liming conducted in Sweden. Agricultural lime (i.e., powdered $CaCO_3$) is generally transported to the watershed in large trucks and applied as a slurry with a sprayer truck. The $CaCo_3$ dose required to achieve adequate neutralization of watershed systems is generally two orders of magnitude greater than that of direct water addition which is due to the many base consuming processes that occur within the forest soil systems (Bengtsson et al. 1980). There have been application rates reported in the range of 5,000-7,000 kg $CaCO_3$/ha.yr. Hultberg and Andersson (1982) reported that some damage to the terrestrial environment may be associated with liming. Sphagnum moss was severely damaged with $CaCO_3$ addition. Damage to lichens, mosses and spruce needles was also observed.

Smelters at Sudbury, Ontario, represent the greatest single source of sulphur dioxide emission in the world. Over the past several years, a terrestrial liming/reclamation program has been operated (Fraser et al. 1982). The affected lands have a pH of approximately 4.0 and concentrations of copper and nickel were measured up to 10 ppm. To reclaim this land, crushed agricultural limestone is applied at a rate of 12.4 short tons/ha, then fertilized with a nitrogen-phosphorus-potash mixture (6-24-24, respectively), and seeded with a variety of blended grasses. The limestone application is labor intensive with 400 students adding the limestone by hand. Over 1000 hectares have been reclaimed to date. According to the authors, this terrestrial liming project has been extremely successful in raising the pH of the soil and complexing the heavy metals (although there is still some minor nickel toxicity). The authors report that grass is now able to grow on barren areas and the resultant shading and lowering of ground temperature has enabled some natural vegetation (e.g., quaking aspen seedlings) to become reestablished. The newly established vegetation is monitored and analyzed, as is the recovery of populations of insects, birds, and small mammals.

Limited information is available on the changes to terrestrial flora and fauna after the addition of lime to forested soils. Tamm (1976) stated that when lime was added to forest soils in small-scale experiments, tree growth rates typically was not enhanced, because of the tendency of lime to immobilize the nitrogen in organic matter and thereby reduce its availability to trees. Fraser et al. (1982) report that lime had little effect on the growth of forest trees, based on preliminary conclusions from forest liming studies conducted in Sweden from 1971 to 1978. Abrahamsen et al. (1980) reported that soil animal populations nearly always fail to increase when soil acidity was reduced by liming. Hultberg and Andersson (1982) report that the liming of watersheds in addition to lakes and streams would release additional phosphorous to the waterbodies and enable these aquatic systems to increase their primary productivity.