

Development of a new system for measurement of total effluent load of water quality

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ABSTRACT

Sustainable use of water resource and conservation of water quality are essential problems in the world. Especially, problems of water quality are serious one for human health as well as ecological system of all creatures on the earth. Recently, the importance of total effluent load as well as the concentrations of pollutant materials has been recognized not only for the conservation of water quality but also for sustainable water use in watersheds. However, the measurement or estimation of total effluent load from non-point source area such as farm lands or forests may be more difficult because both of concentration and discharge of the water are greatly changed depending on various factors especially metrological conditions such as rainfall, while the measurement from a point source area may be easy because the concentration of pollutant materials and amount of discharge water are relatively steady. Therefore, the total effluent load from a non-point source is often estimated by statistical relationships between concentration and discharge, which is called as L-Q equation. However, a lot of work and time are required to collect and analyze water samples and to get the accurate relationship or regressive equation. So, we proposed a new system for direct measurement of total effluent load of water quality from non-point source areas to solve the problem.

In this system, the overflow depth at a hydraulic weir is measured with a pressure gage every hourly interval to calculate the amount of hourly discharge at first. Then, the operating time of a small electric pump to collect an amount of water which is proportional to the discharge is calculated to intake the water into a storage tank. The stored water is taken out a few days later in a case of storm event or several weeks later in a case of non-rainfall event and the concentrations of water quality such as total nitrogen and phosphorous are analyzed in a laboratory. Finally, total load of the water quality can be calculated by multiplying the concentration by the total volume of discharge.

The system was installed in a small experimental forestry watershed to check the performance and know the total load of water quality from the forest. It was found that the system to collect a proportional amount of water to actual discharge operated perfectly and a total load of water quality was analyzed accurately. As the result, it was expected that the system will be very available to know the total load from a non-point source area.

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