A study of the lake waters of Saddleback Lake, Florida was undertaken with the goal of determining the source of elevated radium activities in the lake. Four radium isotopes, $^{226}\text{Ra}$, $^{228}\text{Ra}$, $^{223}\text{Ra}$ and $^{224}\text{Ra}$, were measured and activities of all the four radium isotopes were substantially greater in the well water used to augment the lake as compared to the lake waters. In the surface water, radium activities were highest close to the well used for augmentation in the initial sampling. Activities initially decreased with time after augmentation from the well ceased. The $^{223}\text{Ra}/^{226}\text{Ra}$ activity ratio decreased during the first month of sampling and closely followed an exponential decay curve based on the $^{223}\text{Ra}$ decay constant. Trends in the activities and the $^{223}\text{Ra}/^{226}\text{Ra}$ activity ratios support the conclusion that the well used to augment the lake was the dominant source of $^{223}\text{Ra}$ and $^{226}\text{Ra}$ to Saddleback Lake during this study. The $^{224}\text{Ra}/^{226}\text{Ra}$ activity ratio did not follow the expected trend of exponential decay based on the $^{224}\text{Ra}$ decay constant. While the augmentation well supplied some $^{224}\text{Ra}$, these results suggest that there must be an additional source of $^{224}\text{Ra}$ to the lake. The most likely additional source of $^{224}\text{Ra}$ appears to be the ingrowth of $^{224}\text{Ra}$ on the sediment within the lake from $^{228}\text{Ra}$ (via $^{228}\text{Th}$).