Science & Technical Advisory Committee
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Management Effectiveness and Efficiency:
Assessment of Current Restoration Investments in the APNEP Region: Do Existing Ground-Water Quality Standards Really Protect Water Quality?

Position: The STAC encourages establishment of watershed-specific ground-water standards which consider the effects of downstream loading and pumping withdrawal to protect surface-water quality for aquatic and terrestrial life, not just human health.

Supporting Statement: Eutrophication of the estuaries and sounds by nutrient enrichment of the Albemarle-Pamlico region from both point and nonpoint sources, particularly of nitrogen, is a major problem. Federal and state water-quality standards developed to protect ground-water resources in North Carolina (USEPA 2004; NCDENR 2005) are based upon human-health considerations for the use of ground-water as a source of public drinking water, and not on the potential effects that ground water discharging to a stream could have on aquatic life. Although ground water in an aquifer may contain chemical constituents at concentrations that meet water-quality standards based on human health, the cumulative mass of a given constituent, such as nitrate, discharged to a receiving stream is a quantity sufficient to have a deleterious effect on downstream water quality and aquatic life, particularly in the most downstream portions, the estuaries and sounds.

For example, Bear Creek in Lenoir County, North Carolina, considered a biologically healthy stream by current standards (Neuse River Basin Plan 2002), has a median nitrate concentration of about 3 mg/L, mostly derived from ground-water baseflow. This concentration is considerably less than the federal MCL and state drinking water standard of 10 mg/L (U.S. Environmental Protection Agency, 2003). Yet, the nitrogen yield of more than 3 ton/mi^2 from Bear Creek to the Nutrient Sensitive Waters of the Neuse River is more than twice the yield measured in most other tributary streams, and is 5% of the total load delivered to the estuary by Neuse River, even though the stream drains only about 58 square miles.

Existing nitrate ground-water standards do not protect aquatic life or prevent eutrophication in the downstream estuaries and sounds, because they are based primarily on biological integrity of the immediate receiving stream and not on cumulative loading effects in the estuary. In addition, ground-water standards for other chemical constituents, such as sodium and chloride, which are based primarily on aesthetic quality, will not protect terrestrial plants. As cities with increasing water demand draw from surficial aquifers near coastal areas, they may draw in salt water, which can be treated by ion exchange adequately for human consumption. However, as salt water is drawn into the well field, rooted vegetation that is not salt tolerant is likely to die.

Loading is managed through the TMDL process. Quantitative control is on point sources through the NPDES program, whereas NPS loads are managed by expecting decreases through voluntary use of best management practices (BMPs). Water quality data are available for major drainages in several river basins in the Albemarle-Pamlico region and may be adequate to explicitly estimate nonpoint source contributions from ground water draining agricultural and urban lands. Discussions between surface-water and ground-water entities, both State and Federal, should result in more meaningful ground-water standards that protect both human health and aquatic/terrestrial life.

References

North Carolina Division of Water Quality. 2002. Neuse River Basinwide Water Quality Plan: North Carolina Department of Natural Resources and Environment Division of Water Quality, 210 p.

North Carolina Department of Environment and Natural Resources. 2005. Classifications and water quality standards applicable to the groundwaters of North Carolina: Environmental Management Commission, Administrative Code, Title 15A, Subchapter 2L, Section .0200.

U.S. Environmental Protection Agency. 2003. National Primary Drinking Water Standards, EPA 816-F-03-016.

U.S. Environmental Protection Agency. 2004. Safe Drinking Water Act 30th anniversary, understanding the Safe Drinking Water Act, EPA 816-F-04-030, accessed March 2, 2007 at http://www.epa.gov/safewater/sdwa/30th/factsheets/understand.html