FEDERAL WATER QUALITY ADMINISTRATION
ENVIRONMENTAL PROTECTION AGENCY

Selected Summaries of WATER RESEARCH

Research and Development

Robert A. Taft Water Research Center, Cincinnati, Ohio

WINTER 1970

STEROID HORMONES AS WATER POLLUTANTS (W70-3)

Knowledge of the fate of steroids normally present in domestic wastewater is rather meager. The authors sought a better understanding of steroid biodegradation. The data obtained showed that the susceptibility of the natural and synthetic ovulation-inhibiting steroids varied as to the rate of oxidation by the microorganisms of activated sludge. The synthetic estrogen and progestin components of oral contraceptives exhibited greater overall resistance to microbial degradation than the natural hormones.

Tabak, H. H. and Bunch, R. L., "Steroid Hormones as Water Pollutants. I. Metabolism of Natural and Synthetic Ovulation-Inhibiting Hormones by Microorganisms of Activated Sludge and Primary Settled Sewage," *Volume II of Developments in Industrial Microbiology*, Chapter 35, 367-376, 1970.

LAKES—RESTORATION AND PRESERVATION (W70-4)

The authors discuss the sources of lake problems and methods of protecting lakes from eutrophy and its consequences. Methods of nutrient reduction are examined.

Natural processes tend to destroy lakes and man's actions tend to accelerate this destruction. Destruction may result from erosion of the natural dam or sill that controls the lake's minimum level. Erosion contributes materials that settle in quiescent waters to eventually fill the lake basin. Poor land practices can increase erosion, thus increasing the rate of sedimentation. While water is retained in the lake basin, biota convert dissolved nutrients to settleable organic solids, and a portion of these is incorporated in the bottom sediments. Nutrient additions can increase biological productivity, and thus sedimentation. The factors contributing to a lake's aging and eventual death, in unison and as a composite, are discussed.

Keup, L. E. and Mackenthun, K. M., "Lakes—Restoration and Preservation," *Proceedings of Florida's Environmental Engineering Conference on Water Pollution Control, Florida Engineering and Industrial Experiment Station, Gainesville*, 24, No. 3, 94-101, Bulletin No. 135, 1970.

SINGLE-STAGE LIME CLARIFICATION (W70-5)

This study was undertaken to produce suitable clarified water from secondary effluent for an advanced waste treatment system which includes granular activated carbon treatment and electrodialysis. The clarifier was operated at various pH values to ascertain also the effects upon those constituents normally present in secondary effluent.

Results showed that a lime clarification system can be an effective and economical tool for the clarification of relatively hard wastewaters. Water of high clarity, however, is obtainable only during optimal operation of the biological oxidation process. The system also removed large amounts of phosphate, a major nutrient that supports algal life. The economics of the system are comparable with other forms of clarification.

Berg, E. L., Brunner, C. A., and Williams, R. T., "Single-Stage Lime Clarification of Secondary Effluent," *Water and Wastes Engineering*, 7, No. 3, 42-46, 1970.

LAS TOXICITY TO MINNOWS (W70-6)

The primary objective of this paper was to determine the chronic toxicity of LAS to the fathead minnow using "laboratory fish production index" as the measure of effect. The results of this study indicate that lethality of LAS to newly hatched fry was the most critical factor found within the precision of the testing methods. An experimental concentration of 0.63 mg/l LAS was determined as the maximum acceptable concentration. The application factor for LAS for this species and water lies between 0.63/4.35 and 1.2/4.35 or approximately 14 and 28 percent of the 96-hr TL_m value. A LAS concentration between 14 and 28 percent of the 96-hr TL_m value concentration, determined with the species of concern may estimate the maximum acceptable concentration for long-term exposure of these species. This application factor for LAS is the largest of any toxicant studied at the Newtown, Ohio, Fish Toxicology Laboratory.

Pickering, Q. H. and Thatcher, T. O., "The Chronic Toxicity of Linear Alkylate Sulfonate (LAS) to *Pimphales promelas*, Rafinesque," *Journal Water Pollution Control Federation*, 42, No. 2, Part 1, 243-254, 1970.

CONTROLLED-DEPTH, VOLUMETRIC BOTTOM SAMPLER (W70-7)

The shallow-water grab-type sampler described is designed to sample to a constant predetermined depth in any type of bottom (except solid rock or large rubble) over the entire area encompassed by the jaws. Closed ends and screened relief openings prevent blowout on placing or washout during closure. As the jaws are strongly constructed and worked by hand, obstructions between them can often be worked out and the number of "dry hauls" greatly reduced.

If some obstacle prevents complete closure (as determined by the position of the handles), the sample may be released and another grab taken nearby without raising the sampler to the surface for "resetting." Samples have been taken from running streams, quiet ponds, and ocean surf; from boats, through the ice, and while wading; and in mud, sand and coarse packed gravel. Completely illustrated with working drawings.

Jackson, H. W., "A Controlled-Depth, Volumetric Bottom Sampler," *The Progressive Fish-Culturist*, 32, No. 2, 113-115 (14 plates), April 1970.

LIQUID WASTE TREATMENT AND DISPOSAL (W70-8)

The functions of the depth to ground water is to assure good biological treatment and good hydraulics in a soil system. Adequate draining of the unsaturated zone and of the biologically active zone at the surface is necessary to ensure an optimal retention time for biological treatment, and to avoid restricting reaeration of the active zone. A minimum critical depth of unsaturated zone exists, somewhere between 2 ft (0.6 m) and 4 ft (1.2 m), such that treatment capacity is depressed in shallower systems. An optimum depth should be at least 5 ft (1.5 m). Hydraulic longevity also is restricted in shallower systems, probably because limited reaeration permits more rapid accumulation of soil-pore clogging materials.

The authors discuss biological treatment in cold weather. The adverse effects of cold-weather operations can be overcome by achieving biological maturity in the system prior to the onset of the cold season. The use of a medium with adequate adsorptive capacity is another effective way of combatting loss of treatment in cold weather.

Cultivation of vegetation on the surface of the soil system to extend hydraulic longevity is also considered.

Schwartz, W. A. and Bendixen, T. W., "Soil Systems for Liquid Waste Treatment and Disposal: Environmental Factors," *Journal Water Pollution Control Federation*, 42, No. 4, 624-630, 1970.

STREAM MONITORING PARAMETERS (W70-9)

A report on the author's participation in a panel discussion on stream monitoring parameters as applied to Florida streams. Automatic versus manual stations, economic impact on recreation, and a discussion of waste treatment standards are included.

Kittrell, F. W., "Stream Monitoring—Physical and Chemical Parameters," *Proceedings of Florida's Environmental Engineering Conference on Water Pollution Control, Florida Engineering and Industrial Experiment Station, Gainesville*, 24, No. 3, 44-50, Bulletin No. 135, 1970.

ISOLATION OF PHENOLS FROM CARBON CHLOROFORM EXTRACTS (W70-11)

A procedure is presented for efficient isolation of many phenols from carbon chloroform extracts (CCE) prior to chromatographic identification. The phenols, as weak acids, are isolated by a Florisil column cleanup of the CCE. Techniques for evaporation and preparation of the extract are given. Application of the method to grab samples as well as qualitative and quantitative determinations are discussed. Recovery data and relative retention times for a gas-liquid chromatographic separation are reported.

Eichelberger, J. W., Dressman, R. C., and Longbottom, J. E., "Separation of Phenolic Compounds from Carbon Chloroform Extract for Individual Chromatographic Identification and Measurement," *Environmental Science & Technology*, 4, No. 7, 576-578, 1970.

WATER QUALITY EFFECTS OF LEACHING FROM SUBMERGED SOILS (W70-12)

To implement the proposed impoundment of the Northeast Cape Fear River in Dulpin County, North Carolina, the U.S. Army Corps of Engineers asked the Federal Water Quality Administration to investigate the leaching of undesirable materials into the impounded waters. Since the impound ment will inundate an area with rich organic soils, the possibility of leaching is high, and this research is important to the future of the whole project. The authors discuss materials, experimental designs and chemical methods. Analyses were made for color, iron, manganese, phosphorus, and nitrogen.

Keup, L. E., McKee, G. D., Raabe, E. W., and Warner, R. W., "Water Quality Effects of Leaching From Submerged Soils," *Journal American Water Works Association*, 62, No. 6, 391-396, 1970.

MIXED LIQUOR SOLIDS SEPARATION BY FLOTATION (W70-13)

The first full-scale application of dissolved air flotation for mixed liquor solids separation has been incorporated at a new 1.0 mgd Water Pollution Control Facility in Prince William County, Virginia. The results of a field investigation at this facility are reported herein. The data indicate that conventional design criteria do not fully characterize

flotation performance, and a new parameter, developed from a theoretical relationship derived by Howe, is offered as a rational design and operational guideline. Flotation performance is analyzed in terms of float detention time and process design. Cost-quality comparisons of mixed liquor solids separation by flotation and gravity sedimentation are presented.

Mulbarger, M. C. and Huffman, D. D., "Mixed Liquor Solids Separation by Flotation," *Journal of the Sanitary Engineering Division, Proceedings of the American Society of Civil Engineers*, 96, No. SA4, 861-871, August 1970.

BIOLOGICAL PROBLEMS IN WATER SUPPLIES (W70-14)

Although none of the organisms found in surface waters may be injurious to health, domestic water supplies must be free of such organisms, since they, or their by-products, may interfere with filtration and cause customer complaints. The authors have compiled various reports and surveys and their results will be of interest to all concerned with water quality.

Mackenthun, K. M. and Keup, L. E., "Biological Problems Encountered in Water Supplies," *Journal American Water Works Association*, 62, No. 8, 520-526, 1970.

KLAMATH RIVER STUDY (W70-16)

In 1964, the Federal Water Quality Administration (FWQA) initiated the Klamath Basin Study to determine the effects on water quality of agricultural wastes in irrigation return water on the Klamath and Lost Rivers, in Oregon. As part of this study, macroinvertebrates were collected at monthly intervals to determine the effects of irrigation return water and pollution from the city of Klamath Falls on the aquatic life.

Mason, W. T. Jr., Anderson, J. B., Kreis, R. D., and Johnson, W. C., "Artificial Substrate Sampling Macroinvertebrates in a Polluted Reach of the Klamath River, Oregon," *Journal Water Pollution Control Federation*, 42, No. 8, Part 2, R315-R328, 1970.

WATER RESEARCH is issued by the Information Office, Environmental Protection Agency, Federal Water Quality Administration, Cincinnati, Ohio. Reprints of the complete articles may be obtained by writing Director, Office of Information, Federal Water Quality Administration, 4676 Columbia Parkway, Cincinnati, Ohio 45226.

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