**GLEON 11 General Research and Cool Things Poster Abstracts**

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Prolific Ecology of Nainital- The Lake City in the Middle Himalayas, India

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*Nainital* Lake, a natural freshwater body, situated amidst the township of *Nainital* in Uttarakhand State of India. The site is tectonic in origin; crescent shaped and has an outfall at the southeastern edge. *Nainital* Lake is one of the four Lakes of *Kumaon* hills; the other three lakes are the *Sattal* Lake, the *Bhimtal* Lake and the *Naukuchiyatal* Lake. The lake is bounded by the high and steep mountain peaks in the middle Himalayan ranges up to 2,000 m. Coniferous forest trees with typical temperate climate plants cover these hill ranges. Tropical monsoon climate with maximum temperature 24.6°C and minimum of 0.5°C are recorded. The annual rainfall in the basin area of the lake is reported to be 1294.5 mm. As far as for biodiversity is concerned several species of flora and fauna (aquatic and terrestrial), and macrophytes. *Nainital* is the home of large number of species of medicinal flora and horticulture plants. A good number of species of fishes, birds and mammals have also been reported. A scientific study indicates that the open drains feeding the lake introduce toxic substances from the catchment of the lake, particularly heavy metals which get adsorbed onto the suspended sediments. The lake is eutrophic to high nutrient accumulation and growth of phytoplankton. Algal blooms had caused loss of transparency. High Siltation resulting in reduction of lake depth. Clogging of water channels (drains) in the surrounding hills because of encroachment, leading to poor drainage and landslides from the unstable hill slopes draining in to the lake. Inadequate sanitation facilities for the poor section of society, commuters and tourists. The site region has good potential for ecotourism activities by encouraging the ecological awareness among the local communities and visitors.

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Phytoplankton variation as water quality indicator: the case of shallow Chochico Lake

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We evaluated the current trophic state of the shallow lake “Cochicó” by analyzing physicochemical, biological and environmental variables related to water quality. Water samples were collected once a month at two sampling sites, from October 2004 to December 2006. During this study, 36 phytoplankton species were identified. The phytoplankton abundance was maximal in January 2005 (420500 cells $ml^{-1}$) and minimal

in October 2004 (50000 cells $ml^{-1}$). Within the class of Cianophyceae, two species (*Microcystis aeruginosa* and *Microcystis spurea)* were responsible for the high phytoplankton cell density (97%) and for an intense green color of water in summer. The algal bloom was characterized by an average density of 560000 cells $ml^{-1}$, and chlorophyll concentration increased from 40 mg $m^{-3}$ (October 2004) to 89 mg $m^{-3}$ (January 2005). Nutrients showed high concentration values (N: 15 mg $l^{-1}$), which could be attributed to various non-point sources. Margalef index indicated a decline in diversity and the Shannon & Weaner biotic index indicated strongly eutrophic waters, with the exception of the samples obtained in October, which corresponded to moderately polluted waters. Based on our results, Cochicó shallow lake was classified as hypertrophic.

key words: shallow lake, water quality, Cochicó, phytoplankton, trophic state.

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Monitoring of water quality and biota for the assessment of ecological health in Korean reservoirs

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The management of aquatic ecosystems in freshwater bodies has been focusing mainly on sewage treatment facilities and the control of BOD in Korea. However, the paradigm of ecosystem management is being expanded to include ecological integrity of aquatic biota in addition to water quality.Korean Ministry of Environment recently launched projects to develop assessment systems of ecological health in lotic and lentic fresh water habitats. Because of few natural lakes in Korea, most of study related with lentic habitats focused on reservoirs. Recent approaches to develop ecological health assessment systems are discussed in this paper.

Based on analyzing data surveyed more than 500 reservoirs, the lake water quality index(LQI) representing Korean reservoirs was developed. The LQI developed by artificial reservoirs was better adapted than trophic state indices developed for natural lakes. In order to develop quantitative indices of biological integrity in reservoirs, biotic and abiotic habitat surveys are being conducted; phytoplankton, zooplankton, benthos, fish, littoral vegetation, and morphological characteristics.

As the first step to normalize survey methods, sampling methods and gears are compared for fish, macrophytes, and benthic macroinvertebrates. Despite the importance of lentic system as water resources, recreation, and biological integrity, no appropriate tools for assessing health condition in lakes and reservoirs were developed. To make lake assessment system in Korea, we have classified lake type based on morphological and hydrological information. To verify sampling efficiency in lentic ecosystem, environmental surveys were intensively conducted. Multimetric system

adapted for Korean lakes and reservoirs were developed for biotic assessment. Final goal of this project is to make an integrated index representing ecological health condition of lentic ecosystems in Korea.

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Coupled catchment and lake modelling to assess the management of water quality for Lake Rotorua

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Lake Rotorua is a large (80.8 $km^2$) polymictic lake in the central North Island, and has been subject to increasing nutrient concentrations and frequent algal blooms over recent decades. Catchment and in-lake management options for water quality are currently being considered, with the aim of reducing the frequency and intensity of algal blooms, and lowering the Trophic Level Index (TLI) from 4.6 to 4.2. The coupled hydrodynamic-ecological model DYRESM-CAEDYM was used to simulate the lake ecosystem over six decades within the period 1920 – 2100. Meteorological data included historic data along with forecast simulations based on IPCC climate change predictions and downscaling with the model DARLAM. Nitrogen inputs from stream inflows were derived from the Rotorua Taupo Nitrogen Model (ROTAN, NIWA) for three land-use scenarios, including "business as usual" and two levels of dairy conversion within the catchment. Two scenarios of management of bottom sediments using a phosphorus inactivation agent were also simulated, with associated efficacies of 25% and 75% reduction of internal phosphorus loading. We found that catchment management would prevent an increase in TLI over coming decades. However, drastic sediment management would be required to achieve the target TLI in the short to medium term. The coupling of these models provides an excellent tool with which to gain insight into possible results of lake management actions.