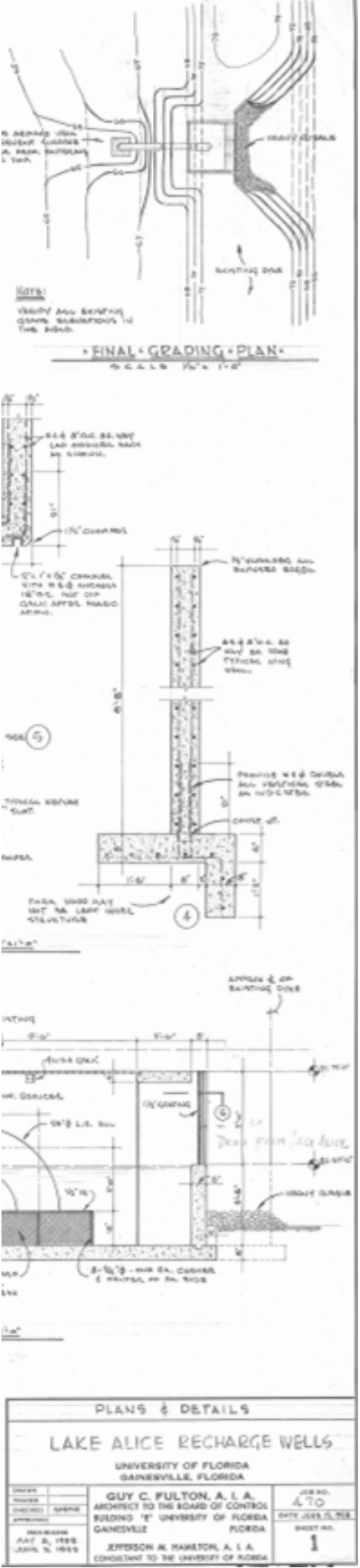


Attachment A – Lake Alice Watershed – History and Literature Review

Prepared for

University of Florida

August 2024

Prepared by

Wetland Solutions Inc

Table of Contents

Table of Exhibits

Figures

Tables

Section 1.0 Introduction

Lake Alice, the primary natural water feature on the University of Florida (UF) Main Campus is historically and ecologically significant. This natural landmark is deeply intertwined with the history and development of the North Florida region, Alachua County, the City of Gainesville, and UF. This report discusses the history of Lake Alice, campus planning and management documents that are relevant to the lake and watershed, research studies about the lake and watershed, news stories about the lake, and other documents that are relevant to resource management on campus. Figure 1 shows a painting of an early proposed layout for campus from 1916 with Lake Alice near the top right of the image (Kintz, 1916).

Figure 1. Painting of Proposed Layout for Campus, 1916

Section 2.0 Lake Alice History

The land now comprising the University of Florida has a history spanning at least 12,000 years, beginning with the Paleoindian Peoples of Florida. Over the millennia, various Native American cultures, including the Timucuan and Potano traditions, utilized the area around Lake Alice, with the Seminole People being the most recent group to inhabit the land that now encompasses Gainesville and the University.

In the late 1800s, the land surrounding Lake Alice was farmland owned by Mr. Witt. Originally called Jonas Pond and covering 2-3 acres, it was renamed "Lake Alice" after Mr. Witt's daughter (Clark, 2006). Since the University's relocation to Gainesville in 1905, Lake Alice has been a prominent feature. The University of Florida acquired the Lake Alice area in 1925 for an agricultural experiment station. The lake has since expanded from approximately 2.5 acres to around 82 acres of open water and emergent marsh (UF Clean Water Campaign, 2009). This expansion was accompanied by various changes in the watershed, including wastewater, stormwater, and lake-level management, as well as the development of buildings and associated infrastructure on campus. An approximate timeline of major events in and around the University that are relevant to this study are provided in Table 1 (Galicza, 2022; Grunewald, 2023; Hasebroock, 2021; Schwartz, 2019b; State Library and Archives of Florida, n.d.).

Table 1. Lake Alice and Watershed Historical Timeline

12,000+ B.C.	Paleoindians move into Florida. Florida is twice the land area it is today.
8,000 B.C.	Early-Archaic Culture develops.
5,000 B.C.	Early-Archaic Culture develops into Middle -Archaic Culture with increasing settlement.
3,000 B.C.	Middle-Archaic Culture evolves into Late-Archaic Culture with large villages and built earthen
500 B.C.	Late-Archaic Culture transitions into Woodland Culture.
100 A.D.	People of the Deptford Culture settle near Lake Alice.
1000	Burial mound (known today as the law school mound) is built by Alachua Tradition Peoples, ancestors of the Potano Indians who lived in Alachua County in the 16th and 17th centuries.
1513	Ponce De Leon explores Florida.
1565	Spanish colonization of Florida begins, starting in St. Augustine.
1821	Onis-Adams Treaty is ratified and the US gains control over East Florida, the land that would become the 27th state, from Spain.
1845	Florida becomes the 27th state in the Union.
1853	The first state-supported institution of higher learning and one of the primary predecessors to the University of Florida, the East Florida Seminary (EFS), opened in Ocala.
1861	EFS closes its Ocala campus due to the Civil War.
1866	EFS reopens its campus in Gainesville.
1884	Another primary predecessor to the University of Florida, the Florida Agricultural College (FAC), was established in Lake City.

1892	USGS Map named the waterbody Lake Alice.
1903	Florida Legislature renamed the FAC to the University of Florida.
1905	Four institutions (including the EFS and former FAC) were combined to create the University of the State of Florida, a school for white males.
1905	Lake City and Gainesville fight to be the home of this new university. Gainesville is chosen and construction begins.
1924	The university begins accepting some white women as students.
1925	UF acquires the land containing Lake Alice which was roughly 2.5 acres in size.
1926	UF constructs a primary wastewater treatment plant with a 0.07MGD capacity.
1930	UF Enrollment reaches 2,000.
1946	Unchlorinated effluent was discharged to a creek that drained to Lake Alice.
1947	Effluent from the new WWTP routed to a sinkhole (Sweet Sink) instead of Lake Alice.
1948	An earthen dam is constructed at the west end of the lake for flood control. This expands the lake area to approximately 20 acres.
1950	UF enrollment reaches 10,000.
1951	The Lake area expands to approximately 37 acres changing community types near the lake.
1958	The University becomes racially integrated.
1958	A nuclear reactor is built on campus.
1959	Two drainage wells are constructed to control lake levels. Any water that risked flooding campus would now drain into the aquifer.
1961	Aerial photo shows Lake Alice at an area of 22 acres due to added discharge of about 8.63 MGD from UF Heating Plant No. 2 east of Lake Alice.
1964	The wastewater effluent discharge to Sweet Sink is discontinued and the 1.7 MGD (6,400 m3 /day) of effluent is discharged to Lake Alice.
1967	The Reitz Union is constructed.
1968	WWTP effluent and cooling water discharges to Lake Alice increases its surface area to 33
1968	Dense hyacinth infestation observed in Lake Alice. A fence is constructed to control the hyacinth. Mechanical and biological controls are introduced. See Figure 3.
1970	Dragline dredges Lake Alice. See Figure 4.
1971	Lake Alice receives 0.86 MGD to 1.7 MGD of sewage effluent and 8.6 MGD to 10.4 MGD of
1976	Effluent from Heating Plant #2 is diverted from Lake Alice.
1994	UF's advanced water reclamation plant (WRP) begins operation. The WRP effluent was discharged to the northern drainage well.

2000	UF Enrollment reaches 50,000.
2004	Discharge of about 0.86 MGD of cooling water from the Reitz Union to Lake Alice is

2.1.1 Anthropogenic History

The anthropogenic history of Lake Alice was pieced together from historic aerials, newspaper articles, interviews, and regulatory permits. This record describes the evolution of the Main Campus of the University and associated stormwater and wastewater changes over the past 100+ years.

2.1.1.1 1890

The earliest USGS topographic map of the area is from the 1890 Arredondo Survey (U.S. Geological Survey, 1890). The map (Figure 2) shows a small lake named "Lake Alice" fed by a stream from the north. This stream will eventually become the stream that now flows through Fraternity Woods. The survey shows Lake Alice connected to the east to a stream-to-sink system. The survey shows a separate stream-to-sink system to the east of an unnamed road. The north fork of the stream is Jennings Creek, the east fork is Diamond Creek. This stream system flows to another pond, which was most likely another sink (possibly Sweet Sink), which today would be in Bartram Carr-Woods near the New Engineering Building and Black Hall. The topography from the top of Jennings Creek to Lake Alice drops about 100 ft.

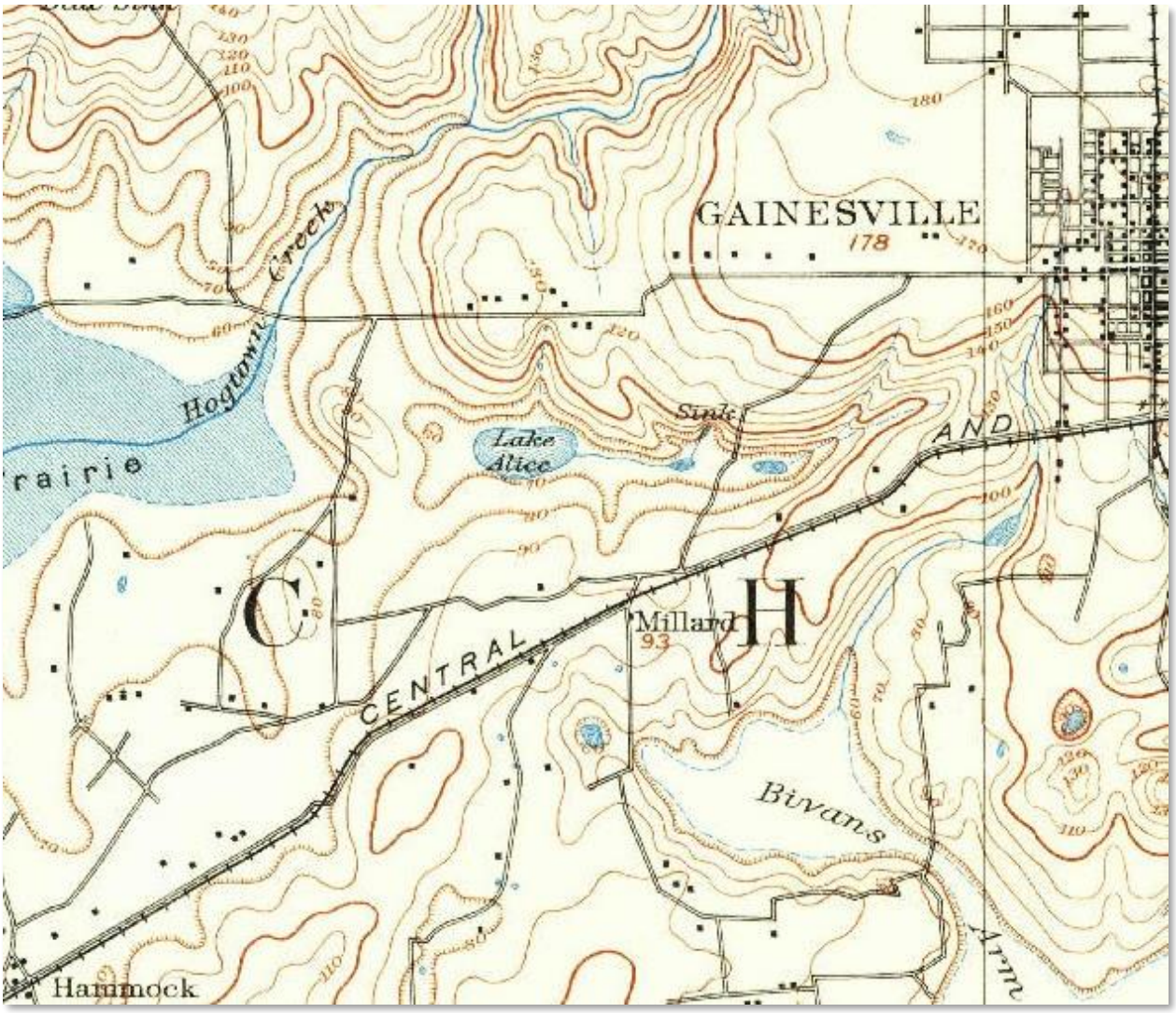


Figure 2. 1890 Arredondo Survey

2.1.1.2 1930s to 1940s

The earliest aerial imagery digitally available from the UF map library is from 1938 (Figure 3). The imagery shows some things that look familiar, like the roads that bound UF: SW 34th Street, SW 2nd Avenue, University Avenue, NW 13th Street, and Acher Road. The "old" part of campus near University Avenue & SW 13th Street is clearly visible. The roads that will become Museum Road, Stadium Road, and Newell Drive are also visible as are McCarty Woods, Bartram-Carr Woods, Harmonic Woods and Graham Woods. The narrow, wooded stream corridors for Jennings Creek and Diamond Creek are visible. At the north end of Jennings Creek are two wetlands that have ditches cut through them to drain to Jennings Creek. The first of these is Yulee Pit and the second appears to have been in the footprint of the current Honors Village and Broward Hall.

Lake Alice appears as a small, 9.5-acre, open water lake with a larger wetland complex to the east. There is also a well-defined round sinkhole with open water to the south, and a second, less-open sinkhole to the southeast of the first sinkhole. The south side of the wetlands is bounded by a dense stand of trees.

Figure 3. 1938 Aerial Image

In 1948, the College of Engineering drafted a report describing the drainage on campus and identifying potential solutions to flooding issues (C. D. Williams, 1948). Drainage patterns were initially modified in 1933 by filling a channel connecting Lake Alice and the main sink on campus, located near the University Spur Line Railroad which ran east of the sewage plant. Shortly after this modification a major rainfall event caused the lake to reach its highest recorded elevation of 72 feet, which would have inundated an area of approximately 132 acres. In approximately 1934, a dike was constructed along the west end of Lake Alice to keep water from flooding the golf course and other off campus areas at elevations below 70 feet. In 1946, a connection was documented between the main sinkhole near the sewage plant and railroad and the City of Gainesville's Well No. 1. It was also noted that the City water was "seriously contaminated". In order to decrease flow to the sink a dam was constructed across the opening to the sinkhole and a 24" pipe with flood gate was installed from the sink to Lake Alice. Based on measurements of water level an estimated infiltration rate of 0.46" per day was calculated for the wetted area. The watershed of the lake was also calculated to be 1,053 acres with a flooded area of 85 acres. Based on a rainfall event of 1.51" it

was estimated that approximately 25% of rainfall was converted to runoff for the basin. In 1947, the dike west of Lake Alice failed twice resulting in flooding to the west and onto the golf course. This flow resulted in development of a sinkhole that allowed water to drain from this area. This paper also presented several possible solutions to flooding on campus including: rehabilitating and increasing flows to the on-campus sinkhole near the railroad, increasing flow and improving the sinkhole west of Lake Alice, and draining water from Lake Alice to Hogtown Prairie. Continued drainage of water to the Railroad Sinkhole was not recommended because, "From a public health viewpoint, it cannot be recommended that surface drainage be permitted directly into an aquifer providing drinking water, if this can be prevented."

By 1949, significantly more development has occurred on campus. The main campus has expanded westward and southward. The area around the running track has grown into an athletic complex with a football field, baseball diamond, and tennis courts. The Florida Veterans housing is on what will become Flavet Field.

There are not significant connections for the stormwater flow from the north and east side of campus to reach Lake Alice, but already the open area of the Lake is 20 acres—or twice as large. On the west side of the Lake the newly constructed dam and channel under Radio Road is visible as is flooding along the edge of the Golf Course and at the sinkhole in the Bat House Woods.

The woods along the north side of the Lake and Wetlands as well as the woods that were the south edge of the Lake in 1937, but are now a middle peninsula, show some signs of damage in a northeast, southwest line. That may be mechanical clearing or possibly wind damage from a storm.

At the north end of Jennings Creek there is a ditch constructed to drain the wetland under what will become the Honors Dorms. Jennings Creek and Diamond Creek join, flow through Bartram-Carr Woods and into a sink, just barely visible through the trees.

McCarty Woods has been thinned enough that the "karst window" known as Liberty (fka Green) Pond is visible as are the karst features known as Ocala Pond, Gator Pond, Dairy Pond, and the Digital Design Wetlands. The stream from the Digital Design Wetlands, shown on the 1890s survey, is not visible on the aerial. At the north end of the Digital Design Wetlands is a dark, round circle which is the Trickling Filter for the wastewater treatment plant. In the 1940s, effluent from the wastewater treatment plant was routed to the Digital Design Wetlands where it drained to a karst feature known as Sweet Sink. Jennings and Diamond Creek may also be connected to this sink by an apparent defined channel connecting the Digital Design Wetlands to Bartam-Carr Woods. Graham Woods also appears to drain to a small creek that flows into the Digital Design Wetlands.

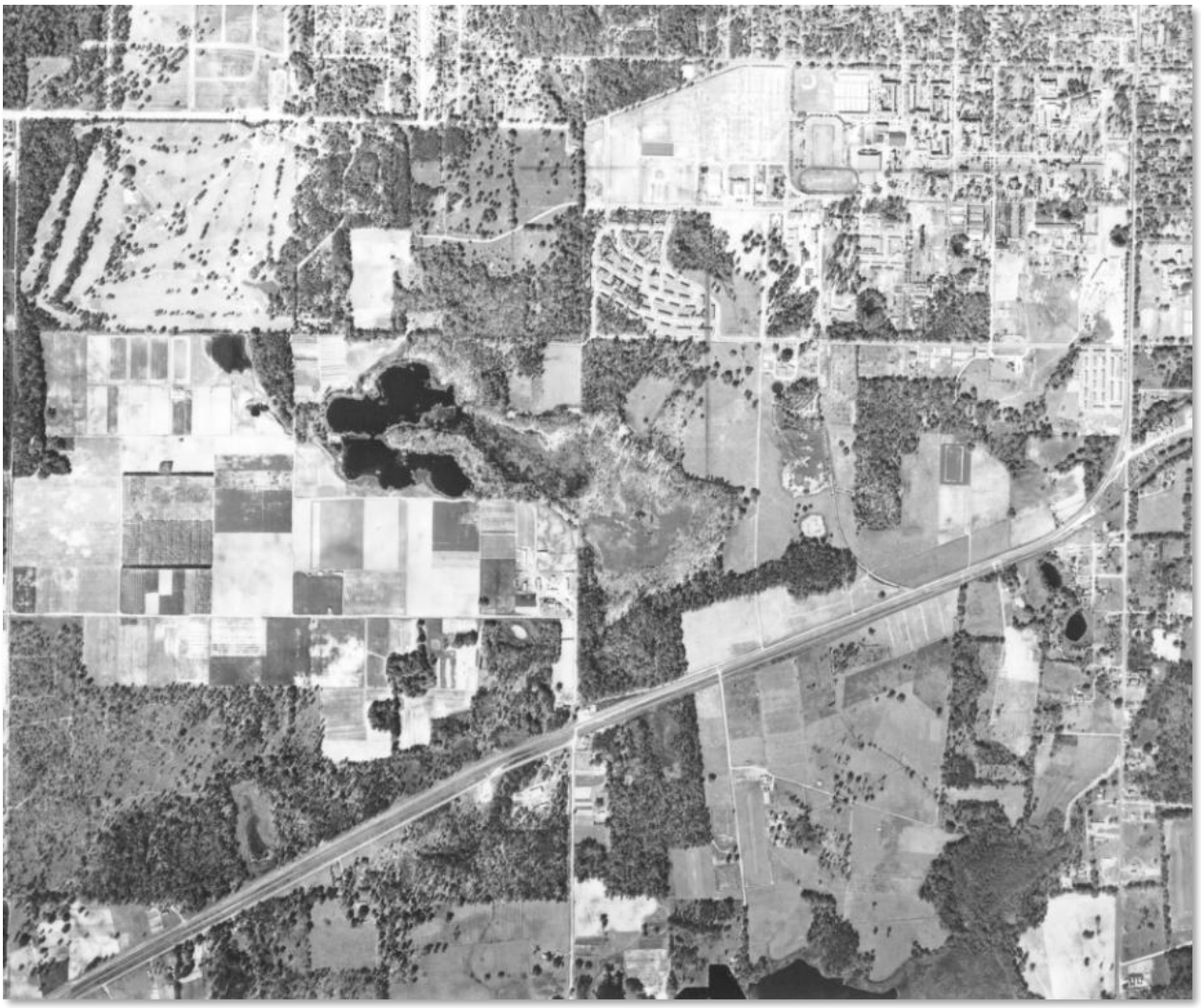


Figure 4. 1949 Aerial Image

2.1.1.3 1956-1959

Seven years later, significant development has taken place, including Newell Drive, the Health Science Center and Hospital, Fraternity Drive, and the Tolbert Area. Aerial images reveal extensive efforts to direct water away from buildings and into creeks, woods, and Lake Alice. Jennings Creek and Diamond Creek converge in the woods, which are bisected by Newell Drive. To the east, a larger wetland complex with low vegetation is visible, along with a ditch draining the wetlands under the road.

The wastewater plant now includes an oxidation ditch and sludge drying beds, with effluent still routed to Sweet Sink. Roads are visible around the sink's boundary.

Museum Road and Gale Lemerand Drive (formerly North-South Drive) have been improved, as has Graham Pond. Drainage from Graham Woods to the north has been redirected to Lake Alice, which has expanded southward, flooding areas across Museum Road and the east end of Radio Road.

Exhibit 1. 1956 Aerial Image

In December 1959, the Gainesville Sun reported "Draining of Lake Alice to cut danger of flood" (Halverson, 1959). The article states that "(b)y 1956, the lake had killed most of the trees around it. The drainage plain was always under water. Overflow last summer drained onto the golf course and parts of the swine fields…". The article details the plan to install two deep drainage wells to drain Lake Alice by 3 to 3.5 feet and return the Lake to a size closer to what it was in 1932, when a "dry plain to the southeast of the lake served as a flood plain to carry off the overflow during heavy rains." The wells, with design plans shown in Figure 5 were tested to each carry 4-5,00 gallons per minute and "will imitate in a man-made way the natural sinkhole now existing near the University incinerator."

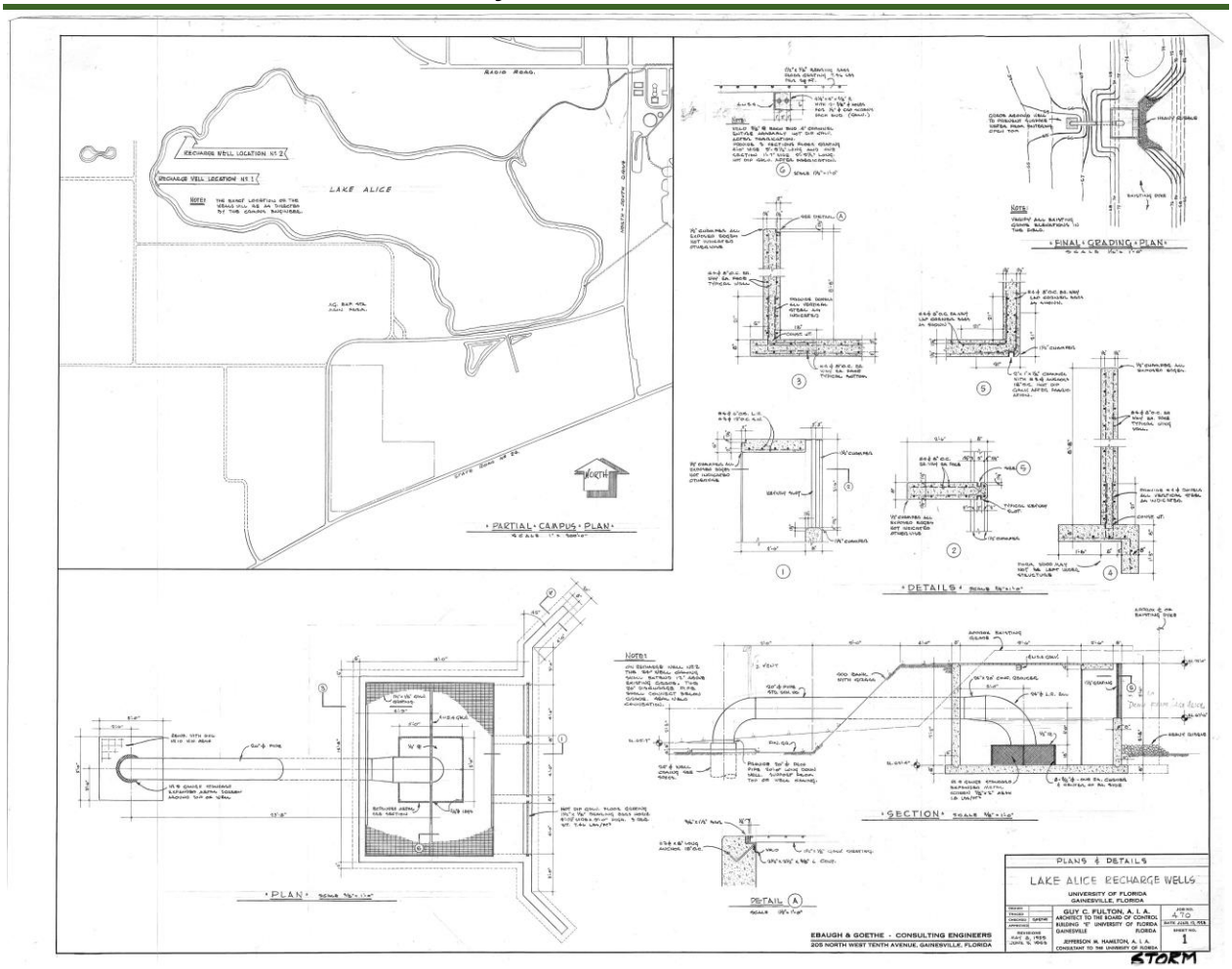


Figure 5. 1959 Drainage Well

2.1.1.4 1964-1966

In 1964, Lake Alice does not appear to be 3 to 3.5 ft lower or similar to the 1938 aerial. The south floodplain remains flooded (Figure 6). The Lake does look remarkably different, with a much smaller open water area and dense, low, uniform wetland vegetation. To the east of Lake Alice there is a wide, straight, well-defined channel that is connected to the wetland south of the treatment plant, and to Jennings and Diamond Creeks.

In 1966, USGS issued a new topographic map (Figure 7) that is strikingly different from the 1890's survey. Even with the new wells, Lake Alice is much larger and shown as connected to an inundated marsh.

Additional growth of the Lake has occurred due to the University beginning to discharge 10 MGD (38,000 m^3/day) of condenser water from Heating Plant #2 to Lake Alice in 1961. Then in 1964, another 1.8 MGD (6,800 m^3/day) of wastewater treatment plant effluent was routed to Lake Alice (Korhnak, 1996). Sweet Sink has been plugged to prevent future discharges to the sink. The predominant stream connection is a large, excavated channel that conveys effluent from the wastewater plant, as well as the flow from Jennings Creek and Diamond Creek to Lake Alice.

The sloped stream that flowed into Lake Alice from the north on the 1890s map is no longer visible. In its place is a steeply sloped depression surrounded by Fraternity Drive, and presumably an underground pipe.

The newly constructed Graham Pond is visible to the south of Graham Hall and to the north of Museum Road. The stream that flowed out of Graham Woods on the 1957 Aerial is also not shown. In its place is a depression with steep banks on the north side, and a building with a pipe presumably flowing under it on the south side.

Figure 6. 1964 Aerial Image

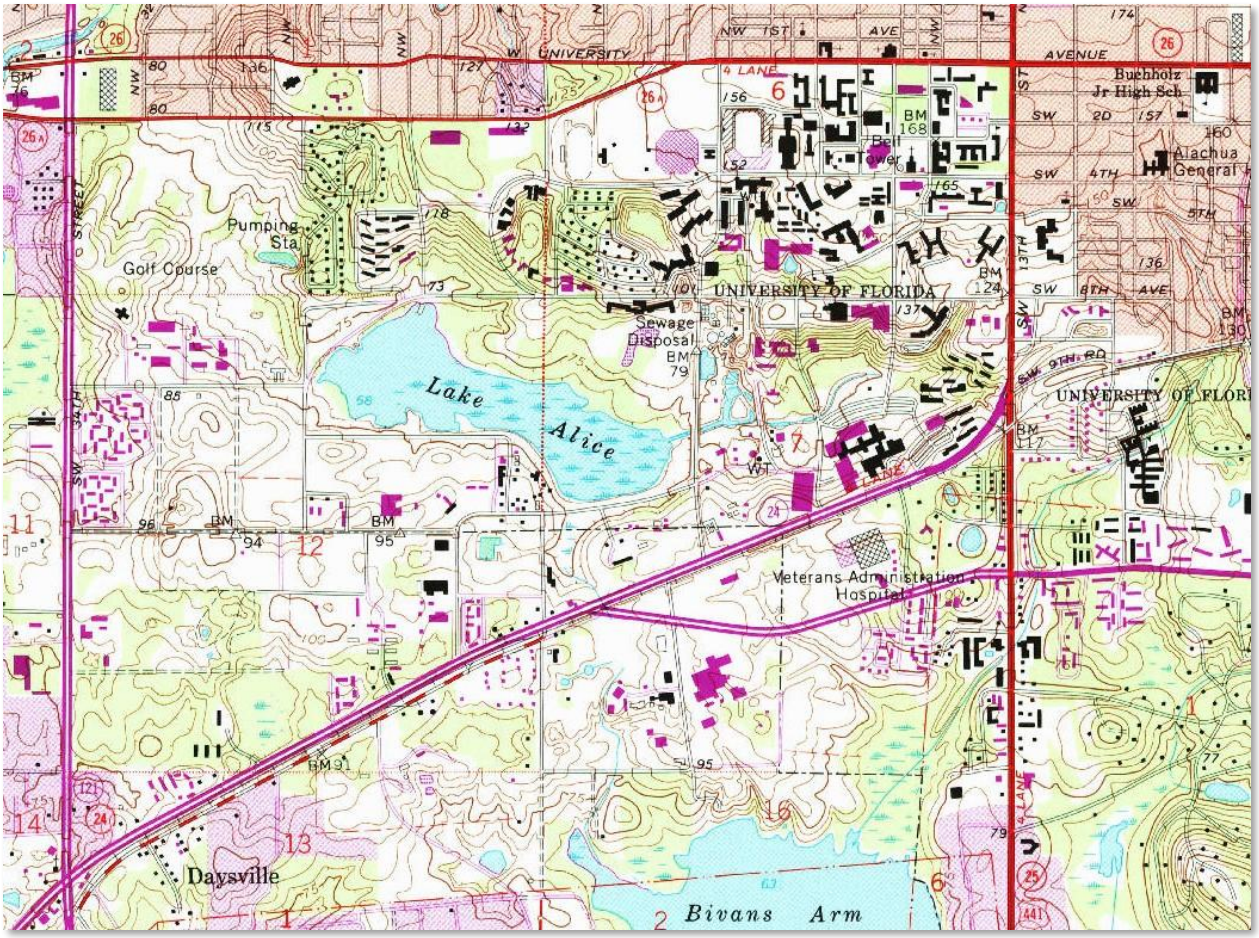


Figure 7. 1966 USGS Topographic Map (U.S. Geological Survey, 1966)

2.1.1.5 1971

By 1971, the campus is so densely developed that it is difficult to trace the aboveground fragments of Jennings and Diamond Creeks. The karst features are small, isolated features and the stands of trees are in small pockets. Most of the major hydrologic changes to the natural streams and the Lake were completed by 1971.

In the late 1960s and early 1970s the nutrient content of the wastewater effluent to the lake contributed to massive growth of water hyacinth that covered Lake Alice. Draglines were used to mechanically remove much of the hyacinth from the lake in the 1970s. A fence was also used to prevent the hyacinth from entering the open water portion of the lake as seen in the 1971 aerial (Figure 8).

Figure 8. 1971 Aerial Image

2.1.1.6 1987 Master Plan Permit

In 1987, CH2M Hill mapped the stormwater drainage basins on campus and applied for the first Master Environmental Resource Permit (ERP) for the main campus (CH2M Hill, 1987). The details of this first master permit are discussed in Section 3.3.1 focused on the environmental resource permit (ERP) for campus.

2.1.1.7 1994

As of 1994 (Figure 9) campus has developed more in the southwestern areas of the University with sports fields, structures, parking, and new IFAS facilities. Lake Alice now has a vegetated eastern edge that is similar to today. There has also been significant expansion of forest around the lake, Hume Pond, and other Conservation Areas. Additional development within the Lake Alice Watershed includes the

O'Connell Center, an expansion of the stadium, the old baseball field, the track, and significant new parking lots. Additionally, the health science and hospital facilities have expanded to include additional structures and parking.

Figure 9. 1994 Aerial Image

Section 3.0 Literature Review

The University of Florida has been located on the current Main Campus since approximately 1905. Since that time the University has grown from an incoming class of about 100 to almost 50,000. This substantial growth has been accompanied by large shifts in the development of an interest in the land on which the University sits. During various periods in the University's history data have been collected and studies have been undertaken on the campus. While not continuous, these data and studies provide snapshots through time that show how the University and its natural resources have changed.

In addition to the data that have been collected and the studies that have been completed, the University at the administrative level has prepared and implemented planning documents to guide the ongoing development of campus to meet its current and future educational goals. This section provides a literature review of documents that pertain to the Lake Alice Watershed and stormwater on campus, as well as an inventory and summary of data collected in the Lake Alice Watershed.

Nearly every campus planning document references Lake Alice, Conservation Areas on campus, or stormwater on campus highlighting the importance of these features and ecological services to campus. These planning documents summarize the goals for natural areas on campus and how these areas should be integrated as part of Main Campus. In addition to planning documents, a multitude of reports, theses, dissertations, and other studies have considered or evaluated the Lake Alice Watershed. This literature review summarizes available information relevant to the Lake Alice Watershed Management Plan (WMP).

3.1 UF Planning Documents

The University of Florida has developed a planning structure that includes three high-level plans for campus: the Strategic Development Plan, the Campus Framework Plan, and the Campus Master Plan with timeframes of 50 years, 15 years, and 10 years; respectively. These plans are bolstered by System Plans for specific areas or components of campus including:

- Campus Design Guidelines
- Conservation Area Land Management (CALM) Plan
- Food Services Master Plan
- Historic Preservation
- Housing Master Plan
- Landscape Master Plan
- Transportation and Parking Strategic Plan
- Utilities and Stormwater
- Wayfinding Master Plan
- Lake Alice Trails Master Plan

The portions of these documents that are pertinent to the Lake Alice Watershed and stormwater are discussed in the following sections.

3.1.1 Strategic Development Plan

Approved in 2016, the Strategic Development Plan is a 40- to 50-year guiding document that includes four primary focus areas: New American City, Proximity, Strong Neighborhoods, and Stewardship (University of Florida, 2016). The plan recognizes the unique nature of the regional aquifer and its vulnerability to depletion and pollution. The plan also found that natural places are an integral part of Gainesville's identity and the most beloved amenities.

Within the Strategic Development Plan protection of natural resources and ecological health is specifically recognized as part of the Stewardship focus area. This focus area called for a landscape master plan, an open space framework, a stormwater master plan, and partnering with the City and County on environmental issues. Collaboration with the City and County included on water issues and on the restoration of stream corridors and the development of pedestrian and bike trails that enhance community connectivity. Specific interventions that were mentioned were daylighting piped streams, removal of invasive plants, and clearing of underbrush.

3.1.2 Campus Framework Plan

The Campus Framework Plan, approved in 2019, builds upon the Strategic Developmet Plan by making recommendations for the "University's on-campus physical development over the next 15 years" (University of Florida, 2019). The Framework Plan developed five focus areas: Open Space and Infrastructure, Interdisciplinary Research, The Future of Learning, The Student Experience, and Academic Regeneration. Lake Alice is recognized early in the Plan as an important natural feature on campus that can promote clarity in wayfinding through campus. The Framework Plan also built upon other system master plans developed based on recommendations of the Strategic Development Plan including: the Landscape Master Plan, the Transportation and Parking Strategic Plan, and the Housing Master Plan. Based on this work the Campus Framework Plan developed a series of initial ideas that included: centering campus around Lake Alice; connecting the campus; transforming residential life; and a diversify, blend, and renew program. Particularly relevant to the LAWMP is the concept of centering campus around Lake Alice.

The Campus Framework Plan identifies Lake Alice as the metaphorical heart of campus, located at the physical heart of campus and conceptualizes the lake as a hub that connects the remote areas of campus around a special and unique natural resource. The lake is identified as an important part of the campus's watershed resources given its location in the low areas of campus with restoration and expansion recommended to improve drainage conditions. Also recommended for Lake Alice is an expanded trail system that provides an immersive experience around and across the lake while providing ecological restoration in some areas to improve the natural conditions.

3.1.3 Campus Master Plan

The Campus Master Plan is meant to guide use and development of facilities and land resources over the next ten years and beyond (University of Florida, 2020, 2021). The plan is comprised of 13 elements that cover facilities in Alachua County including the Main Campus and satellite properties. Reports prepared for the elements include data and analysis reports, plan elements, and evaluation and appraisal reports. Many elements of the Campus Master Plan include environmental or stormwater considerations. The considerations related to this study are summarized in Table 2. This list is not intended to be exhaustive, and the Campus Master Plan should be referenced for complete information.

Table 2. Campus Master Plan Elements Related to the Watershed Management Plan

Element	Report Type	Summary
Future Land Use and Urban Design	Data and Analysis	The Land Development Analysis considers constraints on future development. Wetlands, wetland buffers, floodplains, waterbodies, karst features, steep slopes, rare plants, and poorly-drained soils are all considered as constraints that limit development.
Future Land Use and Urban Design	Data and Analysis	Open space connections were examined for campus which include pedestrian pathways and physical connections between open spaces that might accommodate migration of flora and fauna.
Future Land Use and Urban Design	Data and Analysis	2020-30 Future Land Use Recommendations to increase the acreage of urban park and conservation lands.
Recreation and Open Space	Data and Analysis	Available recreational and open space compared to the City of Gainesville level of service (LOS) standards for development. Recommended LOS is 6.0, 2.0, and 0.8 acres per 1,000 people for conservation, community park, and neighborhood park, respectively. UF provides approximately twice the recommended area. Similarly, Alachua County has a recommendation of 0.5 acres of activity-based recreational site and 5.0 acres of resource-based recreation per 1,000 people in unincorporated areas. UF currently provides substantially more than the recommended acreage for both classifications.
Recreation and Open Space	Data and Analysis	Passive recreation is accommodated in both urban park land uses and conservation land uses. Open spaces include 457 acres of conservation, 79 acres of urban park, and 20 acres of green space buffer.
Conservation	Data and Analysis	This section details the baseline 2005 condition based on the CALM Plan developments at that time. This section compares the projected 2020-30 period to examine future improvements in habitat quality and abundance and diversity of flora and fauna.
Conservation	Data and Analysis	The report details much of the Lake Alice Watershed history and condition. This includes descriptions of land use changes, lake condition, wastewater practices, and flooding. This report also discusses natural community types on campus, invasive plants and their control, soils present on campus, wildlife, and cultural sites.
Conservation	Data and Analysis	Erosion and sedimentation are identified as two of the primary stormwater concerns on campus because the Conservation Areas serve the dual purpose of stormwater management. LID is recommended as a method to manage stormwater to reduce impacts.
Conservation	Data and Analysis	All Conservation Areas on campus are described including actions taken since 2005 and past and current challenges.
General Infrastructure	Data and Analysis	Included within the Stormwater Sub-Element is the regulatory framework for the MS4, the 303(d) list, and the District Stormwater Master Permit. Also provided is a hydrologic overview of campus including a detailed history of the areal extent of Lake Alice and water inputs and details of UF's Clean Water Campaign.
General Infrastructure	Data and Analysis	Stormwater issues on campus are described based on the challenge of providing traditional stormwater controls because of the high degree of urbanization and infill projects. Innovative stormwater management and LID are proposed as possible solutions.

Element	Report Type	Summary
General Infrastructure	Data and Analysis	The agreement between UF and the City of Gainesville is presented, which concluded that the entities contribute similar volumes of stormwater to each other's systems.
General Infrastructure	Data and Analysis	This report identified that although the current Master Permit allowed for an additional 152.7 acres of impervious areas (as of 1/1/2019) without additional stormwater management that the development of this area "…leads to an exacerbation of creek erosion and downstream sedimentation to a system that already has some documented problems."
General Infrastructure	Data and Analysis	LID, ecologically-enhanced systems, and agricultural BMPs are presented as possible methods to reduce stormwater impacts. Also presented were identified priority stormwater projects on campus and potential opportunity areas for incorporating stormwater management or LID techniques.
General Infrastructure	Data and Analysis	Wastewater production, irrigation reuse, and recharge are presented for campus.
Intergovernmental	Data and Analysis	Presents the addition of conservation and urban park areas planned for the 2020-30 Master Plan with a decrease of green space buffer that was changed to urban park for a net increase in area of 17.9 acres.
Urban Design	Plan Element	Objective 1.1 includes Policy 1.1.5 to maintain and enhance open space connections.
Urban Design	Plan Element	Objective 1.2 includes Policy 1.2.7 to develop new facilities that integrate with the natural environment of campus.
Urban Design	Plan Element	Objective 1.3 calls for using landscaping and tree canopy to enhance campus and reflect the ecological setting. Policies include: using appropriate vegetation for landscaping, reduction of hardscape, coordination with LVL Committee for tree removal and replacement, and approval of new landscaping by the LVL Committee.
Urban Design	Plan Element	Provides open space connections map, open space enhancement priorities map, and Lake Alice trails map (current and proposed).
Future Land Use	Plan Element	Changes in land use include increases in the areas of conservation (7.3 acres) and urban parks (15.6 acres) and a decrease in green space buffer (-5.0 acres).
Future Land Use	Plan Element	Policy 1.1.5 calls for functional compatibility when new structures are built adjacent to Conservation Areas.
Future Land Use	Plan Element	Policy 1.2.2 requires amendments in future land use boundaries that impact Conservation Areas to document site alternatives and evaluations that consider impacts and minimization of impacts.
Recreation and Open Space	Plan Element	Policy 1.1.5 calls for enhancing the Urban Park Future Land Use classification to ensure adequate space for passive recreation.
Conservation	Plan Element	Areas designated as Conservation Areas were used as the base layer when designating all future land uses.
Conservation	Plan Element	Calls for reducing the footprint of McCarty Woods because of low ecological value (reversed by 2021 Amendment), preserving Bartram Carr Woods, and increasing Conservation Areas near Lake Alice Creek and around campus by 7.3 acres.
Conservation	Plan Element	Goal 1 calls for preserving, enhancing, and managing campus natural resources as native habitat for flora and fauna.

Element	Report Type	Summary
Conservation	Plan Element	Objective 1.1, Policies 1.1.1-1.1.4 outline regular monitoring in the Conservation Areas to identify non-native vegetation requiring control and edge maintenance, declare the intent to remove non-native and nuisance animals where feasible, and develop areas adjacent to Conservation Areas in a manner that results in minimal visual impacts.
Conservation	Plan Element	Objective 1.2, Policies 1.2.1-1.2.11 discuss wetland and buffer protection, permitting for any impacts in these areas, developing all new structures above the 100-year floodplain, providing native riparian zones as buffers, restoring natural edges to some ponds and creeks on campus, and daylighting piped stream to the greatest extent feasible.
Conservation	Plan Element	Objective 1.3, Policies 1.3.1-1.3.3 present restrictions on activities that would impact habitat and survival of protected species.
Conservation	Plan Element	Objective 1.4, Policies 1.4.1-1.4.4 calls for the CALM Plan to be developed and updated with Conservation Areas preserved and restored as needed and the University pursuing funding to implement the CALM Plan, Landscape Master Plan, and the Lake Alice Trails Plan.
Conservation	Plan Element	Policies 1.4.5, 1.4.9, and 1.4.10 address stormwater and hydrologic function with requirements to implement BMPs, minimize impacts from utilities and stormwater, blend into the Conservation Area, and be approved by the LVL Committee.
Conservation	Plan Element	Policies 1.4.6-1.4.8 and 1.4.11-1.4.15 pertain to using natural areas for education and research, improving appearance and security, enhancing passive recreation and educational signage, and minimizing impacts from land use changes or other activities in the Conservation Areas.
Conservation	Plan Element	Included maps provide natural communities, soils, water resources, and invasive plants.
General Infrastructure	Plan Element	Goal 1 calls for design, construction, and maintenance of an environmentally-sound stormwater system.
General Infrastructure	Plan Element	Objective 1.1, Policies 1.1.1-1.1.6 requires that the University comply with the Clean Water Act and all relevant permitting with the SJRWMD and FDEP. This includes obtaining permits as required, providing stormwater management to meet future service demands on campus, and submitting an annual report of impervious areas and as-builts.
General Infrastructure	Plan Element	Objective 1.2 address maintenance of the existing stormwater system and provision of sufficient infrastructure to meet future needs. Policy 1.2.1 ranks improvement implementation based on eliminating existing deficiencies and deferred maintenance especially those that involve life safety and property protection, maintaining the existing system through routine preventative maintenance, and expanding the system to accommodate stormwater needs. Policy 1.2.2 requires that when maintenance is completed, stormwater systems be upgraded to accommodate future needs. Policy 1.2.3 calls for Facilities to review all proposed development projects to ensure that the existing system can accommodate the needs. Policy 1.2.4 and 1.2.5 addresses construction standards for retention facilities and associated landscapes. Policy 1.2.6 calls for implementing projects to reduce erosion and runoff and improve water quality. Policy 1.2.7 calls for the University to collaborate with the City and FDOT to manage stormwater between the entities.

Element	Report Type	Summary
General Infrastructure	Plan Element	Objective 1.3 calls for protecting natural functions, maintaining water quality, and controlling sedimentation. Policy 1.3.1 states that the University will not allow stormwater discharge to cause or contribute to a violation of water quality in Waters of the State. Policy 1.3.2 calls for implementation of BMPs to reduce impacts. Policy 1.3.3 requires managing sedimentation to limit erosion. Policy 1.3.5 and 1.3.6 pertain to cooperation in managing stormwater with the City and County. Policy 1.3.7 calls for considering different use expectations for Lake Alice, to continue monitoring the lake, and to try to meet Class III-limited water quality standards for the lake.
General Infrastructure	Plan Element	Objective 1.4 discusses the incorporation of sustainable stormwater practices in all campus site development where practicable. Policy 1.4.1 calls for the University to implement stormwater improvements into all new or modified sites. Policy 1.4.2 addresses implementing recommendations in the Landscape Master Plan to incorporate stormwater management. Policy 1.4.3 calls for any stormwater projects in natural areas to receive the approval of the LVL Committee.
General Infrastructure	Plan Element	Objective 1.5, Policies 1.5.1-1.5.3 plans for education and outreach about stormwater issues through outreach and demonstration projects.
General Infrastructure	Plan Element	Objective 3.2, Policies 3.2.1-3.2.3 calls for maximizing the use of reclaimed water while reducing groundwater pumping and effluent discharge down the recharge well.
General Infrastructure	Plan Element	Potential future stormwater improvements are presented in Figure 9-1.
Capital Improvements	Plan Element	Policy 1.1.3 calls for provision of adequate utilities including stormwater management facilities to support land use and development.
Implementation	Plan Element	Policy 1.1.2 addresses minor projects, which require review if they are within or adjacent to conservation, green space buffer, or urban park land uses.

3.1.4 System Plans

System plans provide an increased level of detail for how the University would like to manage various aspects of campus. Portions of the system plans that are relevant to the WMP are discussed in the following sections.

3.1.4.1 Campus Design Guidelines

The Campus Design Guidelines (University of Florida, 2017) build upon the University's Strategic Development Plan with the goals of strengthening City and campus connections, improving the pedestrian experience, enhancing land uses by creating density, and maximizing partnerships to unify the broader UF community. Enhancing the natural campus systems and integrating Conservation Areas with campus was identified as a primary goal of the guidelines, as well as developing a creative, yet cohesive landscape. The Guidelines require project review when major or minor projects have impacts on open space on campus. The importance of the natural landscape and water features are prominently featured in the Guidelines, as is their role in stormwater management.

The natural systems on campus are acknowledged to include lakes, wetlands, streams, and upland forest that have been impacted by encroachment, untreated runoff, and invasive species. The Guidelines

recommend that these areas be rejuvenated with rainwater capture, infiltration, or reuse wherever possible.

3.1.4.2 Conservation Area Land Management (CALM) Plan

The CALM Plan is in the process of being updated. The updated CALM Plan includes 25 specific area plans each of which includes a site, habitat, hydro, and soil map for a Conservation Area on main campus or at one of the satellite facilities. Recommendations compiled as part of the development of the updated CALM Plan were categorized into common themes. These themes include:

- Accessibility and Connectivity: Increasing the connectivity of Conservation Areas while improving accessibility to allow for more opportunities to connect with nature.
- Invasive Species Management: Holistic management to address invasive species through treatment and restoration of native species.
- Boundary Verification: Clearly defining and delineating Conservation Area boundaries based on survey to more effectively communicate these spaces.
- Engagement & Community Outreach: Improving signage and marketing to highlight these areas as valued amenities and to educate about the unique features and biodiversity of the Conservation Areas.
- Safety & Accountability: Updating processes to improve accountability and safety in the Conservation Areas.
- Ecological Restoration & Stormwater Management: Acknowledging the role waterbodies and wetlands on campus play in managing stormwater. Addressing concerns by implementing a watershed management plan for Lake Alice.

The CALM Plan and associated area plans provide the basis for management of Conservation Areas to improve ecological condition and enhance the value of these spaces within the campus landscape.

3.1.4.3 Landscape Master Plan

The Landscape Master Plan developed in 2018 (CRJA-IBI Group et al., 2018) guides the enhancement of campus landscapes with the following key objectives:

- Creating engaging campus spaces that support and educate the community;
- Reducing hardscapes and increasing planted areas to support LID practices;
- Being stewards of the natural systems on campus;
- Promoting the installation and maintenance of native species;
- Accommodating multi-modal transportation;
- Developing a cohesive campus image; and
- Creating a sustainably maintained landscape.

These goals are clearly aligned and consistent with the goals of the CALM Plan and with the goals and objectives of this WMP. This report also highlights the importance of landscaped and natural spaces to the identity of the University and the health and well-being of the campus community. Specific elements

of the vision for the campus landscape that are relevant to the WMP include development of "An interconnected campus" and "A campus connected to its natural systems". While the vision element of "An interconnected campus" is focused on transportation, the development of shared use paths is highlighted. Given that the Conservation Areas currently include many trails and paths and intertwine through campus, development of shared use paths and memorable spaces within the Conservation Areas provides the opportunity to connect users to natural systems on campus while helping them navigate the University. The vision element "A campus connected to its natural systems" highlights the importance of natural systems and developing passive recreational opportunities while enhancing the University's educational mission. The plan also calls for the restoration of these natural spaces along with the incorporation of LID in all campus projects to improve water quality while modeling stormwater BMPs. Specific projects recommended by the plan include Yulee Pit, with development of a project to improve passive recreation, stormwater management, and ecological education; Jennings Creek, to enhance access while reducing invasives coverage and improving bank stability; and Lake Alice, by improving trails between natural areas and integrating overlooks and boardwalks with seating.

The Landscape Master Plan also presented six principles to guide landscape design on campus. Principles 4 and 5 relate specifically to natural areas, stormwater management, and the ecological setting of campus. These principles promote environmental stewardship and integration of natural areas in the University's educational mission. The protection and management of these areas is also highlighted. Within the built areas of campus, it is recommended that manicured edges of water features be returned to a more natural condition to improve habitat value and water quality. These natural areas are highlighted as University assets that can be used for teaching and research. The report acknowledges the changes that have occurred in the hydrologic landscape but recommends that to the greatest extent practicable that these areas should be enhanced, restored, and preserved. The report also recommends that, where possible, underground drainage systems should be daylighted. The value of open spaces and native landscapes on campus are highlighted with the comment, "Too often the native landscape is overtaken by the built environment and the character of the historic ecology is diluted or lost."

Principle 5 "Reflect UF's Ecological Setting in its Plant Materials, Promoting Simplicity and Maintainability in Planting Design", makes recommendations on simplifying campus landscaping to improve the cohesive feel across campus and increase the maintainability of landscaped areas. Recommendations include the protection of existing trees on campus and the use of native plant materials in landscaped areas. The report also recommended tree species based on community types across campus including within Conservation Areas.

Section 5 of the plan discusses natural features on campus and recommends the restoration of these areas to serve as natural respites at the University. Additionally, the report recommends the following:

- Development of a comprehensive stormwater management system
- Discouraging direct discharge of stormwater into campus waterbodies
- Daylighting piped streams to the greatest extent possible
- Removal of non-native plants and re-planting of native species
- Installing riparian buffers along waterbodies
- Providing educational signage
- Correcting erosion along Lake Alice Creek between Center and Newell Drives

- Encouraging access to waterbodies for passive uses
- Ensuring all edges of campus waterbodies are naturally landscaped without hard edges

3.1.4.4 Lake Alice Trails Master Plan

The Campus Trails Master Plan was developed in 2020 (CHW, 2020) and considered existing trails on campus and opportunities to improve connectivity. The project purpose was to "Create a cohesive trail system that celebrates and encourages user interaction with the Campus' unique ecological features while prioritizing conservation management." Based on stakeholder input this report identified a "desire to focus on conservation and ecological function, as well as that centering the campus trail system around Lake Alice." Of the project goals two focused on protection of existing ecological functions and maintenance/enhancement of learning and research within natural areas. The plan also proposed modifications to the trail system around Lake Alice to improve accessibility and connectivity while increasing the availability of user interactions with "this unique ecological resource." Also provided were potential trail alignments, materials, phasing, and cost estimates.

3.2 Municipal Separate Storm Sewer System (MS4)

The MS4 program is a part of a program created by the Federal Clean Water Act, called the National Pollutant Discharge Elimination System (NPDES). NPDES is a federal program, administered by Florida, regulating point sources that discharge pollutants into Waters of the United States (WOTUS). The MS4 permit conditions list best management practices (BMPs) the University uses to minimize the discharge of pollutants from the storm sewer system into receiving waters including Lake Alice. The University's MS4 permit (FLR4E067) lists the receiving waters to which the MS4 discharges as:

- Lake Alice (closed basin), which FDEP lists as impaired for phosphorus.
- Hogtown Creek (closed basin), which FDEP lists as impaired for phosphorus.
- Tumblin Creek/ Biven Arm Lake to the Orange Creek Basin, which FDEP lists as impaired for nutrients (chlorophyll a).

Lake Alice is listed as a receiving water and it is considered a WOTUS. Appendix A provides a memo summarizing the basis, and history, of the U.S. Environmental Protection Agency's determination of Lake Alice as a WOTUS in 1979 based on the definition in 40 CRF 120.2 (a)(1)(i) *"Waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce..."*. EPA determined that Lake Alice was a WOTUS based on the historical or potential future use of the lake by out-of-state or foreign students. However, Lake Alice appeared as a natural lake as early as the USGS 1890 topographic survey. This is significant because it provides evidence that Lake Alice was not excavated from uplands for the purpose of waste treatment, and it is appropriate to consider it a natural lake which was altered to provide flood storage, waste treatment, and stormwater treatment.

The MS4 permit is a General Permit which uses a prescriptive approach to assign management practices that support the water quality requirements of the Clean Water Act. The Generic Permit requires the MS4 Operator to develop and implement a Stormwater Management Program (SWMP) that includes six minimum control measures, with measurable goals for evaluating the programs' effectiveness. The six minimum control measures are:

1. Public education and outreach.

2. Public participation / involvement.
3. Illicit discharge detection and elimination.
4. Construction site stormwater runoff control.
5. Post-construction stormwater management in new development and redevelopment.
6. Pollution prevention/ good housekeeping practices for municipal operations.

3.3 Environmental Resource Permit

Since 1987, the University of Florida Main Campus has had an ERP for the Master Drainage system, issued by the St Johns River Water Management District (SJRWMD). Prior to the Master Drainage Permit and beginning in the early-1980s, each construction project on campus was required to show the drainage area, and drainage path and that the stormwater design for each project provided water quality treatment and met pre-versus post rate control. The 1987 Master Permit fundamentally changed the management of stormwater in the closed basins on campus and is discussed below.

Permits issued since the original master permit in 1987, have largely relied on the same permitting strategy with updates to impervious areas, modeling, and planned development. This has included new permits issued in 2000 and in 2010. These permit reports are discussed in the following sections with information on changes in the reports and permitting information. The ERP was in the renewal process at the time of this report, but a draft permit report from October 17, 2023 was reviewed and is presented here with discussion of permitting changes.

3.3.1 1987 Master Drainage Permit

The initial 1987 master drainage permit report requested a conceptual permit for all of Main Campus to establish criteria for a 20-year planning period. The report further requested individual permits for the Lake Alice Basin, with Lake Alice acting as the approved stormwater management system, and for the Depression Basins, with individual depressional areas acting as the stormwater management systems, for a period of 10 years. These areas were not required to show peak rate reduction because they are closed basins with flooded areas contained on campus. Projects within the stream basin areas (Hogtown and Tumblin) were noted as requiring both water quality and peak flow control with site-specific design details and general permits. Additionally, this document mapped estimated 100-year floodplain elevations for the delineated basins, for use in defining the minimum floor elevations for new buildings. This report also identified the heating plant as susceptible to flooding and recommended several potential improvements to reduce flooding potential.

The Master Drainage Permit divided campus into 4 main watersheds:

- Lake Alice
- Hogtown Creek
- Tumblin Creek/ Bivens Arm
- Depressional Basins

For each of the main watersheds, CH2M Hill developed design and permitting strategies to meet the ERP water quality and water quantity requirements. At the time of this report the Lake Alice Watershed was

approximately 34% impervious with a basin area of 1,059 acres. Fourteen depressional basins were mapped with sizes ranging from 3 to 163 acres (total area 576 acres). Five subbasins were mapped to Hogtown Creek with an area of 117 acres and five basins were mapped to Tumblin Creek with a basin area of 330 acres. CH2M Hill completed a wet detention evaluation for Lake Alice to show that the lake could provide adequate treatment for planned construction projects. The report requested a 10-year individual permit duration with UF submitting annual reports that identify the new impervious area added in each basin. No additional water quality requirements were proposed for the Lake Alice or Depressional Basins unless the construction presented a "major hazard", examples of which included fueling areas, chemical transfer areas, washdown areas, or other sources of oil, grease, and debris.

This report also made the following level of service (LOS) recommendations use of the 10-year, 24-hour storm for "minor internal drainage facilities", the 25-year, 24-hour storm for designing storage basins for peak flow attenuation in the Hogtown and Tumblin Basins, and the 100-year, 24-hour storm used to establish minimum floor elevations. While the report states that no regulatory peak flow control is required in the Lake Alice or Depressional Basins it was stated that designs should consider "total inflows and drainage facility capacities" and that "excavated detention basins may be used for peak flow control". The report goes on to recommend that velocity be considered to avoid soil erosion and scour. Allowable velocities for various channel lining types listed in the report are shown in Table 3 with a range from 1.5 to 6 feet per second (fps) for natural surfaces and up to 10 fps for concrete without energy dissipation. Additionally, it was recommended that storm sewers less than 15 inches in diameter be avoided, and that erosion and scour protection be provided at terminal outlets.

Table 3. Maximum Allowable Channel Velocities for Various Linings (CH2M Hill, 1987)

Channel Lining	Allowable Velocity (fps)
Silt or Fine Sand	1.5
Sandy Loam	1.7
Silt Loam	2.0
Firm Loam	2.5
Stiff Clay	3.7
Hardpans	6.0
Sod	4.0
Lapped Sod	5.5
Geotextile Grid	4 - 8[a]
Concrete	10[b]

Reference: University of Florida (1972)

[a] Varies with grid type

[b] Higher velocities allowable with appropriate energy dissipation

Section 8 of the report details the calculations for Lake Alice being considered the wet detention feature for the basin that drains to the lake. Specific criteria taken from SJRWMD and discussed include:

1. Permanent pool volume provides a minimum residence time of 14 days.
2. Treatment provided for the first inch of runoff or 2.5 inches of runoff over the impervious area, whichever is greater. With no more than half of this discharged in the first 60 hours.
3. Side slopes flatter than 4 horizontal:1 vertical.

4. Pond depth less than 12 feet, with less than 10% of the area greater than 8 feet, 50-70% 4-8 feet deep, and 25-50% 0-4 feet deep. Littoral shelfs should be added with a slope of ^:1 to a depth of 2-2.5 feet.
5. Inlets should be located away from outlets and have settling basin greater than 8 feet deeps.
6. Oil skimmers should be included.
7. Additional treatment is needed for commercial and industrial developments or for discharges to higher class waters.
8. Some treatment credit can be received for use of other best management practices.

The report proceeds to compare Lake Alice to the listed criteria which had not yet been adopted, but most of which have now been incorporated in the SJRWMD Applicant's Handbook. Calculations for the lake at the time included an estimated residence time of 30 days, a treatment volume requirement of 79 acre-feet for the basin area at the time of the report (34.4% impervious with upstream storage of 2.3 acre-feet), and a treatment volume between 68 and 70 feet (NGVD29) of 170 acre-feet. Based on a loading estimate no pollutant concentrations at the lake outlet (wells) were expected to be above primary or secondary drinking water standards except naturally occurring coliform bacteria and turbidity associated with natural organic color. At the time of this report the UF Physical Plant Division was monitoring both surface and groundwater at the following locations:

- Above wastewater outfall
- Lagoon outfall
- Below wastewater outfall
- Lake Alice wells

Based on the presented calculations Lake Alice was described as providing the necessary treatment volume with an excess of 91 acre-feet for future projects. The study also looked at some important hydraulic structures on campus and evaluated potential flooding issues related to capacity and design storm flows. Also identified were 13 flooding problem areas around campus. Similar calculations were presented for the depressional areas on campus to allow for future development. The report identified six high-priority flooding issues and made recommendations and provided estimated costs for improvements in these areas.

3.3.2 2000 Master Drainage Permit

In 2000, UF applied for an updated Master Plan Permit for campus (Causseaux & Ellington, Inc., 2000). The report developed for this renewal generally followed the format of the original permit report with updates based on campus development and improved stormwater modeling since the original permit. This report found that Lake Alice could provide adequate water quality treatment for a total impervious area of about 600 acres (612 acres when incorporating available upstream retention/detention). At the time of this report these areas corresponded to an increase of 184 acres of additional impervious area which was stated to be more than adequate for the requested 10-year permit duration. As with the previous permit, development in the Lake Alice Watershed was based on a ledger system for the basin with the lake identified as a wet detention feature for the basin, although it describes the lake as a "natural system". The report also recommends that "each development project should be analyzed individually to

assure that resulting flood elevations do not threaten structures…" The report also presents the idea of developing master basins for the Hogtown and Tumblin basins although no specific projects were presented.

Based on updated stormwater modeling, basin boundaries, and area calculations the Lake Alice Watershed was shown to have a total area of 1,058 acres, of which 40% was identified as impervious (excluding the lake). Projects within the Lake Alice Watershed were presented by subbasin although the permit request was for a total impervious area for the entire Lake Alice Watershed, not by subbasin. Projects within 50 feet of identified wetlands were required to have project-specific permit review and authorization. Projects within floodplains were identified as requiring special attention and review by the Physical Plant Division to include approval of finished floor elevations and evaluation of floodplain fill and elevation impacts. The report also made recommendations around peak flow control, although not required in the Lake Alice Watershed, to include total inflows and drainage facility capacities.

Detention calculations for Lake Alice were modified based on the recharge well inflow which was elevated 0.5 feet by clogging to 68.5 feet (NGVD29). The analysis appears to rely on historical data for bathymetry and inflows. Since the 1987 report campus crossed the 40% threshold necessitating use of the criteria of 2.5" of runoff over the impervious area. Based on estimated storage and detention requirements the determination was made that Lake Alice could reach an impervious cover of 58% within the Lake Alice Watershed without violating wet detention requirements. The report went on to clarify that,

> *"While this level of development can theoretically be treated by Lake Alice, the actual flood elevation impact on the Lake and on the adjacent Depression areas needs to be carefully considered. This level of additional development is expected to increase the flood elevation in Lake Alice by almost ½ foot and within the golf course depression area by 1½ feet. Such increase may result in structure flooding and may impact operation of the golf course."*

3.3.3 2010 Master Drainage Permit

In 2010, a new master permit report was submitted for the UF campus (Causseaux, Hewett & Walpole, Inc., 2010). As with the previous report this report largely mirrored the 1987 report with differences discussed in this section. As of the time of this report of the additional 184 acres described as available in the 2000 report, 169 acres were still available. This area was characterized as more than enough to meet the development plans for the ten-year permit duration. At the time of this report Tumblin was described as an impaired waterbody and it was stated that additional water quality treatment would be required in that basin. The report also indicated that both state and federal changes to water quality requirements were expected with the FDEP Statewide Stormwater Rule and the EPA Numeric Nutrient Criteria, both of which would affect Hogtown and Tumblin Creek discharges.

The stormwater study area for this report increased by 289.7 acres to 2,458 acres based on updated LiDAR data and a Jones Edmunds Flood Study. The percent impervious was reported as 41.9% (excluding the lake), an increase of 1.9% since the 2000 report. Also noted was the channel erosion that occurred within the channels on campus because of the topography and that the University had completed some erosion control projects within channels. It was also stated that the University would continue to stabilize erosion with additional projects, although no specific projects or locations were identified. The report also discusses the installation of a weir plate at the inflow to Recharge Well R-2 to eliminate low stage discharges and to reduce the comingling of lake and treated effluent.

All basins, with the exception of the Lake Alice Basin, but including the Depressional Basins were indicated as needing to comply with the new Statewide Stormwater Rule that was expected to go into place during the duration of the 10-year permit. The permit also requested various modifications to inspection frequencies including semi-annual sinkhole monitoring and biennial operation and maintenance monitoring of all facilities. This report also indicated that UF would be implementing LID practices "where applicable" to lower the runoff volume from new and existing development. The report also called for problem flooding areas to be identified and ranked with a plan developed to eliminate or minimize flooding. The report called for future modeling to be converted to ICPR with conveyance systems modeled in HydraCAD.

The report mentioned that there were areas of roads over-topping and "nuisance flooding". These areas were recommended for improvement as part of the master plan with opportunities for improvement whenever new development is planned in the vicinity.

3.3.4 2024 Master Drainage Permit

As of May 2024, the SJRWMD is evaluating a new permit application for the new Master Permit. The October 2023, University of Florida Stormwater Management Master Plan and Permit Application Renewal Report (Chen-Moore & Associates, 2023) was reviewed and compared to the 2010 permit with differences discussed. This report relied on an updated ICPR stormwater model originally developed by Jones Edmunds in 2017 for evaluating floodplains on campus. The model was modified to use the curve number method required for permitting by the SJRWMD rather than the Green-Ampt method. The stormwater model covered an area of 1,874 acres, a decrease from the previous models, with the Lake Alice Basin including 1,006 acres. Impervious areas cover 45.7% of the Lake Alice Watershed, an increase of 3.8% from the 2010 permit. This report also includes acknowledgement of the FDEP listing of the Lake Alice Outlet (the area feeding the lake) as impaired for dissolved oxygen, fecal coliform, chlorophyll a, and total phosphorus. The report states that the anticipated development which includes all hardscapes, "is not expected to contribute to pollutant loading and will not adversely affect the quality of receiving waters." The permit requests an additional 22.4 acres of impervious area within the Lake Alice Watershed through 2030. The report requests a new conceptual permit that would authorize construction projects over the next ten years. The report states that:

> *"Individual permits will use this conceptual permit as a guideline for development; however, individual permits must comply with all permitting requirements relating to stormwater management. This means that all individual permits related to development must show that the stream basins provide sufficient water quantity and water quality treatment, such that they are providing a net-improvement to the overall system."*

The report goes on to express the need for all projects to provide stormwater management facilities in compliance with Chapter 62-330 F.A.C. and for all projects, including those within the Lake Alice Basin, to apply for individual permits. The report also states that all projects within the Lake Alice Basin will be required to show net improvement, whenever possible, even if impervious area is not increased due to the impaired nature of the waterbody. As a part of the development of this report a natural resource field assessment was completed and wetland lines were flagged for the Lake Alice and Depressional Basins.

3.4 Wastewater Permit (FLA011322)

The current wastewater facility permit for the University was issued on June 9, 2021, with an expiration date of June 8, 2026. This permit includes both the permit for the wastewater reclamation facility (WRF) and the permit for recharge well R-2, discussed below. The University's WRF is a 3.00 million gallon per day (MGD) advanced wastewater treatment (AWT) facility. The AWT designation means that the facility is designed to achieve concentrations of 5, 5, 3, and 1 mg/L for biochemical oxygen demand (BOD), total suspended solids (TSS), total nitrogen (TN), and total phosphorus (TP), respectively. After treatment water is discharged to one of three disposal locations: the underground injection system U-001 (discussed in the following section, land application system R-001, or Land Application System R-002. The R-001 system is a 3 MGD slow-rate public access reuse system for irrigation that includes 415 acres. The R-002 system allows for lake augmentation up to a level of 69.5 feet. Only water disposed of to R-002 is required to meet the AWT concentrations described above.

3.5 Underground Injection Control (UIC) Permit (335949-UO/5W)

The UIC permit for well R-2 is incorporated as part of the WRF permit. This permit allows for discharge of up to 3.0 MGD of water to recharge well R-2. Most monitored parameters are report only, including TN and TP. The permit for the recharge wells requires weekly readings of flow rates down both R-1 and R-2 with monthly staff gauge readings. Well R-1 is described as a legacy lake-level control well (pre-UIC program) and not associated with the WRF. Three monitoring wells are located near the well and require monitoring. The permit limits flows in Well R-2 to no more than 10 feet per second (12 feet per second in testing or emergency) and 3.0 MGD (2,083 gallons per minute). Sampling at the monitoring wells requires analysis for primary and secondary drinking water parameters.

3.6 Reports, Studies, and Articles

An electronic search for documents related to Lake Alice was performed as part of the literature review. Document categories included dissertations and theses, technical reports, journal articles and publications, and news articles. Findings by document category are summarized in the following subsections and presented in chronological order.

3.6.1 Dissertations and Theses

3.6.1.1 The Breeding Ecology of Four Species of Herons at Lake Alice, Alachua County

Drought conditions and wetland development in the late 1950s in Florida spurred concern about wading bird populations and this dissertation research (Jenni, 1961). The dissertation describes Lake Alice conditions in 1960 and the nesting biology of four heron species. Lake Alice was the primary study site and allowed a description of breeding biology of four heron species from 1958 to 1960. Lake Alice vegetation is described for this time period as well as a summary of historical lake changes. Summaries of breeding, nesting, hatching, feeding, and mortality were made for four heron species (Cattle Egret, Little Blue Heron, Tricolored Heron, and Snowy Egret).

3.6.1.2 Systems Analysis of Nutrient Disposal in Cypress Wetlands and Lake Ecosystems in Florida

This dissertation evaluated the use of natural systems for ecosystem services (Mitsch, 1975). Models, field measurements, and computer simulations were used to evaluate responses from a freshwater lake (Lake Alice) and cypress swamps receiving treated wastewater. Ecological characteristics, nutrient budgets, organic productivity, energy relations, and interactions were compared between the two ecosystems.

In Lake Alice, treated sewage and thermal effluent were 82% of the inflow to the lake. Water hyacinths dominated the system and reduced temperature fluctuations. Gross primary productivity measured as 15.6 to 19.4 g-C/m^2/day in summer. Production by phytoplankton and submerged macrophytes in the open water ranged from 1.3 to 19.4 g-C/m^2/day and was damped by high flushing rates. Nutrient levels were high in the water (0.8 to 2.8 mg/L of phosphorus and 0.6 to 2.4 mg/L of Kjeldahl nitrogen) and in the sediments (2.2 mg-P/g dry wt for phosphorus and 6.2 mg-N/g dry wt for nitrogen). The water hyacinth marsh reduced phosphorus by 11% and nitrogen by 49% compared to the inflow.

Simulated diversion of the sewage flow from Lake Alice with a computer model reduced water hyacinths by 50% or more and dissolved oxygen remained low. Simulated diversion of the diluting effect of the heating plant effluent led to complete hyacinth takeover and much greater seasonal oscillations in chemical parameters. Simulated hyacinth control caused the greatest dissolved oxygen fluctuations when spraying and periodic harvesting were tested and the least with continuous harvesting.

Field data from a cypress dome receiving secondary sewage showed overflow if the water flow was greater than 2.5 cm/wk. Loading rates of up to 13.3 cm/wk were tested. Cypress tree biomass in two experimental domes was estimated to be 13.6 and 17.5 kg/m^2. Net primary productivity was 600 g/m^2/yr in sites in the Withlacoochee State Forest, 192 g/m^2/yr in a wet site with diverted drainage, and 416 g/m^2/yr for a drained site. Diurnal oxygen changes in the pond of a control cypress dome indicated a peak of production in early spring. Light was limited in summer by the canopy and in winter by the shading effect of the stems. In the dome receiving sewage, standing water was coated with a mat of duckweed stimulated by high nutrient levels (up to 12 mg-P/L of phosphorus and 4 mg-N/L of nitrogen). After 8 months of sewage application, phosphorus content doubled in the upper sediments, but nitrogen did not increase. When loading was high and water overflowing, 4% of the phosphorus and 76% of the nitrogen were retained. When loading was low without much overflow, 75% of the phosphorus and 93% of the nitrogen were absorbed.

Simulation of harvesting and drainage of a cypress dome caused excessive growth of understory and likelihood of destructive fire. Organic peat doubled in volume and tree biomass tripled over a 100-year period in a simulation featuring undisturbed conditions. Recovery time of trees after harvesting depended on the degree of harvesting and initial biomass. Simulated addition of sewage caused cypress growth only if the shading effect of the trees on the understory was significant. The angle of the sun and the deciduous nature of cypress were significant features in the simulations of annual patterns in a dome.

The two systems responded similarly to the addition of nutrients through the introduction of plants with low quality structure, intermediate in biomass between phytoplankton of the lake and trees of the dome. Relative C:N:P ratios for the systems were 38:2.7:1 for the lake and 57:12:1 for the forest. Cypress wood has an energy quality 40 times that of water hyacinth biomass. Preliminary evaluation of cypress dome, lake, and technologically based nutrient disposal alternatives suggests that the cypress system may realize a higher work service per purchased energy invested.

3.6.1.3 Water, Phosphorus, Nitrogen, and Chloride Budgets for Lake Alice, Florida, and Documentation of the Effects of Wastewater Removal

This comprehensive thesis is an often-cited reference for the history and conditions of Lake Alice up to 1996 (Korhnak, 1996). This time is significant due to the removal of wastewater effluent disposal in 1994. The thesis is organized into five chapters: Introduction and Site Description, Hydrological Investigations, Water Quality Investigations, Effects of Wastewater Removal, and Summary.

Inputs and outputs of water, phosphorus, nitrogen, and chloride were estimated from measurements and compliance monitoring records for Lake Alice and its upstream marsh for the years 1987 to 1994. These budgets were used to evaluate the UF aquifer protection plan and to predict changes that would occur after wastewater effluent was removed from the Lake Alice system in November 1994. Lake Alice was monitored for 7 months after wastewater effluent removal to document changes in lake surface elevation, concentrations of phosphorus, nitrogen, and chloride, and Secchi depth.

Direct precipitation on the marsh-lake surface averaged 1.2 lake volumes/yr (defined as 333,000 m^3, the estimated volume at a water elevation is 21.00 m msl) and 32% of rain falling on the urban Lake Alice watershed became stormflow inputs (4.8 lake volumes/yr). Base-flow inputs averaged 10.7 lake volumes/yr and effluent from the wastewater treatment plant averaged 6.7 lake volumes/yr. Estimated evapotranspiration outputs were 1.2 lake volumes/yr and injection well outputs reported by UF averaged 11.0 lake volumes/yr. Storage changes in the system were small, as injection wells stabilized lake levels. The water balance residual was large, 11.2 lake volumes/yr, and the error was attributed to under measurement of injection well outputs and unmeasured lake bottom leakage. Korhnak made independent estimates of the injection well discharges with a stage-discharge relationship for the injection well outlet structure (p. 61). The stage-discharge estimate was always greater than the WWTP reported discharge. When injection well flow sensors were checked by CH2M Hill in 1989, sensors were heavily fouled and underreporting discharge. However, when corrected injection well discharge values were utilized, Korhnak's water balance estimate still suggested other unaccounted outflows from the lake with sinkhole or sediment leakage postulated.

Inputs to the Lake Alice system of phosphorus and chloride were balanced by outputs, but the system removed half of the nitrogen inputs. Most (71%) of the nitrogen loss was attributed to the loss of nitrate-N, and water chemistry sampling at the marsh-lake interface suggests that most of the nitrate-N loss occurred in the anoxic marsh. Nitrogen removal rates of the Lake Alice marsh (850 kg/ha/yr) compared favorably to removal rates reported in the literature, but phosphorus outputs from the marsh were observed to exceed inputs.

After wastewater effluent removal in November 1994, the surface elevation of Lake Alice failed to fall, and coliform-contaminated lake water continued to be injected into the Floridan Aquifer. Concentration declines of total phosphorus, total nitrogen, and chloride were less than predicted by an equilibrium load reduction model. Mean in-lake concentrations declined from 1,140 mg/m^3 to 590 mg/m^3 for total phosphorus, from 2,500 mg/m^3 to 930 mg/m^3 for total nitrogen, and from 47,000 mg/m^3 to 32,000 mg/m^3 for chloride. Mean post-removal Lake Alice Secchi depth (0.9 m) was not significantly different from mean pre-removal Secchi depth (0.9 m). Water levels remain maintained by the west drainage well intake, therefore inputs continue to exceed outputs, and an accurate Lake Alice hydrology model is still needed. Regarding, the discharge of coliform bacteria to the aquifer, Korhnak p. 164 notes: Compliance by UF with Florida's laws protecting aquifer water quality, will require treatment of lake water entering the injection well, or alternate disposal plans for UF's excess stormflow and base flow.)

3.6.1.4 Water of the University of Florida: Managing for Water Quality in the Lake Alice Watershed

This thesis provides a multi-disciplinary approach to sustainable water management on the University of Florida campus by using scientific data to inform policy and management (Wells, 2005).

In 1972, the United States Congress enacted the Clean Water Act. This act set forth groundbreaking standards for water quality including the reduction and elimination of point source pollutants. As a result, the nation's waters have on the whole, improved in water quality. Today, however, non-point source pollution, such as stormwater, is one of the leading causes of impairment. Identifying, managing and preventing non-point source pollution is one of the challenges facing municipalities and communities nationwide. The Clean Water Act addresses stormwater discharge through Phase II of the National Pollutant Discharge Elimination System (NPDES) program. The University of Florida (UF) obtained an NPDES permit in the fall of 2003. This permit renewed interest in and commitment to water quality, and in particular stormwater management, on the UF campus.

Hydrologic history of the main watershed on campus reveals that Lake Alice has had high nitrogen and phosphorus levels for more than thirty years. Lake Alice has also received numerous designations with potentially conflicting management goals including a Class III water body, a stormwater management system, and a university-designated conservation area. Water quality data for 15 sites throughout campus collected between November 2003 and December 2004 revealed high phosphorus levels throughout the campus and nitrate levels as high as 11.5 mg/L in two creeks, Hume Creek and Fraternity Row Creek. While there are no Class III numeric standards for nitrate levels, research has shown toxicity levels to freshwater species at concentrations below 10 mg/L. A characterization of the Hume Creek watershed during storm events and dry weather periods indicates three stormwater drainage culverts contributed high concentrations of nitrate to the sub-watershed. These culverts receive water from athletic field drainage areas indicating that fertilizers may be the primary source of nitrates. The scientific data from both the Campus Water Quality monitoring program and the Hume Creek characterization enable the University to potentially address a long-standing problem through targeted BMP implementation.

3.6.1.5 Methodologies to Evaluate Decentralized Stormwater Best Management Practices in Gainesville, FL

This thesis provides a framework to evaluate low impact development methods as a type of BMP for controlling urban stormwater quantity and quality on a range of watershed scales (Kertesz, 2006). The thesis presents methodology to determine watershed goals, obtaining data, building a geographic database, moving the spatial and physical information from the geodatabase to a hydraulic/hydrologic modeling program, and evaluating BMPs by manipulating functional unit parameters. For this thesis, the method to determine the performance of a BMP is to simulate its performance using the EPA's stormwater management model (SWMM). Appendix A of the thesis summarizes regulations pertaining to Lake Alice water quality as of 2005.

Chapters 4, 5, and 6 focus on evaluating the Lake Alice Watershed, progressing from a large watershed (1,000 acres) in Chapter 4, to a medium scale (300 acres) in Chapter 5, to a fine-scale watershed analysis and simulation study (7 acres) in Chapter 6. Modeling at the fine-scale level captures the spatial reality of the site of interest and promotes a modular approach to modeling the larger watershed by aggregating those spatial data and combining the associated analysis with other micro-scale models to form a larger

macro model. Results indicate that even a small increase in the depression storage of a functional land unit can reduce annual runoff volume measurably if placed in a strategic location.

Future recommendations included collecting field measured parameters such as suction head and initial deficit, performing sensitivity analysis on these, and other parameters needed by SWMM, and conducting multi-event runoff analyses to compare percent onsite control of watersheds. Results from such research could determine if aggregated watershed models produce rainfall-runoff relationships comparable to the highly disaggregated simulation during larger storm events. Future research can use SWMM to simulate loading released (and loading captured) by a sub catchment of any size. Just as with water quantity, the ability to represent a sub catchment as both a control and a source allows one to simulate a path of pollutant or nutrient transfer throughout the watershed and place a BMP in the optimal location to control water quantity, quality, or both.

3.6.1.6 Place Attachment as an Integrating Concept: Social Science Considerations in Watershed Management

The Lake Alice watershed was utilized to explore human-place relationships, a concept within the social sciences that attempts to define and measure emotional attachments to physical places, within a specific geographic context (Linhoss, 2008). A survey of 376 university students, faculty, and staff was conducted and showed a moderate, positive relationship between place attachment to Lake Alice and willingness to engage in "place-protective behaviors" (Pearson's correlation = .458). Place attachment was measured using a scale that conceptualizes place attachment into two dimensions: place identity and place dependence. Place identity was more strongly correlated than place dependence with place-protective behaviors. The frequency of visits to Lake Alice was moderately correlated with place attachment (Gamma = .421).

It was also found that respondents exhibited a poor knowledge of surface waters on campus, but a high knowledge of general water issues, such as sources of pollution and wetland benefits. The majority of survey respondents think that the water on campus is polluted, and that not enough had been done on the part of UF to prevent pollution or to educate the community about water quality issues. Faculty members were found to be the least attached to Lake Alice and were also the least likely to report engaging in place-protective behaviors. Two-thirds of respondents did not know behaviors that can prevent or reduce pollution to watersheds. This thesis shows that understanding resident's attachment and preferences to elements of their respective watershed can help managers determine priorities for conservation plans and education efforts and provide insight into behavior change strategies.

3.6.1.7 PUR® Packet Effectiveness in the Presence of Pesticides and Increased Organic Matter

This thesis evaluated the effectiveness of the PUR® Packet to remove compounds from an untreated water source. Water from Lake Alice on the University of Florida Campus was selected for treatment (T. N. Williams, 2011). This source water was spiked with Humic Acid, Toluene, and Atrazine to create a more competitive environment for adsorption. This was also done to increase the Natural Organic Matter concentration. Atrazine was the primary pesticide focused on because it is widely used throughout America, particularly in the Midwestern Corn Belt. A series of tests were run to see if the PUR® packet alone was enough to combat this contaminant or if the addition of Activated Carbon was necessary for acceptable removal.

The PUR® packet treatment removed in 79% to 95% of color, 97% to 100% of turbidity, and 45% to 100% of Toluene. When Atrazine was added to samples, the removal of Atrazine itself was almost nonexistent 2% to 14% removal) and the removal efficiency of Toluene was greatly diminished (6% to 36% removal). The addition of activated carbon prior to water treatment improved Toluene and Atrazine removal slightly.

3.6.1.8 Lake Alice Ecological Park, Senior Capstone Project

This capstone project presents a hypothetical project, a botanical and teaching park located in the northwest portion of the Lake Alice basin (Gibbs, 2012). The project goals include education about ecological issues, providing recreational opportunities, and reducing stormwater run-off into Lake Alice. Several case studies of ecological parks are examined, a site inventory and analysis was made on land usage, cultural resources, environmental resources, soils, topography, and roadways. Several landscape architecture plans are presented with conceptual and master plan guidelines. Scale renderings and perspective illustrations are provided as well.

3.6.1.9 Hydrological Restoration by Low Impact Development Retrofit and Low Impact Development Design Selection Analysis

This dissertation explores the impact of low impact design retrofits to restore natural hydrological systems, through use of hydrologic and hydraulic model forecasting, in combination with the USEPA Rainworks Challenge nationally winning retrofit design of the University of Florida campus, to yield educational and environmental benefit (Fanara, 2015). This research is concluded with the implementation and development of a land development design tool, TRASI (Treatment, Retention, and Sustainability Index) for site design developers and engineers to determine the most cost-effective LID technique for a specific project. The Rainworks Challenge design proposes aesthetic improvements including two bioswales, raingardens, disconnection, wet detention, and pervious pavement, with a goal to educate pedestrians about hydrology throughout campus.

Results of hydrologic modeling show that the proposed Rainworks Challenge projects would improve both surface and subsurface hydrological conditions by reduction of surface flow (45% volume reduction to Lake Alice), and improvement of subsurface recharge and a 6% increase in saturated zone storage; however, even with the proposed improvements the subsurface water table is still as low as 26ft below that of pre-development conditions. Iterative modeling was performed to determine the impact of disconnection and detention and find the most effective combination for a “Maximum LID” scenario. The results show that pavement coefficients have a logarithmic relationship with infiltration, recharge, and saturated zone storage that has consistent effectiveness as the coefficient is reduced from 0.9 to 0.1. Detention is limited by infiltration; and results show that effectiveness is limited to 4 inches prior to reaching an asymptote where there is minimal benefit to additional detention. The combination of 0.1 pavement coefficient and 4 inches of detention throughout campus was used for a maximum LID scenario, resulting in saturated zone storage reaching 90% of that of the predevelopment conditions.

TRASI was identified as an easy and quick way for developers and engineers to consider, and even prioritize sustainable design for new and retrofit construction. This is an effective preliminary design tool, which uses local Florida regulation and statewide design standards to determine the most effective suite of LID tools for the user goal. The user can choose a goal of most cost effective, least cost, greatest nutrient removal, or most aesthetic. The tool was applied to the University of Florida campus, and the results for

the most aesthetic design were the combination of tools used for the proposed Rainworks Challenge design.

3.6.1.10 Nitrogen Fluxes and Dynamics in an Urban Watershed

The main purpose of this dissertation was to identify major nitrogen sources in an urban watershed, the Lake Alice watershed, and how nitrogen fluxes change before they reached the receiving water, as well as the flow path in which the source nitrogen reached to the headwater (J. Luo, 2015). This approach quantifies the nitrogen discharging watersheds and supports prioritized nitrogen management. The dissertation identified the land use of greatest concern in Lake Alice watershed regarding creating nitrogen loads among three urban land uses and implied the N transport flow path during storms in this land use, providing a direction for future stormwater N control and management.

Chapter 1 provides a literature review of nitrogen cycling in global and regional (urban) scales, urban nitrogen management practices, and introduction to in-situ nitrate monitoring devices. In Chapter 2, nitrogen fluxes from three small urban catchments of different land uses were determined and compared regarding different management practices from each catchment. Sports Field Catchment (SFC) with intense fertilization/irrigation was found to produce the greatest nitrogen load (37 kg/yr) compared to Reclaimed Water Irrigated Catchment and Control Catchment (with no irrigation). In addition, baseflow nitrogen was dominating in the nitrogen fluxes from SFC, indicating regular fertilization/irrigation practices were the major drivers for the great nitrogen load. In Chapter 3, spatial changes in nitrogen fluxes from catchments to basins in urban streams were investigated to determine the major nitrogen contributor to Lake Alice watershed, and how hydrology drove the spatial changes of NO_3-N concentrations was discussed. The results suggested that sports fields could be the largest nitrogen contributor to Lake Alice watershed and the streams delivering flow from sports fields could produce the greatest nitrogen load to Lake Alice. A dilution effect happened along the flow paths of urban streams to Lake Alice, which was a sink for nitrogen although the amount of nitrogen load may be insufficient to cause eutrophication or limit the reproduction of biomass. In Chapter 4, a comparison between high resolution in-situ Submersible Ultraviolet Nitrate Analyzers (SUNAs) and autosamplers was made to determine the more effective approach in characterization storm events. It showed that SUNAs exhibited a better performance than autosamplers as they could capture more information during the storms than autosamplers, providing immediate signals for NO_3-N response to hydrological changes. In Chapter 5, the relationship between NO_3-N concentrations and discharge was examined. There was a significant relationship between NO_3-N concentrations and discharge. The measured NO_3-N concentration changes during storms were clockwise loops, suggesting an immediate dilution effect. It can also be inferred from the SUNA concentration curves that the increasing NO_3-N concentrations after storms were attributed to NO_3-N rich groundwater rather than surface runoff.

3.6.1.11 Effect of Nutrient Reduction on the Water Quality and Largemouth Bass *Micropterus salmoides* Population in Lake Alice, Gainesville, Florida

Lake Alice has many attributes including serving as a field training site for UF students studying aquatic, environmental, and fisheries sciences. This thesis examines how the water quality (characterized by Secchi depth, total phosphorus, total nitrogen, and chlorophyll concentrations) and the largemouth bass population (numbers and proportional size distribution (PSD)) differed following to the rerouting of treated effluent from the UF wastewater treatment facility in November 1994 (Schwartz, 2019a).

The author includes a summary of historical lake modifications and fishery events. Water and fish samples were collected by students of UF's Introduction to Fishery Science classes from 1988 to 2018. The data from 1988 to 1994 were used as baseline conditions for the lake while receiving the treated effluent, and the period of 1988 to 2000 was used to examine the effects of nutrient reduction. The year 2000 was chosen as the last year in the study period because it was the last consecutive year since 1988 without the occurrence of a major fishery event.

Years following the removal of treated effluent to the lake showed a significant increase in Secchi depths, and reductions in total phosphorus (TP), total nitrogen (TN), and chlorophyll (CHL). These changes demonstrated that a reduction in nutrient loading to the lake would decrease the nutrient and phytoplankton concentrations. However, the lake remains in the eutrophic trophic classification, likely due to naturally phosphorus rich soils and geology. The numbers of largemouth bass > 250 mm total length did not show trends over the 1988 to 2000 time period, although the size distribution of largemouth bass was lower in the post-effluent removal time period. However, after evaluating long-term data, the author suggested that the annual population changes and size distributions observed in the largemouth bass population during the study period were small oscillations in a longer trend and were not related to the effluent removal event.

3.6.2 Reports

3.6.2.1 Lake Alice Drainage Project. A Preliminary Report

The 1948 Lake Alice Drainage Report is a preliminary report by the staff of the Department of Civil Engineering (C. D. Williams, 1948). It was signed by C.D. Williams, Head Professor of Civil Engineering, and generates a series of internal memoranda at the University of Florida. The report appears to be a response to the September 1947 flooding of the golf course property from lake overflow. Three phases of historical drainage are defined, the original or natural drainage system, the system between 1933 and 1947, and the present 1948 situation. The exhibits (maps), were not part of the file.

The reports discussion of the original, pre-developed drainage system states: "*Drainage areas marked II to VIII, inclusive, drained directly into a pond near the University Spur Railroad in the vicinity of the sewage plant,* (t)*hence into a crevice in the limestone – labeled Sink Hole. Areas marked IX and X drained into the pond known as Lake Alice and, when the water level reached approximately elevation 65, overflowed through a creek channel into the same sink hole*." Discussion of other subbasin drainage suggested that the sinkhole near the spur railroad, south of the WWTF was the original stormwater drainage for about 537 acres of campus. An aerial view of this area from 1947 shows the features in this area (Figure 10).

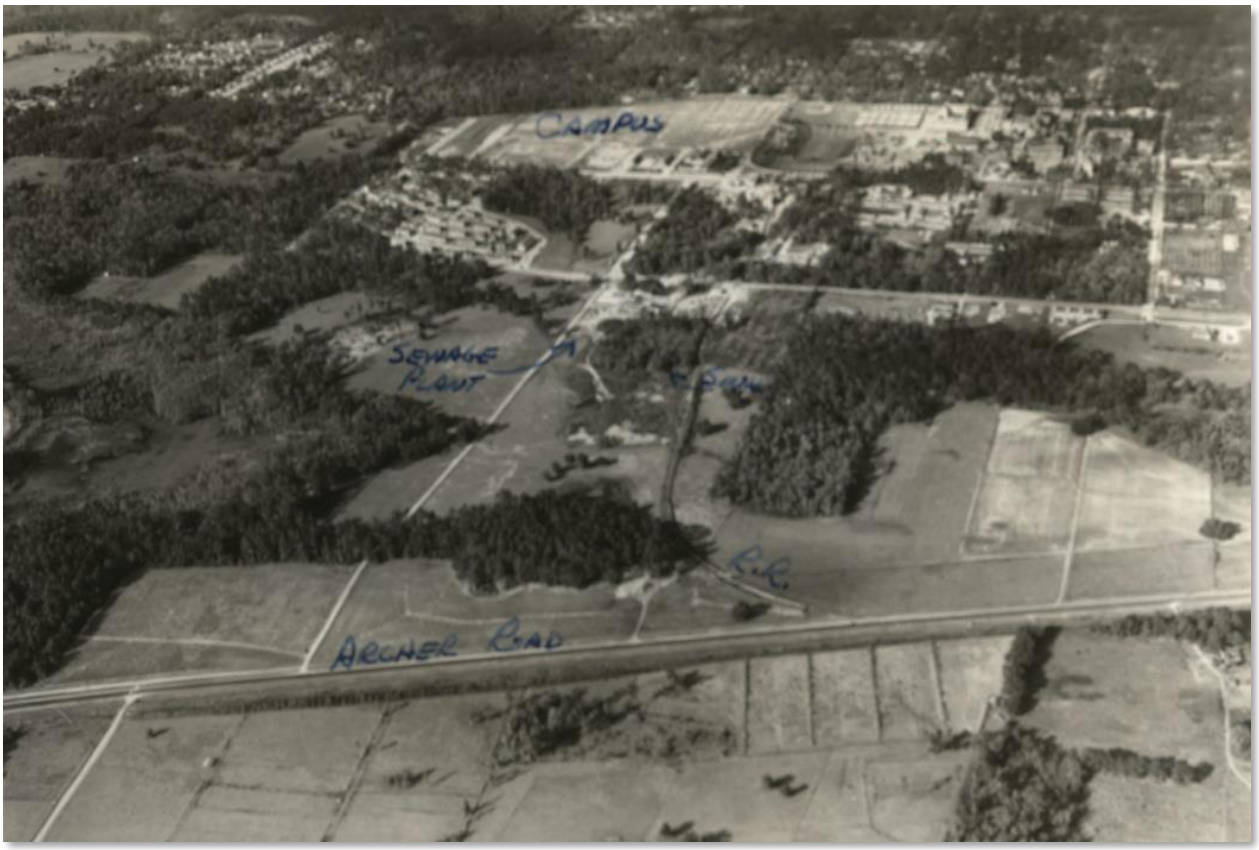


Figure 10. 1947 Aerial Showing Sewage Plant, Railroad Spur, and Sinkhole Drainage Feature

Discussion of the period from 1933 to 1947 contains key milestones: "*The flow of water (stormwater) was changed in 1933 by the filling of the connecting channel between Lake Alice and the main outlet sink near the railroad. This channel was filled to elevation 73, dividing the general drainage area into two distinct parts.*" This modification removed drainage east of the lake and heavy rainfall in 1933/34 caused the lake to fill to the highest elevation of 72 with approximately 132 acres inundated. "*The exact date has not been determined but, approximately in 1934, a dyke was constructed along the west end of Lake Alice preventing the water from entering Area XI* (closed basin) *and the golf course, so long as it did not rise above elevation 70. While this dyke completed the confinement of Lake Alice, its construction did not violate the natural direction of flow toward the east* (which was already altered in 1933)*. Without the dyke, overflow from Lake Alice would enter Area XI, flooding property other than that owned by the University. This overflow and flooding could not have occurred had the natural drainage* (the sinkhole near the railroad) *been preserved.*" An aerial image from 1947 shows the location of the new sinkhole west of Lake Alice and the location of the constructed dyke (Figure 11).

Figure 11. 1947 Aerial Photograph Showing Lake Alice, New Sinkhole, and Constructed Dyke

Discussion of the present situation notes that: "*In July 1946 it was established that water entering the sink hole near the railroad was directly connected with City of Gainesville Well No. 1, which supplied a considerable part of the drinking water used by the City and the University. At the same time samples of the City water were found to be seriously contaminated. The sink was receiving continuous flow from the University sewage plant which was not adequately treating the sewage, and with each rain received large quantities of polluted water.*" To protect the drinking water supply, (by August 9, 1946) "*a dam was constructed across the opening to the sink hole near the railroad track and a 24 inch pipe with flood gate was installed from the pond to the Lake Alice area* (east)*, following the general route of the original natural connection between these areas*."

Direct lake level measures in July and August 1947 suggested that 25% of the rainfall in the watershed reached the lake, the surface of the water on Lake Alice lowered at a rate of 0.25 inches/day between rainfall, and that percolation rates appeared to be rapid. "*During the later part of July, 1947, a small break occurred in the dyke at the west end of Lake Alice. Water from this break flowed westerly into a low area, where a new sinkhole developed. This sink hole was observed for about three weeks and was found to take all of the water coming into it. A study of the quality of the overflowing water was made to determine whether it was safe to permit this water to escape into the sink. The water was about 50% saturated with dissolved oxygen and had a very low biochemical oxygen demand, from 1.5 to 4.2 parts per million. These facts would seem to indicate that the impounding of waters from the polluted drainage areas II and III and from the sewage plant – with only partial treatment at that time – had a very beneficial effect. Uranine dye was placed in the sink and no traces were found in the City water*."

The final historical events discussed were "*During September, 1947, a large break in the dyke at the west end of Lake Alice permitted water to escape more rapidly than the new sink hole would accommodate.*

This water flowed into the lower regions of the area marked XI and flooded about 19 acres of University and Golf Club land. On December 31, 1947, the water level in the impounded Lake Alice area was elevation 69.2, which was 0.8 feet higher than on August 9, 1946, before the sink hole at the Railroad was closed."

Factors considered in the report to improve lake drainage were listed as natural drainage of the areas, changes made in the natural drainage, reasons for changes in natural drainage, quantities of water involved, possible methods of draining the areas, value of lands salvaged, cost of proposed methods of drainage, and effects on community property of public health.

Three general plans were suggested to address the drainage problem. "*The first plan would be to return the flow to the natural drainage system by reopening the large sink near the Railroad, and connecting the Lake Alice Area to this sink. A second plan would be to dispose of as large a quantity of water as possible in the sink area west of Lake Alice, maintaining a ponding area at all times, but lowering the water during the dry season to provide storage capacity for the wet season. The third plan would be to provide complete removal of the water to another watershed, such as Hogtown Prairie*." Preliminary cost estimates were made for each plan.

Plan One was not supported, "*From a public health viewpoint, it cannot be recommended that surface drainage be permitted to enter directly into an aquifer providing drinking water, if this can be prevented. The State Board of Health was consulted on this matter in August at the request of the President and would not give their approval to returning drainage waters to this sink hole*."

Plan Two was recommended because it approximated what was already happening and was cheaper than Plan Three. "*Plan Two contemplates the use of a new sink hole to the west of Lake Alice. The quality of water entering this sink was checked and found to be of normal drainage character because of the effect of ponding and aeration provided.* (first UF treatment wetland system) *During August the Board of Health indicated that they would approve permitting drainage into this sink, so long as an effective ponding is maintained. This plan is low in cost but there is some uncertainty about the capacity of the sink hole*."

3.6.2.2 Factors Affecting Accelerated Eutrophication of Florida Lakes

This report (Putnam, 1968) notes that Florida has a vast and valuable resource of fresh water including about 30,000 lakes. Florida lakes have been enriched with nutrient salts from the land, with urbanization and intensive agricultural practices have increased nutrient additions to lakes on an unprecedented scale in recent years. This enrichment has accelerated the eutrophication of surface water thereby shortening the lives of lakes and generally impairing the quality of the water.

The report seeks to provide management systems by a quantitative understanding of what eutrophication is; what are the most effective combinations of enriching substances, and how these relate, for example, to the physical environment of lake morphology, climate and various edaphic factors. To accomplish these objectives, a whole lake (Anderson-Cue Lake) enrichment experiment was conducted to understand completely the eutrophication process.

While Lake Alice was not experimentally manipulated, it was one of the 37 Alachua County lakes included in the report and was an important data point along a eutrophication spectrum. Tabular data list the lake as senescent, with a depth of 4.92 feet, an area of 78.1 acres, very high total orthophosphate (1.06 mg/L), and low total organic nitrogen (0.75 mg/L) in relation to the other Alachua County lakes. The report text states that "*Lake Alice has been classified senescent. This lake was once eutrophic, but in recent years water hyacinths have taken over nearly all of the lake's surface. The lake is very shallow, and decaying*

vegetation and sediments produce obnoxious odors. Lake Alice receives treated sewage effluent from the University of Florida waste treatment plant. Nutrient concentrations in the lake do not reflect this enrichment source; evidently the extensive hyacinth growths assimilate the nutrients rapidly. Because of the light cover produced by the hyacinths, the lake is almost devoid of phytoplankton."

3.6.2.3 Trophic State of Lakes in North Central Florida

This historic report is one of the first to examine a population of 55 lakes and ponds from North-Central Florida (Brezonik & Shannon, 1971). General limnological and trophic conditions were described from watershed, morphometric, physical, chemical, sediments, and algal primary production parameter evaluation. Relevant to the LAWWP, the physical and chemical descriptions of Lake Alice are provided as a snapshot from 1968 when the Alachua County lakes were sampled. Lake Alice was described as having a 28.6 ha surface area, a mean depth 0.9 m (maximum depth of 1.5 m), clustered with other alkaline clear lakes, was until recently covered almost entirely by a dense crop of water hyacinth (*Eichhornia crassipes*), a trophic state index value of 10.7 (placing it in the hypereutrophic group). The report authors note that while Lake Alice has been ranked in the hypereutrophic group, it would be classified as oligotrophic if based on plankton productivity alone. At that time, Lake Alice had a profuse growth of water hyacinths, combined with a short hydraulic detention time (on the order of 2-3 days), and plankton productivity was restricted. However, the trophic state indicators nitrogen and phosphorus (0.9 mg/L) had extremely high concentrations to counteract the low chlorophyll *a* values. The report states that Lake Alice is an outlier based on nutrient loading as it receives 1 to 2 MGD of sewage effluent and 10 to 12 MGD of cooling water from UF facilities.

3.6.2.4 The Geology of the Western Part of Alachua County, Florida

This report describes the geology of western part of Alachua County as an area that consists of a low, nearly flat, limestone karst plain bounded on the east by a subdued westward-facing escarpment (K. E. Williams et al., 1977). Erosionally isolated, residual remnants of the Hawthorne Formation are found in all areas of the limestone plain and, in the southern portion of the county, large flat-bottomed lakes and prairies are common.

Lake Alice drains into (or drained into before control structures were erected) a small sink located on the University of Florida campus. It appears obvious from the topographic maps that Lake Alice has, in fairly recent times, covered a much larger area and was once a tributary to Hogtown Creek. It was captured and its surface level drastically lowered by the opening of the sink. A small stream tributary to Lake Alice was captured in 1971 by collapse of a portion of its stream bed. The sink into which the stream flowed was approximately 15 to 20 feet deep. The sinkhole intersected a cave with over 900 feet of passageway, including a room over 20 feet high. This sink has been subsequently filled by the university.

3.6.2.5 Nutrient Loading – Trophic State Relationships in Florida Lakes

This report examined quantitative relationships among lake trophic state indicators and watershed factors using a database of 101 Florida lakes (including Lake Alice) (Baker et al., 1981). The database was used to determine relationships between non-point source (NPS) nutrient loading rates and land use characteristics of Florida watersheds; to evaluate interrelationships among trophic state indicators in Florida lakes; and to revise nutrient loading models and develop appropriate nutrient loading criteria for these lakes. The report helped establish empirical relationships between land use, nitrogen/phosphorus concentrations, and phytoplankton responses. Information specific to Lake Alice is limited, with mean

water chemistry values of 5.8 µg/L of chl *a*, pH value of 6.81, alkalinity of 7.86 mg/L as $CaCO_3$, conductivity of 541.3 µmhos/cm, color of 46 CPU, total phosphorus of 0.857 mg/L, and total nitrogen of 0.639 mg/L (about 88% in the form of organic nitrogen).

3.6.2.6 Groundwater Monitoring Plan for the University of Florida Wastewater Treatment Plant and Lake Alice Recharge Well System

The groundwater monitoring plan was prepared in accordance with the requirements of Chapter 17-4.245(6)(d), F.A.C. The plan provides for monitoring of discharge water quality and quantity, the quality of groundwater in the vicinity of the discharge, and the direction of groundwater flow (CH2M Hill, 1986). The document includes a report on physical, chemical, and hydrogeological characteristics of the site.

The proposed monitoring plan, when implemented, will include three aquifer Zone I wells and five aquifer Zone II wells. Both aquifer zones are within the upper part of the Floridan Aquifer System. The Lake Alice discharge is to aquifer Zone II. All monitoring wells will be equipped with pumps for sampling and an access port for water level measurements. Monitoring parameters will include biological indicators, common anions and cations, and other parameters, including trace metals and organic compounds as determined to be appropriate on the basis of an initial priority pollutant analysis. Discharge rates will be measured by an electromagnetic flowmeter installed at each well. Full implementation of the monitoring plan will depend on the appropriation of construction funds by the Florida Legislature. An interim monitoring plan is proposed to be implemented upon approval of the full plan by the Florida Department of Environmental Regulation. The interim plan utilizes seven existing wells and is described in detail in the report. Water quality data from as early as 1981 are presented.

3.6.2.7 Groundwater Monitoring Plan Amendment - Volume 2 - University of Florida Water Reclamation Facility

Volume 2 (Barnes, Ferland and Associates, Inc., 1996) includes a portion of the Appendices to the main report. Appendix C is a Recharge Well – R-2 Facilities Operation and Maintenance Manual (1995) which includes flow monitoring equipment manuals and methods, recharge well operations and maintenance manuals, and recharge well drilling records.

Appendix D contains FDER temporary operating permit (DTOl-170758) and WWTP operation permit (DC01-207372); and FDER OGC Consent Order (No. 90-0878 = UIC) letter to UF which notes:

> *"5. Respondent's wastewater treatment plant discharges it's treated effluent, under a Department issued temporary operating permit, to a surface water body (Lake Alice), which in turn discharges through two lake level control wells to a Class G-II ground water aquifer (Floridan).*
>
> *6. Respondent's lake level control wells (R-1 and R-2) are Class V, Group III injection wells as defined within Part V of Florida Administrative Code Chapter 17-28.*
>
> *7. Monitoring at the lake level control well (R-2) and compliance wells M-lS, M-2S, and M-lD, reveal the established limits for corrosivity, turbidity, total suspended solids, color, and fecal coliform to have been exceeded. The document attached hereto as Exhibit I, provides a monitoring summary for each water quality standard exceeded.*
>
> *8. Respondent's activities have resulted in violation of Section 403.161(l)(b), Florida Statutes, which makes it a violation of Chapter 403 to fail to obtain any permit or to violate or fail to comply with any rule or permit issued by the Department pursuant to its lawful activity.*

9. Respondent's activities have further resulted in violation of 403.161(1)(a), Florida Statutes, which makes it a violation of Chapter 403 to cause pollution.

10. The parties have met and discussed this matter on March 16, 1990 and as a result of these discussions, the issues raised herein have been resolved."

The remaining contents of the report are Appendix E - the Lake Alice Lake Level Operation Protocol; Appendix F - SJRWMD Well Inventory Records; Appendix G - Graphical Presentation of 1990-1995 Monitoring Well Data; and Appendix H - Quality Assurance / Quality Control Plan.

3.6.2.8 Lake Alice Watershed Initiative

Beginning in Spring 2005, Professor Heaney and his students began preparing an overview of the history of the use of Lake Alice and water quality and quantity trends (Heaney, 2004). Studies of Lake Alice date to the 1940s with water quality data being available intermittently from the early 1970's to the present. The hope was to develop a university-wide initiative to use the Lake Alice watershed as a living laboratory for teaching and research for UF students and faculty.

3.6.2.9 2004 Hurricane Impacts on Lake Alice Watershed

The unprecedented four recent hurricanes in Florida have stressed stormwater management systems in unique ways (Heaney et al., 2004). The Lake Alice Watershed (LAW) drains the most heavily developed 80% of the University of Florida campus. Lake Alice was originally a small sinkhole that has grown from 1 to 33 ha during the past century in response to its increasing use by the University of Florida for disposal of wastewater, stormwater, and cooling water. It is a highly valued natural area and is popular for passive recreation. This paper describes the behavior of the lake during the past two months during the four hurricanes. Lessons learned are presented along with suggestions for improved stormwater management during these extreme wet-weather periods. Recommendations include: accurate hydrologic and spatial data and simulation models are essential to predict watershed performance; bathymetry of Lake Alice needs to be remeasured; and a comprehensive management plan is needed for the Lake Alice Watershed.

3.6.2.10 2004 Conservation Area Land Management (CALM) Plan

The Conservation Area Land Management (CALM) plan documents existing conditions and specifies management activities for Conservation Areas on the University of Florida Campus (University of Florida, 2004). These Conservation Areas are defined in the Campus Master Plan as having a Conservation Future Land Use designation. In most cases, the areas are also listed in the 1995 and 2000 Master Plans as Preservation Areas.

The CALM plan serves as the Conservation Element's Data and Analysis that covers Campus Conservation Areas within the Campus Master Plan. Previous Master Plans documented the existence of Conservation Areas, but provided little background information nor guidance for improvements to each of the areas. Therefore, the premise behind this CALM plan was to create a plan that documents existing conditions on campus natural areas and makes recommendations that enhance these special places. Additionally, the plan is intended to demonstrate the University's commitment to preserving and improving campus natural areas.

Beginning in the fall of 2003, an ad-hoc working group of University staff, faculty, students and interested community members conducted tours of 25 campus Conservation Areas and 5 passive recreation areas in order to determine their current state and recommend improvements for each area. From these 30

areas that were visited 22 specific area plans have been developed (passive recreation areas were not included and some Conservation Area were grouped together) that outline issues and strategies for each Conservation Area. The recommendations from this working group formed the foundation of the CALM plan and specific area plans.

The conservation land use designation of the Campus Master Plan's future land use map formed the starting point for remapping all land use categories by identifying and protecting those lands that should not be developed. Remapping efforts were based on up-to-date spatial data that illustrated the inaccuracy of many conservation boundaries that were on the adopted future land use map (areas where land use designations conflict with the underlying use of the land or natural features). This new and more accurate data included wetland boundaries, floodplain boundaries, tree canopy coverage, steep slopes, archeological sites and other natural and anthropogenic features that represent logical separation lines between uses. Thus, using this new data the ad-hoc working group, along with staff, began the remapping efforts with the adopted 2000-2010 boundaries serving as the starting point. Through the work of the Conservation Study Committee these boundaries were revised, with some areas being added and others being eliminated.

Site visits by the working group lead to the observation, in most cases, that Conservation Areas on campus have not been actively managed. Thus, management issues identified by the group included basic problems of erosion, sedimentation, trash, unauthorized parking, invasive non-native plants and lack of amenities for visitors. In order to address these concerns, the working group came up with a number of management activities that have been included within the specific area plans and in the activities spreadsheet. Typical activities that were identified include fencing, educational/interpretive signage, invasive non-native plants management, trail marking, and habitat enhancements (plantings and shelters). Additionally, the working group recognized the importance of several Conservation Areas to support environmental research/teaching and identified measures that should be taken to enhance these uses and foster multidisciplinary projects where feasible.

Successful performance will be measured by implementation of management strategies, along with changes to baseline conditions herein. Therefore, this plan represents the baseline report for the University's Conservation Areas and will serve as the basis for measuring future improvements, habitat quality and flora and fauna abundance and diversity.

Funding to implement these recommendations will come from a variety of sources including the following:

1. Grants – The University successfully received a grant from the Department of Environmental Protection to eradicate invasive non-native plants in two Conservation Areas. Other grants that could be applied for include stormwater and erosion grants from state and federal agencies, demonstration grants for establishment of best management practices, and wildlife.
2. Capital Improvements Trust Fund (CITF) – The University has requested $500,000 for FY 2005-2006 for management activities detailed in the CALM plan.
3. Division of Academic Affairs – Currently, this Division supports efforts at Seahorse Key and the NATL Conservation Area. This support could be broadened as other Conservation Areas are used as outdoor teaching laboratories that support academic research and teaching.
4. Division of Finance and Administration – This Division, through the Physical Plant Division, currently provides the bulk of maintenance within and around Conservation Areas through

mowing, tree planting, fencing, informational kiosks and by limiting vehicular access by unauthorized personal.

5. IFAS facilities – IFAS also provides maintenance to Conservation Areas within and adjacent to its operations through mowing, fencing and by limiting vehicular access by unauthorized personnel.
6. Partnerships – Some success has been achieved at improving Conservation Areas with cooperation by the City and Gainesville Regional Utilities. Efforts will be made to build upon these partnerships and gain new partners, particularly in the areas of invasive plant management and stream erosion.
7. Management Endowments – Promote and expand Conservation Area management through securing long-term endowments through charitable giving with the University of Florida Foundation.

3.6.2.11 University of Florida Wildlife Inventory and Monitoring Program: One Year Survey Results and Data Summary

Facilities Planning & Construction (FP&C), as part of UF's Master Plan, has backed the creation of a program aimed at monitoring wildlife populations in several selected conservation areas on the UF campus (Dawson & Hostetler, 2005). This program was established during fall 2004 and was conducted through August 20, 2005. This report details the results of the monitoring of birds, herps, and mammals in those selected conservation areas (including Lake Alice South) and presents a summary of collected data. Method, site, and volunteer limitations of the program were discussed. Management recommendations included invasive/exotic plant control, trash removal, and water quality monitoring.

3.6.2.12 Floristic Inventory of Selected Natural Areas on the University of Florida Campus: Final Report

This report summarizes the results of a one-year study documenting the diversity of vascular plants in 11 conservation areas on the University of Florida campus (Ionta & Judd, 2005). From September 15, 2004 to August 20, 2005, Gretchen Ionta, with the assistance of Dr. Walter S. Judd, conducted a floristic inventory of selected conservation areas on the University of Florida campus using standard field and herbarium methods. This study was funded by Facilities Planning & Construction (FP&C) as part of UF's Master Plan.

Vascular plant surveys were made in eleven UF Conservation areas: Bivens Rim Forest Area, Bivens Rim Forest East Area, Fraternity Wetlands, Graham Woods, Harmonic Woods, Hogtown Creek Woods, Lake Alice Natural Area, Lake Alice Natural Area South, McCarty Woods, Health Science Center Park, and the Surge Area Wetlands. Each conservation area was surveyed by walking its perimeter, available trails, and a series of transects which were carefully chosen to make sure that all vegetation types were sampled. Surveys were repeated several times and included all seasons. Vascular plant species encountered were identified and recorded along with abundance and location information. Voucher specimens were properly stored in the University of Florida Herbarium.

There were three main plant communities in the conservation areas surveyed: upland mesic mixed hardwoods hammock, bottomland mixed hardwood forest, and marsh.

Mesic upland hammocks (southern mixed hardwoods) are present in Bivens Rim Forest East, Bivens Rim Forest, Fraternity Wetlands, Graham Woods, Harmonic Woods, Health Center Park, Hogtown Creek

Wetlands, Lake Alice Natural Area, MCarty Woods, and Surge Wetlands. These mesic upland canopies are characterized by the following species: *Carpinus caroliniana* (American Hornbeam), *Carya glabra* (Pignut Hickory), *Celtis laevigata* (Hackberry), *Fraxinus americana* (White Ash), *Liquidambar styraciflua* (Sweetgum), *Magnolia grandiflora* (Southern magnolia), *Ostrya virginiana* (Eastern Hophornbeam), *Pinus taeda* (Loblolly Pine), *Quercus hemisphaerica* (Upland Laurel Oak), *Quercus michauxii* (Basket Oak), *Quercus virginiana* (Live Oak), *Sabal palmetto* (Cabbage Palm), *Tilia americana* var *caroliniana* (Carolina basswood) and *Ulmus alata* (Winged Elm).

Bottomland hardwood forests are present in eight areas: Bivens Rim Forest East, Bivens Rim Forest, Fraternity Wetlands, Graham Woods, Hogtown Creek Wetlands, Lake Alice Natural Area, Lake Alice South and Surge Wetlands. The following tree species are typical of these communities: *Acer negundo* (Boxelder), *Acer rubrum* (Red Maple), *Celtis laevigata* (Sugarberry), *Cornus foemina* (Swamp Dogwood), *Fraxinus caroliniana* (Carolina Ash), *Liquidambar styraciflua* (Sweetgum), *Nyssa sylvatica* var. *biflora* (Swamp Tupelo), *Pinus taeda* (Loblolly Pine), *Quercus laurifolia* (Diamond Leaf Oak), *Quercus nigra* (Water Oak), and *Sabal palmetto* (Cabbage Palm).

Marshes are present in three natural areas: Bivens Rim Forest East, Bivens Rim Forest, Lake Alice Natural Area, and Surge Wetlands. Typical species found in these communities include: *Acer negundo* (Boxelder), *Acer rubrum* (Red Maple), *Cephalanthus occidentalis* (Common Buttonbush), *Colocasia esculenta* (Wild Taro), *Hydrocotyle* sp. (Marsh pennywort), *Lemna* sp. (Duckweed), *Ludwigia peruviana* (Peruvian Primrose willow), *Myrica cerifera* (Wax Myrtle), *Salix caroliniana* (Carolina Willow), *Sambucus nigra* subsp. *canadensis* (Elderberry), *Typha latifolia* (Broadleaf Cattail) and *Zizaniopsis miliacea* (Southern Wild Rice).

A total of 378 different taxa representing 111 plant families were found in the inventory of selected UF Conservation Areas and 338 were identified to species. Seventy percent of the species identified were native. Thirty-two species were listed by the Florida Exotic Pest Plant Council (EPPC) as exotic species with the potential to disrupt Florida's native plant communities. One species documented in this study, *Matelea floridana* (Florida Milkvine), is endangered in Florida. This plant was documented in Bivens East, Graham Woods, Harmonic Woods, Health Center Park, Hogtown Creek, and Surge Wetlands. In these areas it was infrequently found scattered throughout the mesic hammocks. *Lobelia cardinalis* (Cardinal flower) and *Athyrium filix-femina subsp. asplenioides* (Southern Lady Fern) are listed as threatened in Florida. Cardinal flower occurs in Hogtown Creek natural area near the stream in the northwest corner of the property. Southern Lady Fern was infrequently seen in Fraternity Wetlands and Harmonic Woods.

The Lake Alice natural area had 183 different taxa with 164 of those identified to species, 70% of which were native, 12% were EPPC category 1 or 2, and there were no endangered or threatened plant species as defined by the State of Florida.

3.6.2.13 Waters of the University of Florida. A Plan for Achieving Sustainable Water Management in the Lake Alice Watershed

This report provides a multi-disciplinary approach to sustainable water management on the University of Florida campus by using scientific data to inform policy and management (Wells et al., 2006). The United States Congress enacted the Clean Water Act in 1972, which set forth groundbreaking standards for water quality including the reduction and elimination of point source pollutants. However, non-point source pollution, such as stormwater, remains a leading cause of impairment. The Clean Water Act addresses stormwater discharge through Phase II of the National Pollutant Discharge Elimination System (NPDES) program. The University of Florida (UF) obtained an NPDES Phase II permit in the fall of 2003. The NPDES

permitting process renewed interest in and commitment to water quality, and in particular stormwater management, on the UF campus.

Hydrologic history of the main watershed on campus reveals that Lake Alice has had high nitrogen and phosphorus levels for more than thirty years. Lake Alice has also received numerous designations with potentially conflicting management goals including a Class III water body, a stormwater management system, and a university-designated conservation area. Water quality data for 15 sites throughout campus collected between November 2003 and December 2004 revealed high phosphorus levels throughout the campus and nitrate levels as high as 11.5 mg/L in two creeks, Hume Creek and Fraternity Row Creek.

The report suggests that data from the Campus Water Quality monitoring program and the Hume Creek characterization enable the University of Florida to potentially address a long-standing water quality concern in Lake Alice through comprehensive basin management, targeted BMP implementation, and a Community-Based Social Marketing Strategy. The report authors provide conclusions and recommendations and suggest that the University of Florida may attain sustainable surface waters through a multi-disciplinary approach to management.

3.6.2.14 A Comparison of the University of Florida's Stormwater Discharge into the City of Gainesville, in Relation to the City of Gainesville's Stormwater Discharge into the University

The University of Florida and the City of Gainesville share similar roles in maintaining water quality and conveyance infrastructure in their respective jurisdictions (University of Florida, 2008). Since water and topography do not respect political boundaries, both entities share some of the same watersheds.

The primary drainage basin for the University is the Lake Alice Basin/Watershed. This basin also receives water from the University Heights neighborhood around Norman Hall. Much of this area was developed prior to modern stormwater regulation and, thus, lacks the water quality/quantity treatment that is required to help meet pre-development run-off patterns.

This report is intended to resolve the question and to serve as an update to changes due to annexation through the year 2007 by calculating the areas of untreated impervious surfaces that are discharging to the three basins described in this report. The report, if accepted, credits each entity with providing offsetting services for the other. Additionally, this determination serves as the basis to solve related SMU billing issues that are being delayed pending resolution of the parity of areas issue.

The report concludes that the City and University contribute similar amounts of untreated stormwater into each other's respective systems/basins. Although, the analysis shows a slightly larger amount of untreated stormwater from impervious surfaces coming into the University's system, there is a high probability that some of this area is now, or eventually will be, treated through the requirements placed on new developments under stormwater rules.

This analysis is based on the gross calculations of impervious surfaces that may not fully account for stormwater volumes that exceed pre-development runoff. However, both entities recognize that the University discharges only minimally into any City infrastructure that requires investment or maintenance by the City. Due to the issue of technical precision and actual infrastructure impacts, the University and the City agree that the stormwater credits derived to the University from off-campus sources is sufficient to offset any stormwater impacts from the campus into the portions of the Hogtown Creek Watershed and Bivens Rim/Tumblin Creek Watershed included in this analysis.

Based on the analysis provided in this report, the proposed Stormwater Management Utility (SMU) boundary will be applied as shown in Figure 5 to describe the areas where there is a reciprocal relationship between the stormwater basins of the City and University. Additionally, the University is committed to following the City's Hogtown Creek stormwater rule for all new impervious surfaces added within any basins that drain into City maintained basins (Hogtown and Tumblin/Bivens). By following this approach, it is understood that the University shall not be contributing additional stormwater burdens upon the City as it continues to meet its future needs.

The conclusions of this report were found to be technically accurate based on the best available data and professionally accepted methodology by the City of Gainesville Public Works Department, and by the University of Florida's Physical Plant Division and Facilities Planning and Construction Division.

3.6.2.15 2010 Water Quality Report, University of Florida, Main Campus, University of Florida Clean Water Campaign

The UF Clean Water Campaign is an initiative by faculty, staff, and students at the University of Florida whose mission is to protect the campus waterways from non-point source pollution (Lenta & Clark, 2010). The campaign partially addresses requirements under the NPDES MS4 Phase II permitting. The UF Clean Water Campaign focuses on the public education and participation components of the UF stormwater management program. The campaign aims to reduce stormwater pollution as well as other non-point sources of pollution through the following activities: Campus Water Quality Monitoring Program (CWQ); storm drain marking events to discourage dumping in storm drains; an informational website to educate the public about their role in keeping water clean; and a tour of Best Management Practices (BMPs) that are found on the UF campus or could be implemented in the future. For more information see http://campuswaterquality.ifas.ufl.edu which has a link to a kiosk installation (UF Clean Water Campaign, 2009).

The University's Clean Water Campaign webpage (UF Clean Water Campaign, 2020) states that "*Lake Alice facilitates groundwater recharge, provides habitat for wildlife and serves as an outdoor classroom for students and faculty to learn about natural Florida systems. All surface drainage entering the lake originates within the boundaries of campus, making UF solely responsible for the management of the system.*"

Periodic water quality monitoring of Lake Alice has occurred, often in association with the UF Department of Fisheries and Aquatic Sciences field classes. However, monitoring of tributaries that flow into Lake Alice or other natural areas on campus has been sporadic. An effort to increase water quality sampling effort was initiated in May 2003 by the UF Wetlands Club and subsequently organized under the UF Clean Water Campaign. The 2010 report outlines the results of data collected that year from 11 stations on the UF campus, 5 stations at the Stormwater Ecological Enhancement Project (SEEP) located in the Natural Areas Teaching Lab (NATL), and 4 stations on the UF Golf Course.

The Campus Water Quality Monitoring (CWQM) program is managed by the Soil and Water Sciences Department with financial support from the Physical Plant Division. Part of a student Research Assistantship is allocated to oversight of the CWQM, and this student is responsible for monitoring all sampling, data collection and analysis, preparation of samples for analysis, and volunteer recruitment and training. Sample analysis was conducted at the Wetland Biogeochemistry Laboratory within the Soil and Water Sciences Department.

The 2010 Water Quality Report summarized field and water chemistry parameters by site which were sampled during that calendar year. Tables of minimum, median, and maximum values as well as box and whisker charts are presented for each of the measured parameters. High nitrate values were noted from streams draining athletic fields. Two other CWQM reports from the same time period (Linhoss & Clark, 2009) and (Moran & Clark, 2010) had similar findings.

3.6.2.16 Campus Water Quality: Status and Trends

A copy of this presentation was reviewed but the audience and venue are unknown (Clark, 2012). The presentation outline includes a policy (Campus Master Plan - 2005-2015) element that UF shall continue to monitor Lake Alice and other surface water bodies for compliance with existing standards for water quality in order to meet Class III water quality standards and report findings to the Lakes, Vegetation and Landscape Committee annually. The presentation discussed water quality standards and impairment elements. The Campus Water Quality Monitoring (CWQM) program and selected nutrient results from 2003-2008 are presented in some detail. Athletic field fertilization was listed as a potential source of elevated inorganic nitrogen values observed at some stations. The associated electronic data file "Master Spreadsheet CWQ up to 2012-10-September2014 corrected.xlsx" was evaluated in the Lake Alice Watershed Management Plan Attachment B - Data Inventory and Analysis document. The data file contains the field and water chemistry parameter values from the CWQM program. The data are organized by station and date and span from May 2003 through September 2013. Qualitative observational data are also provided following the same structure, but these observations are less complete. There is also a table of site names with latitude and longitude coordinates and a corresponding graphic to illustrate sample collection sites on the UF campus.

3.6.2.17 Swamp Ethics: Trails as a Catalyst for Water Education

With the publication of the Campus Trails Master Plan, University of Florida is refocusing its campus core to Lake Alice (Y. Luo, 2020). The lake's function as the main collection point for campus surface runoff and its critical role in the functioning of the university, is largely unknown to students and faculty alike. Motivated to shift current attitudes and behavior, an interdisciplinary team of students worked together to transform this undervalued area of campus into a thriving network of recreational trails centered around stormwater collection and treatment. Following the recommendations put forth by the University Master Plan, "Swamp Ethics" prioritizes the concepts of education, recreation, and environment in its mission.

Informed by discussions with stakeholders, faculty members, and local professionals, and a review of current literature, the project team designed a stormwater system that applies LID techniques and Place Theory. The project "toolkit" includes elements such as floating wetland treatment cells, bioswales, rain gardens, permeable pavement, and green roofs.

From the conceptual plans presented, construction phasing and integration with the campus master plan are discussed. The performance of design elements was evaluated using stormwater runoff as the metric. The report concludes with cost estimates and a discussion of grant funding sources.

3.6.2.18 Campus Streams – Semester Report. SWS4905: Individual Work in Soil & Water Science

This paper notes the role of Lake Alice in campus stormwater collection, as well as water quality monitoring efforts since 2003 (Azeem-Angel & Reisinger, 2021). The project hoped to expand the focus of the Campus Water Quality Monitoring Program to also study heavy metal (lead, zinc, cadmium, and copper) concentrations within UF campus stream sediments. The project's four key research questions were: What is the current water quality of campus tributaries? What is the potential impact on Lake Alice? How has water changed over the past decade? What are the organic matter and heavy metal concentrations in the sediments of tributaries that flow into Lake Alice?

Sampled sites were visited three times during 2021 based on a subset of the sites (8 of 20) sampled during the Clean Water Campaign of the 2000s. During each site visit, field parameters, surface water, sediment samples were collected. The UF, IFAS Analytical Research Laboratory (ARL) performed all nutrient analyses to be consistent with analytical approaches from previous monitoring. Heavy metals were extracted from the sediment by the same laboratory.

Field parameter results from 2021 were generally within the range of values observed in 2010. The most notable difference between the nutrient analytes (Ammonium, Nitrate, TKN, TP, and SRP) was the independence between nitrogen and phosphorus. Ammonium concentrations increased compared to the 2010 data, while nitrate concentrations were typically below the 2010 values despite high variability between sites. Total and soluble reactive phosphorus concentrations appeared more consistent between sites and within the range observed during 2010. The heavy metal sediment values were far below harmful concentration thresholds. The associated electronic data file "20230705_Campus Streams ARL Data_cleaned by AJR.xlsx" was evaluated in the Lake Alice Watershed Management Plan Attachment B - Data Inventory and Analysis document. The data file contains the field, nitrogen and phosphorus water chemistry values, and sediment metal values. The data are organized by station and date and span from February 2021 through September 2021. There is also a table of site names with latitude and longitude coordinates and a corresponding graphic to illustrate sample collection sites on the UF campus.

3.6.2.19 Lake Alice Conservation Area Assignment 2 - Topography, Geology, Hydrology, LAA 2330 Site Analysis Class Report, Group 43

This September 29, 2021, story map report is from the UF LAA2330 Site Analysis class about the Lake Alice conservation area, specifically the topography, geology, and hydrology (UF Landscape Architecture, 2021a). The report is a synthesis of basic data available in Geographic Information System (GIS) format. The report includes some history, data layer imagery, and photographs including historic and modern images. The abstract states Lake Alice includes multiple features related to its topography, hydrology, and geology that make it an ideal place for people to visit and appreciate nature. These features all contribute to how people interact and experience the area. It also makes it a viable stormwater management system and conservation area.

3.6.2.20 Lake Alice Topography, Geology, and Hydrology. LAA 2330 Site Analysis Class Report

This October 3, 2021, story map report is from the UF LAA2330 Site Analysis class about Lake Alice topography, geology, and hydrology (UF Landscape Architecture, 2021b). The report is a broader synthesis of data available in GIS. The report includes some history, summaries of information, data layer imagery,

and photographs including historic and modern images. Various stormwater BMP examples are shown, as well as perceived opportunities and threats to the lake. The summary states Lake Alice plays a large part in the identity of UF and also serves many important functions in the day-to-day life of those who are present at the University. One of the largest functions that the lake serves is its vast draining capabilities for the surrounding area that help to prevent local flooding while also providing a natural filter to the water that is drained there.

3.6.2.21 University of Florida Lake Alice, Assignment 5 Human Systems Final Analysis + Site Synthesis. LAA 2330 Site Analysis Class Report

This December 13, 2021, Lake Alice story map report is from the UF LAA2330 Site Analysis class, Assignment 5 Human Systems Final Analysis + Site Synthesis (UF Landscape Architecture, 2021c). The report is a synthesis of basic data available in GIS. The report includes data layer imagery, modern photographs, perceived strengths and weaknesses of the lake. The report states that less intensive recreational use should be promoted, specifically walking trails that can be accessed from any side of the lake would better enhance accessibility. The summary states the watershed topography drains to Lake Alice, since the University of Florida has a high point of about 135 ft above sea level, while Lake Alice has a low point of about 70 ft. The lake serves as a nature preserve and when walking around Lake Alice one can often see animals using this water resource.

3.6.2.22 LAA 2330 Site Analysis Class Report

This September 11, 2022, Lake Alice story map report is from the UF LAA2330 Site Analysis class, Assignment 5 (UF Landscape Architecture, 2022). The report includes some GIS data layers, as well as graphics and text descriptions of the UF Conservation Master Plan, and Lake Alice geomorphology, hydrology, climate, ecology, soils, infrastructure, cultural and social resources. The report includes perceived strengths, weaknesses, opportunities, and threats of the lake. The report states that The Lake Alice Conservation area, as per the name, is conflicting, since the lake is both an official storm retention pond and an official conservation area, both classifications include a plethora of rules. The lake area being a storm retention pond and previously used waste management system has made an impact on the site. But the site can continue to be cultivated to the UF standards to encourage human interaction.

3.6.2.23 Ecological Assessment Report University of Florida, Master Stormwater Drainage Permit Renewal

WSP USA E&I (WSP) was contracted by the University of Florida to perform wetland delineations and permitting services in support of the renewal of the University Master Drainage System Permit (ERP 4-001-15570-19) (McMorrow, 2022).

This report is supplemental to the permit application for approval of the University Stormwater Management Master Plan and Permit. The Master Permit authorized construction and operation of modifications to the master surface water management systems for the Lake Alice Watershed and Depressional Basins UF-1 through 3 and UF-5 through 9. WSP performed wetland delineations within the Lake Alice Watershed and these referenced depressional basins.

This Ecological Assessment addresses the wetland and threatened and endangered species survey associated with the master surface water management system. A desktop evaluation of the project area was conducted by WSP biologists in advance of the site assessment to develop a preliminary

understanding of the possible extent of the wetlands, and potential for the presence of T&E species. The desktop evaluation included a review of available information, including the U.S. Geological Survey (USGS) topographic data, current aerial photography, the St. Johns River Water Management District (SJRWMD) Land Use Land Cover GIS layer (2020), the U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) data, Florida Natural Areas Inventory (FNAI) data, Federal Emergency Management Agency (FEMA) floodplain data, U.S. Department of Agriculture (USDA) Natural Resources and Conservation Service (NRCS) mapped soils, and the USFWS Information for Planning and Consultation (IPaC) Resource List Report.

The USFWS NWI data show the project area includes freshwater emergent wetlands, freshwater forested/shrub wetlands, freshwater ponds, and riverine ecological communities. Most of the project area is described as Institutional, with some high and medium density residential, commercial and services, golf courses, roads and highways, and sewage treatment land uses throughout. Natural land uses within the project area include upland mixed coniferous hardwood, mixed wetland hardwoods, freshwater marshes, wet prairies, mixed scrub-shrub wetlands, lakes, and reservoirs according to the SJRWMD Land Use Land Cover Map.

The FNAI Biodiversity Matrix indicated that no state or federally listed species have been documented for the project area; one protected bird species (Wood Stork (Mycteria americana) is listed as likely to occur in the vicinity of the project area. The USFWS IPaC database identified five federally listed species (there are no critical habitats for these species within the project area); and 19 bird species protected under the Migratory Bird Treaty Act.

Between March 8 and November 2, 2022, WSP biologists conducted natural resource field assessment of the project areas by pedestrian survey. Sites were also field evaluated for the presence of wetlands in accordance with USACE and FDEP delineation methods. The delineated wetlands were primarily mixed wetland hardwoods, surrounded by mowed grass or paved roads with wetland boundary generally set at the top of bank. Other wetlands included riverine systems that were also generally bordered by mowed grass. The largest wetland system in the project area is Lake Alice which consists of an open water lake, freshwater marsh, and mixed wetland hardwoods. Hydrologic wetland indicators observed included surface water, saturation, rack lines, elevated lichen lines, highwater marks on trees, and crawfish burrows. Hydric soil indicators observed included muck, stripped matrix, and gleyed matrix. Dominant canopy vegetation within most of the wetland areas were facultative wetland species including sugarberry (*Celtis laevigata*), sweetgum (*Liquidambar styraciflua*), laurel oak (*Quercus laurifolia*), cabbage palm (*Sabal palmetto*) and hickory (*Carya* sp.).

3.6.3 Journal Articles

3.6.3.1 Dynamics of Range Expansion of Cattle Egrets in Florida

Observations on the range expansion of (Western) Cattle Egrets (*Bubulcus ibis*) into north Florida were made at Lake Alice during the spring and summer of 1954 by the author (Rice, 1956). The lake area is reported at 90 acres with most covered by a low, shrubby swamp and an open-water portion with native emergent and floating vegetation. The nesting of herons, egrets, and other wading birds is described, and the author concludes that the initial Cattle Egrets came from Lake Okeechobee with flocks of other species of herons.

3.6.3.2 Limnological Characteristics of North and Central Florida Lakes

This journal publication (Shannon & Brezonik, 1972) is derived from the author's 1971 report titled Trophic State of Lakes in North Central Florida . Lake Alice was one of 55 lakes and ponds from North-Central Florida that was sampled during a one-year period. Lakes were compared and classified based on physical, chemical, and primary production characteristics. Lake Alice was noted as an outlier due to high nutrient loading and low phytoplankton production.

3.6.3.3 Removal of Algae from Florida Lakes by Magnetic Filtration

The purpose of this research was to investigate the removal of algal populations from lakes by magnetic separation in a laboratory setting (Bitton et al., 1975). Florida lakes are particularly known for their eutrophic condition and environmental engineers were interested in the feasibility of direct removal of phytoplankton. Magnetic filtration of lake water samples for the removal of algal populations was accomplished following the addition of 300 mg/L of magnetite and 50 mg/L of alum. Samples came from five lakes located in the vicinity of Gainesville, including Lake Alice. The technique enabled good removal (94%) of algal cells from three lakes (including Alice) where the pH was around seven. The other two lakes, with a higher pH, displayed a lower removal unless the pH was lowered to seven or lower.

3.6.3.4 Evaluation of *Cercospora rodmanii* as a Biological Control of Water Hyacinths

A fungus, *Cercospora rodmanii* Conway, which was isolated from declining water hyacinths in Rodman Reservoir in Florida, was evaluated for its biological control potential on water hyacinths during two growing seasons (February-November) (Conway, 1976). Results of greenhouse and field studies indicated that the fungus was responsible for the water hyacinth decline. Infection was initiated on water hyacinths in Lake Alice on the University of Florida campus during September and October, 1974. A combination of conidia and mycelia was applied to the plants. When the inoculum level was increased by a second similar spray application the disease spread rapidly. Browning of the water hyacinths in the test pool was augmented in the later stages of the test by below freezing temperatures. Cercospora rodmanii can be a virulent pathogen on water hyacinth and its effect on field populations of water hyacinth will be evaluated further to quantify damage to the plant.

3.6.3.5 Ecosystem Modeling of Water Hyacinth Management in Lake Alice, Florida

A mathematical model was developed for Lake Alice, with a key objective to inform the management of water hyacinth (*Eichhornia crassipes*), a non-native, floating aquatic plant (Mitsch, 1976). Mitsch characterized the history of Lake Alice as once being a sinkhole fed by a small marshy creek until an earthen dam was built at the west end of the lake in 1948. This impoundment of the lake and the addition of sewage and heating plant effluent from campus facilities increased its extent from about 4 ha (10 acres) to its present size of 33 ha. The western half is a deeper, open water area while the eastern portion is a shallow marsh.

Simulated diversion of the treated sewage inflow reduced water hyacinths by 50% or more. Simulated diversion of the diluting effect of a heating plant effluent led to complete hyacinth takeover and much greater seasonal oscillations in the chemical parameters. Simulated hyacinth control caused the greatest dissolved oxygen fluctuations when spraying and periodic harvesting were tested and least with continuous harvesting. It was suggested that the above mentioned diversions were shown to be ecologically unattractive even without considering the economic costs of alternatives to lake disposal.

3.6.3.6 Recovery of Coliphages from Wastewater Effluents and Polluted Lake Water by the Magnetite-Organic Flocculation Method

A magnetite-organic flocculation method was developed for the concentration of coliphages (virus that infect coliform bacteria and are used in aquatic systems for risk assessment for human enteric viruses) from wastewater effluents and polluted lake water (Bitton et al., 1981). A high percent (68 to 100%) recovery of coliphages from sewage effluents was achieved by this procedure. Coliphage recovery from Lake Alice, a sewage-contaminated lake, showed phage concentrations ranging from 230 to 1,900 plaque-forming units per liter. This method is simple and inexpensive and may be carried out under field conditions.

3.6.3.7 The Phenology and Growth of Water Hyacinth (*Eichhornia crassipes*) in a Eutrophic North-Central Florida Lake

This journal publication (Center & Spencer, 1981) characterized the phenology and growth of water hyacinth collected from Lake Alice between May 1974 to April 1975. Three distinct phases of annual growth were described, all of which were interpreted as mechanisms to increase leaf area index (leaves per plant, leaf density, and leaf size) following winter dieback. The maximum rate of biomass accumulation was estimated to be about 20 g/m^2/day with a maximum relative growth rate of about 1.50% per day. Maximum growth occurred in April ahead of attainment of the peak standing crop (~ 2.3-2.5 kg/m^2). Plant density was inversely related to plant size and appeared to be a function of the degree of intraspecific competition for light and space. Peak densities as high as 180 plants/m^2 occurred in April but this was reduced to stable values of 70-80 during the summer. The authors suggest that the response of water hyacinth to various environmental conditions through changes in plant proportions, leaf size and form is the result of its adaptation to tropical riverine systems in which the plant is likely to encounter frequent expansions or contractions of the available habitat with alternating wet and dry seasons. These adaptations permit the plant to persist upstream following flooding, rapidly recolonize areas after being washed out, and to establish new populations if swept downstream. This ability to rapidly re-establish populations following extreme perturbations makes permanent control of this weed difficult in its adventive range.

3.6.3.8 Wastewater Effects on a Water Hyacinth Marsh and Adjacent Impoundment

This report (Vega & Ewel, 1981) examines Lake Alice, which was described at the time as a water hyacinth (*Eichhornia crassipes*) marsh covering two-thirds of the impoundment that has received sewage effluent for nearly 20 years. Water from the marsh flows into an area that is maintained free of water hyacinths and is discharged through wells at the far end of the impoundment. A water budget for the basin was estimated, and phosphorus concentrations were measured monthly at three stations in the marsh and at the discharge wells in the lake. Productivity levels were measured monthly where the marsh joins the lake and at the discharge wells. Only 16% of the phosphorus that enters the basin is stored. Gross primary productivity levels in the open-water areas are very high (22 g-O2/m^2/day), but high respiration rates appear to keep the lake in steady-state.

3.6.3.9 Pesticide Screening in Fish and Sediment from Lake Alice, University of Florida Campus, Gainesville

This paper (Jennings, 1988) presents results of a small, pilot study to determine if pesticides could be detected from sediment or fish samples collected from Lake Alice during September 1987. Four sediment

samples from the upper 6 inches were collected with Ponar dredge and four largemouth bass were collected via electrofishing and separated into individual muscle and fat/visceral samples. Only one sediment sample (with the most organic content) and all eight fish samples were analyzed for organochlorine pesticides. None of the samples (sediment or fish) produced detectable levels of organochlorine pesticides. The author noted that the findings were the result of one sampling event with a small sample size.

3.6.3.10 Food Habit Comparison of Two Populations of Blue Tilapia, *Oreochromis aureus*, in North-Central Florida

Food habits of two populations of blue tilapia, *Oreochromis aureus* (Steinhachner), in North-Central Florida were compared for type, amount, and energy of foods consumed (Cailteux et al., 1992). Blue tilapia are among the most common exotic fish species in Florida and their interactions with native species were of concern. Blue tilapia in Lake Alice consumed mostly diatoms (probably detrital in nature), whereas blue tilapia in Lake George ingested mostly epiphytic green algae and diatoms. Stomach fullness was highest in fall samples and lowest during spawning (March and April) months in both lakes. Total energy values (kilocalories/gram dry weight) were significantly ($P \leq 0.05$) higher in Lake George than Lake Alice. The relative digestibility of foods was also higher in Lake George, but assimilable energy values were higher in Lake Alice. Blue tilapia appear to maintain populations in thermally suitable habitats with both epiphytic and epipelic sources of algae foods.

3.6.3.11 Production and Survivorship of the Functional Stolons of Giant Cutgrass, *Zizaniopsis miliacea* (Poaceae)

Giant cutgrass (*Zizaniopsis miliacea*), a tall emergent grass native to the southeastern United States, was studied in two Florida lakes. In Lake Seminole (15,176 ha) giant cutgrass forms large expanding stands, but in Lake Alice (9 ha) it is confined to a stable narrow fringe (Fox & Haller, 2000). By monitoring individual plants in Lake Seminole, it was found that an average decumbent flowering stem produced three flowers and ten nodes, 80% of which became rooted in the substrate. Such flowering stem development could potentially result in stand expansion of 2.2–2.7 m/yr, depending upon water levels and rates of node rooting. Once flowering stems became decumbent in Lake Alice, they typically broke, producing no more than two flowers with four nodes in a growing season. While still attached to the parent plant, few of these nodes were able to become rooted in the substrate, limiting the rate of stand expansion in Lake Alice. Sections of flowering stems bearing axillary shoots that were detached from the parent plant and free-floating could become rooted on reaching shallow water and produce robust, new, flowering plants. This interesting mode of population dispersal and spread has important implications for the distribution and management of giant cutgrass.

3.6.3.12 Eradication of a Reproducing Population of Convict Cichlids, *Cichlosoma nigrogaciatum* (Cichlidae), in North-Central Florida

This publication reports on the eradication of a nonindigenous fish, convict cichlids, *Cichlasoma nigrofasciatum*, from Green Pond on the UF campus, in December 2001 (Hill & Cichra, 2005). Green Pond is adjacent to the J. Wayne Reitz Union with an outlet stream and culvert drainage that goes to Hume Pond and then to the eastern marsh part of Lake Alice. The cichlid population had persisted for three or more years despite cold winter air temperatures owing to the thermal refuge afforded by a constant influx of warm water from UF cooling systems. A brief shutdown of the water flow allowed the use of rotenone

to renovate the pond. Over 1,000 convict cichlids ranging from 33-101 mm total length were removed and data were collected from representative specimens. Relations of standard length, weight, and body depth to total length were estimated. Plant material dominated the stomach contents in frequency of occurrence, followed by unidentified organic material and amphipods. However, fish and plant material made up the greatest volume of stomach contents. Although it was winter, three of 14 females examined had apparently ripe eggs and there were nests and brood pits within the pond. Two other nonindigenous fish species were found—two black pacus, *Colossoma macropomum* (Characidae), and an oscar, *Astronotus ocellatus* (Cichlidae). Also collected were native yellow bullhead, *Ameiurus natalis* (Ictaluridae), eastern mosquitofish, *Gambusia holbrooki* (Poeciliidae), and sailfin molly, *Poecilia latipinna* (Poeciliidae).

The publication also serves to document exotic fish introductions to Lake Alice and the cold induced, massive die-off of another nonindigenous fish, blue tilapia, *Oreochromis aureus* (Cichlidae), which occurred in Lake Alice during the winter of 2000-2001 (authors' personal observations).

3.6.3.13 An Assessment of Small Unmanned Aerial Vehicles for Wildlife Research

The publication documents the testing of unmanned aerial vehicles (UAVs) for wildlife monitoring (G. P. Jones et al., 2006). Lake Alice was one of several sites used as a site for wildlife detection. The authors noted that for UAVs to be useful as management or research tools, they should be durable, modular, electric powered, launchable and recoverable in rugged terrain, autonomously controllable, operable with minimal training, and collect georeferenced imagery. Current technology has largely addressed all these needs and continues to advance. Today's UAVs could contribute to surveying Lake Alice boundaries and vegetation communities.

3.6.3.14 Environmental Sampling Reveals that *Pythium insidiosum* is Ubiquitous and Genetically Diverse in North-Central Florida

Pythiosis is a deadly disease of horses, dogs, and other mammals, including humans, in tropical and subtropical regions. In the United States, the disease has been reported in the Southeast as well as in the temperate North and the dry Southwest (Presser & Goss, 2015). The causal agent of pythiosis is *Pythium insidiosum*, one of few mammalian pathogens in the fungus-like Oomycetes. *P. insidiosum* has not been studied in the environment in the United States.

It was hypothesized that lakes and ponds in North-Central Florida are suitable habitat for *P. insidiosum* given anecdotal reports of pythiosis in Gainesville, Florida dogs. Lake Alice was one of 19 waterbodies sampled and *P. insidiosum* was found in 11 of the sampled lakes including Lake Alice. Sequencing of the ITS region separated isolates into three genetic clusters, including a distinct group previously represented by a single isolate from South Carolina. AFLP genotyping of isolates showed genetic variation in Cluster I, which is the group associated with the majority of characterized clinical isolates from the Americas. Results indicate that animal exposure to *P. insidiosum* in North-Central Florida is common. This study provides the first evidence that *P. insidiosum* may be more widely distributed in freshwater lakes and ponds in the Southeastern United States than previously appreciated.

3.6.3.15 Effects of Nutrient Reduction on the Water Quality and Largemouth Bass Population in Lake Alice, Florida

Lake Alice, located on the University of Florida's campus in Gainesville (FL), was sampled for water chemistry and Largemouth Bass (*Micropterus salmoides* (LMB)) by UF's Introduction to Fishery Science class (IFS) annually from 1988 to 2020 (Schwartz et al., 2021). Prior to November 1994, the lake received direct inputs of nutrient-rich, treated effluent from UF's wastewater treatment plant. Effluent was completely removed by 1995, providing an opportunity for IFS to assess the long-term changes that occur in a single lake following point-source nutrient diversion. All water chemistry and fish data were mined from the class records kept by UF's Program of Fisheries and Aquatic Sciences (Millhopper Complex in Gainesville, FL). Data were examined for immediate effects and long-term trends using a modified regression approach developed to provide statistically meaningful information. Following diversion of the treated wastewater, the commonly measured trophic state parameters (TP, TN, chlorophyll, And Secchi depth) underwent noticeable changes, but effluent removal did not significantly ($p = 0.22$) increase or decrease the estimated number of LMB in the lake. decrease on the long term. However, both K and Wr for LMB declined significantly over time as did PSS-Q and PSS-M. Information obtained at Lake Alice, when compared to that obtained from cross-lake Florida studies and from a major Florida sportfishing lake undergoing oligotrophication, demonstrate that fish parameters, especially those for LMB, need to be clearly defined when considering implementation of nutrient criteria. LMB can survive in eutrophic and hypereutrophic lakes and these lake types are some of Florida's best fishing lakes. Thus, controlling nutrient inputs to lakes may not always be the best management strategy if the primary use of the lake is fishing. Fish habitat improvement provides an alternative management strategy to nutrient control. Eutrophication of Florida lakes is, therefore, most likely not a severe problem for Florida's LMB fisheries unless nutrient enrichment directly results in habitat loss. Application of Florida's nutrient standards, numeric nutrient criteria, and management practices should reflect this reality.

3.6.4 Newspaper and Other Articles

3.6.4.1 Article – Pearson's Poop

This column (Pearson, 1950) from The Florida Alligator contains facts and information UF students should know. It states that Lake Alice contains fish, but fishing is prohibited, and students should not fish there.

3.6.4.2 Draining of Lake Alice to Cut Danger for Flood

This newspaper article (Halverson, 1959) summarizes the drainage well project through an interview with the UF campus engineer, Calvin C. Greene, Jr. Lake Alice serves as a natural drainage basin for part of the campus, with expansion of the lake corresponding to growth of buildings and streets in the watershed. The article notes that by 1949, aerial photographs showed an increase in lake area adjacent overflow areas had become permanently inundated. Rainfall induced flooding around Lake Alice had the potential to inundate the golf course, the hospital steam plant, and sewage plant. To reduce flooding and maintain the lake to a controllable size, two drainage wells have been installed at the northwest corner of the lake. The drainage capacities of these two wells (also called recharge wells) are expected to maintain lake levels between three and three and one-half feet lower than present conditions. The project would purportedly return the lake shoreline size and shape to 1932 conditions. One well is reported as 115 feet deep; the second as 450 feet deep. Well flow rates of 4,000 to 5,000 gallons per minute were reported from construction testing.

3.6.4.3 Lake Alice has Her Ups and Downs

This newspaper article (Gainesville Sun, 1959) reports on concerns about flooding control by drainage wells and lake levels dropping so low that birds and other wildlife would leave the area.

3.6.4.4 UF Dents City Budget 'Wasting' Free Water

This article (The Florida Alligator, 1963) mentions that the City of Gainesville has been providing UF with free water as part of the incentive program to get UF to relocate from Lake City in 1906. The article says UF makes up 20% of Gainesville's entire water consumption, suggesting the campus uses an abnormally high amount of water for its size. The bill for 1962 water use was $80,000.

3.6.4.5 Alligators Roam Freely Around UF

This article (Langworthy, 1965) reminds readers that alligators are free to roam the campus day and night, and according to C. Greene, director of plants and grounds, "The gators come from Lake Alice, which is their natural habitat and move freely from pond to pond." The supervisor of University grounds stated "If I catch one on campus, I puts him back in Lake Alice. But with a few days the alligator returns to the same pond where I found it." Dr. A. Carr, Professor of Zoology was interviewed and said that he rarely observed overland campus gator movement on campus and said "Most students do not even realize they're here."

3.6.4.6 Road To Divide UF Campus Already Divisive

This article (Ryan, 1969) is about a proposed highway that would divide the University of Florida campus along the eastern side of Lake Alice. The State Road Department has completed a preliminary survey and is moving ahead with final plans on the four-lane, throughway linking West University Avenue with U.S. 441 south of the city.

Opponents to the proposed route will have their say before the University's Campus Land Use and Planning Committee. Their primary objection to the route and parking lot is the effects construction will have on Lake Alice, an on-campus body of water of some 60 acres. Opponents claim clearing and building will "immediately and irreplaceably destroy the major wildlife values of the entire lake area." What will be left, they say, will be "at best a landscaped pond devoid of visible wildlife and surrounded on all sides by roads and parking lots." Dr. John H. Kaufmann, associate professor of zoology who heads a hastily-formed "Ad Hoc Committee on Lake Alice," yesterday pointed out that the lake offers more than aesthetic values, however. "Many people in the university and in Gainesville are aware of Lake Alice as one of the few spots remaining where one can see an alligator or an egret in its natural surroundings," he said.

"Relatively few," Kaufmann continued, "appreciate the functions it serves in teaching and research programs of the university, or of the potential it has as a scenic and educational facility for both the university and the general public." Kaufmann said the lake and its wooded north shore are used extensively for upper division and graduate courses in zoology, entomology and botany and, with development, could be utilized by beginning zoology and biological sciences students.

Proponents have advanced four major arguments in favor of the present throughway alignment:

- The natural character of Lake Alice has already been damaged by past construction and pollution, making it unsuitable for further research and education.
- Future space demands will inevitably result in intensive development of the Lake Alice area, making any attempt to develop it for biological use doomed from the start.

- Other areas are more appropriate for the biological functions Lake Alice now serves.
- Gainesville urgently needs another north-south traffic artery with access to a proposed University Activities Center. This need can best be filled, from an engineering standpoint, by the proposed route.

Kaufmann's answers to the arguments go like this, in order:

- "It is true the lake undergone many undesirable changes in recent years…but its biological usefulness has not been destroyed, and there are good prospects for repairing much of the damage done so far."
- "Areas that are set aside soon enough eventually become inviolate because are the last open areas amid the steel and concrete. The possibility that future expansion will eliminate the wildlife is a poor excuse for irrevocably destroying it now."

Kaufmann said plans for the throughway "are being made with undue haste and too little publicity." He said his group "realized last week what was happening…"

3.6.4.7 Help Save Lake Alice

The editorial (Kaufmann, 1969) seeks to correct the impression on the effect of the proposed campus freeway on the aesthetic, teaching, and research values of Lake Alice. Far from being a move to "protect" the lake from further encroachment, the proposed four-lane divided highway and 2,000 car parking lot along the north lake shore will destroy present and potential lake values. The editorial suggests the final approval for the plan must be given by President O'Connell and opposition letters should be sent to his office.

3.6.4.8 Article – The Fate of Lake Alice Rests with State

This is an article (J. Davis, 1969) about revised plans (provide 400-foot boundaries around lake) for a through-campus highway. The plan splits the four-lane highway int two double lane, one-way roads that encircle the lake. This article states an ad hoc faculty committee, "Save Lake Alice", was formed to preserve lake wildlife habitat and the plans are with the State Department of Transportation for cost and feasibility review.

3.6.4.9 Sewage, Alice Pollution

An editorial article (Harper, 1969) concerning wastewater treatment, Lake Alice environmental quality, and City of Gainesville drinking water.

3.6.4.10 Graduate Program Focus on Lake Alice

The Department of Environmental Engineering Graduate Seminar is focusing on the problems of Lake Alice (The Florida Alligator, 1970). The program will be split into three components- problem characterization, problem analysis, and reports on results and findings. Interested faculty and students are invited to attend the seminar series.

3.6.4.11 Alice's Hyacinths Subject of Plans

Plans for cleaning the western end of Lake Alice were announced at the Clean Earth Festival on the Plaza of the Americas (Strang, 1970). Students are needed to pull hyacinths out of the water by hand because mechanical methods would damage the natural shoreline. A committee headed by Dr. G. Davis of UF includes members from the Sierra Club, Student Government, Environmental Action Groups and local garden clubs.

3.6.4.12 Alligator Background Report, Lake Alice, Footprints: Both Mar Environment

Threats to UF campus environment cover a spectrum from eutrophication of Lake Alice to the creation of footpaths by students going to class (Wise, 1970). Environmental Action Group (EAG) members are concerned about sewage treatment effluent, the water hyacinths, and the loop highway proposed around the lake.

3.6.4.13 Prettier Alice

Picture article showing a track excavator removing water hyacinth plants from Lake Alice (Gainesville Sun, 1970).

3.6.4.14 Volunteers Answer Call to Clean Out Hyacinths

Dr. J.F. Gamble, Associate Professor of Environmental Engineering, said an outpouring of responses to cleaning of Lake Alice has come from fraternities, garden clubs, biology classes, and others (Hartman & Darden, 1970). These volunteers will supplement the contractor hired to remove hyacinths who has been taking out 80-100 truckloads daily. The volunteers focus will be working along shorelines with manual equipment to try to minimize damage to the natural shorelines.

3.6.4.15 Lake Alice Cleanup a Success

This article (Morgan, 1970) covers the recent removal of an estimated 5,000 tons of water hyacinths. It was reported that plans to redirect wastewater and stormwater from Lake Alice will continue to be developed.

3.6.4.16 Save the Lovely Alice from the Green Strangler!

An article (Patterson, 1970) on efforts to control the abundance of water hyacinth on Lake Alice which includes current efforts and plans that have been discussed.

3.6.4.17 Lake Alice Sanctuary Threatened

A group of students calling themselves Students Against the Cross Campus Highway (SAACH) say the beauty of Lake Alice and it's wildlife are threatened by plans for a $1 million, state funded highway that would encircle the lake (Godown, 1971). The UF campus planner, B. Munson, is leading the effort and noted that the Lake Alice Use Committee is being consulted. SAACH contends that the loop road would not alleviate campus traffic and only serve to connect city and county traffic flows, and that a required environmental impact assessment has not been done.

3.6.4.18 Lake Alice Loop Surveying of Cross Campus Highway Stalled while Corn Ripens in Field

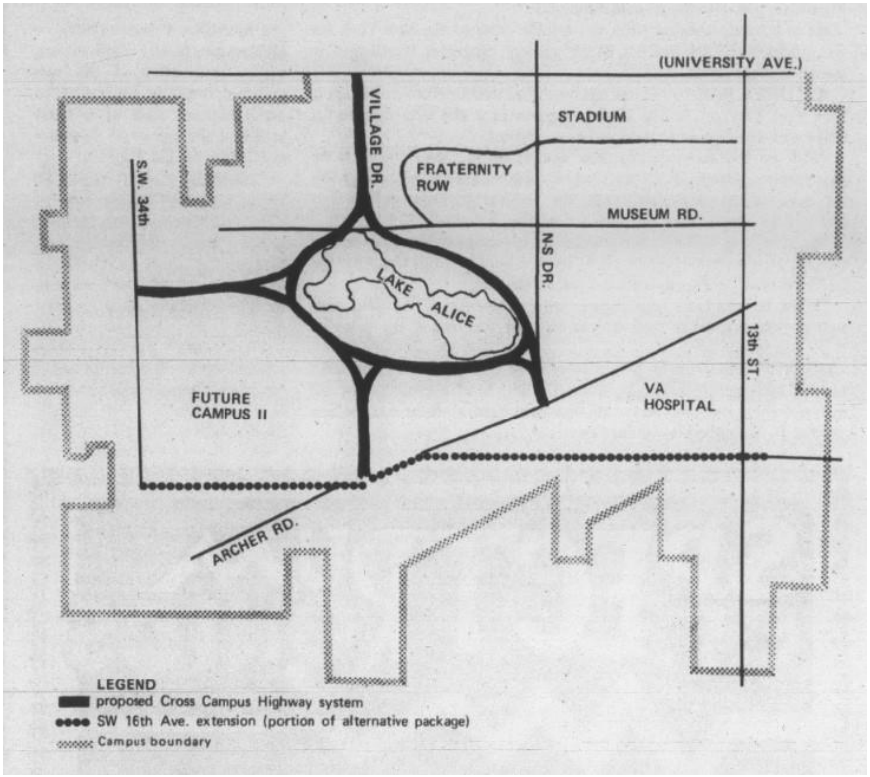
This article (Garte, 1971) covers efforts for a planned highway and states survey is officially complete except for a field waiting for corn to be harvested. The article states that representatives of campus, the City, County, State Department of Transportation (DOT) reached agreement in a meeting held March 26, 1971, in which the road will be a four-lane highway that will encircle Lake Alice. Proponents say the road will help with traffic as the campus and city grow, opponents say the road will negatively impact the lake.

3.6.4.19 Loop Road Endangers Lake

This article mentions the loop road may change the tranquil nature of Lake Alice (Garte, n.d.). The State Department of Transportation DOT has appropriated $1.3 million or UF's benefit to design a roadway which would best improve the traffic congestion being experienced on surrounding campus roads. A map graphic is shown. UF students held a "No Road" rally on October 12, followed by campus highway referendums with 95% of the vote against the proposed loop road.

3.6.4.20 Cross-Campus Highway: Rocky Road of Conflict Leads to Hearing

Multiple articles in this edition of the paper discuss the plan by UF administration and the state Department of Transportation (DOT) to build a cross-campus highway which would encircle Lake Alice (Logan, 1972). Growth in UF, the City, and the State have led to this traffic proposal, but controversy and protests by several groups, most notably the Environmental Action Group (EAG) have led to a DOT hearing for January 12th. In the same paper edition, there is an Editorial to cut class and attend the hearing on campus, and two articles about the controversy and pros and cons of the road plan.



3.6.4.21 Loop Road Stifled; Alternatives Sought

The UF Department of Physical Planning will make new recommendations to relieve campus traffic after plans for the Lake Alice Loop Road were declared indefinitely postponed (Kuehn, 1972). Dr. J. Stafford of UF will have new recommendations for the state Department of Transportation (DOT). The DOT has about $1 million appropriated to UF for traffic resolution. The loop road had been the object of much opposition over the past year, which was reported as an important factor in stopping the road construction.

3.6.4.22 Gainesville and County Unite over Waste Water

The article (Macina, 1972) states that the Alachua County and Gainesville City Commissions have agreed to create a joint committee to take charge of the city and county wastewater. The joint committee was supported by federal grant funding incentives to partner with municipalities. City Commissioner and UF Assoc. Professor of Finance and Insurance J.G. Richardson was appointed chairman, but no mention of UF wastewater in the article.

3.6.4.23 Article – Sewage Plant Makes Water Drinkable

This article (Pitts, 1973) about the UF sewage treatment plant states that UF wastewater receives primary and secondary treatment, then flows through Lake Alice, which acts as a natural tertiary treatment. The article notes that there are two treatment processes, that the Grounds Department uses dried solids as mulch, there are six chlorine contact chambers, and that the nutrient rich effluent stimulates the growth of water hyacinths which need to be cleaned out of Lake Alice regularly.

3.6.4.24 Treated Waste Water Disposed through New Method

An article (Stoun, 1973) about a wastewater disposal method being tested by UF with the City of Tallahassee, which uses a sprinkler irrigation system and a treatment plant (Southwest WTP) to distribute effluent over farmland instead of being discharged to surface waters of Lake Munson. Plans to expand the Tallahassee WTP to 10 MGD are underway and it hoped all the discharge could eventually be retained on land. UF IFAS's Dr. A.R. Overman was awarded a grant from the EPA. According to Dr. Overman, inadequately treated sewage effluent must be kept from infiltrating Florida's ground water supplies.

3.6.4.25 Gator Ban for Gatorman Frustrates UF Celebrity

The article (Lichtenstein, 1973) states that “Gatorman”, Curtis Read, an employee at UF, has been arrested once and warned several times against bothering the alligators and trespassing in Lake Alice. A large alligator in the lake is referred to as “Albert” and Read says he intervened in a struggle between Albert and another alligator thereby gaining its trust. Read states he likes to feed Albert, then get in the water with him.

3.6.4.26 Lake Alice is Alligator Haven

This article (Tharpe, 1973) was published in a time when alligators were still listed as an endangered species (1967-1987) and sightings on UF campus made the news. According to UF superintendent of grounds (N. Lake), alligators are free to roam wherever they want to, but most alligators live and feed in Lake Alice. A trapper, L.M. Crews, working under the Florida Game and Fresh Water Fish Commission (GFC) said three alligators were relocated during the last year and that, “The worst thing in the world you

can do is feed a gator." A GFC biologist (M. Fogarty) speculated that based on state alligator population estimates, there may be a time when controlled harvesting is necessary.

3.6.4.27 Alligators are Stayin' Alive

Eight large and "potentially dangerous" Lake Alice alligators have been granted a temporary reprieve after a two-hour discussion between members of the Audubon Society, UF officials, environmental representatives and a nuisance alligator expert from the Florida Game and Fresh Water Fish Commission (Small, 1979). Dr. Kaufmann, Zoology Department, spoke in favor of trying to live the alligators, such as education against feeding and retraining alligators that lose their fear of humans. UF Environmental Health and Safety Director B. Dunavant was willing to consider alternatives presented by the zoology department, and that human safety was the priority.

3.6.4.28 UF Yet to Apply for Lake Alice Permit

Staff at the US EPA say UF is in the process of preparing an application for a permit to continue discharging sewage into Lake Alice (Smith, 1980). UF associate director of the physical plant said, "We do have the blank forms, but that's about as far as we've gone." Flow from the wastewater treatment plant into Lake Alice varies from 1.2 to 1.5 MGD. The permit for discharging sewage became necessary in 1979 when a clearer definition of the bodies of water covered by the Clean Waters Act place Lake Alice under the jurisdiction of the EPA.

3.6.4.29 Pollution in Lake Alice may be Illegal

This article (Ortega, 1980) says UF officials could legally pollute Lake Alice if they wanted to, but instead sewage is being dumped into the lake without a permit federal officials said was necessary eight months ago. UF Physical Plant Associate Director, B. Martin, said the lake may not be under the federal Environmental Protection Agency's authority. Mr. Martin said, "We sent a letter…to find out if we were indeed under their jurisdiction" and that "We felt that the federal guidelines did not apply to Lake Alice because we discharge below the surface." Mr. Martin said water coming from the sewage plant is drinkable. An EPA water quality standard coordinator in Atlanta, M. McGee, said once jurisdiction for Lake Alice is decided, testing of the water quality will be left up to UF.

3.6.4.30 City to Ask for Public Hearing on Wastewater Treatment

The article (Curtin, 1984) states Gainesville city commissioners will ask the state Department of Environmental Regulation (DER) to hold a public hearing to promote awareness about UF's application to renew its wastewater treatment plant permit. A member of the City's Water Management Committee is concerned about the effects of WWTP and Shands discharges on Lake Alice. UF's current permit expires May 21st. DER's branch manager anticipates no problems with the facility.

3.6.4.31 Groundwater Worries Delay Plant's Permit

This article states that after a year, a UF application to renew its wastewater treatment plant permit has not been approved because officials have not come up with a groundwater monitoring plan (Curtin, 1985). According to L. Carter, an engineer with the Florida Department of Environmental Regulation (DER), UF was in compliance under old DER rules, but that is no longer the case, as the aquifer is now being more stringently protected. UF's Physical Plant is reported to have a monitoring plan in the works. Nothing ever

resulted from a public hearing request in May 1984 (Curtin, 1984) because city commissioners did not express interest in having a hearing.

3.6.4.32 Water Runoff May Poison Lake Alice

The article (Cobb, 1986) states that UF's Athletic Association has applied for a stormwater management permit from the St. Johns River Water Management District (SJRWMD). The permit would allow the control of runoff from UF tennis courts, but a member of Gainesville's water management advisory board (M. Smith) says a stormwater permit should not be issued because it only addresses a small part of a big problem. Smith said UF has no comprehensive plan for dealing with stormwater runoff, that most of the runoff drains to Lake Alice, that the lake already receives 3.1 MGD from UF's sewage treatment plant, and that the volume of water decreases Lake Alice's ability to clean water before flowing into the aquifer.

3.6.4.33 Lake Alice: Cost of Clean Water Rises

This article (Doherty, 1986) discusses UF's testing efforts on Lake Alice because of increased concern over groundwater quality. Per R. Cremer, the director of UF's physical plant, 3.1 mgd goes to Lake Alice where it is further purified before being injected into Gainesville's primary source of drinking water, the Floridan Aquifer. If the lake becomes unable to perform the filtering process, contaminated water may find its way into the aquifer. UF samples monthly, but new state regulations adopted in 1984 require stricter monitoring. UF has spent the last two years revamping its groundwater testing system, based on a CH2M HILL study. Eight wells around Lake Alice will be used for monitoring at various intervals. State DER officials have held UF's wastewater management permit for the last two years, waiting on the monitoring plan to be completed. The article states that the permit is one issue, but the other problem local officials have raised is stormwater runoff. The stormwater issue arose after UF had applied for a stormwater permit to construct six tennis courts near the law school. Prior stormwater permits were issued by the state DER, but the St. Johns Water Management District has jurisdiction now. City Commissioner, W.E. McEachern said, "UF doesn't have a comprehensive stormwater management program." UF facilities planning director, J. Carlson, said he's not quite sure what a "comprehensive stormwater management program is."

3.6.4.34 Fix Waste-Flow Problems in Lake Alice

Earlier this month a pump station mishap sent raw sewage into Lake Alice and UF officials didn't think they needed to notify anyone (Carney, 1989a). State Department of Environmental Regulation (DER) officials advised UF they'd broken state law and ordered them to ensure it doesn't happen again. The spill came after a float valve stuck at the sewage lift station near Museum Road and Village Drive overflowed. DER officials said no one knew UF had overflow lines going into Lake Alice. UF Physical Plant Director R. Cremer, said he isn't even convinced that having sewage overflow in the lake is a violation. Cremer said the runoff has gone into the lake ever since the lift station was built but didn't know how long ago that was. The UF sewage treatment plant permit requires that any spills be reported.

3.6.4.35 Operations Upgraded After Spill

A sewage spill in March to Lake Alice is forcing UF to clean up its act (Carney, 1989b). The listed repairs include modifying the lift station, so it doesn't overflow into Lake Alice, installing louder and more visible alarms, posting an emergency 24-hour phone number, and training for Physical Plant staff on maintenance, operation, and emergencies of the wastewater system.

3.6.4.36 Article – Sewage Plant Upgrade Expensive

The article (Carney & Taylor, 1989) cites a UF engineering consulting firm's report (CH2M Hill, June 2, 1989) that the UF sewage treatment plant is obsolete and can never meet water quality regulations. Cost estimates to upgrade range from $3 to $20 million. A copy of the report was sent to the Florida Department of Environmental Regulation (DER), with the Gainesville DER branch manager commenting that the best solution is to improve the treatment plant, use some treated water for campus irrigation and inject the rest into the underground aquifer. That plan would bypass Lake Alice and cost about $12 million. Currently about 2 MGD goes through Lake Alice and to prevent the lake from overflowing two wells on the west side of the lake drain directly into the Florida Aquifer. The article states the water from the sewage treatment plant can't be directly injected into the aquifer because it still has high nutrients that the lake absorbs, but as water goes through the lake it gathers bacteria and animal waste; either way, water going into the aquifer does not meet water quality standards. DER staff and UF Physical Plant Director (R. Cremer) said it would be an impractical, if not impossible, task to bring the lake up to aquifer-injecting standards. Cremer said one solution would be to take Lake Alice out of the system by injecting treated wastewater directly into the aquifer.

3.6.4.37 Alligators Mate Early in Season

This article (Wright, 1989) discusses increased alligator activity on Lake Alice corresponding to their breeding season. UF zoology professor, K. Vliet, reports that alligator nest near the UF sewage plant to avoid human contact and he estimates that there are between 20 to 30 alligators in Lake Alice, and that larger alligators can exclude smaller alligators through competition.

3.6.4.38 Lake Alice May be Site of Houses for Stadium Bats

UF Athletic Association (UAA) officials have proposed building a bat house at Lake Alice for bats that have taken up residence in UF stadiums (Sneed, 1990). An estimated 3,500 North American free-tailed bats have been living in spaces underneath the Varsity Tennis Courts and Percy Beard Track stadium for more than a year. UF environmental health and services assistant director, T. Turk, said Lake Alice is a suitable site, since the bats already go there to drink. A UAA employee said placing the bat house at Lake Alice is the best solution for all concerned.

3.6.4.39 Band Practice Field May go to 'Waste'

A planned wastewater treatment plant (WTP) may be constructed south of the existing WTP (Ehrlich, 1991). The new facility upgrade will reclaim all wastewater from UF and Shands Hospital. The treated water will be used for injection wells, golf course irrigation, and cooling systems at Shands. According to president of the UF's Student Chapter of the Florida Pollution Control Association, the existing WTP has not been meeting national standards for at least five years.

3.6.4.40 UF Invites Bids for New Waste Water Treatment Plant

UF began taking bids for a new wastewater treatment facility in October (Zeeb, 1992). The new plant is slated to begin construction in December and Physical Plant Engineer, C. Wickberg said the new plant should be constructed by April 1994 at a cost of about $10 million. Public Education Capital Outlay (PECO) funds will pay for the project. Portions of the original plant are more than 40 years old, and the new plant will also supply treated reclaimed water for irrigation and industrial purposes on campus.

3.6.4.41 Lake Alice Alligator Faces Death Penalty

A three-legged, 9-foot alligator that was sunning by a walking path along Museum Road has been reported as a nuisance by UF police (Gross, 1994). A licensed trapper, hired by the Florida Game and Freshwater Fish Commission has been authorized to remove the alligator.

3.6.4.42 New Group to Fight Lake Alice Housing

A group tentatively called "Alice's Friends" has formed with the hope of stopping UF's plans to construct student housing near the northwest shore of Lake Alice (Hiers, 1994). The group's first meeting time and location is listed.

3.6.4.43 Fate of 'Nuisance' Alligators Debated

The article (Fontaine, 1995) said students and Gainesville residents were reminded of alligator danger following two alligator attacks in six days, resulting in hospitalization of a 7-year-old boy (in a City creek), and death of a puppy (walking around Lake Alice). With an estimated statewide alligator population of more than one million, annual harvesting programs are managed by the Florida Game and Fresh Water Fish Commission and any alligators that lose their fear or behave aggressively towards humans are treated as nuisance animals eligible for removal by certified trapping agents. At the time there were about 12,000 alligator related complaints in Florida and about 4,000 required the removal of the alligator.

3.6.4.44 The Way I See It…Nature is More Important than Housing

This opinion piece (Bromberg, 1995) reports on the controversy surrounding plans to construct new student housing along Lake Alice. The author notes that Lake Alice is a special place on campus that should be preserved and remain unchanged and encourages students to be vocal in opposition to the proposed development.

3.6.4.45 Living in Harmony: Lake Alice Gets New Safety Signs

In a public safety effort, UF Physical Plant Division has installed gator-safety guidelines about the potential danger (The Independent Florida Alligator, 1996). UF assistant vice president for administrative affairs said the University reviewed its safety polices at Lake Alice after an incident with a dog. The signs warn against feeding the alligators and staying away from the water's edge.

3.6.4.46 Ten-Year Plan May Threaten Lake Alice

This article (Sissons, 1997) notes that one of the most unique aspects of UF, Lake Alice, is threatened by future UF plans for construction of student housing on Bathouse Field north of the lake. UF faculty and graduate students expressed concerns that construction would have on the ecology and recreation aspects of the lake. Groundbreaking is planned for 2003, and facilities would consist of 11 buildings with 176 units and parking lots.

3.6.4.47 UF Runs Its Own Wastewater Collection, Reclamation System; Processed Water Is Used For Campus Irrigation

This guest column article by B. Armaghani, Engineer at the Physical Plant Division Systems Department, is about UF's independent wastewater system (Armaghani, 1998). The collection systems cover three square miles, has a combined 25 miles of gravity and force main flows, from pipes ranging from four inches to 24

inches in diameter, 26 lift stations, and 864 manholes. The wastewater treatment plant has a 3.0 MGD capacity and currently processes about 1.9 MGD. The campus wastewater collection system is divided into four sections which are described, as is the disposal of treated, reclaimed water to campus irrigation and Lake Alice injection wells.

3.6.4.48 UF's Water Reclamation Facility Wins EPA Southeast Region Environmental Award

This article (The Independent Florida Alligator, 1998) notes that the UF Water Reclamation Facility won second place for the 1998 Southeast Region Environmental Protection Agency's Operation and Maintenance (O&M) award. The EPA provides O&M awards to facilities that demonstrate outstanding and innovative practices. O&M award applications are nominated by the state Department of Environmental Protection.

3.6.4.49 Crowd Rallies for UF Bat House as Vote Nears

The article (Hampshire, 1998) covers an on-site rally held on the evening of December 3, 1998. The rally comes five days before the state's seven-person cabinet is scheduled to vote on the fate of the Bat House and surrounding area. It was reported that people have been fighting the action for 11 years and that a recent petition was signed by more than 8,000 people who opposed the construction.

3.6.4.50 Editorial – A Fair Compromise

The editorial (The Independent Florida Alligator, 1999) notes that the debates surrounding the Bat House relocation, which have gone on for more than a decade, were not repeated with the Baughman Meditation Center. While environmentalists have opposed student housing construction adjacent to Lake Alice, the UF Environmental Action Group (EAG) has acquiesced to the meditation center.

3.6.4.51 Giant Gator Killed in Lake Alice

An article (Geller, 1999) covering the trapping and removal of an 11-12-foot-long alligator that had been observed eating a smaller alligator.

3.6.4.52 Reclaimed Water from UF Facility Will Irrigate Campus This Summer

This article (Armaghani, 2000) notes that keeping the campus as a showcase of the South requires a daily average use of 1.15 MGD, which is typically provided by the Gainesville Regional Utilities and campus groundwater wells. In an effort to conserve groundwater, UF has modified the campus irrigation system to distribute reclaimed water from the campus wastewater treatment facility. Two irrigation water mains will deliver reclaimed water to 97 percent of irrigation zones on campus. This should save over 1 MGD of groundwater withdrawals.

3.6.4.53 Exotic Solution Fishes Out Plant Threat to UF Lake

To biologically control invasive, exotic plant growth, five hundred grass carp were released into the lake by workers from UF's Physical Plant (Heatherly, 2002). It is hoped the vegetarian grass carp will help with control of filamentous algae and hydrilla, both of which occur in nuisance levels in the lake. Introduced grass carp had been in Lake Alice until the hard freeze during 2001. While another exotic fish, blue tilapia, were killed during the freeze, some survived and tilapia have naturally reproduced their numbers. This

stocking of grass carp was authorized under a permit issued by the Florida Fish and Wildlife Commission, and required that only sterile, triploid fish be stocked. It was reported that it can take up to two years to see noticeable results, and that the grass carp can live 10-16 years and grow up to 60 pounds.

3.6.4.54 Visit to Lake Alice and the Dairy Research Unit

This post came from the Biogas - A Renewable Biofuel website, which was dedicated to increasing understanding of biogas production and utilization and how it can fit into sustainable energy production (Duncan, 2006). This post is a short note about the harvesting of water hyacinths from Lake Alice and documents that as of 2006, this plant was still actively being managed on Lake Alice.

3.6.4.55 Crews Combat Waterborne Week on Lake's Surface

The picturesque lake that some see is covered in a non-native, invasive plant, water hyacinth (Bachmann, 2006). Dr. K. Langland, UF CALS Professor, said the biggest problem on Lake Alice is the water hyacinth whose free-floating mats must be harvested. The urban forester for UF's Physical Plant Division, E. Smith, said the lake acts as a stormwater filter and high nutrient levels stimulate the hyacinth growth. Currently two methods of hyacinth control are used. A grounds worker with the Physical Plant Division runs an aquatic plant harvester as the primary management tool from May through September, with the harvested plant material being mulched. Secondarily, a team from the Environmental Health and Safety Division sprays herbicides along the shoreline. Smith supported the mechanical removal of plants as necessary ongoing maintenance.

3.6.4.56 Volunteers Needed for Clean Water Campaign

This article (The Independent Florida Alligator, 2013) states the UF Clean Water Campaign will hold periodic storm-drain monitoring events in April and during the summer to help raise awareness of water quality on campus. Plans to mark stormwater drains with "No Dumping: Drains to Lake Alice" and other volunteer activities are mentioned.

3.6.4.57 The History of Lake Alice

This post by M. Schwartz provides a summary of Lake Alice's evolution from 1925 to 1994 as a stormwater basin and includes historical aerial photographs (Schwartz, 2019b). The remainder of the story is from 2001 to 2019, a period of time when the lake has been relatively consistent in water levels and appearance.

3.6.4.58 A Lake Named Alice

Watershed, a Pulitzer Center-supported project by student journalists at the University of Florida, won third place in the 2023 Society of Environmental Journalists (SEJ) Awards for Reporting on the Environment (Galicza, 2022). The project was organized by grantee Cynthia Barnett and published by NPR WUFT News.

Commemorating the 50th anniversary of the 1972 Clean Water Act, Watershed examines the environmental health of water ecosystems in Florida. It investigates the threats to clean water from agricultural pollution to ongoing cleanup from oil spills to cruise ship tourism—as well as possible nature-based solutions. The story about Lake Alice was one of twelve around the broad topic of watersheds, and provides a reader with some of the history, conditions, and current appearance of the lake.

3.6.4.59 Re-examining Decades of Climate Change, Environmental Activism in Alachua County

This article (Grunewald, 2023) related to Earth Day discusses Alachua County resident's advocacy for natural resources and includes a timeline of key events. Three of the sixteen events are related to Lake Alice. In 1946, Gainesville residents call for removal of wastewater sewage to the lake. In 1972, lake advocates petitioned against a proposed highway that would encircle the lake. In 1997-1998, a plan to build student housing to the bat house area drew extended protests.

3.6.4.60 UF Hosts First Round of Lake Alice Watershed Management Workshops

This article (K. Williams, 2023) covers the Lake Alice watershed management workshop in the Straughn Center on October 4th, as one of three similar workshops hosted in the last month. The workshops are the first step in a initiative to develop a comprehensive watershed management plan for the main campus. A project team of seven people from UF are leading the initiative, while a steering committee of 29 representatives from UF or partner organizations provide input for different aspects of the watershed. The final plan isn't expected to be finished until the end of the Spring semester.

3.6.5 Internal UF Communications

3.6.5.1 Memorandum – Lake Alice

This is a memorandum from C.D. Williams (College of Engineering) in reply to the request of S.P. Goethe (Ebaugh & Goethe Consulting Engineers) to provide recommendations of the impounded water called Lake Alice (C. D. Williams, personal communication, April 18, 1949). There are four recommended actions, including number 2) returning stormwater flows to the sinkhole near the railroad spur track. The second recommendation contradicts a prior recommendation against utilizing this sinkhole and may be due to the three other recommendations: 1) The effluent from the sewage treatment plant will be impounded separately in an area of approximately one acre immediately south of the plant, 3) immediate elimination of any possible sanitary connection to the streams now leaving campus, and 4) connection of the effluent from the experimental sewage treatment plant to the Campus plant.

The recommendations were made following more data collection and consideration of the following:

1) *All runoff from approximately 1,200 acres of watershed is now being impounded in an area that is cut off from its natural outlet* (sinkhole by railroad spur). *This was effect at a time* (1946) *when the University sewage was not treated and to prevent this sewage from entering water supply aquifers. The impounded body of water is about 120 acres in extent, and is called Lake Alice.*

2) *One year ago* (July 1948) *a report was made in which a complete analysis of possible solutions was presented. At that time it was recommended that overflow waters from the impounded Lake be permitted to enter natural sink areas* (formed in July 1947 after the western dyke discharged water) *and that data be kept for a one year period. It was hoped that these sinks would enable the lowering of the water level during dry seasons to provide sufficient storage during wet seasons. Continuous records and control of the flow from the Lake have been maintained for 14 months. It is now obvious that this means of disposing of the water will not be successful and that the impounded volume of water would only continue to increase."*

3) *Because of the present high elevation of the water, there is not sufficient storage capacity. It is expected that a rainfall at this time would cause the water to overflow Lake Alice and flood property not owned by the University.*

4) *The high elevation of the water in the Lake has flooded areas with vegetation and has provided an added mosquito hazard, which needs continuous attention.*

5) *At the time the natural outlet for the Lake Alice area was closed, the University did not provide complete treatment of sewage and the City of Gainesville did not adequately treat the water supply. Since that time, the University Sewage Plant has been put into operation and the City has completed a plant that provides secondary treatment of the water supply. The quality of the effluent from the University Sewage Plant is found to be better than the water in the stream into which it flows. A report is attached showing the results of a recent bacteriological survey.*

The above recommendations have been discussed with the State Sanitary Engineer. He stated that he would not object to any reasonable plan that I would recommend so long as adequate control of the sewage treatment is maintained. In order that the spirit of this agreement may be carried out, I wish to qualify the above recommendations subject to the following basis for operation of the sewage plant:

1) *The Head Professor of Civil Engineering will determine uses that are to be made of the Sewage Plant and specify treatment processes that are to be employed.*

2) *The Campus Engineer will provide the Head Professor of Civil Engineering with complete records of the results of treatment processes used. These records will include copies of all reports that have been or are to be made to the State Board of Health and any special reports that may be required.*

Attached to the memorandum is a table of bacteriological quality from January 1949 samples, a map of sampling points, and schematic for the weir that controls the ponding area of the sewage plant.

3.6.5.2 Memorandum – Lake Alice

An update memorandum to S.P. Goethe of Ebaugh & Goethe Consulting Engineers regarding Lake Alice water levels (C. D. Williams, personal communication, July 16, 1949). The memorandum states that since April 25 (1949) the level has been lowered 3.5 feet and approximately 45 acres of land have been de-watered. This was accomplished by allowing approximately 26 million gallons of water to flow into the limerock crevices near the University Spur railroad and the action was based on Williams recommendation from April 18, 1949. The memorandum suggests that the University's stormwater and wastewater storage capacity remains limited.

3.6.5.3 Letter – Lake Alice

Letter from J.R. Bekenbach, Director of the Agricultural Experiment Stations, to C.C. Greene, Jr. (Campus Engineer) noting that with the saturated conditions, additional heavy rain might cause Lake Alice to overflow and flood the Country Club (J. R. Beckenbach, personal communication, March 10, 1958). It was recommended *that the flood gates should be kept open, if not all the time, at least when the land is saturated here on campus.*

3.6.5.4 Letter – Disposal Well Installation

Letter from D.L. Kaisrlik, Ebaugh & Goethe Consulting Engineers, to C. Greene, Director of Plants and Grounds, regarding a print set of the disposal well installation for the west end of Lake Alice (D. L. Kaisrlik, personal communication, June 13, 1958). The letter requests review by Mr. Greene, allowing Mr. Goethe to make any minor changes and complete the specs on the well before sending for contractor bids.

The prints were not part of the electronic file. There are handwritten notes on the letter which say marked print returned to Goethe 6/1/59, job was to be bid on 6/23/59.

3.6.5.5 Letter – Lake Alice Level Controversy

A letter from J.R. Beckenbach, Director of the Florida Agricultural Experimental Stations to Dr. J. W. Reitz, UF President, regarding the controversy of Lake Alice levels reported in the paper (J. R. Beckenbach, personal communication, December 14, 1959). Background on the situation is outlined. The Director states his understanding is that the only permanent water was in the northwest corner of the present lake and when 1949 aerial mapping for soil surveys was done, the lake extended south with some overflow swamping area to the east. During that era, the area was a bird sanctuary due to egrets and water bird usage and as the campus has expanded, lake levels have continued to rise.

Detail about the Medical School becoming operational is provided as "*a tremendous additional water load was thrown on the lake due to the fact that the water from the Medical School is completely taxing the capacity of the sink hole behind the incinerator and the level of Lake Alice could not be brought down through the connecting culvert which was installed for this purpose around 1949*. *The lake has since expanded greatly to the east and south. Many of the surrounding trees were drowned out, and water overflowed our pastures to the east on a permanent basis, putting many of our fences under water. During and following heavy rains during the last few years, the lake overflowed to the west and north, flooding more of our areas and extending over on the fairways of the Country Club. Attempts to contain the water gave some temporary relief, but our Mr. George Freeman and his crew were called out many times in the middle of the night on emergency duty. The Country Club has been very tolerant through all of this, realizing that the University was trying to solve this problem.*"

The Director states sympathy with the interests of the Audubon Society and others, *and* (we) *have gone to considerable length in the past to issue permits and to cooperate in all ways with persons having an interest in studying and observing the wildlife of the area. We have policed the lake, and kept poachers and despoilers out. Now we feel that it is both desirable and necessary to our program to drop the water to a safe level somewhat comparable to that of eight to ten years ago. We feel this to be entirely compatible with the real interests of naturalists, and see no reason why such a practical step should disturb the interest and beauty of the area. We would not want it to do so.*

The letter suggests that the flooding should not be allowed now that a disposal means exists. Also, that the drainage well engineers planned to drop the lake level about four feet, leaving a lake area of 1949 conditions, but at least a two- and one-half foot drop in lake levels is needed to clear fence lines, pastures, and protect the Country Club from overflow. The letter closes by saying that cooperation with the naturalist group will continue and hopefully it should be a two-way affair.

3.6.5.6 Letter – Lake Alice Problem

A letter from C.C. Greene, Plant and Grounds Division Director to W.E. Jones, Business Manager, Campus Administration, concerning the Lake Alice problem (C. C. Greene, personal communication, December 16, 1959). It states a copy of a letter is attached for Mr. Jones information. The enclosure was not included in the electronic copy. It is believed that Mr. Jones was appointed to lead the Lake Use and Preservation Committee (LUPC) for Lake Alice by Dr. Reitz and Mr. Greene provided historical information.

3.6.5.7 Letter – Lake Use and Preservation Committee

A letter from W.E. Jones, Business Manager and LUPC Chair in reference to Dr. Reitz's memorandum (December 22, 1959) to establish a special committee to study and report on control of the water level in Lake Alice (W. E. Jones, personal communication, January 8, 1960). The committee met on January 7 and considered the five points set forth in Dr. Reitz's memorandum.

The letter states "*It was the unanimous recommendation of the committee that the water level in Lake Alice be dropped to a level of 69 feet above sea level.* (level based on study of aerial photographs and topographical sketches) *After this lowering is accomplished, its effect on the bird rookeries will be watched for a period of time. This action is to be taken with the full understanding that such a level can be maintained with water supplied from the air conditioning system at the Health Center and from the lagoons adjacent to the Sewage Treatment Plant.*"

The letter states the committee desired to secure funds for drilling of additional disposal wells near Lake Alice for water control during heavy rainy seasons. The letter also states "It was recognized that during extreme flood conditions it may be necessary to break the earth dam at the western end of the lake and flood the swine farm area and parts of the golf course in order to protect Steam Plant No. 2 and the sewage lift station serving the Health Center from flooding. Last Spring, a rise of an additional inch or two of the water level would have resulted in putting these facilities out of operation."

3.6.5.8 Notes – Mr. Jones Lake Committee Speech Notes

This is a collection of typed and handwritten notes that appear to be compiled/written by Mr. Greene to be used by Mr. Jones (Lake Use and Protection Committee Chair) (C. C. Greene, personal communication, February 3, 1960). The notes include an Introduction, Progress of Problem, Aggravation of Problem, Consideration of Problem, Evolution of Plans, Results of Action, Activity Not Yet Completed, and Conclusion.

The bullet points from Results of Actions:

- Objections raised by wildlife interests.
- Flow to wells stopped.
- Committee appointed by President Reitz to restudy matter and make recommendations.
- Recommendation that compromises minimum elevation of Lake be maintained at 69 feet.
- President endorsed committee recommendation.
- One (drainage) well placed in service, present water levels 69.5 feet.

The bullet point from Activity Not Yet Completed:

- Construction of a culvert at North-South Drive with an open ditch connecting the sink hole ponds with Lake Alice.

The bullet points from Conclusions:

- Adequate water is available to maintain any desired minimum lake surface elevation.
- Regardless of the minimum level maintained, periodic flooding is still to be expected until more extensive flood control measures are provided.
- The lower the maintained surface elevation, the less frequent the flood danger, the less severe the results of flooding, and the shorter the duration of flood.
- With present construction it is impossible to lower the lake below its natural level of approximately 67 feet.

3.6.5.9 Letter – Water Hyacinth Control in Lake Alice

Letter from Dr. A. Carr (Zoology) to C.C. Greene (Physical Plant Division Director) asking about the procedure to kill water hyacinth in Lake Alice (A. Carr, personal communication, February 1, 1966). Dr. Carr states that *"At the rate the floating and emergent vegetation of the lake grew last season there will be no remaining open water by this time next year. This blocking of the surface reduces productivity and impairs the value of the place both as a biological reserve and as a drainage basin*." Dr. Carr suggests initiating a hyacinth-poisoning project and then whatever control may be necessary to keep the water open. Dr. Carr offers to help enlist the support of the Florida Game and Freshwater Fish Commission if the project can be authorized by the UF Physical Plant Division.

3.6.5.10 Letter – Water Hyacinth Control in Lake Alice

Letter from C.C. Greene (Physical Plant Division Director) to N.R. Lake (Grounds Department Superintendent) regarding water hyacinth control on Lake Alice (C. C. Greene, personal communication, February 2, 1966). Mr. Greene provides a copy of Dr. Carr's February 1 letter and directs him to get in touch with Dr. Carr and others to "*take such action and offer such cooperation as may be necessary to effect an optimum solution to the problem*." This response to Dr. Carr, marks the era of aquatic plant control as the bigger Lake Alice management concern, replacing the flood concerns that had predominated before.

3.6.5.11 Letter – Hyacinth Herbicide Treatment

This letter from J.B. Opdyke, UF Physical Plant Division, seeks approval from J.B. Miller, State Board of Health, Water Supply Division Director, to apply herbicide (2, 4-D) for water hyacinth removal in Lake Alice (J. B. Opdyke, personal communication, December 5, 1967). The need was stated as the lake being a wildlife sanctuary with seriously depleted oxygen content. The letter states "*We have discussed the problem of hyacinth removal with Mr. Zeiger of the Corps of Engineers and he has advised us that your Division has given permission to apply the herbicide 2,4-D to the hyacinths at a rate of 0.1 parts/million; this treatment will be repeated every 4 to 6 weeks until the situation has cleared up. Since we understand that this herbicide is most effective when there is a warm spell following a cold snap, we are planning to proceed as above in the near future*." A response or correspondence was not found.

3.6.5.12 Letter – Scope of Work for Mechanical Removal of Hyacinths from Western End of Lake Alice

This letter from the College of Engineering, Department of Environmental Engineering (Received from J. Gamble) provides a scope of work for the mechanical removal of hyacinths from the western end of Lake Alice (J. Gamble, personal communication, March 23, 1970). The letter is dated March 23, 1970, and requests contractual services of W.G. Johnson and Son, Inc. Funds ($8,500) are to be released by the University for Lake Alice Restoration. Contractor equipment requirements are listed, the area to be cleared is approximately 40 acres. In addition to hyacinth removal, the services include installation of 150 feet of fence between the eastern and western sections. Removal of hyacinth along the shoreline is to be accomplished by University volunteers to preserve the shoreline in a natural state. The expected time needed to affect a 95 to 99% clearance of the hyacinths is listed as three weeks.

3.6.5.13 Letter – Proposal for Development of the Lake Alice Area

A proposal to the June 1970 Lake Use and Preservation Committee (LUPC) to create a biological center for esthetic enjoyment, teaching, and research (J. H. Kaufmann, personal communication, June 1970). It suggests naming it the William Bartram Biological Preserve to tie in the 200th anniversary in 1975 of Bartram's travels through this region of Florida. The heading of the letter lists the Departments of Zoology and Biological Sciences as well as the Alachua Audubon Society and was submitted by Dr. John Kaufman (Zoology). Three main recommendations were listed:

1. Route of loop road. The road (Museum Road/Drive) will serve as a boundary for a "natural" area on campus where students, staff and the public can observe and study native plants and animals as parts of a living system.
2. Creation of biological preserve. The proposal urges the University to declare in policy that the entire area within the loop road is to be preserved and developed as a biological center.
3. Development of biological preserve. In order of priority, the proposal lists seven components.
    a. Complete hyacinth removal in west end of lake and divert sewage effluent without delay.
    b. Fluctuate the water level to encourage desirable plant growth. The level should be held at 70 ft. from March 1 through August 31 and at 67 ft. the other 6 months.
    c. Set aside are on northeast shore as a refuge and buffer area.
    d. Conduct a detailed survey of the soils, plants, and animals in the loop area.
    e. Structures and plantings to include replanting southern border of lake with hardwoods; lower lake level to clean out east marsh and hyacinths with dredging, construct a series of islands and potholes in the southeast corner; construct one or two islands in the northwest corner; construct two observation towers (with bird watching specifications) on the south shore; construct a trail around the west, south, and east sides of the lake; construct a boardwalk connecting several of the constructed islands; replant the agricultural lands on the south side of the lake in successional stages.
    f. Buildings. Remove as many as possible on the south shore.

g. Restrictions on use. Open to the public except the fenced area on the north shore, no disturbance to limited scientific collecting, no boating, and no vehicles except for maintenance.

The proposal concludes with cost estimates for the trails, boardwalks, observation towers, plantings, and island building and marsh clean-up.

3.6.5.14 Letter – Interest in Lake Alice

A letter from Associate Professor Ward (Botany) to Dr. H.H. Sisler, Dean & Professor Arts & Sciences which lists Dr. Ward's interest in the lake (D. B. Ward, personal communication, June 15, 1970a). The letter was written at the request of Dr. Dana Griffin, a member of the Lake Use and Preservation Committee (LUPC). Dr. Ward infers his observations will be submitted as a report to the LUPC in mid-June, and the subsequent committee report will be sent to Dr. Sisler, ultimately with consideration by the UF President. Dr. Ward lists sending a copy (see Ward 1970 Letter – Interest in Lake Alice Report) of his report to sway Dr. Sisler's views.

3.6.5.15 Letter – Interest in Lake Alice Report

This letter report is addressed to Dr. D.G. Griffin, a member of the Lake Use and Preservation Committee (LUPC) and seeks to influence the committee and ultimately the UF President's views on managing Lake Alice (D. B. Ward, personal communication, June 15, 1970b). Dr. Ward presents a history of the lake from his past ten years of perspective, suggesting that the recent water hyacinth removal efforts have improved the biological diversity and conditions, and that the lake is a complex system. Both herbicide control and harvesting of water hyacinths are objected to due to unintended consequences and contributing to an unstable state. The removal of sewage effluent is recommended.

3.6.5.16 Meeting Minutes – Land Use and Preservation Committee Meeting, June 19, 1970

Summary meeting minutes from the June 19, 1970 Lake Use and Preservation Committee (LUPC) meeting by the Chairman, George K. Davis (G. K. Davis, personal communication, June 19, 1970). The meeting's purpose is to develop a plan for the preservation and use of Lake Alice. Suggestions were requested from all interest groups.

A report was reviewed on progress clearing water hyacinths, with recognition to assisting persons, and the following data. During February and March, Physical Plant removed about 600 tons of hyacinths and during May and June, contractor Buck Johnson with help of Physical Plant, cleared approximately 45 acres by removing approximately 5,000 tons of hyacinths. The oxygen content of the water had increased from below two mg/L to approximately six mg/L, and alligators, bird species, and fish utilization were observed, which refuted the idea of a dead lake. Discussion of clearing and maintaining screens for the discharge wells was pointed out, and that as long as wastewater is entering the lake, undesirable levels of plant life and algae should be expected. Solutions included either divert the nutrient rich wastewater to be used as irrigation water for the campus landscaping or agriculture; or make use of the original sink for drainage (assuming development of alternative water sources for the City of Gainesville).

Additional conceptual solutions include relocation of the Sewage Treatment Plant or utilizing Gainesville's Sewage Disposal Plant. Conflicting proposals existed, such as expanding the waste lagoon to store and transmit water for reuse would conflict with preserving the waste lagoon as a bird sanctuary. Use of the

lake for teaching was deemed feasible (a dozen departments were listed) while long-term research at the lake was not. Discussions of recreational use were presented, advising against boating or swimming, designating lands inside the roads surrounding the lake as natural areas, and focusing on maximizing aesthetic values by use of trails and boardwalks. The need for regulations on boating and fishing were described as urgent, and a study of the place of Lake Alice in the community was mentioned. Considerable discussion was held on how to finance lake management.

The Committee asked the Chairman to prepare a long-range plan statement to be submitted to Dr. Sisler, UF Executive Vice President. The Chairman agreed to do this, taking into consideration more elaborate proposals which have been submitted by Dr. John Kaufmann and Dr. Dan Ward, and may be submitted by the public.

3.6.5.17 Memorandum – Minutes of the Land Use and Preservation Committee Meeting of June 19, 1970, and a Long-Range Plan for Lake Alice and the Surrounding Area

This memorandum is from the Lake Use and Preservation Committee (LUPC) Chairman, G. K. Davis to members of the LUPC and other interested parties (G. K. Davis, personal communication, July 17, 1970). The minutes from the June 19 meeting are enclosed (see Davis 1970a) and members are requested to study the proposed Long-Range Plan and forward any comments by July 24, 1970, so they may be incorporated and forwarded to Vice President Harry H. Sisler's inquiry to the long-range plans for Lake Alice.

3.6.5.18 Memorandum – Copy of the Lake Use and Preservation Committee Report

This memorandum is a notification from W.E. Jones, Chairman of the Campus Planning and Land Use Committee to other Committee members that the Lake Use and Preservation Committee (LUPC) has produced a Long-Range Plan for Lake Alice and the Surrounding Area (W. E. Jones, personal communication, August 19, 1970). The Campus Planning and Land Use Committee has been requested to respond to the Lake Alice recommendations that relate to its functions and responsibilities. It is suggested that an early meeting will be held and Vice President Sisler is copied.

3.6.5.19 Letter – Long-Range Plan for Lake Alice and the Surrounding Area

This letter plan was produced by the Lake Use and Preservation Committee (LUPC) (G. K. Davis, personal communication, August 20, 1970). It is organized into the following sections: Summary, Priorities, Introduction, Maintenance, Control and Use, Development of the border lands, Research and Teaching, Recreation, and a Subcommittee for Preservation of Lake Alice. The plan is summarized below.

Summary

1. Boundaries for Lake Alice Preserve should be identified and publicized at an early date.
2. Given the public interest, plans for development of the lake should be approved or modified by the University administration and given wide publicity.
3. Plans for maintenance, development, and use of the lake are in the report.
4. A Subcommittee for Preservation of Lake Alice should be responsible for the preserve.

Priorities

1. Establishment of the boundaries of the Lake Alice Preserve and publicizing the commitment of the University to a plan of development and use.
2. Marking out the shoreline, establishment of sanctuary areas, and publication of a ruling on boating, swimming, and fishing.
3. Erection of critical fences.
4. Provision for maintenance of the discharge wells and the placement of a possible third well to provide for adequate management of the lake and its level.
5. Development of a plan and support for diversion of wastewater with its nutrients, with special emphasis on the use of the water for irrigation.
6. The construction of walkways, observation posts or towers, and a fishing pier or boardwalk.
7. Planting of trees and other plants and construction of special features such as islands.

The Maintenance of the Lake section discusses recent successful water hyacinth removal efforts and the request that the Physical Plant Division be provided with necessary resources to provide management control in the western portion. The possible need to harvest submerged aquatic plants is discussed as well as aquatic weed control through biological means. A time projection and funding should be provided for the diversion of wastewater from the Sewage Treatment Plant. Connecting to the City sewer system is mentioned, and possible relocation of the system, but not returning to sinkhole disposal. The plan acknowledges that it is unlikely that big changes in the sewage disposal could be expected within a 10-year period, so it was recommended that the University use wastewater for irrigation of landscaping and agricultural areas. It was recognized that a reservoir would be required to handle variations in demand. It was recommended that the area between the Sewage Treatment Plant and the Student Gardens be considered part of the Lake Alice Preserve.

The Control of the Lake section recommended that only boats for management, research, and teaching be allowed. The other control measures were that fishing be limited to walk or pier between the discharge wells, and that swimming be prohibited.

The Development of the area around Lake Alice section recommends the roadways around the lake define the preserve boundary, that UF landscape architects develop a proposal for the preserve, and that a fair proportion of the proposed preserve south of the lake is presently utilized by agricultural programs which would require relocation.

The Research and Teaching section lists subject matter, departments, and faculty that utilize the lake area. The Recreation section contains the recommendation that the primary objective should be the preservation of “natural” areas which would serve as sanctuaries for plant and animal life. A system of boardwalks and observation towers, a fishing area, and special fencing areas with signage to protect people from alligator hazards.

The final section concerns a recommendation that a Subcommittee for Preservation of Lake Alice be formed to collaborate with the Campus Planning Committee and to provide oversight. Special concerns were mentioned about the circular road around the preserve, a program of management, the need for financial support, publicity for the plans, and a naming committee for the preserve.

3.6.5.20 Meeting Minutes – Lake Use and Preservation Committee

This memorandum provides the meeting minutes from the November 18, 1970 Lake Use and Preservation Committee (LUPC) meeting (T. D. Furman, personal communication, November 18, 1970). It is from the Chairman, Dr. Thomas Furman (Environmental Engineering Sciences) to the other members of the committee (14 total). The approved minutes from the June 19 meeting are attached. Key information from the November meeting is presented below.

Mr. Noel Lake reported that work on the northernmost drainage well has been completed and the capacity of the well increased. He discussed the need for a third well – possibly located on the golf course to handle excess flows.

Dr. Davis, the former LUPC Chairman was unable to attend the meeting and his discussion of the "Long Range Plan" was postponed until the next meeting.

Dr. Kaufman presented the plan for the roadway around the lake, that it had been submitted for comments to the State Road Department, and there was considerable discussion concerning keeping the road away from the north and east edges of the lake.

Dr. Emmel (Entomology) presented a proposal for a teaching and research laboratory on the southern shore of Lake Alice. After discussion, alternate sites were suggested.

Mr. Lake said funds had not been earmarked by the Administration to continue control of the hyacinths and the Chairman was asked to request funds from President O'Connell. The Chairman was also instructed to contact Mr. W.E. Jones to determine what had been done to establish the boundary of the Lake Alice Preserve.

The Committee agreed that meetings should be held more frequently, and the next meeting was tentatively set for the second week in December.

Section 4.0 References

Armaghani, B. (1998, July 14). UF Runs Its Own Wastewater Collection, Reclamation System; Processed Water Is Used For Campus Irrigation. *The Independent Florida Alligator*, 9.

Armaghani, B. (2000, May 20). Reclaimed Water From UF Facility Will Irrigate Campus This Summer. *The Independent Florida Alligator*, 9.

Azeem-Angel, M., & Reisinger, A. J. (2021). *Campus Streams—Semester Report (Summer 2021)* (p. 26). University of Florida, Soil & Water Sciences Department.

Bachmann, M. (2006, August 10). Crews combat waterborne week on lake's surface. *The Independent Florida Alligator*, 14.

Baker, L. A., Brezonik, P. L., & Kratzer, C. R. (1981). Nutrient Loading-Trophic State Relationships for Florida Lakes. *Water Resource Research Center*, *56*. https://doi.org/10.13140/RG.2.2.17104.51205

Barnes, Ferland and Associates, Inc. (1996). *Groundwater Monitoring Plan Amendment—Volume 2—University of Florida Water Reclamation Facility* (p. 230).

Beckenbach, J. R. (1958, March 10). *Lake Alice Country Club Flooding* [Letter].

Beckenbach, J. R. (1959, December 14). *Lake Alice Level Controversy* [Letter].

Bitton, G., Chang, L. T., Farrah, S. R., & Clifford, K. (1981). Recovery of Coliphages from Wastewater Effluents and Polluted Lake Water by the Magnetite-Organic Flocculation Method. *Applied and Environmental Microbiology*, *41*(1), 93–96. https://doi.org/10.1128/aem.41.1.93-96.1981

Bitton, G., Fox, J. L., & Strickland, H. G. (1975). Removal of Algae from Florida Lakes by Magnetic Filtration. *Applied Microbiology*, *30*(6), 905–908. https://doi.org/10.1128/am.30.6.905-908.1975

Brezonik, P. L., & Shannon, E. E. (1971). *Trophic State of Lakes in North Central Florida* (Research Project Technical Completion Report 13; p. 106).

Bromberg, B. (1995, October 27). The Way I See It…Nature is more important than housing. *The Independent Florida Alligator*, 6.

Cailteux, R. L., Schramm, Jr., H. L., & Shireman, J. V. (1992). Food Habit Comparison of Two Populations of Blue Tilapia, Oreochromis aureus (Steindachner), in North Central Florida. *Florida Scientist*, *55*(4), 236–243.

Carney, S. (1989a, March 30). DER: Fix waste-flow problems in Lake Alice. *The Independent Florida Alligator*, 1, 5.

Carney, S. (1989b, April 25). Operations upgraded after spill. *The Independent Florida Alligator*, 1, 2.

Carney, S., & Taylor, F. (1989, June 8). Sewage plant upgrade expensive. *The Independent Florida Alligator*, 1, 5.

Carr, A. (1966, February 1). *Water Hyacinth Control in Lake Alice* [Letter].

Causseaux & Ellington, Inc. (2000). *University of Florida Stormwater Management Master Plan and Permit Application* (BR-160; p. 489).

Causseaux, Hewett & Walpole, Inc. (2010). *University of Florida Stormwater Management Master Plan and Permit Application* (10–0054; p. 82).

Center, T. D., & Spencer, N. R. (1981). The Phenology and Growth of Water Hyacinth (Eichhornia crassipes (Mart.) Solms) in a Eutrophic North-Central Florida lake. *Aquatic Botany*, *10*, 1–32. https://doi.org/10.1016/0304-3770(81)90002-4

CH2M Hill. (1986). *Groundwater Monitoring Plan For the University of Florida Wastewater Treatment Plant and Lake Alice Recharge Well System* (State Project No. BR-161; p. 121). Prepared for the State of Florida - State University System University of Florida.

CH2M Hill. (1987). *Permit Application Report and Stormwater Management Master Plan* (BR-161).

Chen-Moore & Associates. (2023). *University of Florida Stormwater Management Master Plan and Permit Application Renewal: SJRWMD Permit No. 4-001-15570-19* (p. 95).

CHW. (2020). *University of Florida Campus Trails Master Plan* (p. 41).

Clark, M. (2012). *Campus Water Quality: Status and Trends* [Presentation, 26 slides].

Cobb, D. M. (1986, November 3). Water runoff may poison Lake Alice. *The Independent Florida Alligator*, 5.

Conway, K. A. (1976). Evaluation of Cercospora rodmanii as a Biological Control of Waterhyacinths. *Phytopathology*, *66*, 914–917.

CRJA-IBI Group, GAI Community Solutions Group, & DRMP, Inc. (2018). *University of Florida Landscape Master Plan Report*.

Curtin, P. (1984, May 10). City to ask for public hearing on wastewater treatment. *The Independent Florida Alligator*. https://ufdc.ufl.edu/UF00028290/04368/images/0

Curtin, P. (1985, March 28). Groundwater worries delay plant's permit. *The Independent Florida Alligator*, 3.

Davis, G. K. (1970, June 19). *Land Use and Preservation Committee Meeting.* [Meeting Minutes].

Davis, G. K. (1970, July 17). *Minutes of the Land Use and Preservation Committee Meeting of June 19, 1970, and a Long-Range Plan for Lake Alice and the Surrounding Area.* [Memorandum].

Davis, G. K. (1970, August 20). *Long-Range Plan for Lake Alice and the Surrounding Area.* [Letter Report].

Davis, J. (1969, December 4). The Fate of Lake Alice Rests with State. *The Florida Alligator*, 5.

Dawson, D., & Hostetler, M. (2005). *University of Florida Wildlife Inventory and Monitoring Program: One Year Survey Results and Data Summary* (p. 59). Department of Wildlife Ecology and Conservation, University of Florida.

Doherty, T. (1986, November 19). Lake Alice: Cost of clean water rises. *The Independent Florida Alligator*.

Duncan, J. (2006, July 11). *Visit to Lake Alice and the Dairy Research Unit*. https://biogas.ifas.ufl.edu/Internships/2006/lakealice.asp

Ehrlich, S. (1991, October 29). Band practice field may go to "waste." *The Independent Florida Alligator*, 3.

Fanara, T. A. (2015). *Hydrological Restoration by Low Impact Development Retrofit and Low Impact Development Design Selection Analysis* [Environmental Engineering Sciences]. University of Florida.

Fontaine, C. (1995, April 26). Fate of 'nuisance' alligators debated. *The Independent Florida Alligator*, 3.

Fox, A. M., & Haller, W. T. (2000). Production and Survivorship of the Functional Stolons of Giant Cutgrass, Zizaniopsis miliacea (Poaceae). *American Journal of Botany*, *87*(6), 811–818. https://doi.org/10.2307/2656888

Furman, T. D. (1970, November 18). *Meeting Minutes – Lake Use and Preservation Committee.* [Meeting Minutes].

Gainesville Sun. (1959, December 13). Lake Alice has her ups and downs. *Gainesville Sun*.

Gainesville Sun. (1970, April 24). Prettier Alice. *Gainesville Sun*.

Galicza, N. (2022, August 14). *A Lake Named Alice*. Pulitzer Center, Watershed Project. https://pulitzercenter.org/stories/lake-named-alice

Gamble, J. (1970, March 23). *Mechanical Removal of Hyacinths from Western End of Lake Alice.* [Letter].

Garte, G. (n.d.). Loop road endangers lake. *The Florida Alligator*, 11.

Garte, G. (1971, September 22). Lake Alice Loop Surveying of Cross Campus Highway stalled while corn ripens in field. *The Florida Alligator*, 22–23.

Geller, B. (1999, May 16). Giant gator killed in Lake Alice. *Gainesville Sun*.

Gibbs, L. M. (2012). *Lake Alice Ecological Park* [Senior Capstone Project]. University of Florida.

Godown, J. (1971, August 20). Lake Alice sanctuary threatened. *The Florida Alligator*, 9.

Greene, C. C. (1959, December 16). *Letter – Lake Alice Problem* [Letter].

Greene, C. C. (1960, February 3). *Notes – Mr. Jones Lake Committee Speech Notes* [Notes].

Greene, C. C. (1966, February 2). *Water Hyacinth Control in Lake Alice* [Letter].

Gross, E. (1994, April 19). Lake Alice alligator faces death penalty. *The Independent Florida Alligator*, 1, 8.

Grunewald, C. (2023, April 17). Re-examining decades of climate change, environmental activism in Alachua County. *The Independent Florida Alligator*, 2.

Halverson, P. (1959, December 8). Draining of Lake Alice to cut danger of flood. *Gainesville Daily Sun*.

Hampshire, C. (1998, December 4). Crowd rallies for UF Bat House as vote nears. . , P. 1. *The Independent Florida Alligator*, 1.

Harper, C. (1969, November 18). Sewage, Alice Pollution. *The Florida Alligator*, 8.

Hartman, E., & Darden, F. (1970, May 6). Volunteers Answer Call To Clean Out Hyacinths. The Florida Alligator, Vol 62, No. 134, p. 20. *The Florida Alligator*, 20.

Hasebroock, A. (2021, March 17). UF won't use McCarty Woods as a building spot in 2020-2030 plans. *The Independent Florida Alligator*. https://www.alligator.org/article/2021/03/mccarty-woods?ct=content_open&cv=cbox_featured

Heaney, J. P. (2004). *Lake Alice Watershed Initiative* (p. 1). University of Florida, Dept. of Environmental Engineering.

Heaney, J. P., Kertesz, R. A., Reisinger, D., Zelazo, M., & Knight, S. (2004). 2004 Hurricane Impacts on Lake Alice Watershed. *1st Annual Stormwater Management Research Symposium Proceedings,* 12.

Heatherly, M. (2002, May 30). Exotic solution fishes out plant threat to UF lake. *The Independent Florida Alligator*, 5.

Hiers, F. (1994, May 31). New group to fight Lake Alice housing. *The Independent Florida Alligator*, 1.

Hill, J. E., & Cichra, C. E. (2005). Eradication of a Reproducing Population of Convict Cichlids, Cichlasoma nigrofasciatum (Chichlidae), in North-Central Florida. *Florida Scientist*, *68*(2), 65–74.

Ionta, G., & Judd, W. S. (2005). *Floristic Inventory of Selected Natural Areas on the University of Florida Campus: Final Report* (p. 122). Department of Botany, University of Florida.

Jenni, D. A. (1961). *The Breeding Ecology of Four Species of Herons at Lake Alice, Alachua County, Florida* [Dissertation]. University of Florida.

Jennings, C. A. (1988). Pesticide screening in fish and sediment from Lake Alice, University of Florida Campus, Gainesville. *Aquatics*, *10*(2), 12–13.

Jones, G. P., Pearlstine, L. G., & Percival, H. F. (2006). An Assessment of Small Unmanned Aerial Vehicles for Wildlife Research. *Wildlife Society Bulletin*, *34*(3), 750–758.

Jones, W. E. (1960, January 8). *Lake Alice Committee Update* [Letter].

Jones, W. E. (1970, August 19). *Copy of the Lake Use and Preservation Committee Report.* [Memorandum].

Kaisrlik, D. L. (1958, June 13). *Disposal Well Installation.* [Ebauch & Goethe, Consulting Engineers. Gainesville, Florida.].

Kaufmann, J. H. (1969). Help Save Lake Alice. *The Florida Alligator*, *Vol. 62, No. 22*.

Kaufmann, J. H. (1970, June). *Proposal for Development of the Lake Alice Area.* [Letter].

Kertesz, R. A. (2006). *Methodologies to Evaluate Decentralized Stormwater Best Management Practices in Gainesville, FL.* University of Florida.

Kintz. (1916). *Original Painting of Proposed Layout of the University of Florida Campus* [Map].

Korhnak, L. V. (1996). *Water, Phosphorus, Nitrogen, and Chloride Budgets for Lake Alice, Florida, and Documentation of the Effects of Wastewater Removal*. University of Florida.

Kuehn, B. J. (1972, March 28). Loop road stifled; alternatives sought. *The Florida Alligator*, 1.

Langworthy, J. A. (1965, November 12). Alligators Roam Freely Around UF. *The Florida Alligator*, 5.

Lenta, I., & Clark, M. (2010). *2010 Water Quality Report University of Florida Main Campus*. University of Florida.

Lichtenstein, B. (1973, October 24). Gator ban for Gatorman frustrates UF celebrity. *The Independent Florida Alligator*.

Linhoss, J. (2008). *Place Attachment as an Integrating Concept: Social Science Considerations in Watershed Management* [Interdisciplinary Ecology]. University of Florida.

Linhoss, J., & Clark, M. (2009). *2009 Water Quality Report University of Florida Main Campus*. University of Florida.

Logan, M. (1972, January 12). Cross-Campus Highway: Rocky road of conflict leads to hearing. *The Florida Alligator*.

Luo, J. (2015). *Nitrogen Fluxes and Dynamics in an Urban Watershed* [Dissertation, Interdisciplinary Ecology]. University of Florida.

Luo, Y. (2020). *Swamp Ethics: Trails as a Catalyst for Water Education* (p. 18) [Landscape Architecture Project Team]. University of Florida, Department of Landscape Architecture.

Macina, M. (1972, June 20). Gainesville and county unite over waste water. *The Florida Alligator*, 3.

McMorrow, S. (2022). *Ecological Assessment Report University of Florida. Master Stormwater Drainage Permit Renewal* (PROJECT NO.: 6572210005, p. 40) [Prepared by WSP]. University of Florida.

Mitsch, W. J. (1975). *Systems Analysis of Nutrient Disposal in Cypress Wetlands and Lake Ecosystems in Florida*. University of Florida.

Mitsch, W. J. (1976). Ecosystem Modeling of Waterhyacinth Management in Lake Alice, Florida. *Ecological Modelling*, *2*(1), 69–89. https://doi.org/10.1016/0304-3800(76)90007-7

Moran, P., & Clark, M. (2010). *2010 Water Quality Report University of Florida Main Campus*. University of Florida.

Morgan, P. (1970, July 6). Lake Alice Cleanup a Success. *Gainesville Sun*.

Opdyke, J. B. (1967, December 5). *Hyacinth Herbicide Treatment.* [Letter].

Ortega, A. A. (1980, October 2). Pollution in Lake Alice may be illegal. *The Independent Florida Alligator*, 15.

Patterson, J. (1970, Summer). Save the Lovely Alice From the Green Strangler! University of Florida Magazine. Summer, 1970, Volume 1, No 4. *University of Florida Magazine*, *1*(4).

Pearson, B. (1950, July 8). Pearson's Poop. *The Florida Alligator*, 4.

Pitts, J. (1973, March 7). Sewage plant makes water drinkable. *The Independent Florida Alligator*.

Presser, J. W., & Goss, E. M. (2015). Environmental Sampling Reveals that Pythium insidiosum is Ubiquitous and Genetically Diverse in North Central Florida. *Medical Mycology*, *53*(7), 674–683. https://doi.org/10.1093/mmy/myv054

Putnam, H. D. (1968). *Factors Affecting Accelerated Eutrophication of Florida Lakes.* (Research Project Technical Completion Report. OWRR Project No. A-002-FLA; NOTE: This Report, after Final Correction and Editing, Will Be Published by the Florida Engineering and Industrial Experiment Station, College of Engineering, University of Florida, as Technical Progress Report Number 16 and Florida Water Resources Research Center Publication Number 5., p. 127). University of Florida, Environmental Engineering Department.

Rice, D. W. (1956). Dynamics of Range Expansion of Cattle Egrets in Florida. *The Auk*, *73*(2), 259–266. https://doi.org/10.2307/4081477

Ryan, J. (1969, October 19). Road to Divide UF Campus Already Divisive. *Tampa Bay Times*. https://www.newspapers.com/article/tampa-bay-times/39283235/

Schwartz, M. K. (2019a). *Effects of Nutrient Reduction on the Water Quality and Largemouth Bass Micropterus Salmoides Population in Lake Alice, Gainesville, Florida*. University of Florida.

Schwartz, M. K. (2019b, December 20). The History of Lake Alice. *Reefs to Rivers: Florida Fisheries Science*. https://flafsstudentsubunit.wordpress.com/2019/12/20/the-history-of-lake-alice/

Schwartz, M. K., Canfield, D. E., & Cichra, C. E. (2021). Effects of Nutrient Reduction on the Water Quality and Largemouth Bass Population in Lake Alice, Florida. *Florida Scientist*, *84*(1), 1–20.

Shannon, E. E., & Brezonik, P. L. (1972). Limnological Characteristics of North and Central Florida Lakes. *Limnology and Oceanography*, *17*(1), 97–110. https://doi.org/10.4319/lo.1972.17.1.0097

Sissons, A. (1997, February 4). Ten-year plan may threaten Lake Alice. *The Independent Florida Alligator*, 3.

Small, R. (1979, May 22). Alligators are stayin' alive. *The Independent Florida Alligator*, 1, 2.

Smith, R. (1980, April 1). UF yet to apply for Lake Alice permit. *The Independent Florida Alligator*.

Sneed, N. (1990, January 17). Lake Alice may be site of houses for stadium bats. *The Independent Florida Alligator*, 8.

State Library and Archives of Florida. (n.d.). *Florida Memory Timeline*. Retrieved May 31, 2024, from https://www.floridamemory.com/learn/exhibits/timeline/

Stoun, H. (1973, March 9). Treated waste water disposed through new method. *The Independent Florida Alligator*, 8.

Strang, S. (1970, April 21). Alice's Hyacinths Subject Of Plans. *The Florida Alligator*.

Tharpe, J. (1973, November 16). Lake Alice is alligator haven. *The Independent Florida Alligator*.

The Florida Alligator. (1963, March 26). UF Dents City Budget 'Wasting' Free Water. *The Florida Alligator*.

The Florida Alligator. (1970, January 13). Graduate Program Focus on Lake Alice. *The Florida Alligator*.

The Independent Florida Alligator. (1996, March 27). Living In Harmony: Lake Alice Gets New Safety Signs. *The Independent Florida Alligator*.

The Independent Florida Alligator. (1998, September 30). UF's Water Reclamation Facility Wins EPA Southeast Region Environmental Award. *The Independent Florida Alligator*, 13.

The Independent Florida Alligator. (1999, January 26). Editorial – A fair compromise. *The Independent Florida Alligator*, p.6.

The Independent Florida Alligator. (2013, April 10). Volunteers needed for Clean Water Campaign. *The Independent Florida Alligator*.

UF Clean Water Campaign. (2009). *Lake Alice Conservation Area Kiosk*. Lake Alice Conservation Area Kiosk. https://soils.ifas.ufl.edu/campuswaterquality/pdf/Lake-Alice-kiosk_v5.pdf

UF Clean Water Campaign. (2020, November 1). *UF Clean Water Campaign* [Webpage]. https://soils.ifas.ufl.edu/campuswaterquality/water/index.shtml

UF Landscape Architecture. (2021a). *Lake Alice Conservation Area Assignment 2—Topography, Geology, Hydrology* (Story Map Group 43; LAA 2330 Site Analysis Class Report, p. 12). Landscape Architecture, College of Design, Construction and Planning, University of Florida. https://storymaps.arcgis.com/stories/a31841ed924b41ba8b433824255bf26e/print

UF Landscape Architecture. (2021b). *Lake Alice Topography,Geology, and Hydrology* (LAA 2330 Site Analysis Class Report, p. 37) [Story Map]. Uniiversity of Florida. https://storymaps.arcgis.com/stories/e5892ec2c8344f2a8957b6a7c28a9452/print

UF Landscape Architecture. (2021c). *University of Florida Lake Alice Assignment 5 Human Systems Final Analysis + Site Synthesis* (LAA 2330 Site Analysis Class Report, p. 19) [Story Map]. Uniiversity of Florida. https://storymaps.arcgis.com/stories/e21ec016715e43c1a39f72c049ac6772/print

UF Landscape Architecture. (2022). *Lake Alice Conservation Area Assignment 05* (LAA 2330 Site Analysis Class Report, p. 46) [Story Map]. Landscape Architecture, College of Design, Construction and Planning, University of Florida. https://storymaps.arcgis.com/stories/eabab179aebf4b17b52bbf22c8ad0bf0/print

University of Florida. (2016). *University of Florida—Strategic Development Plan—Phase 1 Summary Report* (p. 198). https://strategicdevelopment.ufl.edu/wp-content/uploads/docs/UFlorida_SDP_Phase_1_Summary_Report_FINAL-REDUCED.pdf

University of Florida. (2017). *Campus Design Guidelines* (p. 48). University of Florida. https://facilities.ufl.edu/wp-content/uploads/forms/standards/UFDesignGuidelines.pdf

University of Florida. (2019). *Campus Framework Plan* (p. 253). University of Florida. https://facilities.ufl.edu/wp-content/uploads/plan/docs/19_1031_UF_CampusFrameworkPlan.pdf

University of Florida. (2020). *Campus Master Plan*. University of Florida. https://facilities.ufl.edu/campus-planning/campus-master-plan/campus-master-plan-2020-2030/

University of Florida. (2021). *Campus Master Plan, 2020-2030 Amendments*. University of Florida. https://facilities.ufl.edu/campus-planning/campus-master-plan/campus-master-plan-2020-2030/

University of Florida, F. P. & C. D. (2004). *Conservation Area Land Management (CALM) Plan* (p. 26). University of Florida.

University of Florida, F. P. & C. D. (2008). *A Comparison of the University of Florida's Stormwater Discharge into the City of Gainesville, in Relation to the City of Gainesville's Stormwater Discharge into the University.* (p. 21). University of Florida.

U.S. Geological Survey. (1890). *Arredondo Survey Topographic Map* (1955th ed.) [Map]. USGS.

U.S. Geological Survey. (1966). *Gainesville East, FL Topographic Map* (1967th ed.) [Map]. USGS.

Vega, A., & Ewel, K. C. (1981). Wastewater Effects on a Waterhyacinth Marsh and Adjacent Impoundment. *Environmental Management*, *5*(6), 537–541. https://doi.org/10.1007/BF01866727

Ward, D. B. (1970a, June 15). *Interest in Lake Alice* [Letter].

Ward, D. B. (1970b, June 15). *Interest in Lake Alice Report.* [Letter Report].

Wells, A. O. (2005). *Waters of the University of Florida: Managing for Water Quality in the Lake Alice Watershed* [Masters Thesis]. University of Florida, Interdisciplinary Ecology.

Wells, A. O., Ankersen, T. T., Clark, M., Aldridge, M., Gregory, W., & Miralia, Q. (2006). *Waters of the University of Florida—A Plan for Achieving Sustainable Water Management in the Lake Alice Watershed* (p. 54). Conservation Clinic - UF Levin College of Law.

Williams, C. D. (1948). *Lake Alice Drainage Project* (p. 16) [Preliminary Report]. University of Florida, Department of Civil Engineering.

Williams, C. D. (1949, April 18). *Memorandum—Lake Alice* [Memorandum].

Williams, C. D. (1949, July 16). *Memorandum—Lake Alice* [Memorandum].

Williams, K. (2023, October 9). UF hosts first round of Lake Alice watershed management workshops. *The Independent Florida Alligator*, 1.

Williams, K. E., Nicol, D., & Randazzo, A. F. (1977). *The Geology of the Western Part of Alachua County, Florida.* (Report of Investigations 85; p. 108). State of Florida, Department of Natural Resources, Bureau of Geology.

Williams, T. N. (2011). *PUR ® Packet Effectiveness in the Presence of Pesticides and Increased Organic Matter* [Master Of Engineering]. University of Florida, Environmental Engineering.

Wise, B. (1970, April 22). Alligator Background Report, Lake Alice, Footprints: Both Mar Environment. *The Florida Alligator*, 12.

Wright, B. (1989, June 20). Alligators mate early in season. *The Independent Florida Alligator*.

Zeeb, B. (1992). UF invites bids for new waste water treatment plant. *The Independent Florida Alligator*.