ASSESSING THE RELATIONSHIP BETWEEN FORESTS AND WATER IN THE HIGH ROCK LAKE WATERSHED OF NORTH CAROLINA

Tom A. Gerow, Jr., David G. Jones, and Wenwu Tang[1]

Forests are recognized as a priority source of relatively high quality and reliable water, be it for human use or ecological function. The High Rock Lake watershed straddles the piedmont and foothill regions of North Carolina, and a Total Maximum Daily Load (TMDL) restoration plan is being developed for the reservoir. The findings of the study should add to the body of knowledge regarding how forests can be a solution for protecting water resources, and may help to reduce the costs of treating public water supplies. Seventy-one datasets obtained over five years of benthic macroinvertebrates sampling within the watershed were analyzed, and used as a proxy for determining overall water quality. Estimates of the costs to treat water, and water quality grab sample data from thirteen public water systems in the watershed were also obtained and analyzed. Finally, a method was developed for conducting a GIS-based stream buffer land cover assessment, in an effort to localize the findings of the study and identify potential land parcels where forestry-related conservation practices may improve watershed health, function, or quality. This study identified a correlation between the extent of forest cover, and effects of other land cover types, with the quality of water for ecological function as well as the relative cost to treat public water supplies. When evaluating aquatic life Biotic Index and EPT Taxa Richness, better results were observed in those subwatersheds where the forest cover was approximately 37 to 48 percent (or more) of the land use/land cover; and where natural cover was approximately 50 percent (or more) of the land use/land cover. Conversely, when urbanized or developed land cover exceeded approximately 20 percent, the measures for aquatic life worsened. These overall trends identified that the percent forest or natural cover can be a corollary indicator of the general quality of water, and that in this study area, better water quality was associated with those subwatersheds that were predominantly forested. Another aspect of this study examined the quality of water samples taken at multiple water supply intakes and associated cost estimates for treating the water for human use. A general trend was observed that indicated costs to treat the water were lower when the contributing watershed consisted of approximately 70 percent (or more) forest cover. Alternatively, higher costs to treat water occurred with increased turbidity, and turbidity was found to be higher when the amount of forest cover fell below 60 to 70 percent of the watershed's total land cover. An analysis was conducted of land cover / land use for each of the 127 subwatersheds (12-digit HUC) within the High Rock Lake watershed, to categorize each subwatershed in accordance with the identified "Forest Cover Model" thresholds related to forest cover and water quality, (i.e., forest cover is below 37 percent; or forest cover is between 37 and 48 percent; or forest cover exceeds 48 percent.) The map generated from this analysis quickly identifies forest cover in relative terms, which can also be used to correlate the anticipated quality of water originating from each subwatershed. With this information, end users can quickly identify where in the watershed different approaches in deploying forest and land management best management practices (BMPs) may be appropriate, to sustain quality water resources, given the relative amount of forest cover in the subwatershed. In addition, a closer examination was made to evaluate the stream buffer structure and land cover within select subwatersheds to identify streams that could potentially benefit from forestry related conservation measures, with the presumption that improvements to its riparian buffer should translate to improvements to the stream itself. This High Rock Lake watershed assessment study was conducted by faculty, staff, and students of the Center for Applied GIS Science at the University of North Carolina at Charlotte, with funding and project oversight provided by staff of the North Carolina Forest Service, via grants from the USDA Forest Service and the USEPA.

[1]Tom A. Gerow, Jr., Staff Forester for BMPs, North Carolina Forest Service, Raleigh, NC 27699
David G. Jones, Head of Geospatial Services Branch, North Carolina Forest Service, Raleigh, NC 27699
Wenwu Tang, Assistant Professor and Interim Executive Director, Center for Applied GIS Science, University of North Carolina at Charlotte, Charlotte, NC 28223

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