Agriculture and future riverine nitrogen export to US coastal regions: Insights from the Nutrient Export from WaterSheds Model

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We examine contemporary (2000) and future (2030) estimates of coastal N loads in the continental US by the Nutrient Export from WaterSheds (NEWS) model. Future estimates are based on Millennium Ecosystem Assessment (MEA) scenarios and two additional scenarios that reflect "business as usual" and "ambitious" approaches to nutrient management. Fertilizer recovery efficiencies (as percent of N-inputs recovered in aboveground plant biomass) are 48%, 48%, 57-63%, and 70% for year 2000 conditions, "ambitious", MEA, and "business as usual" scenarios, respectively. Modeled total dissolved nitrogen (TDN) export is 2.1 Tg N y^{-1} in 2000 and ranges from 1.4-2.5 Tg N y^{-1} in 2030, depending on scenario. Agriculture is the largest source of coastal TDN, representing 32-51% of riverine export. Other sources of TDN include atmospheric N deposition (7-10% of total, depending on scenario), human sewage (9-14%), and N-fixation on non-agricultural land (28-50%). Our analysis suggests that reducing coastal N loads will require aggressive management action to control agricultural N. Under "business as

usual" approaches, population-driven increases in crop production increase coastal N loads by 20% (to 2.5 Tg N y^{-1}). Under MEA scenarios, moderate improvements in fertilizer recovery efficiency result in coastal N loads that are relatively unchanged from 2000 (2-2.1 Tg N y^{-1}) despite population growth. In the "ambitious" scenario, coastal N loads decrease 33% in 2030 (to 1.4 Tg N y^{-1}). Fertilizer recovery efficiencies reflected in the MEA and "ambitious" scenarios have not yet been achieved on production scales. Without widespread improvement in agricultural N management, N-induced coastal eutrophication will continue to be a problem for many US coastal areas.

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