Evaluating dead zones, also known as hypoxic zones or regions of water lacking adequate oxygen content is of extreme importance when monitoring the health of marine ecosystems. Determining the spatiotemporal configuration and quantifying the causes of these oxygen deficient waters is crucial. A geospatial modeling approach to understanding the land-based triggers of dead zones, particularly farm practices has not been given adequate scholarly attention. By enumerating the spatial extent of dead zones and assessing the land-based causes of these regions of hypoxia, it is possible to define more efficient mitigation measures to ameliorate the health of these aquatic ecosystems. Using Sea-Viewing Wide Field of View Sensor (SeaWiFs), Moderate Resolution Imaging Spectroradiometer (MODIS), and Landsat images, coupled with geostatistical modeling techniques, this study explores the relationships between agricultural land use practices in the Mississippi River watershed and dead zone development in the Mississippi River delta at three times-steps– 2001, 2006 and 2011. To better understand the role of fertilizer runoff from the Mississippi River watershed on hypoxic zone development, a seasonal approach that examined the start and end of the growing season was undertaken. Results of the study demonstrated statistically significant positive relationships between agricultural land use practices and hypoxic zone creation. The outcome of this study is invaluable since it aids in pinpointing the major land-based causes of hypoxic zone development and will help in assisting environmental planners in developing adequate mitigation measures for dead zone remediation.