

THE WATER AND WATERSHED OF KANGAROO LAKE

KANGAROO LAKE is a natural drainage type lake with an inlet source of water at its north end, Peil Creek, and an outlet at its southeast end, Heins Creek (Figure 1). It is a shallow lake with an average depth of 6 feet and a maximum depth of 12 feet. The lake covers an area of 1,123 acres and is separated by a causeway, County Road E, into the north and south basins of about 300 and 820 acres, respectively (Figure 2). Surveys of these two basins show that the plant community is more diverse in the north than south basin because it is less disturbed from development and motor craft. A greater variety of small (microscopic) animals or zooplankton also has been recorded in the north than in the south basin (Sager and Grimm, 1997). The absorptive and storage capacity of the abundant aquatic plants in the north basin serve to slow sedimentation and filter substances derived from runoff into Peil Creek and subsequently carried to the lake, such as phosphorus and other minerals in or applied to the soil on surrounding land.

DRAINAGE LAKE

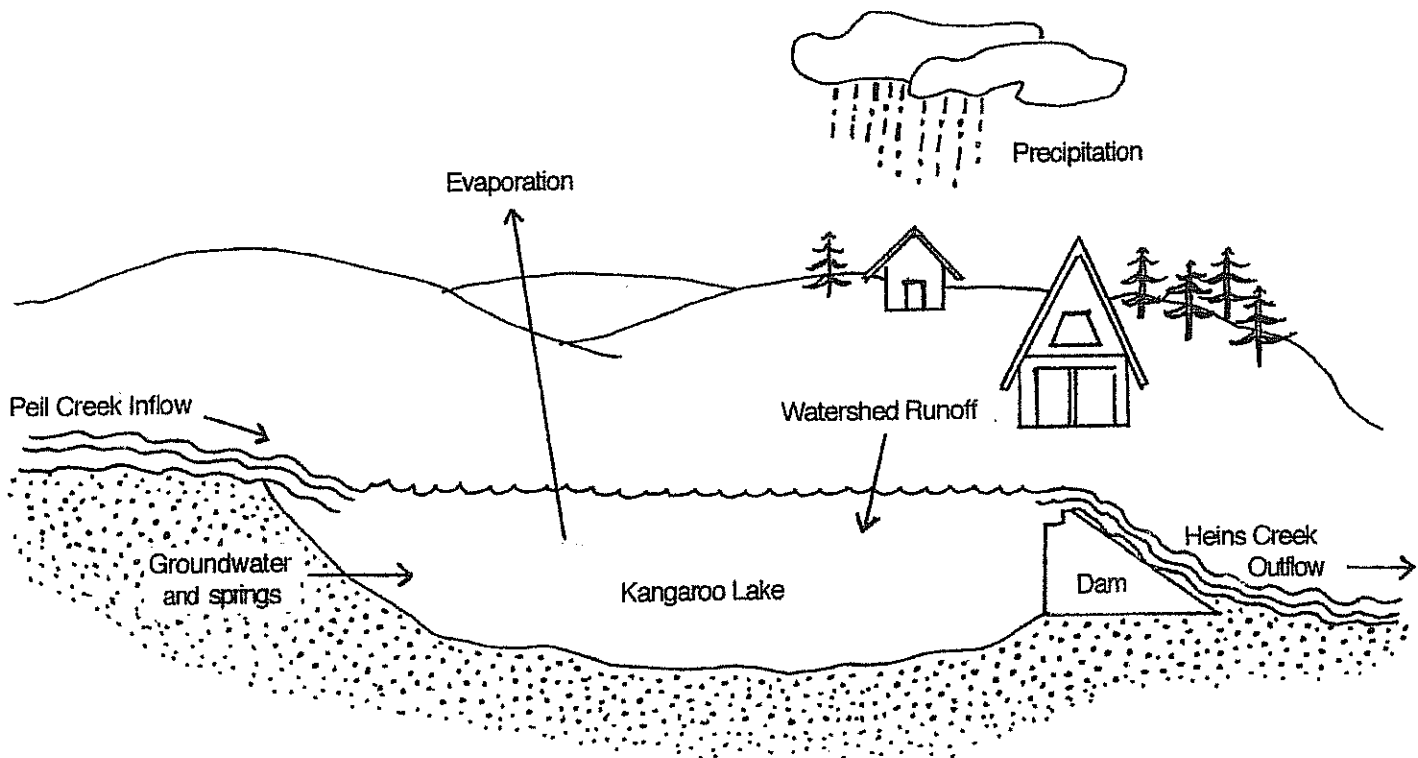


Figure 1. Drainage Lake.

WATER CYCLE

The water cycle for Kangaroo Lake is derived from rain and snow that falls directly on the lake, or enters it as groundwater and springs, or as watershed runoff, or as inflow from Peil Creek (Figure 1). The total yearly precipitation onto our watershed averages about 25-30 inches. Only about 1/3 of this precipitation will enter the lake from ground water and creeks or directly fall onto the lake, and of that, it is estimated that 2/3 will evaporate, flow over the dam or be taken up by plants to produce their sugars (McGinley, 2007). Trees and forested areas of our watershed, and on our property, protect and provide us with the water quality we desire.

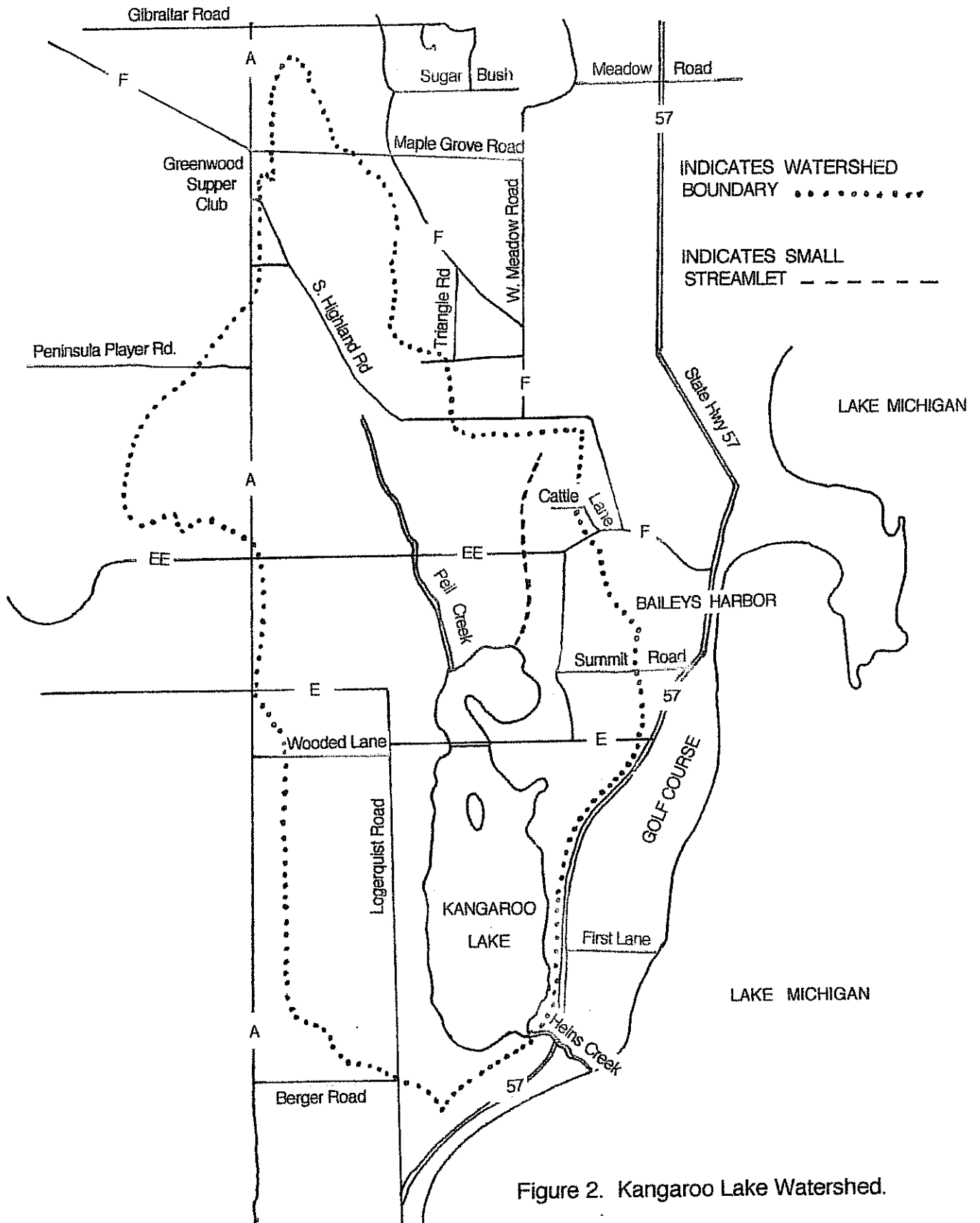
Precipitation absorbed into the soil becomes the groundwater that enters the underlying limestone (dolomite) rock and moves along the fractured limestone toward the lowest point—creeks, wetland and the lake. It slowly dissolves some of the limestone during its movement and becomes alkaline with a pH above pH 8.0. Because of its alkalinity the water is somewhat hard, and its pH indicates that its carbon dioxide (CO_2) content is present primarily as bicarbonate (HCO_3^-) (Sager and Grimm, 1997). This ground water in our surrounding subterranean rock forms the aquifer that feeds our creeks and lake, and also our private wells. Thus, high quality ground water is indispensable for our fresh well-water supply, and it is critically important that we protect all the water in our watershed.

Water loss from the lake is a result of evaporation off the lake surface and as outflow into Hein's Creek. Both types of losses can be significant and contribute to the fluctuation of water level during the year. But about mid-June the lake level drops below the spillway of the dam on the south end at Heins Creek and then water loss is primarily from evaporation off the lake surface. It is estimated that loss by evaporation can be as much as 1 inch per day during a hot, dry day.

Water north of the causeway, the north end of the lake, was established as a sensitive area in 1996 and is protected under Chapter NR107 of Wisconsin's Administrative Code (Szymanski, 1996). Motorized boats are not permitted in this natural area (electric motor is for handicapped individual only) under Wisconsin State Statute 3050 (6) and local ordinance so as to protect the various natural habitats of the north end.

The land immediately surrounding the north basin is an important part of the lake watershed. Nearly all of the shoreline of the north basin is forested down to the lakeshore. Forested land maximizes water absorption into the soil thereby minimizing water runoff into the lake and, thus, provides maximum protection of the water for the lake. Much of the land adjacent to the water basin of the north end composes the 400-acre Kangaroo Lake Preserve, a natural area owned by The Nature Conservancy and Door County Land Trust, accessible to us for hiking among other activities. While there is little development along the shore of the north basin, nearly all of the shoreline of the south basin is developed.

KANGAROO LAKE WATERSHED



WATERSHED

The watershed boundary of a lake represents the highest land surrounding all sides of the lake. All precipitation falling onto the watershed flows down into streams and the lake, and finally to a single outlet, Heins Creek (Figure 2). Portions of the watershed boundary for Kangaroo Lake, represented by the dotted line on Figure 2, are visible at several locations around the lake, such as the over-view of the lake along Hwy 57 near South Kangaroo Lake Road, looking west from Red Cherry Road, and noting the downward slope from County Road A when traveling east on Fairview and Beach Roads, and Wooded Lane. On the west side of the lake, the watershed extends north of the Greenwood Supper Club.

The Kangaroo Lake watershed includes 6,170 acres and represents an area ratio of watershed-to-lake of a favorable 5.5 to 1. Lakes with a higher ratio, as 10 to 1, have a greater amount of land to water and may, but not necessarily, have management problems related to excessive amounts of phosphorus or sediments entering the lake from the greater land area surrounding the lake. That is, as the drainage area of a lake increases, so does the potential quantity of nutrients and sediments that are delivered to the lake. Our watershed consists of forest (30%), row crops (22%), grassland (20%), wetland (9%), urban (3%), golf course (1%) as well as the 15% lake surface (Figure 3). Vegetative cover on the land, including forest, grassland, wetland and meadows allow water to infiltrate into the ground and does not produce much surface runoff. In contrast row crops, residential or urban areas with much hard surface, as roads, driveways, etc, reduce water infiltration into the soil and increase surface runoff into the lake.

In an effort to improve the quality of our lake water it is important that we minimize runoff and protect the groundwater sources from pollutants or unnecessarily high levels of chemicals. A major interest is being directed to greatly reduce the amount of phosphorus entering the lake from these sources. Our local soil around the lake, for example, contains more than enough phosphorus for growing all plants, including grass. Fertilization is rarely necessary, and if it is, as shown from a soil test, you are urged to purchase phosphorus-free fertilizer for lawns from local hardware and co-op stores, or urge your lawn-care provider to apply phosphorus-free fertilizer.

PEIL CREEK

Peil Creek is a primary source of water entering Kangaroo Lake from the northern area of the watershed and enters the lake along its western edge (Figure 2). In fact, much of the watershed area is north of the lake. Woodland, wooded swamps and grassy marshes shelter most of the more than 2 mile-long creek, and runoff water that enters the creek is of good quality.

Peil Creek derives sufficient water from the watershed to allow it to flow year-round during most years. Its continued flow throughout the year, with its oxygen content, may contribute sufficient oxygen to the water of the ice-covered lake during the winter to minimize the potential for winter fish kills that typically occur in shallow lakes.

Landuse Classifications (acres)

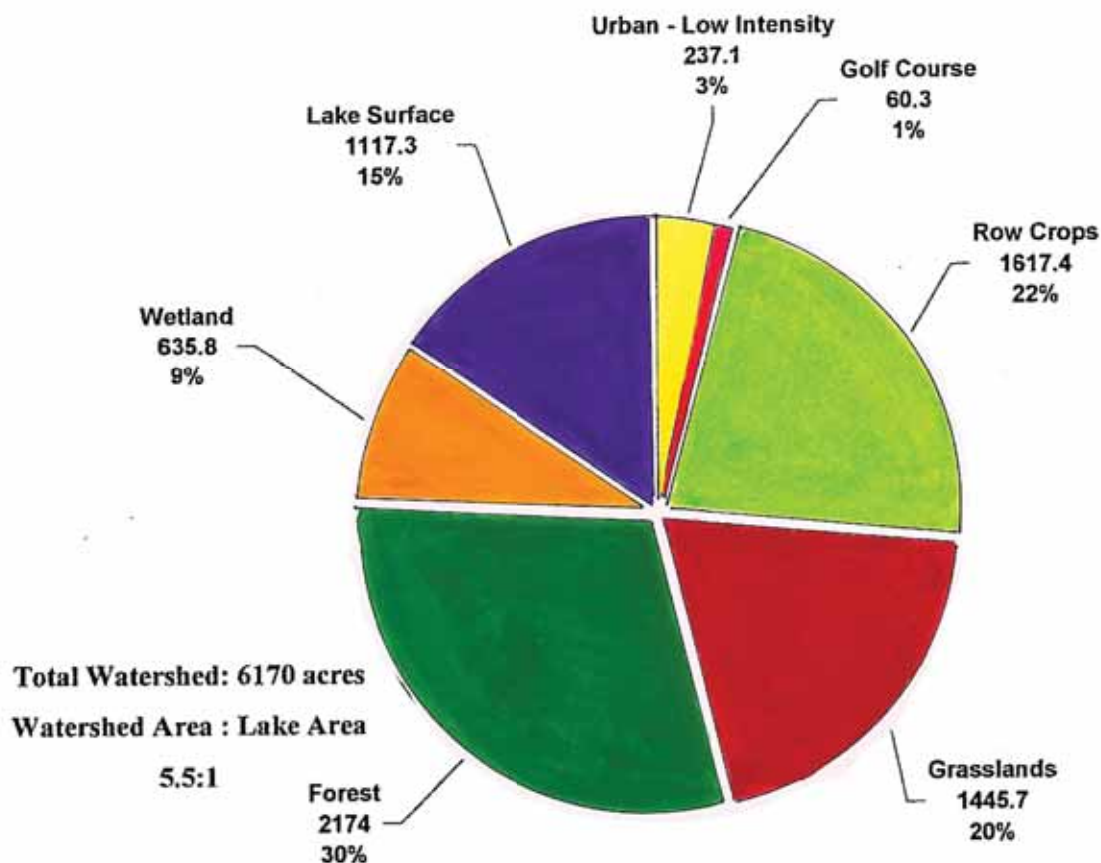


Figure 3. Land Use Classifications.

Deprivation of oxygen is common in shallow lakes similar to ours, and in other areas such as Minnesota some lakes are aerated to reduce loss of fish from winter fish kills.

HEINS CREEK

The dam at Heins Creek was built in the 1930's by state engineers to help stabilize the water level of the lake. It is a permanent non-adjustable concrete dam with a spillway 50 feet in length. A 4-inch steel pipe containing a welded metal grate 4 feet wide was attached sometime later, and supports metal mesh grids that prevent carp entering the lake from Lake Michigan. Pond level of Kangaroo Lake at the spillway is 598 feet above sea level (asl) (Geological Survey Map, 1982), and is approximately 20 feet higher than Lake Michigan at its current level of 577 feet asl. Thus, water flows down Heins Creek from Kangaroo Lake into Lake Michigan.

Depth of water at the spillway of the dam varies throughout the year. In spring, water from melting snow and rain raises the lake level several inches above the spillway (9 inches in 2008, for example) and then typically recedes throughout the summer and fall

during which times it can drop 12 inches or more below the spillway. Heins Creek ceases to flow significantly after the lake level drops below the level of the spillway. In recent years, 2005 and 2007, the water level dropped in excess of the typical level and exposed shallow shoreline areas at the south end and elsewhere around the lake, and rocky areas in the lake became more prominent.

OTHER STREAMS

A second, but minor creek drains the eastern portion of the watershed north of County Road EE (Figure 2, shown as dashed line). It may have been more significant when the lake was higher during early lake history. At present, during the spring runoff, creek water enters near the eastern edge of the north basin (the 'nose' of the Kangaroo), flows south under County Road E and then into the bayou.

Other streams drain the watershed along the eastern, southern and western shores. Water along the eastern shore of the north basin drains via an outlet into the woodland to form the swamp adjacent to County Road E near the causeway. It passes under County Road E, and then under Elm Point Road to form the stream along North Cote Drive and then flows into the lake. At the south end of the lake, water from a grassy marsh in Meridian Park flows through the wetlands adjacent to the south shore and then into the lake. These streams and other streamlets may not flow all year.

INFORMATION SOURCES

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