Understanding how forests respond to traditional management in the context of climate change is increasingly important for developing multi-objective management strategies. In the Missouri Ozarks, the influence of long-term forest management on climate mitigation and adaptation potential is largely unknown. Using data from two long-term thinning studies, we determined the influence of stand density on carbon dynamics and drought response in the Missouri Ozarks. First, carbon storage and sequestration rates of even-aged shortleaf pine and upland oak forests were assessed to better understand the role of manipulating stand density in mitigating climate change. Next, we developed a shortleaf pine tree ring-width chronology to determine the influence of thinning on tree-level growth response during a severe drought. Results offer valuable information to land managers regarding the effects of stand density and traditional management practices on mitigation and adaptation to climate change in the Missouri Ozarks.