Atmospheric deposition of sulfuric and nitric acids is thought to contribute to the recent acidification of soils and surface waters in Europe and North America (Galloway et al., 1983; van Breemen et al., 1984). The acid/base status of soil and drainage water is regulated by a series of processes which either produce or consume acid neutralizing capacity (ANC; van Breemen et al., 1983; Gherini et al., 1985; Reuss & Johnson, 1985; Cosby et al., 1985a,b). Biogeochemical processes such as cation exchange, anion adsorption, weathering, as well as assimilatory and disassimilatory reduction reactions all increase ANC and pH of drainage water by the release of basic cations (Ca\(^{2+}\), Mg\(^{2+}\), Na\(^{+}\), K\(^{+}\)) or retention of strong acid anions (SO\(_4^{2-}\), NO\(_3^{-}\), Cl\(^{-}\)). Watersheds that release low concentrations of Ca\(^{2+}\) and exhibit conservative transport of Ca\(^{2+}\) are particularly sensitive to strong acid inputs and may export high concentrations of acidic cations (H\(^{+}\), Al\(^{3+}\)) in drainage waters (Driscoll & Newton, 1985; Cronan & Schofield, 1990).

Elevated concentrations of Al are significant because Al: (i) is an important pH buffer in acidic waters (Driscoll & Bisogni, 1984), (ii) may alter the cycling of important nutrients such as P and dissolved organic carbon (DOC) through adsorption or direct precipitation reactions (Dickson, 1978), (iii) may serve as a coagulant in lake ecosystems resulting in increases in transparency and decreases in thermal stratification (Effler et al., 1985), and (iv) is potentially toxic to aquatic organisms (Schofield & Trojnar, 1980; Baker & Schofield, 1982; Hall et al.,...