

An Introduction to Portage County Drainage Lakes

Four drainage lakes were represented in this study including Collins, Fountain, Spring, and Tree Lakes. Drainage lakes receive water from inlet streams, groundwater, runoff, and direct precipitation. Drainage lakes have stream outlets that allow water to leave the lake. The stream outlet may include a dam that controls the water level in the lake, but in contrast to an impoundment, these were lakes prior to dam installation. The majority of water entering a groundwater drainage lake enters as groundwater, whereas a drainage lake receives much of its water from an inlet stream. In terms of summer surface temperature, several of these lakes are similar to the impoundments (Fountain and Spring) suggesting these lakes have relatively high inputs of groundwater relative to their size, and several have relatively warm summer water temperatures (Collins and Tree) suggesting these lakes have relatively low rates of water flow in comparison to their lake size.

Surface watersheds for these lakes are larger and are the most important area likely to impact water quality along with near lake shore activities. The inlet streams may be impacted by both surface runoff and groundwater inflow. Because of the greater amount of groundwater moving into groundwater drainage lakes, land use in the groundwater watershed is of even more importance than for seepage lakes. These lakes have some of the largest groundwater watersheds. In addition, this large source of water prevents the extreme fluctuations in water level that is more typical of lakes without stream inlets.

Drainage lakes tend to have more abundant vegetative growth because the stream inlets bring sediment and leaves along with dissolved nutrients from the watershed into the lake. These materials have organic materials and nutrients associated with them, adding to the available nutrients in the lake. Realistically, they will never be clear sand bottom lakes, but if nutrients and sediment are maintained in the watershed they can be lovely, productive lakes with good fisheries.

Fountain, Spring and Tree Lakes have very large groundwater watersheds compared to their lake volume. This means that for their size, they receive a lot of groundwater annually. With it, the groundwater carries dissolved minerals and pollutants into the lake. Because of the large amount of water entering these lakes, anything dissolved in the groundwater is also abundant in the lake water. As a result, Fountain, Spring, and Tree Lakes have hard water and excess calcium carbonate carried into the lake forms a *marl* precipitate. Hard lakes tend to be very productive; calcium is used by animals to form shells and bones.

Collins Lake has much smaller groundwater watershed compared with its lake volume. It receives more surface water compared to groundwater and is a softer water lake with less calcium. These types of lakes are far less tolerant to inputs of phosphorus; increased phosphorus produces more algae and nuisance levels of aquatic plants.

Table 1 Average pH and hardness for drainage lakes in Portage County Lake Study.

Lake Name	pH	Total Hardness (mg/L)
Collins	7.43	79
Fountain	8.32	190
Spring	8.07	210
Tree	8.27	185

For additional information, terminology, and concepts in this document please consult the *GUIDE FOR BACKGROUND INFORMATION AND INTERPRETATION OF PORTAGE COUNTY LAKE STUDY RESULTS AND RECOMMENDATIONS*.