Effects of nitrogen-saturated forests on downstream water quality in Fukuoka City

SHINOZUKA, Kenichi¹; CHIWA, Masaaki¹; TAYASU, Ichiro²; YOSHIMIZU, Chikage²; KUME, Atsushi¹

¹Department of Agro-environmental Sciences, Faculty of Agriculture, Kyushu University, ²Research Institute for Humanity and Nature

Nitrogen is often limiting nutrient for plant growth and is mainly supplied from atmosphere. Forests can act as a filter for atmospherically deposited nitrogen and maintain background concentration levels of nitrogen in streams. However, recent increases in atmospheric nitrogen deposition have resulted in a shift from net-nitrogen retention to high levels of net-nitrogen loss from forested, resulting in high nitrogen concentration stream water.

In the Tatara River Basin, Fukuoka City, nitrogen retention capacity of upland forests has decreased and nitrate concentrations in downstream water have been increasing (Chiwa et al., 2012). This study analyzed NO₃⁻-δ¹⁵N, NO₃⁻-δ¹⁸O in addition to NO₃⁻ concentrations in stream water in the Tatara River Basin to assess the impact of nitrogen saturation forest on downstream water quality.

In northern part of the basin, NO₃⁻ concentrations of upstream were lower than downstream. In contrast, in southern part of the basin, NO₃⁻ concentrations in upstream were lower than downstream. NO₃⁻-δ¹⁵N in upstream was significantly lower than downstream in both northern and southern parts of the basin. In contrast, little difference of NO₃⁻-δ¹⁸O was observed between upstream and downstream in both parts. It has been known that the value of δ¹⁵N and δ¹⁸O ratio due to human wastewater is 10 to 20 ̄ and -5 to 7 ̄, respectively (Kendall and others, 1995). Therefore, the different trends in NO₃⁻ concentrations from upstream to downstream between two parts could be caused by different amounts of human sewage to the downstream between two parts.

Keywords: nitrogen saturation, stream water quality, nitrogen isotope, land use