

Self-Published, 2026, 1–1

Advance Access Publication Date: 19 February 2026

Original Article, Submitted for Publishing

Evaluating Novel Stream Influence on Nitrate, Nitrite, and Ammonia Concentrations within the Potomac River

Ryan S. Nisay^{1,*}, Christian S. Shire² and Carter Lepuil³

^{1, 2, 3}Research Division, Loudoun Nature Conservation Project, 20166, VA, USA, ¹Cornell University, 14850, VA, USA, ²Gannon University, 16541, PA, USA and ³Boston Conservatory at Berklee, 02215, MA, USA

*Corresponding author. ryan.nisay@loudounnatureconservation.org

Abstract

Nutrient enrichment remains a persistent driver of water quality impairment throughout the Potomac River and Chesapeake Bay watershed, motivating the implementation of localized stream restoration projects designed to reduce downstream nitrogen transport. This study assessed spatial patterns in dissolved inorganic nitrogen along a newly constructed stream corridor between River Bend Middle School and Potomac Falls High School in Loudoun County, Virginia. Five monitoring sites were established along a longitudinal gradient, including an upstream control (Site A), three locations within the restored reach (Sites B–D), and a downstream site (Site E). Water samples were collected twice daily over three weeks and analyzed for nitrate (NO_3^-), nitrite (NO_2^-), and ammonium (NH_4^+) using electronic probes and colorimetric methods, along with supporting physicochemical parameters. Nitrate concentrations were consistently highest at the upstream control. They declined across the restored reach, while concurrent variability in nitrite and ammonium concentrations indicated active nitrogen cycling rather than conservative transport. These longitudinal trends are consistent with in-stream biogeochemical processing, including potential nitrification and denitrification within the constructed corridor. Although causal mechanisms cannot be directly confirmed, the observed patterns suggest that the restoration reaches functions as a reactive nitrogen-processing zone capable of altering nutrient speciation prior to downstream export. This work provides field-based baseline data on nitrogen dynamics within a suburban restoration project and highlights the potential role of small-scale stream interventions in watershed-scale nutrient management.

Key words: dissolved inorganic nitrogen, stream restoration, nitrate attenuation, denitrification, suburban watershed, Potomac River, nutrient cycling