Droughts may be classified as meteorological, hydrological or agricultural. When meteorological drought appears in a region, agricultural and hydrological droughts follow. In this study, the standardized precipitation index (SPI) was applied for meteorological drought analysis at five stations located around the Lakes District, Turkey. Analyses were performed on 3-, 6-, 9- and 12-month-long data sets. The SPI drought classifications were modeled by artificial neural networks (ANN), which has the advantage that, in contrast to most of the time series modeling techniques, it does not require the model structure to be known \textit{a priori}. Comparison of the observed values and the modeling results shows a better agreement with SPI-12 and ANN models. While the mean square error (MSE) values varied between 0.061 and 0.153 for training stage, they varied between 0.09 and 0.147 for testing stage of SPI-12 values. Also, the highest R2 values obtained as 0.930 for training stage and 0.923 for testing stage of Sütçüler station between SPI-12 and ANN models.