



**Effects of flood control and other reservoir operations on the water quality of the lower Roanoke River, North Carolina: USGS Scientific Investigations Report 2012-5101**

*Ana Maria Garcia*

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The Roanoke River is an important natural resource for North Carolina, Virginia, and the Nation. Flood plains of the lower Roanoke River, which extend from Roanoke Rapids Dam to Batchelor Bay near Albemarle Sound, support a large and diverse population of nesting birds, waterfowl, freshwater and anadromous fish, and other wildlife, including threatened and endangered species. The flow regime of the lower Roanoke River is affected by a number of factors, including flood-management operations at the upstream John H. Kerr Dam and Reservoir. A three-dimensional, numerical water-quality model was developed to explore links between upstream flows and downstream water quality, specifically in-stream dissolved-oxygen dynamics. Calibration of the hydrodynamics and dissolved-oxygen concentrations emphasized the effect that flood-plain drainage has on water and oxygen levels, especially at locations more than 40 kilometers away from the Roanoke Rapids Dam. Model hydrodynamics were calibrated at three locations on the lower Roanoke River, yielding coefficients of determination between 0.5 and 0.9. Dissolved-oxygen concentrations were calibrated at the same sites, and coefficients of determination ranged between 0.6 and 0.8. The model has been used to quantify relations among river flow, flood-plain water level, and in-stream dissolved-oxygen concentrations in support of management of operations of the John H. Kerr Dam, which affects overall flows in the lower Roanoke River. Scenarios have been developed to mitigate the negative effects that timing, duration, and extent of flood-plain inundation may have on vegetation, wildlife, and fisheries in the lower Roanoke River corridor. Under specific scenarios, the model predicted that mean dissolved-oxygen concentrations could be increased by 15 percent by flow-release schedules that minimize the drainage of anoxic flood-plain waters. The model provides a tool for water-quality managers that can help identify options that improve water quality and protect the aquatic habitat of the Roanoke River.

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