

**Report to White Lake Town Board  
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LIMNOSCIENCES

In meeting with NC DEQ recently, I provided data and summary information from the work that has been done at the lake in the past 6 years, and provided clarifications for some of the information that they have provided in reports which is not correct. I expanded upon a document that I had provided to the town board a year ago, which should be of interest to new board members:

**What to Know About Groundwater Flow Interactions with White Lake**

*Based on the work of Consolvo (2022), Shank and Zamora (2019), and Frey (1949)*

- Sources of water supplying White Lake: rainfall and groundwater from the surficial or water table aquifer, which surrounds and underlies the lake. There is no evidence for any deeper confined aquifer contribution to the lake.
- The higher the water table level is above the lake level, the greater the hydraulic gradient—the driving force to move groundwater into the lake. Water table elevations rise because of *rainfall* (and fall when there is a lack of it).

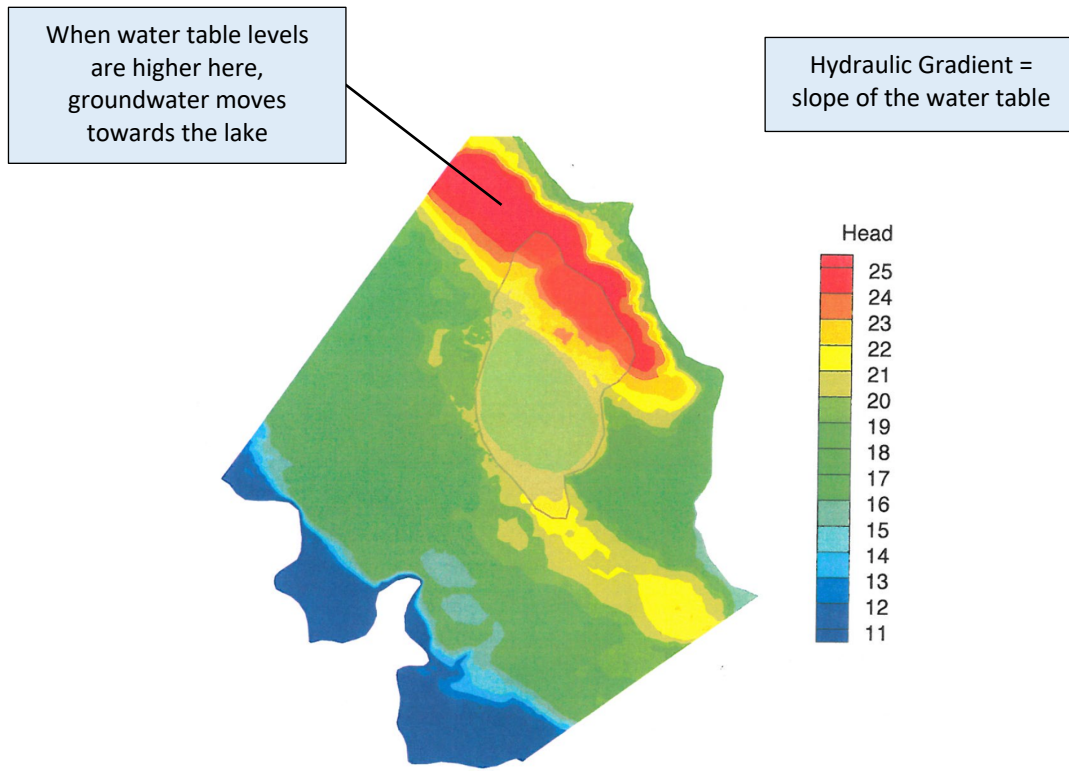


Figure provided by Shank and Zamora in a 2018 quarterly report to the Town of White Lake.

- Groundwater flow interactions with White Lake are *variable*, depending on the dynamics between *lake levels* and *water table levels*.

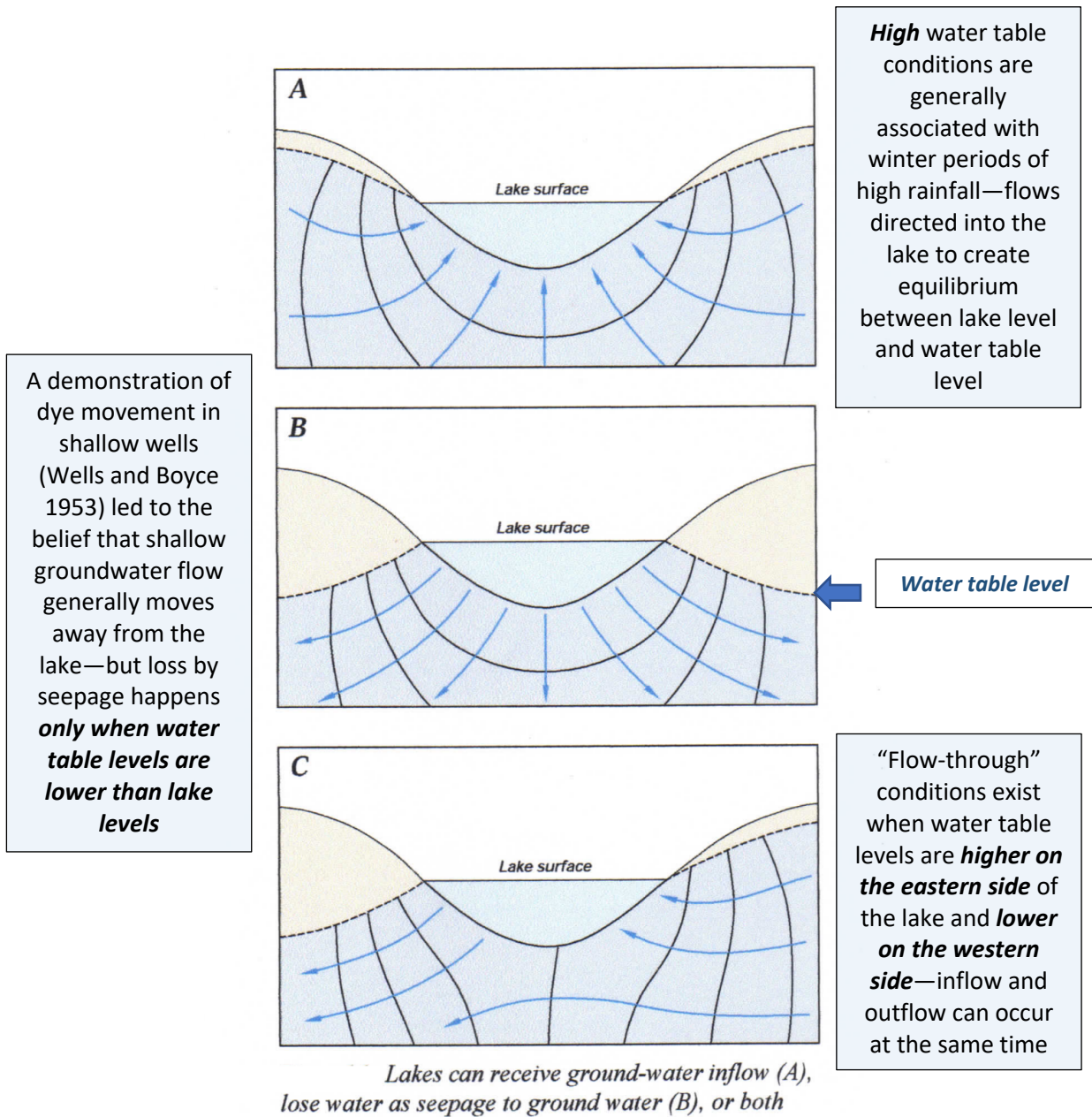
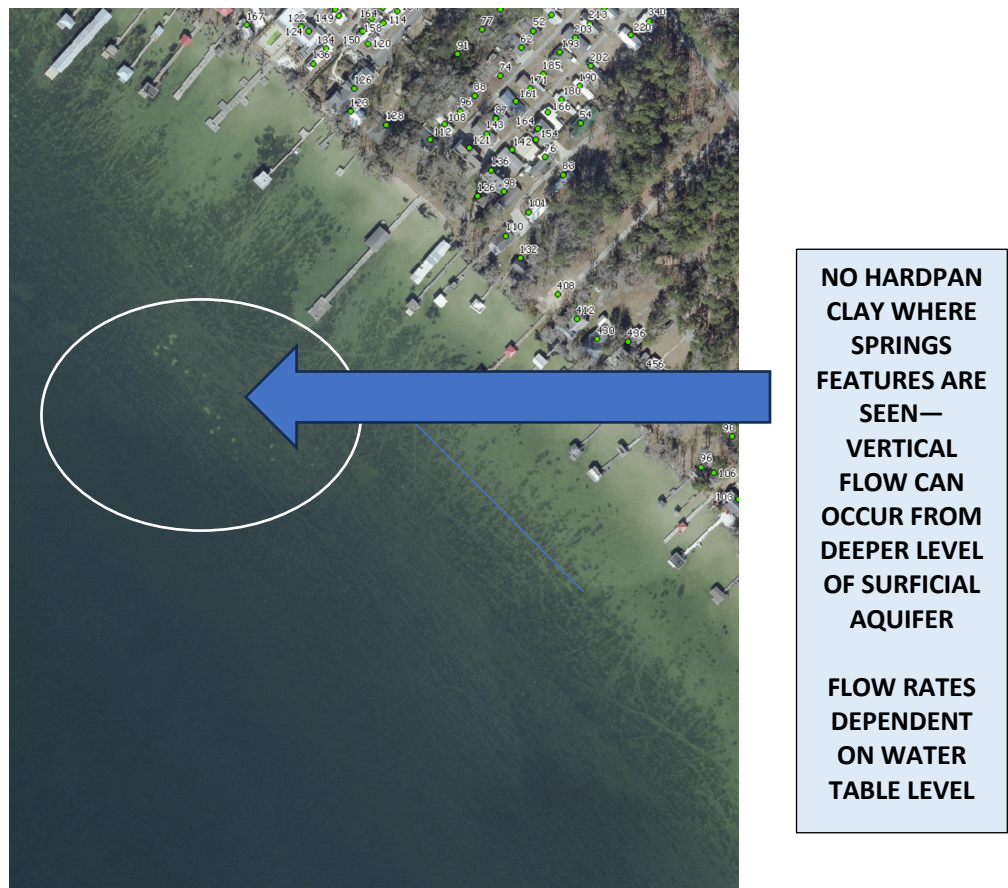


Figure reproduced from: Winter, T.C., W.H. Judson, O.L. Franke, and W.M. Alley. 1998. Ground water and surface water: a single resource. U.S. Geological Survey Circular 1139 <https://doi.org/10.3133/cir1139>

Shank and Zamora’s work documented all three conditions, with flow-through conditions more common during the period when they were monitoring.

## Flow From Springs Related to Water Table Levels

- David Frey studied Bladen County Bay Lakes in the 1940s and noted that small springs were found in shallow water in all these lakes.
- White Lake's distinctive springs have been described as depressions up to 8 inches deep, with "dimples" visible in these sandy areas.
- The surficial aquifer is bisected by a clay "hardpan" layer in many areas, creating a semi-confined aquifer below the clay. The White Lake springs are places where there is no hardpan clay layer, so when the water table levels are sufficiently higher than lake levels, flow from the deeper surficial aquifer can be visible as "boils" of water which stir up the sand.
- Often, flow from the springs sites is not visible or detectible by temperature differences, but seepage is sufficient to keep the sandy depressions clear of sediment buildup, so that they have been visible in aerial photos.



Screenshot of 2013 aerial photo of White Lake (accessed from Bladen GIS website), showing the springs, which cluster around the 7-foot contour on the eastern shoreline. Rainfall in June and July of 2013 was very high.