This study presents a model to estimate lake water temperatures using Geographical Information Systems (GIS) and Artificial Neural Network (ANN) techniques. Lake Eğirdir was selected as the case study area because it is one of the important surface water resources in Turkey. Initially, the water temperature of the lake was determined using 44 stations by in-situ measurements. The relative humidity, air temperature, air pressure, and water depth parameters were used to develop the ANN models for estimating the water temperature of Lake Eğirdir. The parameter maps were derived by using GIS techniques. The developed ANN models were very effective in the estimating of water temperature for Lake Eğirdir. The best ANN model having an $R^2$ of 0.949 and MSE of 0.075°C$^2$ is based on the input parameters of relative humidity, air pressure, and water depth. The results of the best ANN model were compared with the in-situ measurements and shows that the modeling results are compatible with the in-situ measurements of the lake water temperatures. Finally, the ANN method found was useful for estimating lake water temperature in which water temperature measurements are quite difficult, especially for large lakes, or to estimate missing water temperature data.