Using National Trends Network Data to Assess Nitrogen Deposition in a Near-Coastal Environment: Marine Corp Base Camp Lejeune (MCBCL), Jacksonville, NC

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Long-term sustainability of our nation's military training bases is of critical importance to national security. Presented here are the results of a now concluded multi-year effort to assess and quantify the degree of atmospheric loading of nitrogen (N) and other nutrients arising from wet and dry deposition to the aquatic and terrestrial ecosystems at MCBCL. One question to be addressed by this research was whether National Trends Network data available from nearby collector NC29 at the Hofmann Forest, Onslow Co., NC was sufficient to allow modeling of historic and current trends in N deposition, in order to support development of conceptual/mechanistic ecological models that will lead to effective management for the long-term sustainability of military training. Four battery-powered approved Mercury Deposition Network (MDN) collectors located across MCBCL were used to determine the weekly composition of rainfall from July 2009 – June 2011. Spatial patterns in weekly rainfall amounts were determined using manual rain gauges and tipping-bucket gauges. Both annual (2010) and seasonal data were comparable for inorganic N deposition between MCBCL and the 9-year average values derived from the NC29 dataset (2003 – 2011). However, significant amounts of organic-N in wet deposition (total N minus inorganic N) were present during all seasons of the year, ranging from ~20% in Summer to ~40% in Winter of total N deposition. Reliance on NTN data alone underestimated total N deposition by ~ 1 kg N ha^{-1} yr^{-1}. Seasonal differences in NH_4^+-N were evident between the datasets, perhaps due in part to the use of thymol as a preservative. Seasonal differences in SO_4^{2-} deposition were also noted, with substantially more SO_4^{2-} being recorded during the Summer of 2010 by NTN NC29 than at MCBCL. No readily apparent gradient in N deposition was detected moving inland across MCBCL, thus the results from the 4 MDN collectors were combined to produce an uncertainty estimate. Average annual (2010) wet deposition of total N was 4.3+/-0.7 kg N ha^{-1} yr^{-1}, and for inorganic N was 3.2+/-0.4 kg N ha^{-1} yr^{-1}. As expected, a definite gradient in wet deposition of Cl^- and Na^+ existed moving inland. Reliance on NTN NC29 data alone would underestimate Cl^- and Na^+ inputs, both on an annual basis, and especially across seasons of the year. The overall agreement between measured amounts of the wet deposition of inorganic N by this project to the nearby NTN collector NC29 indicates that the amount of atmospheric loading of inorganic N to MCBCL has been relatively constant for at least the past 10 years.

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