PART B: Examination of Lake Water Levels

After water quality and clarity, the most talked about lake issue is the water level of the lake. As part of the above section on the hydrogeology of the lake, this part takes a more in depth look at water levels and how they relate to groundwater, rainfall and other factors. Also, part of this section will deal with the lake drain or outlet found at Turtle Cove.

Controlling Legislation

Presented first are two pieces of legislation designed to control the digging of ditches around the lake which could be detrimental to lake levels. In the 1971 session of the General Assembly, HB406 entitled "AN ACT TO PREVENT THE DIGGING OF DITCHES BELOW A CERTAIN LEVEL IN BLADEN COUNTY" WAS ADOPTED. The Act states that "It shall be unlawful for any person, firm, or corporation to dig any ditch under any portions of US Highway 701, NC Highway 53, or S.R. 1515 (White Lake Drive) which surround the body of water in Bladen County known as White Lake below 66 feet above sea level." The second Act, HB994, was ratified in 1973 and entitled "AN ACT TO AMEND CHAPTER 500 OF THE SESSION LAWS OF 1971 SO AS TO ALLOW THE TOWN OF WHITE LAKE TO DIG DITCHES BELOW A CERTAIN LEVEL IN BLADEN County." This Act allows the town, with approval from the North Carolina Highway Commission, to dig around these roads for the purposes of installing, repairing, or maintaining water and sewer lines. Copies of this legislation are found in ***Attachments 8 and 9.***

Geologic formation of the lake

As noted in the hydrogeological section in *Part A*, the lake is basically a bowl sitting atop the surficial aquifer and the soils beneath it. The lake's elevation is slightly higher than most of the land surrounding it. The exception is the sand ridge at the northern end which is a factor that directs the flow of groundwater from the northwest towards the southeast. The lake has no surface inlet which is a major factor in the clarity of the water. No water flows into the lake from surrounding wetlands or streams. The water supply for the lake principally comes from groundwater flow and rainfall.

There is only one outlet for the lake water located at a series of pipes found in Turtle Cove. The drainage of the immediate land surrounding the lake is into the lake. This area can be generally described as that land surface inside the loop of US Highway 701, NC Highway 53, and White Lake Drive. ***Figure 1*** shows the general elevation of land surrounding the lake. The topographic slope of the land colored in blue directs most of

any surface water into the lake. The groundwater flowing by and around the lake that does not flow into the lake, will evaporate or eventually discharge into the Cape Fear River.

Figure 1. White Lake Watershed Drainage Area

Source: ESRI/ArcGIS Living Atlas

Lake levels are mainly subject to the availability and flow of the groundwater in the area. Besides evaporation, a lack of rain over time will begin to have an effect on groundwater levels therefore reducing the flow rate into the lake. A clear confirmation can be drawn linking rain water and lake levels by using the correlation of severe droughts and lake levels. In the 1900s there were four instances of extremely severe droughts. The first

was from 1927 to 1930 when there was a nationwide drought so severe that agricultural seasons were completely wiped out over these three years. The Dust Bowl of the greater Midwest took place during this time. From 1930 to 1934 a significant drought hit most of North Carolina. In 1932, a whole agricultural growing season was wiped out. In the middle 1950s another statewide severe drought took place. Correspondence from White Lake officials and citizens to state officials in 1954 documented the low lake levels. A study undertaken by the District Geologist for the US Geological Service attributed the drought to low water levels in all the surrounding lakes. ***Figure 2*** shows a map of the United States illustrating a significant drought occurring over the southern half of the United States. Other correspondence in 1956 pointed to recent rains having solved the lake level issue. Finally, in 1988, the state experienced another severe drought that not only affected the surficial aquifer, but was also felt in the confined aquifer immediately underneath. In each of these cases, all lakes and ponds in the region experienced extremely low levels. Small ponds simply disappeared until the rains returned.

The **Appendix Section** following this plan has a number of archived correspondence and reports, principally from the 1950s. This correspondence and reports discuss the low water levels in White Lake and the associated effects of the statewide drought taking place at this time. It is noted that subsequent rainfall in 1955 and 1956 resolved the issue.

Figure 2. National Drought Conditions 1952 – 56, US Department of Agriculture

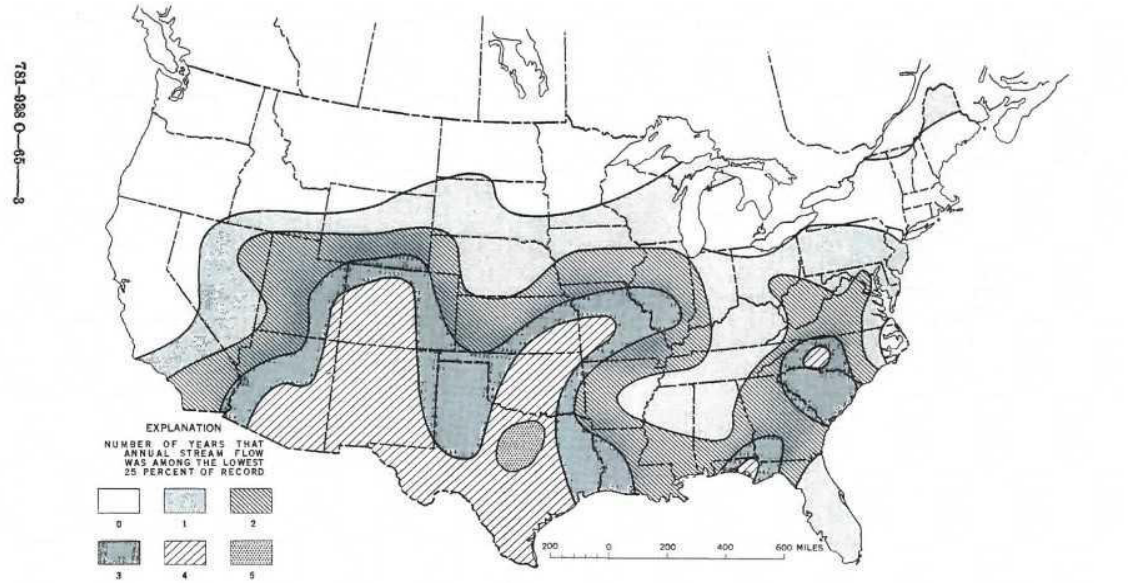

FIGURE 12.—Extent and persistence of streamflow deficiencies for 1952–56. Based on discharge records from about 125 index stream-gaging stations in the United States and Canada.

Source: US Drought Monitor

The State of North Carolina, through legislation, has set the desired upper limit of the lake as 66 feet above mean sea level (the Division of Water Resources cites 65 feet.). There are two sets of markers that show the lake level; one located at Goldston's Beach pier and the second at the Turtle Cove outlet. The Turtle Cove station has been calibrated by

a surveyor. There are two important functions served by the Turtle Cove outlet. The first is that this is the only outlet for lake water to be flushed out of the lake. The flushing can help water quality by removing algae and nutrients out of the lake. The second is to control flooding during major rain events such as those of a hurricane. Otherwise, the lake level could rise to a level where adjacent property owners experience significant flooding. Excess water that travels through the piping located at the outfall travels through a ditch to NC highway 53 where another pipe travels under the road into a nearby wetland/creek. This pipe was installed as an emergency drain when extreme lake overflows occur. There is a recommendation concerning this outlet found in the Action Steps portion of this plan.

Figure 3 is an aerial photograph showing the location of the Turtle Cove outlet and its drainage corridor towards NC highway 53 and Turnbull Creek.

Figure 3. Turtle Cove Outlet and Drainage Ditch, prepared by the LRCOG

Source: LRCOG

It is important to note that there is a state regulation that prohibits the altering or damaging of a lake outlet for any state lake. According to Parks and Recreation Rules (07NCAC 13A .0406) “No person shall in any way damage or alter drainage ditches, drainage gates,

or other inlet or outlet for any state park or lake; nor in any way change the water level of a state lake."

Lake levels are a concern for several groups living around and using the lake. Recreational boaters desire a higher water level in order to have sufficient drafting under their boats which are anchored at piers or buoys. They also rely on high lake levels to help avoid disturbing aquatic vegetation and sediment on the lake bottom. The disturbance of aquatic vegetation and sediment is a significant contributor to the water quality and clarity issues. It has been documented and reported in most every study on water quality problems over the last century that motor props and wave action cause the aquatic plants to be dislodged from the lake bottom and in shallow areas they clearly agitate the lake bottom disturbing the sediment layer to the point of significantly affecting water clarity. The larger the craft and motors, the more harm is caused.

One way to control this may be to develop a recreational carrying capacity use formula which takes into account available surface for boat usage and a formula to calculate a reasonable number of boats in use on the lake at any one time. This is discussed further in the Action Step section later in the plan.

Lake Levels – Pumping groundwater to raise lake level / changing pH levels

Finally, the idea that needs to be addressed is the concept of drilling a well or series of wells around the lake for pumping groundwater into the lake to 1) raise the lake level when needed, and 2) to help lower the pH level of the lake water. This idea was initially raised in the mid-1950s, and it has surfaced again over the last few years.

As noted above, the first recorded instance of this idea appeared in the mid-1950s when a statewide drought had significantly lowered the level of the lake by two feet. A report was provided by the then Superintendent of State Parks and given at a Town Board meeting on June 20, 1955 that addressed the feasibility of implementing this concept. A well driller by the name of R. C. Hester provided a document with a scenario showing an equation on the undertaking of such a project. Mr. Hester, from Hester Well Company out of Raleigh, was engaged by the state to undertake the study of using a well for extracting groundwater to help replenish the lake. A summation of his report is presented below.

- Using a well rated at pumping 1,000 gallons of water per minute, the well would pump 1,440,000 gallons per 24-hour day. (1,000 gallons x 60 minutes = 60,000 gallons. 60,000 gallons by 24 hours = 1,440,000 gallons).

- Based on the fact that it would require 27,154 gallons to raise the level of one (1) acre of water one (1) inch. It would require 28,946,164 gallons of water to raise the level of the entire lake (1,066 acres) one (1) inch. (27,154 gallons x 1,066 acres = 28,946,164 gallons.)

- It would require approximately 20.1, 24 hour days of pumping at 1,000 gallons per minute to raise the water level of the lake one (1) inch. (28,946,164 gallons / 1,440,000 = 20.1 days).

- At the above rate, it would require approximately 241 days of pumping 24 hours a day to raise the water level of the lake one (1) foot. (20.1 days x 12 = 241.2 days). This equates to just over **347,000,000 gallons**.

It was the conclusion of the Town Board and state officials that this was not a viable solution.

In talking with DWR, it is their opinion that a project like this would not be permitted due to the impact on neighboring wells and the aquifer system.

It has also been suggested recently that water pumped from the aquifer system could be pumped into the lake to decrease the pH level of the lake. For this to work, the water would need to be taken from the surficial aquifer. This is due to the fact that after approximately 75 feet in depth, the low pH level becomes neutral and therefore not an effective solution. Again, pumping at significant rates would affect the natural movement of the ground water which is counterproductive to the natural flow of the surficial aquifer.