

## Erosion and Deposition of Terrestrial Soil Supplies Nutrients to Estuaries and Coastal Bays: A Flood Simulation Study of Sediment-Nutrient Flux

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**Abstract :** Estuaries and coastal bays can receive large quantities of sediment from surrounding catchments during flooding or high flow periods. Large river systems that feed freshwater into estuaries can flow through several catchments of varying geology. Human modification of catchments for agriculture, industry and urban use can contaminate soils with excess nutrients, trace metals and other pollutants. Land clearing, especially clearing of riparian vegetation, can accelerate erosion, mobilising, transporting and depositing soil particles into rivers, estuaries and coastal bays. In this study, a flood simulation experiment was used to study the flux of nutrients between soil particles and water during this erosion, transport and deposition process. Granite, sedimentary and basalt surface soils (as well as sub-soils of granite and sedimentary) were collected from eroding areas surrounding the Brisbane River, Australia. The <63 µm size fraction of each soil type was tumbled in freshwater for 3 days, to simulation flood erosion and transport, followed by stationary exposure to seawater for 4 weeks, to simulate deposition into estuaries. Filtered water samples were taken at multiple time points throughout the experiment and analysed for water nutrient concentrations. The highest rates of nutrient release occurred during the first hour of exposure to freshwater and seawater, indicating a chemical reaction with seawater that may act to release some nutrient particles that remain bound to the soil during turbulent freshwater transport. Although released at a slower rate than the first hour, all of the surface soil types showed continual ammonia, nitrite and nitrate release over the 4-week seawater exposure, suggesting that these soils may provide ongoing supply of these nutrients to estuarine waters after deposition. Basalt surface soil released the highest concentrations of phosphates and dissolved organic phosphorus. Basalt soils are found in much of the agricultural land surrounding the Brisbane River and contributed largely to the 2011 Brisbane River flood plume deposit in Moreton Bay, suggesting these soils may be a source of phosphate enrichment in the bay. The results of this study suggest that erosion of catchment soils during storm and flood events may be a source of nutrient supply in receiving waterways, both freshwater and marine, and that the amount of nutrient release following these events may be affected by the type of soil deposited. For example, flooding in different catchments of a river system over time may result in different algal and food web responses in receiving estuaries.

**Keywords :** flood, nitrogen, nutrient, phosphorus, sediment, soil

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