

Water Quality Assessment of

Lower Lake Lafayette

Leon County

Sampled February 1998

June 1998

Bureau of Laboratories
Division of Administrative and Technical Services

Comprehensive Quality Assurance Plan No's:
Laboratories- 870346G & 870688G
Field- 980028

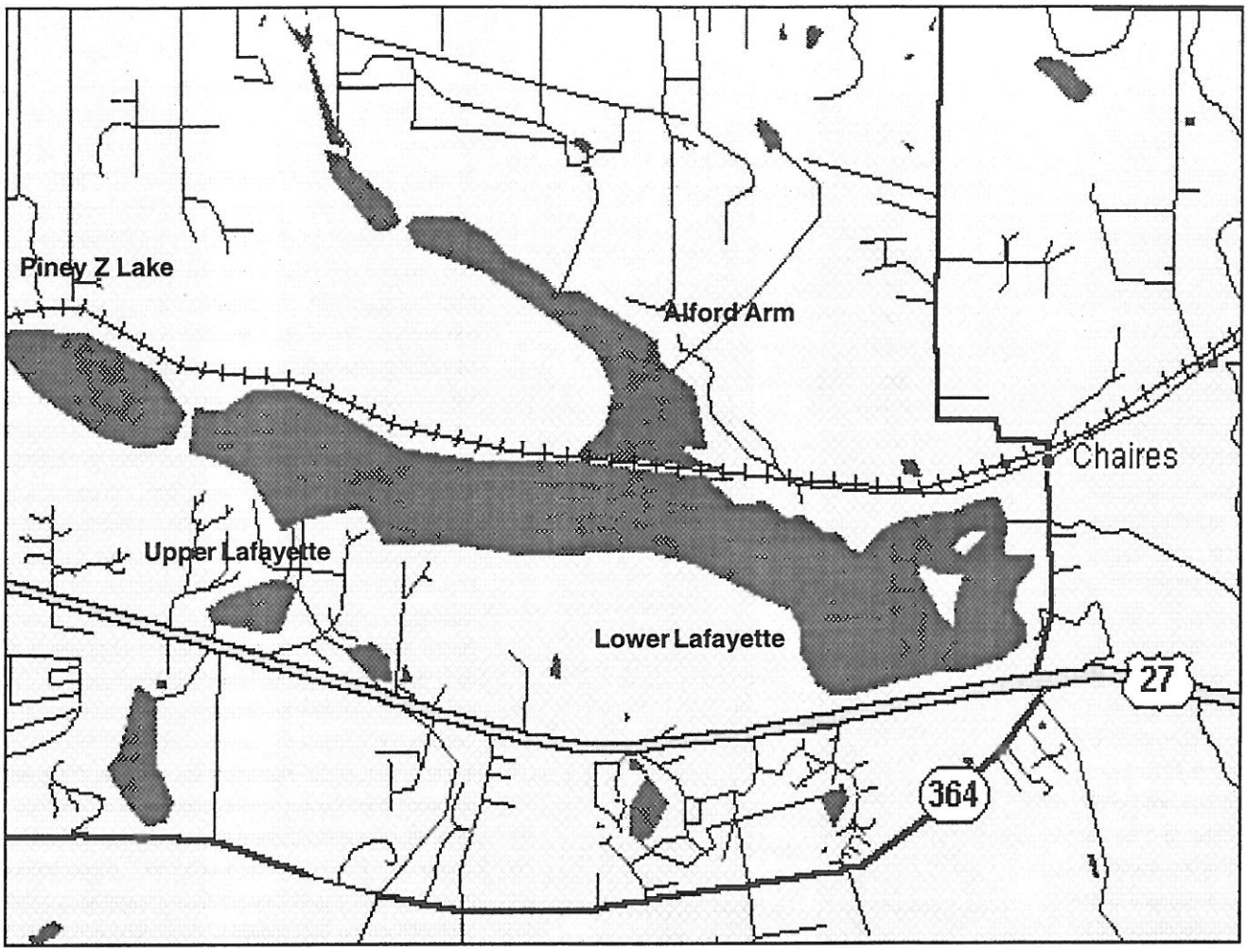


Figure 1: Overview of Area (see map in appendix for sampling locations)

Executive Summary

On February 16, 1998, staff from the Bureau of Laboratories and the Northwest District Branch Office visited key areas of the lower Lake Lafayette basin and collected water samples for nutrients and microbiological analysis. This was primarily a reconnaissance to determine potential problem areas in which to focus future sampling or management efforts.

Fecal and total coliform bacteria contamination was not a problem at any site sampled. While turbidity was highest at Station 5 (14 NTU), there were no turbidity violations.

Excessive nitrogen enrichment was observed at Station 5, adjacent to the Meadows at Woodrun WWTP treatment pond. Ammonia (4.9 mg/L) and TKN (5.4 mg/L) at Station 5 exceeded the values found in 95% of other Florida lakes, while nitrate-nitrite (0.075 mg/L) exceeded the 70th percentile. Seepage from the treatment pond appeared to be the source of this nutrient enrichment. Evaluating ways to prevent this seepage from reaching the lake (lining the pond, etc.) appears warranted. All other lake stations had nutrient concentrations which were low to average for Florida lake systems.

Pond; site #3, Leon County Landfill-site of stormwater discharge to lower Lake Lafayette; site #4, Talquin Electric wastewater treatment pond (Meadows at Woodrun WWTP); site #5, Lower Lafayette, near Talquin Electric sewage treatment pond; and site #6, Alford Arm at the railroad tracks.

The following personnel were involved in this investigation: Russel Frydenborg and Rebecca Northup (FDEP Bureau of Laboratories) and Marlane Castellanos (Northwest FDEP Branch Office of Ecosystem Management) conducted the field work. Chemical and microbiological analyses were performed by the FDEP Central Chemistry and Biology Laboratories.

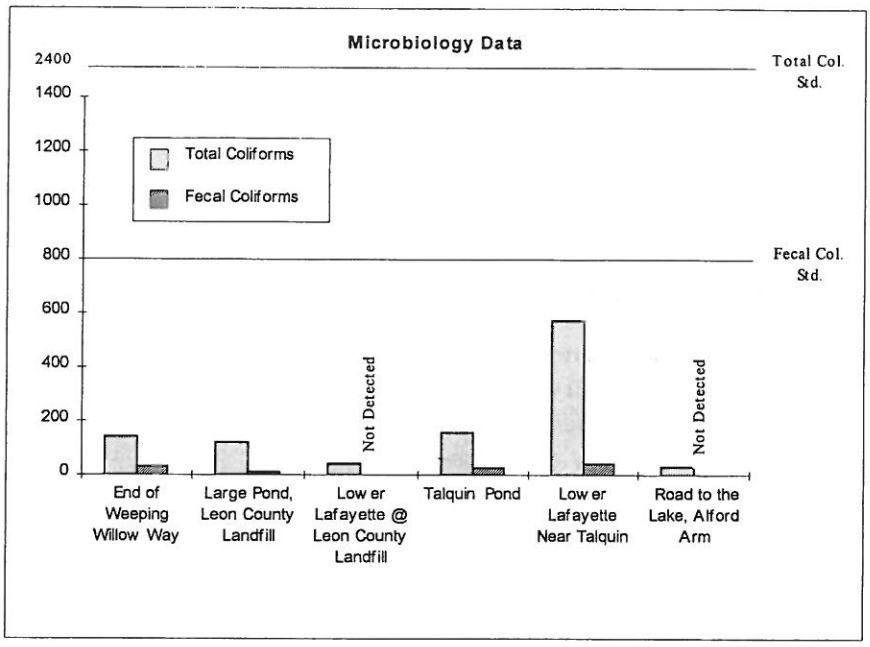


Figure 2: Microbiology Data (#/100 ml) for Lake Lafayette

Results and Discussion

Site Descriptions and Vegetation

Most of lower Lake Lafayette is better described as a semi-permanently inundated wetland as opposed to the deeper, open-water systems normally referred to as lakes. An exception to this was the vicinity of station 1, at the western-most part of lower Lafayette, just east of Piney Z. At station 1, accessed from the end of Weeping Willow Way in the Windwood Hills Subdivision, there was an approximately 100-acre area of open water, fringed with emergent plants. The water sample was taken near the shore, in approximately 1.5 m of water. Plants observed included *Salvinia rotundifolia* (water fern), *Eichhornia crassipes* (water hyacinth), and *Cephalanthus occidentalis* (button bush), with periphyton (attached algae) common on submerged surfaces.

Station 2, was in Large Pond, located in the Leon County landfill. Large Pond has a surface area of approximately 10 acres of open water, with *Panicum hemitomon* (maidencane) and *Najas* sp. (water naid) growing in the littoral zone, with periphyton also common. Large Pond was sampled to help determine if nutrient-rich leachate from a nearby unlined landfill cell might be affecting it.

Station 3 was located in a swampy section of lower lake Lafayette where most of the treated stormwater runoff from the landfill enters the system. There was an overstory of *Taxodium ascendens* (pond cypress), with *Cyrilla racemiflora* (titi), *Limnobium spongia* (frog's bit), *Wolfiella* sp. (bog mats), *Saururus cernuus* (lizards tail), and *Sphagnum* sp. present in the understory. *Lemna* sp. (duckweed), which appeared to originate from the stormwater holding pond (located up-slope) during the last discharge event, was present as well.

Station 4 was located in the "Meadows at Woodrun" WWTP percolation pond. This site was sampled to establish whether sub-surface lateral flow from this pond was affecting lower Lake Lafayette, located within 50 m from the pond.

Station 5 was adjacent to "Meadows at Woodrun" WWTP percolation pond. Extensive seepage, with iron-reducing bacteria and an oily sheen, was observed at the lake margin, downslope from the percolation pond berm. The seepage water was somewhat turbid, with the turbidity extending approximately 20 m from the lake edge. The water sample was taken near the edge of the turbid water. *Taxodium ascendens* (pond cypress), *Limnobium spongia* (frog's bit), *Sparganium americanum* (bur-reed), and periphyton was observed at this site.

Limnobium spongia (frog's bit), *Ludwigia carolina* (red ludwigia) and periphyton were common at Station 6, located just north of the railroad tracks in Alford Arm, accessed from the "Road to the Lake". Because of topography, this area potentially receives nutrients

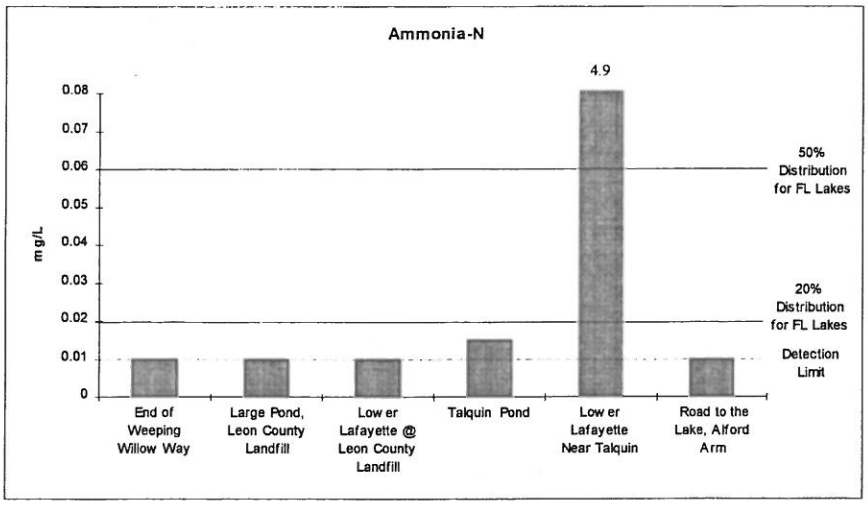


Figure 5: Ammonia-N for Lake Lafayette

Florida (value at site, 5.4 mg/L). TKN at Station 4 (1.4 mg/L) was also somewhat elevated compared with the remaining sites. The four other sites measured less than 0.60 mg/L for TKN, which is lower than 80% of other Florida lakes (see appendix for results).

With the exception of Station 4, total phosphorus results ranged from 0.017 mg/L (Station 1) to 0.041 mg/L at Large Pond (Station 2), which are lower than average values for Florida lakes. Total phosphorus at the Woodrun WWTP treatment pond was 0.2 mg/L.

A hypothesized mechanism for the elevated nitrogen levels at Station 5 is as follows:

The top of the treatment pond was approximately 2 m higher than the water level in Lake Lafayette during our sampling, forming a head-pressure gradient to move water through the berm to the lake. Organic nitrogen in sludge at the bottom of the treatment pond is reduced into ammonia as the leachate moves underground (in anaerobic conditions) to the lake, resulting in higher ammonia levels in the lake than in the surface layer of the treatment pond. After entering the aerobic water of the lake, some of this ammonia is oxidized into nitrate-nitrite. Total phosphorus was not elevated at Station 5, since it is bound to particulates that do not migrate through soils.

Nutrient enrichment was not found at an area with lake-side residential use (Station 1), in Large Pond adjacent to an unlined landfill cell (Station 2), the area of Lake Lafayette where stormwater from the landfill enters the lake (Station 3), or in portions of Alford Arm which receive urban stormwater (Station 6). Considering the type of wetland system which most of Lake Lafayette could be classified, no unusually abundant aquatic plant growth was observed at any station, and the only exotic plant (water hyacinth) was seen at Station 1.

Nutrient concentrations will vary with season and stormwater inputs, and the aquatic plants present in the system will assimilate nutrients. This study was intended to be a visual and water quality reconnaissance of the area, and does not represent a definitive evaluation of the nutrient budget of Lake Lafayette.

Conclusions

Fecal and total coliform bacteria contamination was not a problem at any site sampled. While turbidity was highest at Station 5 (14 NTU), there were no turbidity violations.

Excessive nitrogen enrichment was observed at Station 5, adjacent to the "Meadows at Woodrun" WWTP treatment pond. Ammonia (4.9 mg/L) and TKN (5.4 mg/L) at Station 5 exceeded the values found in 95% of other Florida lakes, while nitrate-nitrite (0.075 mg/L) exceeded the 70th percentile. Seepage from the pond appeared to be the source of this nutrient enrichment. Evaluating ways to prevent this seepage from reaching the lake (lining the pond, etc.) appears warranted. All other lake stations had nutrient concentration which were low to average for Florida lake systems.

Literature Cited

Livingston, R. J. 1997. Effects of urban development on the lakes of Leon County (1988-1997). Center for Aquatic Research and Resource Management. 51 p.