River Water Quality Grading and Water Pollution Assessment Based on Statistical Techniques

KANG YOUNG JUNG[*1], KANG YOUNG JUNG[1], YEONG JAE LEE[1], DON WOO HA[1], JONG HUN BAEK[1], EUN HYE NA[1], KYUNGHYUN KIM[2]

[1]National Institute of Environmental Research Yeongsan River Environment Research Center, [2]National Instiute of Environmental Research Watershed Pollution Load Management Research Division

(a) Purpose of study or research hypothesis

A plan for improving the water quality and aquatic ecosystem of the mainstream must comprehensively consider and diagnose the tributaries that comprise it as their water quality must first improve for mainstream water quality management. This study provides a systematic framework for tributary water quality management by developing a grading system to set priorities among polluted tributaries and suggesting an effective way for water pollution assessment by applying various statistical techniques.

(b) Key issue(s) or problem(s) addressed

Efforts to improve mainstream water quality have been limited by increasing point pollution sources as well as nonpoint sources such as cattle manure and agriculture. Pollution from waste incineration, household wastewater, and manure application worsens daily in upstream ditches, tributaries, and branches, which flow into the mainstream. Systematic and focused water quality and aquatic ecosystem management based on monitoring tributary discharge is therefore necessary.

(c) Methodology or approach used

Tributary water quality influencing variables (e.g., discharge, water quality, pollution loads, and land use levels) were selected as assessment items based on tributary water quality and discharge data. Tributary water quality was graded to set priorities by scoring various assessment outcomes with multivariate statistical analysis, land use analysis, estimation of contributions to pollution, and water quality load density analysis. Water pollution assessment was conducted on weekly discharge data for priority tributaries through water quality trend analysis, principal component analysis (PCA) ordinations, and load duration curve (LDC).

(d) Results or conclusions derived from the project

Tributaries with higher pollutant concentrations were classified as those of improvement priorities. Methods for improving water quality, such as strengthening requirements for discharged wastewater treatment water quality during the dry season, establishing artificial wetlands to mitigate pollution in the high discharge area during the flood season from June to August, and minimizing pollutant inflow to the river basin through low impact farming and soil erosion programs, were identified based on statistical analyses and the LDC-based water pollution analysis.

(e) Implications of the project relevant to congress themes

A statistical grading approach would be effective for prioritizing tributaries for water quality management. Using a water pollution assessment derived from statistical techniques and the water quality measurement network, highly pollutant tributaries selected by this method may provide useful technical

information and support policies to prevent tributary pollution.

Keywords : **Statistical analysis, Load duration curve(LDC), Tributaries, Improving water quality, Grade Classification, Environmental water**