ENVIRONMENTAL QUALITY

Chair: Peter Hippensteel
Department of Biology
Tri-State University
Angola, Indiana 46703 (219) 665-3141 ext. 276

Chair-Elect: Jack Leonard
ICFAR
611 N. Capitol
Indianapolis, Indiana 46204 (317) 262-5026

ABSTRACTS

Background Levels of Potential Toxicants in Indiana Stream and Lake Sediments. Greg R. Bright. Indiana Department of Environmental Management, Indianapolis, Indiana 46241.——Sediment monitoring is becoming increasingly important as a tool for detecting loadings of potentially toxic materials in streams and lakes. To determine whether loadings are occurring, the evaluator needs to know what the natural or "background" concentrations are. Sediment data gathered by various government agencies, universities and consultants from "background" locations (no known point sources of pollution) from across the state were assembled and computerized. Mean concentrations, range of concentrations, and standard deviations were tabulated for 21 inorganic and 13 organic constituents in background sediments. Results show that background levels in Indiana sediments are similar to those reported from Illinois. The amount of variability in naturally occurring inorganic constituents, as measured by the coefficient of variation ($s/\bar{x}$ [100]), ranged from 52% to 153%, with a mean of 98%.

The Water Quality of Northeastern Indiana Lake Inflows. Peter A. Hippensteel, Tri-State University, Angola, Indiana 46703.——The inflows of several lakes were monitored to determine the potential impact on the eutrophication of their respective lakes. Most inflows were of intermittent water quality. Both high and low flow sampling must be done to completely evaluate the magnitude of impact on each inflow. The obvious factors that influence the chemical concentrations of the inflows are the types of agricultural activity, wetland alteration, residential development, and the size and number of municipal and industrial outfalls within the watershed.

Enhancement of Phenol Biodegradation by Soil Inoculation. Russell Holland and Deborah D. Ross. Department of Biological Sciences, Indiana University-Purdue University at Fort Wayne, Fort Wayne, Indiana 46805.——A gram positive, non-spore forming bacterium capable of growth on 0.1% phenol was isolated from soil collected from an abandoned hazardous waste landfill using the selective enrichment technique. The bacterium was then employed in experiments to determine the feasibility of using bacteria to degrade contaminants in soil. In these experiments, radiolabelled phenol was added to soil along with sufficient unlabelled phenol to bring the final concentration to 100 ppm. Biodegradation was determined by counting the radiolabelled CO_2 produced by mineralization of the phenol. The rate of biodegradation of phenol in inoculated soil was compared to the rate in uninoculated soil. It was found that the initial rate of biodegradation was faster in the inoculated soil and was initiated with a shorter lag time than in the uninoculated soil.

Creation of an Urban Acid Deposition Database. ROBERT A. PRIBUSH, PATRICIA S. MUIR, BRADLEY H. CARTER, MICHAEL J. STEVENSON AND KIMBERLY A. WADE, Department of Chemistry and the Holcomb Research Institute, Butler University, Indianapolis, Indiana 46208.——Since July, 1985, wet and dry deposition samples have been collected weekly at the Butler University Environmental Preserve (BUEP) and the samples analyzed using protocols adapted from the National Atmospheric Deposition Program (NADP). Comparison is made between NADP network data, gathered exclusively at rural sites and BUEP data, which should reflect air quality patterns in urban Indianapolis.

Noteworthy for this time period is the annual volume-weighted pH of 4.25 which showed insignificant seasonal variation and a narrow single-event range of 3.72 to 5.12. The annual pH is typical of values measured at Ohio and Illinois NADP sampling sites located directly east and west of Indianapolis. Significant anion and cation annual mean values were also typical of this region.

This detailed database provides a baseline for Indianapolis air quality with respect to acid deposition. Continuous operation of the BUEP monitoring station should provide sensitive diagnostic information regarding the impact of industrial and domestic demographic changes on the environment about Indianapolis.

A Computer Raindrop Model Used to Predict the Equilibrium of pH of Rainfall over Indianapolis. ROBERT A. PRIBUSH AND MICHAEL J. STEVENSON, Department of Chemistry and the Holcomb Research Institute, Butler University, Indianapolis, Indiana 46208.——Understanding rainfall pH sensitivity to ambient SO_2 levels is important in establishing practical goals regarding the control of sulfur emissions. In an attempt to relate SO_2 levels to the measured pH of Indianapolis rainfall, a computer model was adapted which inputs six components expected to control the pH of rainfall: liquid water content, SO_2, CO_2, NH_3, and aerosol SO_4^{2-} (and/or NO_3^-). Relating these species to others found at equilibrium requires seventeen simultaneous equations generated from the ideal gas law, Henry's Law, the law of mass action, conservation of mass, electroneutrality, and aerosol scavenging principles. Output is in the form of graphical diagrams in which concentration of each water-soluble species is plotted vs. pH.

The theoretical pH values determined by this model were in excellent agreement with measured pH values of samples collected at the Butler University Environmental Preserve, validating the applicability of this model to the Indianapolis environment. The apparent tolerance of the pH of Indianapolis rainfall to varying SO_2 levels and meterological conditions is discussed.

Impact of Heavy Metal Pollution on Sediment Bacteria in the Maumee River. DEBORAH D. ROSS, Indiana University-Purdue University at Fort Wayne, Fort Wayne, Indiana 46805.——River water and sediment samples were collected along a heavy metal concentration gradient in the Maumee River. Samples were analyzed for total bacterial numbers, heterotrophic activity, and numbers of bacteria resistant to Cu and Pb. Resistance was estimated by comparing CFUs on unsupplemented nutrient agar with CFUs on nutrient agar supplemented with order of magnitude increments of the heavy metals ranging from 0.001 to 1.0 mM. Both river water and sediment bacteria were more tolerant of Pb than Cu. However river water bacteria were less tolerant to both Cu and Pb than were sediment bacteria. No significant correlation was observed between heavy metal pollution at the sampling site and numbers of resistant bacteria, indicating that heavy metals are not exerting selective pressure on bacterial communities in the river.

Results of Surface Water Investigations of the Grand Calumet River/Indiana Harbor Canal Basin. JEROME RUD, HAROLD BONHOMME, GREG BRIGHT, NEIL PARKE AND JAMES STAHL,

Indiana Department of Environmental Management, Indianapolis, Indiana 46241.——As a participant in the Northwest Indiana Environmental Initiative, the Indiana Department of Environmental Management (IDEM) has been working with other governmental agencies and universities to document the current environmental conditions of the Grand Calumet River/Indiana Harbor Canal basin. This paper describes the recent water-related investigations which include water, sediment, crayfish, macroinvertebrate, and fish data from several stations on the GRC/IHC; and sediment, fish, and water (nutrients only) data from the Marquette Park Lagoons and Wolf and George Lakes (near Hammond). Crayfish were collected with a simple trap designed from coffee cans and hardware cloth. Sedimentation rates also were calculated.

Air Quality Monitoring in Southwest Indiana During the 1986 Growing Season. J.E. SIMON, M. SIMINI, R. GRANT, B. MCFEE AND D. REINERT, Department of Horticulture, Purdue University, West Lafayette, Indiana 47907.——An air quality monitoring program begun in 1984 to determine levels of air pollutants in southwest Indiana and their impact on agricultural crops was continued and expanded during the 1986 growing season. Air pollutant levels prior to 1986 were shown to induce injury on sensitive crops. Concentrations of ozone (O_3) and sulfur dioxide (SO_2) were measured at two sites (Vincennes and Decker) and nitrogen oxides (NO_x) were measured at Vincennes. Bulk sulfate and nitrate deposition was measured at Vincennes, Decker, Patoka, and Owensville. Daily mean O_3 concentrations of 0.05 ppm to 0.08 ppm were recorded throughout the growing season. These levels have been shown to induce injury on watermelons, muskmelons, and other crops grown in the region. Ozone-type foliar injury occurred on watermelons, muskmelons and potatoes grown in this region during the 1986 growing season. Levels of SO_2 occurred during the daylight hours generally when O_3 concentrations were greatest. Measurable amounts of NO_x, which can contribute to the formation of O_3, were also present.