretarial support, funds for mailing Board business, and funds for running public meetings. This is recommended because the City has shown a commitment to the development of a lake management plan for Lake Wailes. Lake Wailes is also an important part of the City's infrastructure. Operation of a functional Advisory Board would benefit the City by providing a local authority that could focus on Lake Wailes and deal directly with local problems before it is necessary to involve the Board of County Commissioners or state authorities. The Advisory board would also provide citizens with a single point of contact alleviating much of the intense frustration that arises when a citizen has to contact numerous agencies and divisions within the agencies in an attempt to get an answer to their concerns. The Board shall also provide a direct point of contact for other federal, state, and local agencies with responsibility in the region and facilitate work to be done on Lake Wailes.

Section 2 - Management of Water Quality in Lake Wailes

Managing water quality in Lake Wailes, as with all lakes, is a difficult objective, primarily because defining "water quality" itself is a difficult task. Water quality can only be defined after first establishing a desired use for a given waterbody. For example, a productive lake with a Secchi depth of two feet has poor water quality for swimmers who want to see the bottom of the lake as they swim. The same lake, however, would have good water quality to anglers because highly productive lakes produce abundant fish. This illustrates a primary difficulty in managing water quality--a lake cannot be all things to all people.

The first step in developing a management plan for water quality in Lake Wailes is to define desired lake uses and issues associated with water quality. Thus, on January 12, 2002 a group of citizens identified the following issues as major concerns with respect to the management of water quality in Lake Wailes (see Appendix I):

Nutrient concentrations, water clarity and general lake trophic status

Bacteria concentrations and possible contamination

General chemical and heavy metal contamination

Sediment load

Most citizens believed these concerns were linked with stormwater inputs to Lake Wailes.

A panel of water quality experts from around the state examined the pros and cons each of the above issues. There were no major disagreements among the experts and the following discussions represent a common consensus about the management of water quality in Lake Wailes.

Nutrient concentrations, water clarity and general lake trophic status

Lake trophic status is defined as "the degree of biological productivity of a water body." Scientists debate exactly what is meant by biological productivity, but it generally relates to the amount of algae, aquatic macrophytes, fish, and wildlife a waterbody can produce and sustain. The nutrients, phosphorus and nitrogen are generally considered the factors limiting the biological productivity of a lake and this is the reason that nutrients are a major concern when developing a management plan for water quality. The geology and physiographic region in which the lake is located determine the concentrations of nutrients in a lake, unless some anthropogenic activity elevates the nutrient concentrations above background levels.

A Lake Region incorporates both geology and physiography of a region into a geographic area in which lakes have similar geology, soils, chemistry, hydrology and biological features. In 1997, using LAKEWATCH data and other information, the United States Environmental Protection Agency divided Florida into 47 Lake Regions using these similarities as criteria. Lake Wailes is located in the Northern Lake Wales Ridge Region, which is described as:

This narrow ridge forms the topographic crest of central Florida, with this lake region extending south from Clermont Uplands in Lake County to the Livingston Creek drainage in Highlands County. Elevations are generally 100-300 feet. The well-drained sandy soils are covered by citrus groves, pastures, and urban and residential development. The lakes are mostly alkaline, low to moderate nutrients, clear water lakes. Nitrogen values tend to be high. These lakes are richer in nutrients than lakes in the Southern Lake Wales Ridge located to the south, although the cause of this is not readily apparent. Citrus production and land cover appear similar in both regions.

Lake Wailes has recently been sampled a total of 3 months by LAKEWATCH volunteers from 11/1/01 to 1/9/02. An average has been calculated for each water quality parameter sampled (total phosphorus, total nitrogen, total chlorophyll, and water clarity or "Secchi Depth") and is referred to in the table below as the "Average for Lake Wailes." Averages were also calculated for other lakes in the Northern Lake Wales Ridge Region. These averages have been grouped into ranges from low to high and are shown in the table below (Table 1). Using the table, you can see how Lake Wailes compares to other water bodies in the Northern Lake Wales Ridge Region.

Table 1. Current water chemistry averages for Lake Wailes and water chemistry ranges in each quartile for lakes sampled in the Northern Lake Wales Ridge Region.

Northern Lake Wales Ridge Region

	Total Phosphorus (µg/L)	Total Nitrogen (µg/L)	Total Chlorophyll (µg/L)	Secchi Depth (ft)
Average for Lake Wailes	32	938	27	3.2
< 25th percentile	3 - 8	331 - 632	1 - 4	1.6 - 3.3
25th to 50th percentile	8 - 16	632 - 1015	4 - 11	3.3 - 6.2
50th to 75th percentile	16 - 22	1015 - 1760	11 - 20	6.2 - 8.5
> 75th percentile	22 - 38	1760 - 5970	20 - 52	8.5 - 24.6
Number of lakes used to define each range	20	18	18	16

Total phosphorus, total nitrogen, and chlorophyll in Lake Wailes currently average 32 µg/L, 938 µg/L, and 27 µg/L, respectively. Secchi depth in Lake Wailes currently averages 3.2 ft. These values, although variable, fall within the range listed for the lakes of the Northern Lake Wales Ridge Region and overall suggest that Lake Wailes, as other lakes in the region, is moderately

eutrophic. Based solely on this analysis, it also seems that Lake Wailes is not receiving nutrient inputs in excess of background levels.

Many researchers have also sampled the water chemistry of Lake Wailes over the last 30 years (Holcomb 1969, Shireman et al 1979, Canfield 1981, Canfield and Hoyer 1992, Polk County Natural Resources, and Florida LAKEWATCH 2002), thus providing a unique opportunity to compare current values with historical values (Table 2). For the period of record 1969 to 2002, annual average total phosphorus concentrations ranged from 10 µg/L in 2000 to 75 µg/L in 1985 with no real observable trend. Similarly, total nitrogen concentrations ranged from 461 µg/L in 1980 to 1925 µg/L in 1990 with no observable trend. These data confirm the Lake Regions analysis and again suggest that Lake Wailes is not receiving, at least for the last 30 years, a large amount of nutrients above background levels.

Table 2. Annual average water chemistry values for Lake Wailes.

Study	Date	Total Phosphorus (µg/L)	Total Nitrogen (µg/L)	Chlorophyll (µg/L)
Holcomb (1969)	1969	28	595	6
Shireman (1974-1977)	1974	42	960	9
Shireman (1974-1977)	1975	65	972	8
Shireman (1974-1977)	1976	69	998	11
Shireman (1974-1977)	1977	60	1022	8
Shireman (1978-1979)	1978	38	772	6
Shireman (1978-1979)	1979	29	697	4
Canfield (1981)	1980	21	461	5
Polk County Natural Resources Data	1985	75	1300	43
Canfield and Hoyer (1992)	1986	25	773	43
Canfield and Hoyer (1992)	1987	30	962	41
Florida LAKEWATCH Data	1990	30	953	26
Polk County Natural Resources Data	1990	63	1925	35

Florida LAKEWATCH Data	1991	32	843	26
Polk County Natural Resources Data	1991	71	1037	20
Polk County Natural Resources Data	1992	57	1825	35
Polk County Natural Resources Data	1993	35	1525	30
Polk County Natural Resources Data	1994	60	1125	10
Polk County Natural Resources Data	1995	34	950	11
Polk County Natural Resources Data	1996	42	780	10
Polk County Natural Resources Data	1997	70	520	4
Polk County Natural Resources Data	1998	56	490	4
Polk County Natural Resources Data	1999	25	575	4
Polk County Natural Resources Data	2000	10	632	2
Florida LAKEWATCH Data	2001	36	938	29
Polk County Natural Resources Data	2001	27	1093	17
Florida LAKEWATCH Data	2002	26	933	32
Polk County Natural Resources Data	2002	22	1373	20

Chlorophyll concentrations, however, were significantly lower in the 1970s and late 1990s with most values less than 10 µg/L. Lake Wailes had abundant submersed aquatic macrophytes (primarily, *Hydrilla verticillata*) during these low chlorophyll periods. Grass carp were stocked into Lake Wailes in the later part of the 1970s and by the early 1980s there was little or no submersed aquatic vegetation left in the lake. Hydrilla then reestablished itself in the late 1990s and was then treated with herbicides and the lake was again stocked with grass carp. These actions created the lake's current condition of virtually no submersed aquatic vegetation.

Lakes with abundant submersed aquatic macrophytes sometimes are very clear because the macrophyte presence can limit the growth of free-floating algae, which are estimated by use of measurements of chlorophyll concentrations. If macrophyte bottom coverage in a lake is less than about 30% then the presence of macrophytes does not appear to impact whole lake algal abundance. However, lakes with aquatic macrophytes covering over 50% of the lake bottom

typically have reduced algal levels and clearer water. One explanation is that either aquatic macrophytes, or perhaps the algae attached to them (called periphyton), use available nutrients, thus competing with the free-floating algae. Another explanation is that aquatic macrophytes anchor the nutrient rich bottom sediments in place, buffering the action of wind, waves and human effects, and thereby deprive the free-floating algae nutrients contained in the sediments that would otherwise become available when bottom sediments are stirred up. Macrophytes also provide calm water conditions within their extensive beds allowing large algal cells to settle and be lost to the water column thereby causing the water to become clearer. Whatever the mechanism, after grass carp and herbicides eliminated the submersed aquatic vegetation in the 1970s and late 1990s Lake Wailes, chlorophyll concentrations increased significantly. The increase in observed chlorophyll concentrations, therefore, was probably not the result of increased nutrient loading from the surrounding developed areas.

Bacteria concentrations and possible contamination

There are many possible sources of bacterial contamination in Florida lakes, but the sources can be grouped into three broad categories: human waste contamination, domestic animal waste contamination, and natural sources of contamination (e.g., aquatic birds). The disposal of untreated human waste into the nearest water body, which was once a common practice, is no longer practiced or condoned. There are also legal requirements for the treatment of wastes. In the highly developed areas of Florida, large municipal wastewater treatment plants usually provide treatments. Small package plants and septic tanks are generally used in rural areas.

The detection of human pathogens (bacteria and viruses) in water is extremely difficult. When attempts are made, it is an extremely costly and time-consuming operation. The attempts are also seldom successful. Therefore, nearly all-bacterial monitoring programs use certain groups of non-disease causing (nonpathogenic) bacteria as bacterial indicator organisms of fecal contamination. If the indicator organisms are present in a water sample, it is traditionally assumed that disease-causing bacteria could also be present. Historically, agencies charged with insuring public health used two groups of bacteria to detect fecal contamination - the total coliform and fecal coliform bacterial groups.

The coliform group consists of several major types of bacteria (genera) belonging to a family of bacteria that the professionals call the Enterobacteriaceae. Bacteria have historically been assigned to the coliform group defined based on the ability of scientists to detect lactose fermentation (the production of gas). Based on this definition, all aerobic and facultative anaerobic, gram-negative, nonspore-forming, rod-shaped bacteria were included in the coliform group. Total coliform counts were obtained after incubating (keeping the sample at an elevated temperature) the water sample for 48 hours at 35 C. Fecal coliforms were separated from total coliforms by incubating samples at 44.5 C for 24 hours. Regardless of the seemingly complex definition for the coliform group of bacteria, the total and fecal coliform groups were chosen at the time because they were the only tests readily available and the measurements were easy to make. Their use continues in the 21st century not only because of the ease of measurement, but also because the tests are relatively inexpensive and there are legal criteria established for assessing the safety of the water.

When many cities and towns were contaminating water with untreated waste discharges, the total and fecal coliform tests were an extremely important detection tool and problems with the tests were not considered important. The vast majority of cities and towns have now constructed wastewater treatment plants and eliminated the major health threats. Due to shortcomings with the older total and fecal coliform tests and advances in the detection of pathogenic bacteria and viruses, there were demands at the end of the 20th century to establish new criteria before using a group of bacteria as an indicator of fecal contamination and possible health problems. However, today's health agencies continue to use the total and fecal tests to determine the safety of water for recreation because the criteria for closing a waterbody to recreation are established in law.

As noted earlier, it was assumed by many agencies that the detection of coliforms meant that recent fecal contamination was present and that a health threat could be posed by the possible presence of pathogens. Many state governments, including Florida, enacted legislation establishing numerical coliform counts as criteria for determining the safety of water for drinking and recreation. However, the use of total coliforms became problematic as the major sources of fecal contamination were corrected. Total coliforms are a natural part of the bacterial community (microfauna) of plants. When there is no major source of contamination, the bacteria originating from plants can dominate and provide elevated total coliform counts. The presence of total

coliforms, therefore, can not always be used to indicate the possible presence of pathogens. Their presence is only indicative of the presence of plant material in water.

The more reliable indicator of fecal contamination is the fecal coliform bacteria test. Use of this test, however, has been based on the assumptions that fecal coliforms are only from warm-blooded animals and that fecal coliforms do not survive in water for an extended period of time. When dealing with massive human contamination from untreated wastes or from an inoperative wastewater plant, these assumptions are typically good. Unfortunately, the assumptions have become dogma among many public health workers. Studies of fecal coliform bacterial tests have shown that non-harmful bacteria can yield false positive results with the standard tests. The studies have also definitively shown that fecal coliforms can survive and even multiply in the natural environment. Perhaps even more important is the fact that the fecal coliform counts do not correlate with the incidence of gastrointestinal illness in recreational waters. Florida, like many other states, has established numerical criteria for fecal and total coliform contamination in fresh waters classified as Class III waters (Florida Department of Environmental Protection: Chapter 62-302.530, Florida Administrative Code). Class III water is defined as water designated for the purpose of recreation and the propagation and maintenance of a healthy, well-balanced population of fish and wildlife. In Florida, the fecal coliform standard is:

> *MPN or MF counts shall not exceed a monthly average of 200, nor exceed 400 in 10% of the samples, nor exceed 800 on any one-day. Monthly averages shall be expressed as geometric means based on 10 samples taken over a 30-day period.*

The total coliform standard is:

> *Less than or equal to 1000 as a monthly average; nor exceed 1,000 in more than 20% of the samples examined during any month; less than 2,400 at any time. Monthly averages shall be expressed as geometric means based on a minimum of 10 samples taken over a 30-day period using either the MPN or MF counts.*

MPN represents the "most probable number" of bacteria per 100 mL of water sample and MF represents the number of bacterial colonies counted on a membrane filter per 100 mL. As with

any bacterial indicator, it is impossible to guarantee with 100% certainty that some individual will not become ill upon contact with water. However, if the number of total coliform and fecal coliform colonies isolated from a water sample is below the state-established criteria, there is a very strong probability that the water is safe for recreation!

To obtain a quick picture of what the bacteria levels currently are in Lake Wailes, water samples were collected from 10 stations on March 28, 2001 (Table 3) and both total and fecal coliforms were counted. Total coliform bacteria counts ranged from 500 to 9400 MPN. Total coliform bacteria exceeded 1,000 MPN in 70% of the samples. Total coliform bacteria did exceed 2,400 at any one station. Total coliform bacteria levels at Lake Wailes were, therefore, not within the acceptable range as defined by the Florida Administrative Code (FAC), Section 62-302.530. Fecal coliform bacteria counts for Lake Wailes ranged from 0 to 400 MPN. Fecal coliform bacteria exceeded 400 MPN in 0% of the samples. Fecal coliform bacteria did not exceed 800 at any one station. Fecal coliform bacteria were, therefore, within the acceptable range as defined by the Florida Administrative Code (FAC), Section 62-302.530.

Keeping in mind that these are data from only one day, the evidence suggests that Lake Wailes is not experiencing a massive, continuous bacterial contamination above state standards. If small problems exist more sampling would be required, but the lake is probably safe for recreational use.

Table 3. Total and Fecal coliform counts taken at ten stations in Lake Wailes on March 28, 2002 by Florida LAKEWATCH.

Lake	County	Station	Location (Latitude and Longitude)	Total Coliforms (MPN)	Fecal Coliforms (MPN)
Wailes	Polk	1	27 54.331, 81 34.473	2300	200
Wailes	Polk	2	27 54.224, 81 34.706	2600	0
Wailes	Polk	3	27 53.960, 81 34.720	500	0
Wailes	Polk	4	27 53.879, 81 34.422	1600	200
Wailes	Polk	5	27 54.012, 81 34.213	500	0
Wailes	Polk	6	27 54.049, 81 33.958	9400	0

Wailes	Polk	7	27 54.119, 81 34.011	1500	0
Wailes	Polk	8	27 54.285, 81 34.092	800	0
Wailes	Polk	9	27 54.295, 81 34.342	2600	400
Wailes	Polk	10	27 54.330, 81 34.419	3000	0

General chemical and heavy metal contamination

Many citizens were concerned about the possible contamination of fish with heavy metals and other chemicals. Little information is available on the concentrations of heavy metals or other chemicals in the fish of Lake Wailes. We therefore, collected 12 largemouth bass on January 24, 2002 and had them analyzed for mercury, a metal of concern in many Florida lakes (Table 4).

Table 4. Mercury concentrations found in largemouth bass collected by Florida LAKEWATCH from Lake Wailes (Polk County) on January 24, 2002.

Lake	County	Total Length (mm)	Weight (g)	Sex	Mercury Concentration (ppm)
Wailes	Polk	342	580	F	0.09
Wailes	Polk	365	797	M	0.18
Wailes	Polk	372	756	M	0.17
Wailes	Polk	385	715	M	0.26
Wailes	Polk	419	938	F	0.27
Wailes	Polk	420	1082	F	0.27
Wailes	Polk	432	1308	F	0.12
Wailes	Polk	434	1457	M	0.27
Wailes	Polk	445	1350	F	0.15
Wailes	Polk	459	1565	F	0.09
Wailes	Polk	467	1624	F	0.16
Wailes	Polk	481	1793	M	0.27

The Florida Department of Health (FDOH) has established guidelines for three consumptive use advisories. If the average mercury concentration of harvested fish is below 0.5 ppm, then an *Unrestricted Consumption of Fish Advisory* is issued and there is no limit set as to the amount of fish that you should eat in a given amount of time. If the average mercury concentration is between 0.5 ppm to 1.5 ppm, then a *Limited Consumption of Fish Advisory* is issued. A *Limited Consumption of Fish Advisory* means that fish "should not be eaten more than once a week by adults. If you are pregnant, a nursing mother, a woman who intends to have children, or a child under 15 years old, you should not eat those fish more than once a month (One portion equals 8 ounces or one-half pound of fish)". If the average mercury concentration is above 1.5 ppm, then a *No Consumption of Fish Advisory* is issued. A *No Consumption of Fish Advisory* means that no fish should be eaten from the lake sampled.

The data in Table 4 suggests that there is no immediate concern about the concentration of mercury in the largemouth bass of Lake Wailes. Although other types of fish were not sampled, there is a good probability that the fish are also safe to eat relative to mercury. There is no information on other types of possible chemical contamination of Lake Wailes' fish, but with the absence of any industrial source there is a good probability that the fish are safe to eat.

Sediment load

While there seems to be no reason for concern about nutrient inputs or contamination with heavy metals or other chemicals, it is obvious from a visual inspection of Lake Wailes that stormwater is inputting considerable amounts of sediments. In front of every stormwater culvert, there is a delta of built up sediment. The sediment is accelerating the filling in of select areas of Lake Wailes but probably not at a rate that would drastically affect the whole lake. The sediment build up in front of the stormwater pipes, however, also allows the growth of some terrestrial and aquatic vegetation that otherwise would not grow in those areas.

This vegetation is used by some aquatic bird populations and may be deemed a benefit by individuals whose interest is primarily birds. However, the sediment is covering substantial hard substrate that could be used for fish spawning habitat making the addition of stormwater

sediments a negative attribute. This once again points out one of the main difficulties in lake management - that a lake can not be all things to all people or all animals.

Summary of Options to be Considered for the Management of Water Quality in Lake Wailes

The following options for water quality management of Lake Wailes are listed for consideration by participants. These options are not presented as recommendations by the water quality experts who were brought together to discuss the pros and cons of identified issues, but rather as possible approaches to water quality management in Lake Wailes.

Option 1. Do Nothing extra to manage water quality

Doing nothing to manage water quality in Lake Wailes is a viable and inexpensive option. This option may be appropriate for Lake Wailes because there seems to be no long-term changes in the important water chemistry variables used to assess lake trophic status (total phosphorus, total nitrogen, and chlorophyll). Both bacteria concentration and mercury concentration in fish seems to be below concentrations of concern. There are also few complaints from user groups concerning water quality.

Option 2. Continue Monitoring Lake Trophic State Parameters

Currently, citizen volunteers working under the auspices of Florida LAKEWATCH are measuring water clarity (Secchi Depth), algal biomass (as measured by chlorophyll concentrations), and total phosphorus concentrations and total nitrogen concentrations in Lake Wailes. With the continued support of the citizens, this monitoring effort should be sufficient to detect any significant changes that may be occurring to the trophic status of Lake Wailes. The Florida LAKEWATCH program, however, is not set up to continually monitor bacteria and other forms of contamination in Lake Wailes and some additional financial resources would be needed to conduct a longer term research study. Otherwise, the City of Lake Wailes could perhaps fund the Polk County Public Health Office to monitor the lake.

Throughout Florida, there are concerns about phosphorus enrichment. Although the available evidence does not support, the concept that is experiencing significant nutrient enrichment, concerns were expressed about runoff of lawn fertilizers to Lake Wailes. Control of phosphorus would be the element of concern because phosphorus is generally the limiting factor for algal growth. If homeowners wish to reduce the potential for phosphorus inputs to Lake Wailes, there are now available phosphorus-free fertilizers. These fertilizers work well on lawns and because they contain sufficient nitrogen the lawns remain very green.

Option 3. Expand Lake Monitoring to Include Potential Chemical and/or Biological contaminants

Research for this report has not detected any cases in which chemical or biological contamination of Lake Wailes has caused environmental degradation or human health problems. However, if these issues remain of concern to citizens using Lake Wailes, significant additional funding would have to be appropriated to measure other chemicals or bacteria and viruses that may be entering Lake Wailes from poorly functioning septic tank systems, point sources such as the City's sewage lift station, or stormwater runoff.

Studies monitoring environmental chemical contamination from diffuse sources such as pesticides will be extremely costly. Although expensive, scans of select fish species would be more cost-effective and directly address concerns about eating fish.

Option 4. Dredge and remove sediments in front of some or all of the stormwater pipes entering Lake Wailes

Sediment deposition from stormwater pipes is enhancing the filling in of Lake Wailes, suggesting that the removal of all of these sediments would reverse this trend. Some sediments, however, have created habitat that is used by aquatic birds. Therefore, it may be desirable to remove sediment from some stormwater pipe while leaving some for aquatic bird habitat at other pipes or at each individual pipe.

Removing sediments from a lake can be expensive if access is limited and there is no upland disposal site. Access at Lake Wailes is not a problem as the sediments in front of the stormwater pipes can be reached from shore using available equipment. Disposal of the sediments should not be a problem as Polk County staff has indicated that they would be willing to accept the material at the county landfill. Finally, sediments will enter Lake Wailes forever and the removal of sediments will have to be considered a long-term management option. However, sediments would not have to be removed every year, as large sediment loads do not enter Lake Wailes. The frequency of sediment removal will have to depend upon the ultimate look desired, but it probably would not have to occur but every 5 to 10 years.

Section 3 Manage water level in Lake Wailes

One of the major concerns put forth by the citizens during a workshop on citizens' concerns regarding the future management of Lake Wailes is water level. The statement of "no water, no lake" sums the concerns of the citizens nicely. The importance of water level to Lake Wailes cannot be overstated because water level is related to land owner access and travel within Lake Wailes, aquatic plant abundance and species composition, fish and wildlife populations, and flooding and property damage both at the lake and in the watershed.

The first step in developing a comprehensive management plan for water levels in Lake Wailes is to understand what water levels have been in the past. The citizens using Lake Wailes have noticed approximately a 10-ft of drop in average water level since 1965 (Figure 1). In the early 1960s, Lake Wailes' water level averaged about 109-ft mean sea level (MSL) but by 1990 water level averaged less than 100-ft MSL. As Water and Earth Sciences Inc.'s scientists pointed out when examining a water budget for Lake Wailes, some of the decrease is probably related to decreases in rainfall during this same time period, but another reason is probably related to groundwater utilization.

To examine this further, we collected water level data from 36 other lakes that are all connected to the same aquifer on the Lake Wales Ridge. For each lake, we calculated a long-term average water level and then for each year we calculated the deviation from the long-term average water level. This way we could plot all of the lakes on the same plot using the same relative scale (Figure 2). The data indicate that after 1960 all of the monitored lakes on the Lake Wales Ridge seemed to be suffering from decreased water levels. The good news is that after 1990 all of the lakes including Lake Wailes began to increase in water level even though rainfall has been lower than indicated by historical records. This increase water level is believed by the Southwest Florida Water Management District to be the result of water conservation measures that began in the early 1990s. With the return of normal rainfall and continued water conservation measures, lake water levels on the Lake Wales Ridge (including Lake Wailes) should come closer to historical levels.

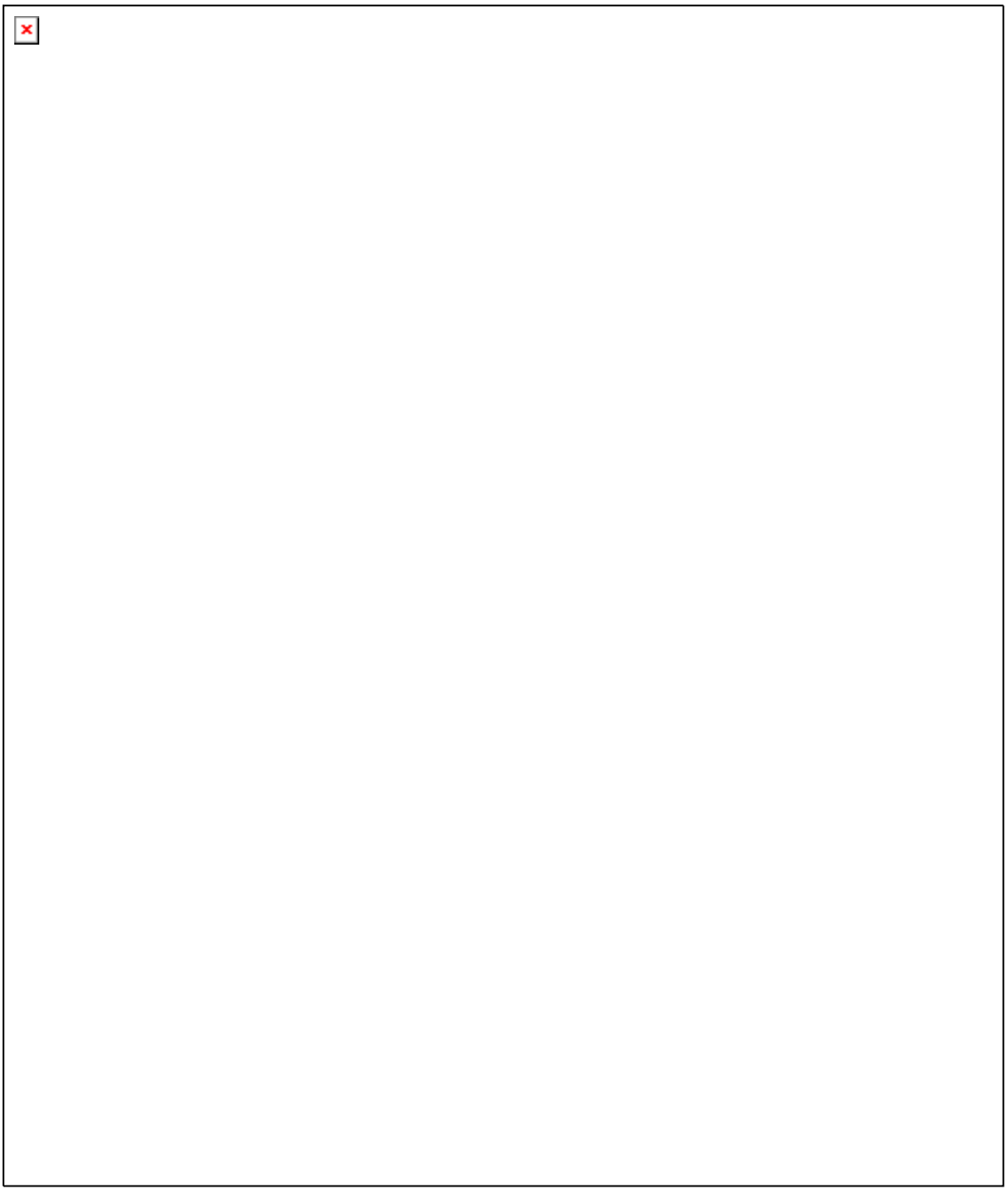

Figure 1. Long-term monthly water level (ft MSL) and long-term rainfall (inches) for Lake Wailes.

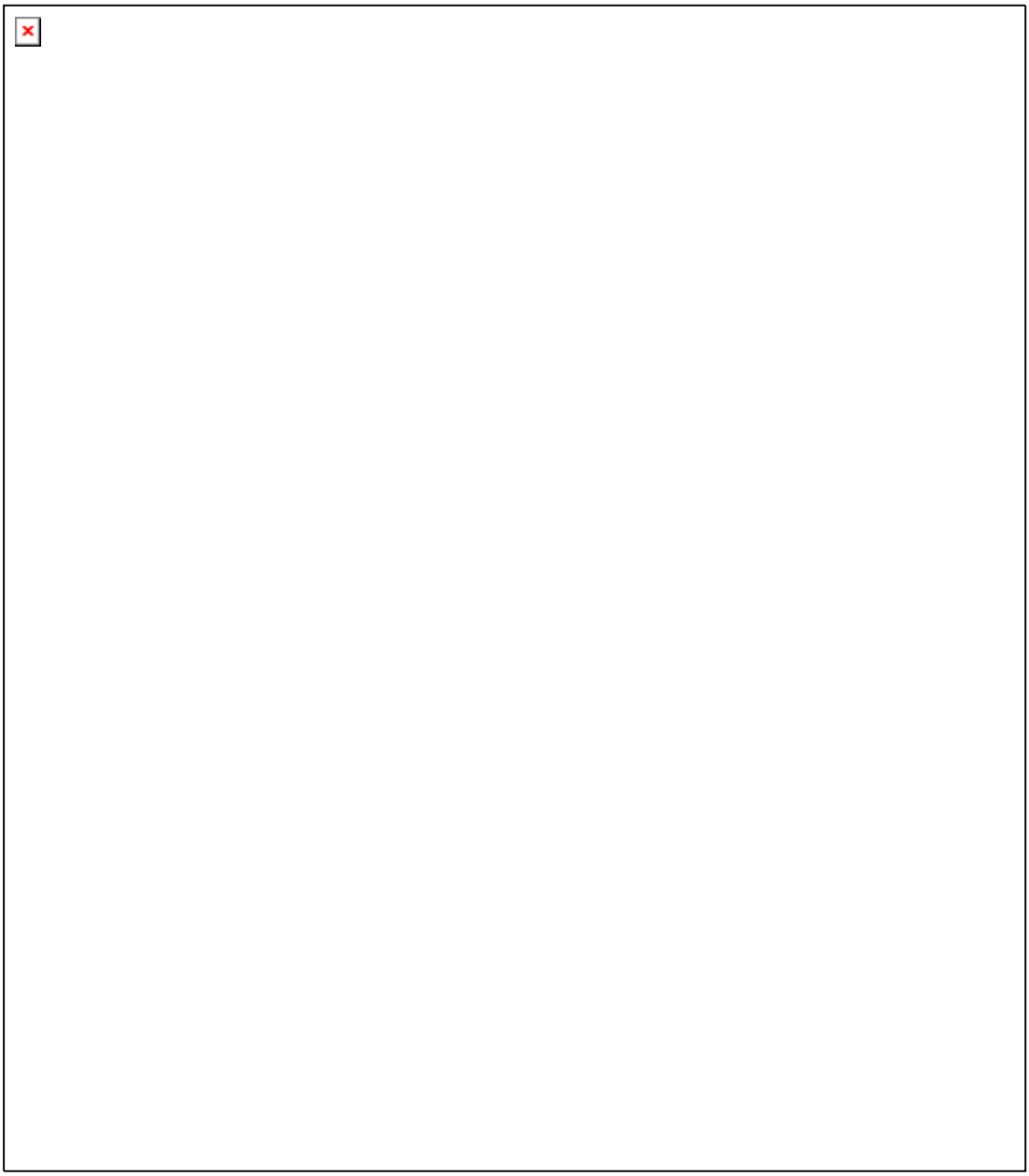

Figure 2. Lake level deviation from long-term average lake level for 36 lakes on the Lake Wales Ridge including Lake Wailes and long-term rainfall records.

Summary of Options to be Considered for the Management of Water Levels in Lake Wailes

Option 1. Do Nothing extra to manage water level

Making no changes and living with the current water level situation shown in Figure 1 is a viable option. Figures 1 and 2 show that the water levels in Lake Wailes, as well as other lakes on the Lake Wales Ridge, have been steadily increasing since 1990. This is extremely important in light of the fact that rainfall during this time period is still lower than historical record. Thus, if/when rainfall comes back to normal; water levels in Lake Wailes should gradually increase.

Option 2. Augment Lake Wailes with reuse water

A lengthy report by Water and Earth Sciences entitled "Lake Wailes Water Balance and Augmentation Study" shows that augmentation of 1.0 million gallons per day (MGD) with treated wastewater would result in a 3 to 5 ft increase in Lake Wailes' water level. There is, however, a significant risk of decreasing water quality in the lake with the nutrients that would be added through augmentation. The level of nutrient additions would probably stimulate the growth of free-floating algae (increased chlorophyll). While the increase in chlorophyll would probably increase fish abundance in Lake Wailes, water clarity would decrease significantly and algal blooms would probably become more noticeable. It is also possible that the increase in algae could lead to occasional lowering of oxygen concentrations and potential fish kills.

Option 3. Examine options to decrease water usage from the aquifer

The water level trend in Lake Wailes and other lakes on the Lake Wales Ridge suggest that improvements in water usage can impact water levels of the lakes. Maintaining efficient use of water and recycling water at every chance will, therefore, help to maintain higher water levels in Lake Wailes. Options that may assist water level maintenance at Lake Wailes is the indirect augmentation of the lake with treated wastewater by spraying the water on Lake Wailes' watershed and the recycling of water at major industrial sources so that the impact on the aquifer

is minimized. However, it must be remembered water levels in Lake Wailes could reach undesirable high levels if Florida experiences a number of high rainfall years such as happened in the 1940s and early 1950s.

Section 4 - Management of Aquatic Plants in Lake Wailes

In the early 1970s, the most outstanding biological feature of Lake Wailes was the dense stands of submersed aquatic vegetation (primarily, *Hydrilla verticillata*) that covered approximately 80% of the lake's surface area during the summer months (Hardin and Atterson 1980). In 1974, grass carp were stocked because the hydrilla essentially eliminated the recreational usage of the lake for the vast majority of users. Hydrilla was eliminated from Lake Wailes by 1976. Eventually, the grass carp died out of Lake Wailes and hydrilla again became a problem in the late 1990s with almost 70% of the lake bottom covered with the plant. In April of 2000, herbicide treatments were initiated on Lake Wailes to control the hydrilla. Additionally, between 1991 and 2000 over 1,300 grass carp were also stocked to help control the aquatic weed problem. As of 2002, there is little submersed or floating leaved aquatic vegetation in Lake Wailes. The emergent vegetation is dominated by stands of cattail *(Typha spp.)*, bulrush *(Scirpus spp.)* and torpedo grass (*Panicum repens*). Grass carp can live for many (>10) years so there is reason to believe that the current aquatic plant condition of Lake Wailes will likely continue for many years.

In addition to the emergent plants, the non-native floating water hyacinth (*Eichornia crassipes*) and water lettuce (*Pistia statiotes*) are present in Lake Wailes. Grass carp will not control these plants and they have tremendous growth potential. These plants can completely cover a lake in one growing season, causing damage to fish, wildlife and recreational activities. For example, unmanaged water hyacinth can double every 7 - 10 days. Ten plants under the right environmental conditions can grow to cover one acre in a single growing season, often weighing 200 tons. Therefore, the benefit of controlling those 10 plants early should be obvious. A maintenance control program using aquatic herbicides is required in Florida to insure that water hyacinth and water lettuce do not become aquatic weed problems. Consequently, maintaining these types of aquatic plants at the lowest possible levels (maintenance control) ultimately improves and encourages native fish and wildlife habitat while maintaining lake conditions for recreational activities.

Maintenance control (or management) refers to controlling problematic aquatic plants at low levels and doing it before the plants reach a problem level. It has been defined in a Florida Statute as follows:

> *....a maintenance program is a method for the control of non-indigenous aquatic plants in which control techniques are utilized in a coordinated manner on a continuous basis in order to maintain the plant population at the lowest feasible level as determined by the department [Department of Natural Resources now Department of Environmental Protection.] F.S. 369.22*

Maintenance control of aquatic weeds (both native and non-native) reduces the detrimental environmental effects caused by the aquatic weeds and reduces the potential for environmental impacts from aquatic plant control activities. Maintenance control offers the following advantages:

1. Detrimental impacts of aquatic non-indigenous weeds on native plant populations are reduced.
2. Detrimental impacts of aquatic weeds on water quality are reduced.
3. The amount of organic matter deposited on the lake bottom from natural processes is reduced.
4. The amount of organic matter deposited on the lake bottom after control of aquatic plants is reduced.
5. Less herbicide and therefore money is used in the long-term.

For example, maintenance of water hyacinth to less than 5% coverage under experimental conditions reduced herbicide usage by a factor as great as 2.6; reduced deposition of detritus by a factor of 4.0; and reduced depression of dissolved oxygen that occurred beneath the vegetation mats.

A major problem encountered when conducting a maintenance control program is that people do not perceive a weed problem and question the need to spray aquatic herbicides or use grass carp. Therefore, public education is an important part of a successful aquatic plant maintenance control program. It is also important to stress that maintenance management is the most environmentally sound method for managing invasive non-native plants and encouraging the growth of native aquatic plants.

The currently remaining emergent vegetation in Lake Wailes provides habitat for both bird and fish populations. However, the emergent plants can also inhibit access and add substantially to organic particulate matter in the lake. The Florida Department of Environmental Protection (DEP) has the ultimate responsibility to manage aquatic plants in public lakes such as Lake Wailes and the Department issues plant management permits at both public and private lakes. Polk County Natural Services is the agency that actually carries out plant control for Lake Wailes using some of their own money and matching funds from DEP. A permit currently exists for Lake Wailes to control certain areas of emergent plants (Figure 3) and for maintenance control of all floating-leaved plants.

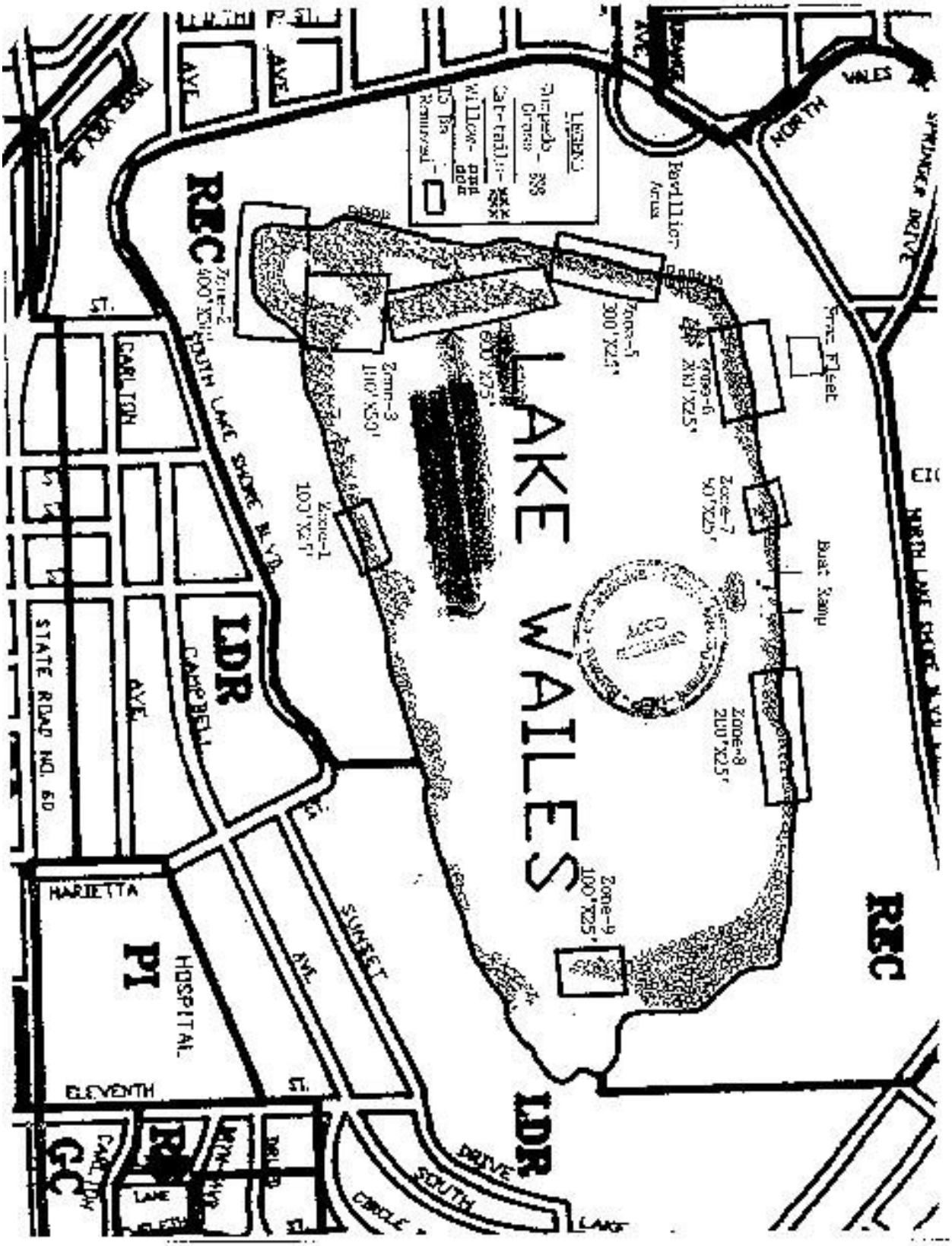

Figure 3. Permit areas for aquatic plant control in Lake Wailes.

Summary of Options to be Considered for the Management of Aquatic Plants in Lake Wailes

Option 1. Do nothing extra to manage aquatic plants

While the do nothing option is always available, the presence of invasive exotic plants in Lake Wailes suggests that this option may not be the best choice. The grass carp currently have hydrilla under control but when they eventually die out hydrilla will most likely grow again to problem levels. Maintenance control of exotic floating leaved plant is currently keeping water lettuce and water hyacinth at low levels, but one or two seasons of no control (with the right weather conditions) could result in these plants dominating the lake. With no control, even the emergent plants will encroach and hamper lake access

Option 2. Maintain the current level of aquatic plant control

The current level of aquatic plant management is generally at a level desired by most users of Lake Wailes. Thus, the Department of Environmental Protection and Polk County should continue their current level of funding to support this desired amount of aquatic plant management.

Option 3. Increase the current level of aquatic plant management or adjust the current levels to include other sections of Lake Wailes

Some users of Lake Wailes deem the current level of aquatic plant management insufficient or plant management efforts are not being conducted in areas that users think should be controlled. Thus, additional needs exist which are not being addressed by the current level of aquatic plant management. These needs should be identified by citizens as management objectives and adjusted accordingly by the professionals charged with implementing management programs.

Section 5 - Management for recreational activities including boat ramp access, access for swimming, sidewalks for walking, and riparian rights

Lake Wailes is used for many recreational activities including but not limited to fishing, boating, walking around on sidewalks, birding, some swimming, and simple aesthetics. By all standards, Lake Wailes is an urban lake and should be managed as such. The citizen who participated in the January 12, 2002 workshop on Citizens Concerns Regarding the Future Management of Lake Wailes, however, ranked the management of the urban type management issues such as swimming and walking trails as fourth amongst their concerns.

Currently, Lake Wailes can be used at some level for all of these activities. The professionals who met to discuss the citizens' concerns agreed some general management actions could enhance certain aspects of recreational uses of Lake Wailes. For example, increasing trash pick-ups around the lake would increase the aesthetic enjoyment of the lake. Organizing volunteers or working through the City of Lake Wailes, small items like the example of trash pick up could be accomplished with little outlay of money. Other Items like improving the boat ramp access for fishing and general boating and developing a beach for swimming would take more planning and outlay of money, but these goals are not unobtainable. The primary impediment to moving forward on any issue is really not the lack of money, but the lack of citizen consensus.

The Lake Wailes boat ramp is sufficient when water levels are up, but during the current drought the end of the ramp is exposed making it difficult if not impossible to launch a boat. Extending the ramp would allow for boating even during drought conditions. Funds are available from the Florida Fish and Wildlife Conservation Commission for boat ramp improvements. The citizens working with the City of Lake Wales under the organization of this lake management effort would have a good chance of being able to leverage funds to extend and even improve the boat ramp.

Many citizens remember the swimming beach and dock that used to exist at Lake Wailes (Figure 4). They were also in favor of recreating at least a swimming beach if not a pavilion and dock. A beach could be created by adjusting the shoreline areas that are already permitted for aquatic weed control and then bringing in some equipment to clean a swimming area. This would not be

very expensive because the City of Lake Wailes already has some equipment that could be used for the job. There are, however, additional issues concerning the development of a swimming beach that will cost additional money.

Issues needing debate include but are not limited to; liability concerns, maintenance of the beach, and bacterial monitoring. Liability and maintenance probably will not become a major concern if the City of Lake Wales establishes the beach under the right guidelines. The biggest problem will be the establishment of a good bacterial monitoring program. The USEPA is now accepting volunteer bacterial monitoring data for beaches. However, if counts ever exceed State of Florida criteria, the City will have to close the beach for use. If this happens, The City will probably need to initiate a more intensive bacterial sampling program to find the source(s) of contamination.

The establishment of sidewalks will not hurt the ecology of Lake Wailes. Concerns of the private property owners having property nearby will have to be addressed. It probably is not possible to circle the entire lake. More importantly, if the lake's water level increases, there is a chance some of the sidewalk infrastructure could be lost. Conversely, if water levels fall it must be recognized that riparian owners have a legal right of access.

Summary of Options to be Considered for the Management of Recreational Activities in and around Lake Wailes

Option 1. Do nothing and maintain current level of management for recreational activities at Lake Wailes

As long as water levels are sufficient to launch boats into Lake Wailes, people can use the lake for most recreational activities. Therefore, the do nothing option is a viable option for the management of recreational activities. However, it must be recognized that the riparian owners have the legal right for reasonable access to the lake.

Option 2. Identify individual actions that would improve recreational activities and find working groups to accomplish the tasks

Some management activities that might be initiated to improve the recreational activities are small items that could be accomplished by organized volunteer groups (i.e., Florida LAKEWATCH volunteer water quality monitoring, increased trash pick up by volunteers who adopt a section of shoreline, or working with the Sheriff to have help from prisoners). Other activities are larger and will require more organization and money (i.e., developing a beach and establishing a bacterial monitoring program). Both large and small actions however, need to be identified by citizens to organize working groups to pursue and eventually accomplish the stated objectives. The organization would work best through the Lake Advisory Board discussed in Section 1 of this report.

Option 3. Request funding from Florida Fish and Wildlife Conservation Commission to improve and extend the boat ramp at Lake Wailes as well as enhancing fish and wildlife habitat

Many of the recreational activities on Lake Wailes require boat access. To increase the ability of people to launch boats, especially in light of decreased water levels, funding should be secured to extend the boat ramp at Lake Wailes. The Fish and Wildlife Conservation Commission has a boat ramp improvement fund, but Lake Wailes has to get on the Commission's annual work schedule. Establishing artificial structure such as bush piles to attract anglers and fish can mitigate the loss of vegetation and its effect on anglers and fish. Artificial habitat structures can also be established to attract certain bird species that perhaps require trees.

However, the attraction of more birds raises the possibility that bacterial tests may exceed State of Florida criteria and causes a closure of a beach if it is established. Most of the bacteria coming from natural populations of birds pose no threat to human health. If bacterial counts become high, the bacterial monitoring program needs to look for false positives from soil borne bacteria like Klebsiella. These bacteria pose no threat to human health, but will make water samples appear polluted.

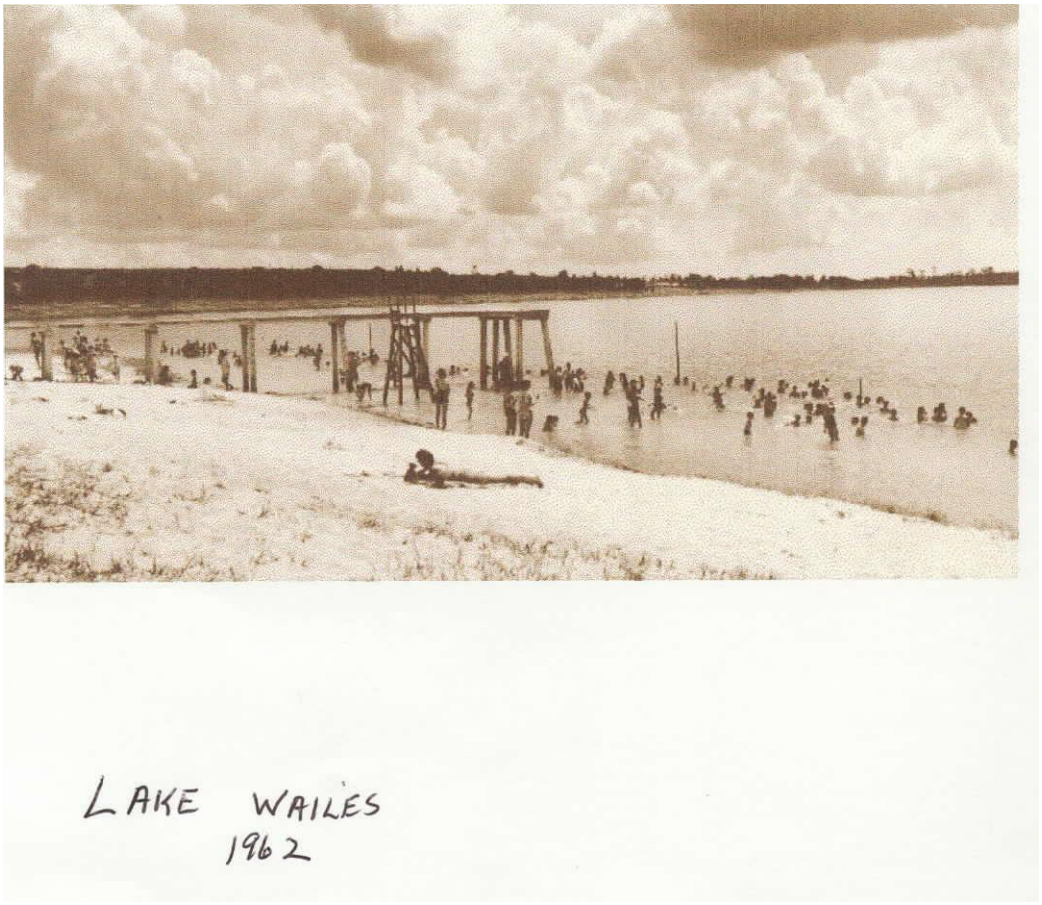

Figure 4. A picture of the Lake Wailes beach in 1962.

Section 6 - Management of Fish and Wildlife at Lake Wailes

Attendees of the January 12th meeting expressed concerns regarding the fish and wildlife populations of Lake Wailes. Lake Wailes has been a research lake studied by the University of Florida since the early 1970s. In 1986, the University of Florida surveyed the fish population of Lake Wailes using electrofishing transects and the bird populations of Lake Wailes using whole lake counts (Canfield and Hoyer 1992). This allows for a historical comparison with present fish and wildlife conditions and a comparison with expectations based on the findings from other Florida lakes.

We conducted a single day fish survey using electrofishing in January 2002 to compare fish life at Lake Wailes with the fish life found among 60 other Florida lakes, ranging in size and chlorophyll levels. During the census, 369 fish per hour were counted and an estimated 59.0 kg per hour was caught, We also captured11 species of fish (Table 5). Largemouth bass and bluegill dominated the fish population, accounting for 59% and 15% of the captured fish by weight.

Table 5. Lake Wailes electrofishing data collected January 2002.

Species[1]	#/hr	kg/hr[2]	Canfield and Hoyer (1992) Ranges		
			Min weight (kg/hr)	mean weight (kg/hr)	max weight (kg/hr)
Blue tilapia	3	3.111	0.611	2.635	6.963
Black crappie	11	2.015	0.008	0.667	2.866
Bluegill	213	8.847	0.039	4.966	44.702
Bowfin		1.619	3	54.5	225
Brook silverside	6	0.026	0	0.013	0.065
Florida gar	8	5.387	0.08	5.393	32.858
Golden shiner	5	0.267	0.004	0.625	6.504
Largemouth bass	47	34.571	0.112	9.084	32.667
Redear sunfish	12	0.621	0.037	2.615	18.31
Seminole killifish	62	2.550	0.002	0.414	2.234
Threadfin shad	8	0.042	0.002	0.339	1.087

Total	369	59.012

[1] Total # of species = 11.

[2] Weights calculated using regressions from Hoyer and Canfield 1994 and from Bill Schaeffer, Florida Fish and Wildlife Conservation Commission (personal communication).

Overall fish abundance was appropriate for the amount of chlorophyll found in Lake Wailes (Figure 4A), and the number of species caught was appropriate for Lake Wailes' size based on what has been found from 60 other Florida lakes (Figure 4B). Because the weight of the fish captured in Lake Wailes was at a level comparable to other Florida lakes of equal trophic status and species richness was at a level comparable to lakes of equal size, Lake Wailes currently has a healthy fish population. The abundance and species richness is also similar to samples collected from Lake Wailes in 1986 (Canfield and Hoyer 1992), indicating that the fish population has not changed much in 15 years.

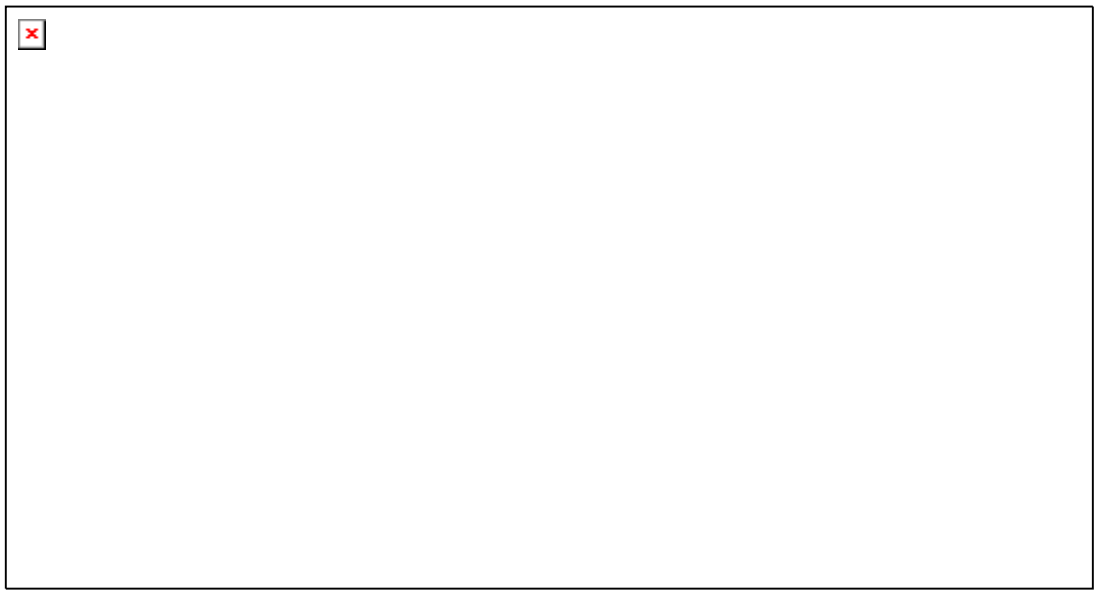

Figure 4A. Catch per unit of effort (kg of fish / hour of sampling) versus total chlorophyll (µg/L) for 60 Florida lakes sampled by Canfield and Hoyer (1992) (solid circles) and for Lake Wailes (Polk County) 1992 (open square) and 2002 (open circle) electrofishing sampling.

Figure 4B. Number of fish species collected versus surface area of lake for 60 Florida lakes sampled by Canfield and Hoyer (1992) (solid circles), and for Lake Wailes 1992 (◊) and 2002

(Δ) electrofishing sampling. The lines represent linear regressions for logged values of the 60 Florida lakes.

We also conducted a single day whole lake bird survey in January 2002 to compare the bird life at Lake Wailes to the bird life found at other Florida lakes ranging in size and chlorophyll levels. During the census, 18 species of birds were observed and 480 birds were counted (Table 6). Bird abundance was appropriate for the amount of chlorophyll found in Lake Wailes (Figure 5A). Bird species richness was also appropriate for a lake of Lake Wailes' size based on what has been found at 46 other Florida lakes (Figure 5B). Because bird abundance on Lake Wailes was at a level comparable to other Florida lakes of equal trophic status and species richness was at a level comparable to lakes of equal size, Lake Wailes seems to currently have a healthy bird population. The abundance and species richness was also similar to samples collected from Lake Wailes in 1986 (Canfield and Hoyer 1992), indicating that the bird population using the lake has not changed much in 15 years.

Table 5. Lake Wailes whole-lake bird count conducted January 24, 2002.

Common Name	Scientific Name	Number
Anhinga	*Anhinga anhinga*	6
Bald eagle	*Haliaeetus leucocephalus*	2
Belted kingfisher	*Megaceryle alcyon*	2
Boat-tailed grackle	*Quiscalus major*	100
Cattle egret	*Bubulus ibis*	51
Common moorhen	*Gallinula chloropus*	14
Crow	*Corvidae*	120
Double-crested Cormorant	*Phalacrocorax penicillatus*	91
Great blue heron	*Ardea herodias*	6
Great egret	*Casmerodius albus*	6
Gull	*Laridae larinae*	39

Little blue heron	*Egretta caerulea*	6
Mottled duck	*Anas fulvigula*	2
Red-winged blackbird	*Agelaius phoeniceus*	2
Snowy egret	*Egretta thula*	3
Tern	*Laridae Sterninae*	6
Turkey vulture	*Cathartes aura*	23
White ibis	*Eudocimus albus*	1
	Total Birds	480
	Total Species	18

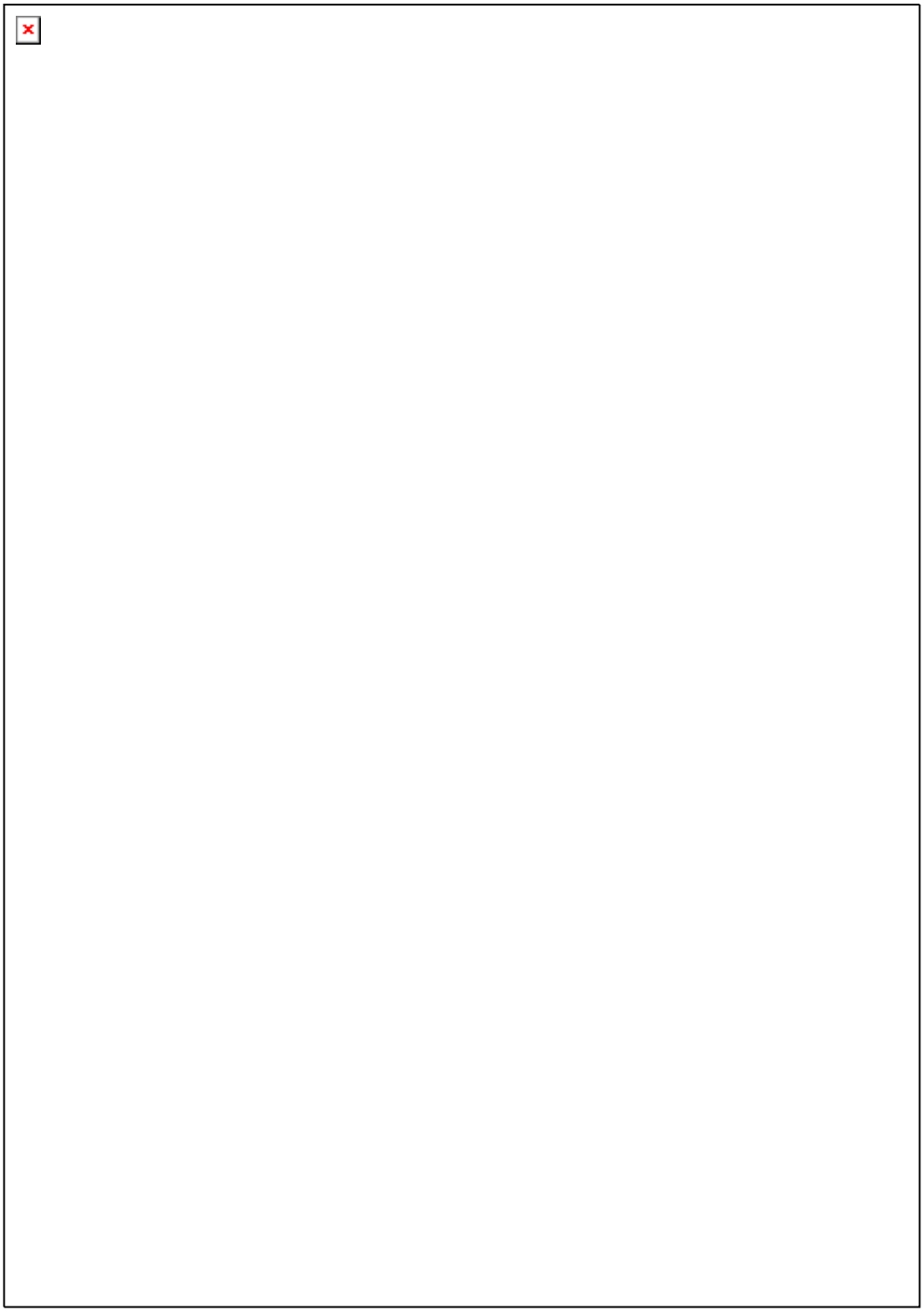

Figure 5A. Bird abundance (numbers / square km) versus total chlorophyll (µg/L) for 46 Florida lakes sampled by Canfield and Hoyer (1992, open circles) and for Lake Wailes in 1986 (diamond) and 2002 (solid circle).

Figure 5B. Number of bird species counted versus surface area of lake for 46 Florida lakes sampled by Canfield and Hoyer (1992, open circles) and for Lake Wailes in 1986 (diamond) and 2002 (solid circle).

Summary of Options to be Considered for Addressing Fish and Wildlife concerns at Lake Wailes

Option 1. Do Nothing extra to manage fish and wildlife

Both the fish and bird populations using Lake Wailes seem to have abundances that would be predicted from the chlorophyll levels. Species richness for fish and birds also seem appropriate for what would be predicted from the Lake Wailes' surface area. The fish and aquatic bird populations have also not changed significantly in about 15 years. Therefore the do nothing option is a very viable option especially considering the fish and wildlife populations currently seems to be in fine shape.

Option 2. Continue to monitor Fish and Aquatic Bird populations Using Lake Wailes

It is always wise to have long-term monitoring information on a lake's fish and aquatic bird populations to see if the populations are changing in a negative way when management activities are initiated. Florida LAKEWATCH has a volunteer bird monitoring program and all that is needed at Lake Wailes is a volunteer willing to count birds. Monitoring fish on the long-term will require some financial support. Either Florida LAKEWATCH or the Florida Fish and Wildlife Conservation Commission might be able to do the work, but the completeness and cost of the project would have to be negotiated as both groups have state budgetary constraints.

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APPENDIX I

Findings from a Workshop on Citizens' Concerns Regarding the Future Management of Lake Wailes