

Response of high nitrogen-loaded forest ecosystem to decreasing atmospheric nitrogen deposition: a review

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Abstract: 【Objective】 Atmospheric nitrogen (N) deposition is a global threat to biodiversity and ecosystem function. Since emission controls, N deposition has decreased or stabilized in European and North America, and China began to be stabilized in 2010. The future trajectory of N deposition may differ by regions. 【Method】 In this study, literature retrieval and extensive analytic methods were used to analyze N deposition recovery. The reaction of the forest ecosystem's soil (acidification and solution chemistry), structure (vegetation-microbial diversity), and function (productivity and carbon sequestration) to decreasing N deposition was studied. 【Result】 Soil solution chemistry (e.g., nitrate and ammonium concentrations, etc.) may responded very rapidly to reducing N input, whereas plant species composition, soil microbial communities, and soil processes may be slow in recovery. When N deposition is controlled, soil acidification can be reduced, and tree growth can be promoted. It is also possible that the vitality of plant may still deteriorating and soil acidity persists due to high rate of atmospheric N deposition. Restoration of plant diversity may face potential barriers to recovery and maintain eutrophication in the short term, but it supports the rise of species in a nutrient-poor. The response of forest ecosystem restoration to emission reduction strategies is delayed. The legacy of earlier N deposition result in a slow recovery, but recovery is simply a matter of time. 【Conclusion】 Therefore, recovery from high N loads is a long and sluggish process, and further emission reduction efforts is still needed in the future.

Key words: decreasing nitrogen deposition; high nitrogen loads; forest ecosystem; forest recovery; soil acidification; biodiversity

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