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Dynamic Variations of Conductivity, Suspended Solids, and Trophic Parameters In a Lentic System Influenced by two Different Serial Impoundments

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This study demonstrates seasonal, interannual, and in-site dynamics of conductivity, nutrients, chlorophyll-a, light regime in Euim Reservoir using a long-term data set from 1993 to 2000. Concentrations of TN and TP averaged 1.602 mg/L (0.031 - 4.171mg/L) and 53 μ g/L (2 - 604 μ g/L), respectively. When we considered a mean ratio of TN:TP ($n = 287$) for the judgement of nutrient limitation, phosphorus was a potential limiting element for phytoplankton growth, based on the criteria of Forsberg and Ryding (1980). Absolute phosphorus concentration, however, was high compared to other systems. Long-term trend of $\text{NO}_3\text{-N}$, TN, and conductivity showed a distinct increasing phase over the eight year period, but the trends of increasing or decreasing in the TP and Chl-a were not clear. Seasonal values, based on trophic variables, TSS, and conductivity indicated that large variation mainly occurred during the period of April - November. Comparisons of water quality among three sites showed that water quality condition was S2, S1, and S3 in good order. High nutrients in the S3 seem to be influenced by nutrient rich meta or hypolimnetic discharges from Lake Soyang within the southern Han-River watershed, whereas low nutrients in the S2 was believed due to surface outflow from the Lake Cheonchon within the northern watershed. Regression analyses of \log_{10} -transformed Chl-a against TP (R^2 values < 0.14) showed that in-reservoir algal biomass was not closely related to flux of phosphorus in this system during premonsoon, monsoon, and postmonsoon periods. The low determination coefficients were probably due to a short hydraulic residence time and high inorganic solids. Trophic state, based on the criteria of TSI (TP), was eutrophic except for a short period in the S2. Trophic state of TSI (Chl-a), however, was oligotrophic in the locations of S2 and S3 and eutrophic in the S1 location. Two dimensional graphical approach of TSI (Carlson, 1993; Havens, 1999) showed that most values of TSI (Chl) - TSI (TP) and TSI (Chl) - TSI (SD), based on the eight-year study, were less than zero at the location of S1 and this pattern was similar in the remaining sites of S2 and S3, indicating a trophic state deviation in the entire reservoir. Therefore, factors other than phosphorus limited algal biomass (Chl - TP < 0), and that non-algal particles dominated light attenuation (Chl - SD < 0). This result suggests that mineral particles and short hydraulic residence time are the primary factor for phytoplankton growth under the high nutrients.

Key words : trophic state, long-term water quality, reservoir, TSI