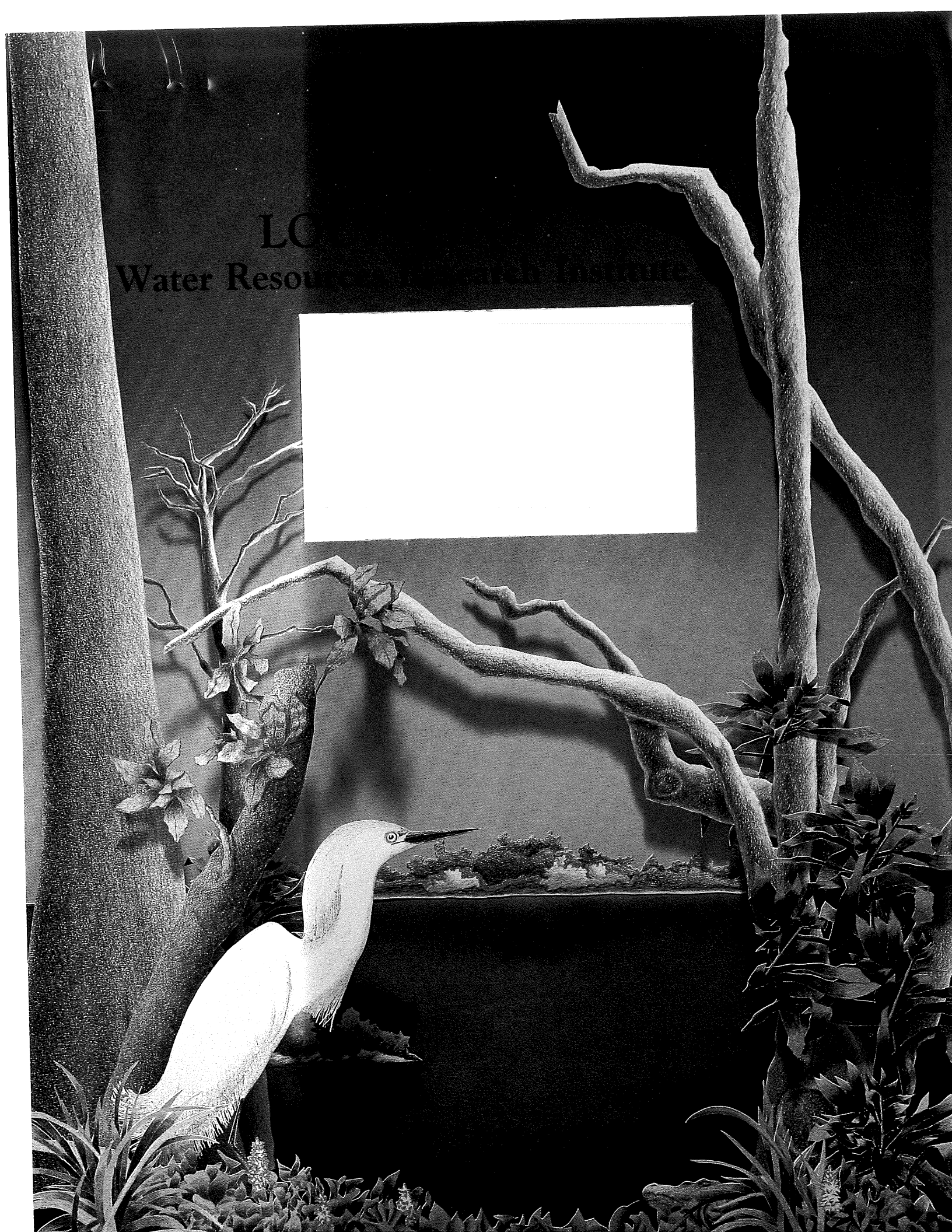

LOUISIANA WATER RESOURCES RESEARCH INSTITUTE

FISCAL YEAR 1989
Program Report

Report No. G 1565 - 02

Report No. 1565-02

Fiscal Year 1989 Program Report
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for

U.S. Department of the Interior
Geological Survey

by

Louisiana Water Resources Research Institute
Louisiana State University
Baton Rouge, LA 70803

W. David Constant, Director

November 1990

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ABSTRACT

The 1989 cooperative research program of the Louisiana Water Resources Research Institute (LWRRI) addressed priority water resources problem areas identified for Louisiana - management of surface water supplies, ground water control and restoration, and wastewater treatment alternatives.

Four research projects funded to address these priority issues were: (1) Nature and Rates of Bacterial Metabolism in the Aquifers of Southeastern Louisiana, (2) Aquaculture/Marine Fisheries Process Wastewaters, (3) The Importance of Denitrification to the Efficiency of Wastewater Treatment in Forested Wetlands, and (4) Field Testing of Rock-Reed Filters for Small Domestic Wastewater Flows.

Cooperative efforts, both in research and in information transfer, were expanded in Fiscal Year 1989. Joint activities between the Institute and state agencies and between the Institute and other university organizations were enhanced. During FY 1989, the Directorship of LWRRI changed from Dr. Marty Tittlebaum to Dr. W. David Constant. There have been significant efforts by the Director to enhance coordination of LWRRI research with other units at LSU and the State. The Advisory Board was restructured for FY 1990 to focus the research program. The Director established milestones for the Institute to enhance growth.

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WATER PROBLEMS AND ISSUES OF LOUISIANA

Louisiana is blessed with an abundance of water resources, agriculture/aquaculture, and resources for industry. Key water resources issues, therefore, become managing the resources present and protecting the quality of those resources to assure continued availability and useability for future generations. Important water resources issues include the problems associated with wetlands and coastal zones, water resources planning and management, water quality protection, and wastewater management.

Louisiana's vast wetlands make up approximately 40% of the nations wetlands. These areas are composed of very sensitive, often delicately balanced ecosystems and are, therefore, particularly vulnerable to contamination or destruction due to man's activities and natural occurrences. Understanding these threats and finding management alternatives for these unique resources are priority issues needing attention.

Resource planning and management are also ever-present issues for Louisiana. Flooding of urban and residential areas periodically causes severe economic loss and human suffering. Yet through flood water control and diversion, valuable sediment load previously available to nourish the state's coast line is diminished or unavailable to the areas most in need. Water resources and environmental issues are intricately interconnected, therefore changes in one aspect produce a corresponding responsive change in another. To effectively manage these resources, global strategies need to be developed.

Water quality protection, particularly of ground water resources, is an emerging issue of concern in Louisiana. Delineating aquifer recharge areas, understanding the impacts of industrial activities on these water resources, evaluating the impact of nonpoint sources of pollution, and exploring protection alternatives are issues at the forefront.

PROGRAM'S GOALS AND PRIORITIES

The primary goal of the Louisiana Water Resources Research Institute (LWRRI) for the Fiscal Year (FY) 1989 was to help meet the present and future water resources research needs to the state and region, with the research contributing to national water research needs. Specific objectives of the Institute were to encourage and support research efforts that help provide answers or alternative solutions to protect and properly manage the state's valuable surface and ground water resources, to train students to be water resources scientists and engineers capable of solving present and future water resources problems, and to transfer research results and findings and provide technical assistance to governmental and industrial personnel as well as the citizens of Louisiana.

The priority problems addressed by the Institute in its FY 1989 program were:

1. unique treatment methods for high organic, low toxicity wastewaters,
2. natural systems for wastewater treatment,
3. treatment of point and non-point sources of contaminated water and wastewater from rural, unsewered areas,
4. use of shallow aquifers in southern Louisiana for domestic and industrial potable water supplies,
5. impact on shallow aquifers in southern Louisiana of sea level rise and other environmental changes, and
6. water quality considerations for the Mississippi River.

The Louisiana priority problems were also identified within the South Atlantic Gulf Region Priorities; therefore, research to address these will benefit the regional and national issues.

Other priorities of the Institute have been and continue to be the development of the Institute to a position of leadership within Louisiana for water resources issues and concerns. Objectives through which this is being achieved are to increase operational efficiency of the Institute, to increase funds available to faculty researchers, and to develop and implement an aggressive information transfer program that will bring recognition to the Institute and its researchers while providing valuable information and education to Louisiana's citizens.

These priorities were focused in FY 1989 by a mission statement with goals, procedures, and assessments to enhance the status of the Institute. This Strategic Plan is detailed in Appendix F. Goal 1 has been accomplished and Goal 2 is the current focus; the Advisory Boards have been restructured into one group with the focus set for FY 91 in nonpoint source pollution research, a primary concern for Louisiana and the region.

RESEARCH PROJECT SYNOPSIS

The Institute's FY 1989 cooperative program addressed the specific research priorities identified above. Four projects were funded. Projects addressed: aquifer characteristics (02), aquaculture/wastewater treatment (03), wetlands/wastewater treatment (04), and rural wastewater treatment (05). The projects were:

02 - Nature and Rates of Bacterial Metabolism in the Aquifers of Southeastern Louisiana - Paul Aharon.

03 - Aquaculture/Marine Fisheries Process Wastewaters - J. D. Bankston and William Branch.

04 - The Importance of Denitrification to the Efficiency of Wastewater Treatment in Forested Wetlands - Robert Twilley.

05 - Field Testing of Rock Reed Filters for Small Domestic Wastewater Flows - Marty Tittlebaum.

A synopsis of each project follows.

SYNOPSIS

Project Number: 02

Start: 09-01-89
End: 08-31-90

Title: Nature and Rates of Bacterial Metabolism in the Aquifers of Southeastern Louisiana

Investigators: Dr. Ellen R. Graber
Prof. Paul Aharon
Dept. of Geology and Geophysics, LSU 70803

COWRR: 05B

Congressional District: 6th

Descriptors: Geohydrology, Bacteria, Isotopes

Problem and Research Objectives:

This study addresses three problems relevant to the southeast Louisiana aquifers. The first is concerned with the rates and spatial distribution of excess CO_2 production. The second concerns whether CO_2 is derived from bacterially-oxidized organic matter. The final is to understand the origin and evolution of the groundwater major element chemistry and its high Na-HCO_3 levels. The specific objectives were:

1. To determine the in-situ rate of CO_2 production.
2. To establish the effect of viable bacterial activity on groundwater chemistry, and to test the hypothesis that high bicarbonate levels are the result of deep seated bacterial metabolism.
3. To ascertain the distribution of bacteria in the subsurface, and to improve understanding of processes which lead to mineralization of corrosive development of secondary porosity in clastic sediment aquifers.
4. To distinguish between aerobic, sulfate-reducing, and methanogneic microbial metabolism.
5. To evaluate the relative roles of calcite dissolution, silicate dissolution, and ion exchange in modifying groundwater chemistry.

Methodology:

Carbon Sources in Groundwaters:

Stable carbon isotopes, ^{13}C and ^{12}C, occur in natural carbon compounds at about 1 and 99% abundance, respectively. Isotope ratios of $^{13}C/^{12}C$ in natural carbon-bearing compounds vary considerably with the source of the carbon and the pathway of carbon fixation during metabolic processes. Hence it is possible

to use carbon isotope ratios to study both the source of the carbon and the biota affecting it.

During rainfall in recharge areas, CO_2-charged precipitation introduces carbon dioxide with atmospheric values of -6 to -7/oo into the aquifer system. As the waters percolate through the unsaturated zone, CO_2 derived from aerobic bacterial oxidation of organic material in the soil zone is added. The isotopic composition of the resultant CO_2 is substantially more depleted in ^{13}C relative to the atmospheric value because organic matter and its oxidation products preferentially sequester the ^{12}C isotope. An increase in CO_2 resulting from bacterial respiration in the soil or aquifer leads to the dissolution of carbonate and silicate minerals, thus adding excess bicarbonate to the groundwater. In the case of carbonate dissolution, the $\delta^{13}C$ composition of DIC is expected to yield intermediate values between those of CO_2 released from bacterial respiration, and those of the dissolved carbonate with typical values of 2 to -5°/oo. In the case of silicate dissolution, DIC $\delta^{13}C$ is expected to remain unchanged, as no new carbon is added to the system.

Mass balance calculations using measured values of $\delta^{13}C$, DIC, alkalinity, sodium, and H_4SiO_4 can be used to evaluate chemical changes occurring between points along a groundwater flow path. The isotope composition of the added CO_2 can be calculated in order to determine its source using the mass balance equation below:

$$\delta^{13}C_f = (\delta^{13}C_i)(m_a) + (\delta^{13}C_a)(m_a) + (\delta^{13}C_c)(m_c)/m_i+m_a+m_c$$

$\delta^{13}C_f$ is the measured (final) isotope composition of the sample, $\delta^{13}C_i$ is the isotope composition of the original DIC, m_i is the number of moles of original DIC, $\delta^{13}C_a$ is the isotopic composition of the added CO_2, m_a is the number of moles of added CO_2, $\delta^{13}C_c$ is the isotopic composition of the dissolved carbonate mineral, and m_c is the number of moles of carbonate mineral dissolved.

Rates of excess CO_2 production along groundwater flow paths can be estimated by applying another mass balance equation:

$$CO_2\ (PR) = (R)(m_a)/L$$

where CO_2 (PR) is the production rate of CO_2 averaged over a flow path segment, m_a is the moles of CO_2 added, L is the length of the flow path, and R is the rate of groundwater flow.

Alkalinity and Total Dissolved Inorganic Carbon (DIC):

An important concept in the study of waters is *alkalinity*, defined as the hypothetical amount of strong base that must be neutralized in order to reach a pH corresponding to a solution of pure CO_2 and water. In a simple system, consisting of only NaOH and CO_2, alkalinity is given by:

$$A = [HCO_3^-] + 2[CO_3^{2-}] + [OH^-] - [H^+]$$

In dilute natural waters, total alkalinity is generally taken to be equal to carbonate alkalinity. Between a pH of 5 and 9, bicarbonate is the dominant carbon-bearing species, and the bicarbonate concentration is essentially equal to the alkalinity.

Total dissolved inorganic carbon (DIC) is the amount of carbon in both charged and uncharged species in solution, and is represented by a mass balance on carbon:

$$DIC = [CO_2] + [HCO_3^-] + [CO_3^{2-}]$$

An important property of alkalinity is that it does not change when CO_2 is added to or withdrawn from the solution. Altering the amount of CO_2 in solution does change the total dissolved inorganic carbon (DIC). Adding or removing bicarbonate (HCO_3^-) changes both DIC and alkalinity in a one-to-one ratio, while adding or removing CO_3^{2-} changes alkalinity by two units and DIC by one unit.

A graphic technique developed by Deffeyes using alkalinity as the ordinate and DIC as the abscissa has a number of useful characteristics. Changes in solution chemistry move the point representing the solution on the diagram in definite directions depending on the reaction stoichiometry. Since reactions such as calcite dissolution and CO_2 addition alter the solution according to definite stoichiometries, the change in solution chemistry can be split into component vectors representing a calcite component and a CO_2 component. In this way, contributions to the carbon budget by various processes can be assessed and distinguished.

Principal Findings and Significance:

The primary goal of this study was to evaluate the contribution of bacterial metabolism to the development of high Na-HCO_3 waters in the Baton Rouge aquifer system. In so doing, the nature and rates of bacterial activity were explored, and the relative roles of ion exchange, silicate dissolution, calcite dissolution, and bacterial oxidation of organic material were elucidated.

The impact of silicate reactions on groundwater chemistry was found to be negligible, while the impacts of bacterial production of CO_2, calcite dissolution, and ion exchange on major element and isotope chemistry were found to be profound. Sodium, derived by a two-for-one ion exchange with calcium, was found to be a good predictor of the amount of calcite dissolved.

The contribution to the carbon dioxide budget by bacteria oxidizing organic matter deep in the aquifers was substantial (3.15 mmol/L), and coequal to the contribution by calcite dissolution (3.05 mmol/L). These contributions can be differentiated by plotting DIC versus alkalinity on a Deffeyes diagram, and by dividing them into their component vectors.

There is no evidence for methanogneic microbial activity on the basis of carbon isotope values. There is also little or no evidence for sulfate reducing bacteria, which can be distinguished form aerobic bacteria on the basis of their byproducts and on the sodium content of the waters. Aerobic bacteria produce CO_2, which causes calcite dissolution and ion exchange with sodium, while sulfate-reducers produce HCO_3^- and no subsequent calcite dissolution and sodium release. Sulfate-reduction can be detected by a sodium deficiency compared with HCO_3^- (alkalinity). In this aquifer system, sulfate-reduction occurs only in the deepest part of the 2800 foot aquifer, and its contribution to the total bacterial carbon budget is insignificant.

Bacterial activity is concentrated at particular zones in the deeper aquifers, and is minimal in the rest of the system. In those areas of high productivity (6.4×10^{-2} versus an average productivity of 5.4×10^{-3}), it is expected that porosity has been corrosively enhanced. The hydraulic conductivities of the 2000 and 2800 foot aquifers, are, in fact, higher than those of the shallower aquifers. Due to calcium uptake on clays, all the waters are undersaturated with respect to calcite, although saturation is approached in the deeper sand units. Local microenvironments may develop in which saturation or oversaturation is achieved, and in which calcite may precipitate. However, calcite cementation should be minimal overall.

Publications and Professional Presentations:

1. Aharon, P. and E. Graber, "Bacterial Metabolism in the Aquifers of Southeastern LA", Presented at the Seventh Annual LA Water Resources Symposium, October 30-31, 1990, Baton Rouge, LA
2. Gronthier, G. and P. Aharon, "Groundwater Sources and Flow Patterns Derived from Stable Isotopes and Elemental Chemistry of the Southeast LA Freshwater Aquifers", Gulf Coast Association of Geological Societies, V. XL, 1990, pp. 251-263.

M.S. Thesis: Project component of M.S. student thesis in progress.

Ph.D. Dissertations: None.

SYNOPSIS

Project Number: 03

Start: 09-01-89
End: 08-31-90

Title: Aquaculture/Marine Fisheries Process Wastewaters

Investigators: J.D. Bankston
William Branch
Louisiana Cooperative Extension Service
LSU Agricultural Center
Baton Rouge, LA 70803

COWRR: 05D

Congressional District: Sixth

Descriptors: Wastewater Treatment, Aquaculture, Fisheries

Problem and Research Objectives:

Consumption of seafood and aquacultural products is increasing as a result of raised levels of health consciousness among Americans. Louisiana's fisheries produce more tonnage than any other state. Marine fisheries and aquacultural production rank second only to forestry in terms of cash receipts to producers of food and fiber in Louisiana. Value added in forestry, however, is several times as great as receipts by producers, whereas value added in aquaculture/marine fisheries is approximately equal to receipts by producers. Much of Louisiana's aquacultural/marine fisheries harvest is shipped out of state after little or no processing. Economic development goals include increasing processing which will lead to more value added and more income in the state.

Current processing is dispersed among more than 400 small processors. The Louisiana Department of Environmental Quality (DEQ) is developing point source discharge permits for all aquacultural/marine fisheries processors. There is little data available to characterize the quality and quantity of wastewater produced by small processors of any aquacultural/seafood commodity. Species unique to Louisiana, such as alligator and crawfish, have received little attention. Without adequate data, DEQ will have to estimate parameters and levels to be regulated, consultants will have to estimate characteristics for design purposes, and the smaller processors will bear a disproportionally high cost of achieving discharge standards.

This project was intended to develop data useful to DEQ, consultants, and the industry n their efforts to meet water quality goals. Effort was to be focused on those species for which the least data existed. Evaluation of existing treatment systems was considered desirable. After data was collected, agency field staff were to be informed of data and assisted in transferring information to the processors and consultants.

Methodology:

Louisiana Cooperative Extension Service (LCES) Fisheries Agents and County Agents located in appropriate parishes were contacted and asked to make arrangements with local producers/processors of alligators and crawfish to collect grab samples of wastewater for analyses. Samples were collected in containers with appropriate preservatives which were provided by commercial wastewater analysis labs in the area. Samples were maintained on ice until delivery to lab within specified time limits as determined by parameters selected for analysis. Agents were asked to determine characteristics pertinent to each source that might help explain variation in data. In some cases additional data such as from water meters was collected. A small number of samples were taken from crab and catfish sources for comparison with data available from the literature. Based on preliminary data analysis and discussions with knowledgeable professionals, parameter selection was modified to reduce analytical cost. Training sessions were held with Fisheries Agents who then arranged for producer/processor meetings in which status of regulations, probable treatment efficacies, data and treatment costs were discussed.

Principal Findings and Significance:

Alligator producer/processors grow animals in pens which contain shallow water and some area above water. The hatchlings grow from a few inches in length in September to three feet or longer within 12 - 18 months, at which time they are harvested for hides and meat. Feed is provided 3-7 times per week. Pens are drained and filled with clean water 3-7 times per week. Feed is pelletized from commercial sources or may be ground fish or nutria. Rations are carefully formulated to maximize growth. Barns and water are kept close to 95°F. Feeding and flushing variations contributed to much of the variation in data. Strength of waste increases with age and weight of animal but many growers have several sizes in various pens in the barn at the same time, so that total barn effluent strength does not necessarily increase with time during the growing season. Water flow appears to average about 2 gallons per animal per day, but varies from 1.5 to 3.3. Some farms had consistently stronger effluent than others with no, as yet, verifiable reason. Lagoons were the most frequent treatment system. They were generally shallow with two or three ponds in series. The last pond usually had algal growth, so that while treatment was occurring, discharge standards could not be met without some kind of polishing technique. Some producers do not dress out their own animals so that processing wastes are not necessarily present in producer wastewaters. The only previous data found was the 1978 Rockefeller Wildlife Refuge research. The means of data collected in this study are comparable to the 1978 data.

Crawfish processors generally wash, boil, peel and pack. Some plants include more steps and some less. Previous work indicates water flow of about 400 gallons per 1000 pounds live weigh processed per day and increasing strength with decreasing production. Sanitary wastes may or may not be included in the plant discharge but are relatively insignificant in terms of treatment loads. Considerable variation occurs depending on where the sample is collected. Highest values were found in boiling water discharge. In most plants, flows are not separated. Septic tanks and lagoons are the most frequently used treatment. As now used, they are inadequate for meeting discharge standards. Algal growth was a contributing factor to effluent strength. Previous data are from samples collected by Bankston and analyzed by Romaire in 1985-6. The means of data collected in this study are similar to Bankston's data.

Catfish processing samples were taken from two plants and hauling tank water samples were taken at one plant. Data were considerably higher than found in the literature in most cases.

Crab processing samples were taken from two plants. Values were lower than found in the literature except for suspended solids which were much higher from one plant. Considerable variation can be found depending on time of day that sample is taken. Crab processing is very similar to crawfish processing and may be done in the same plant. Refrigeration capacity for quick cooling of boiled crabs is generally lacking so that picking may occur very late at night. Wash down water should by very strong at this time but samples taken of effluent being discharged early in the morning may show very light loadings.

Data was collected which will be of value to DEQ in establishing standards, to consultants in designing treatment systems, and to producers/processors in applying for permits. Results of the project include better informed Fisheries Agents with information which has been included in training of producers/processors to reduce their wastewater costs.

Publications and Professional Presentations:

Project Completion Report available from Louisiana Water Resources Research Institute or from the Louisiana Cooperative Extension Service.

Branch, Bill, "Aquaculture/Marine Fisheries Process Wastewaters", Presented at Seventh Annual LA Water Resources Symposium, October 30-31, 1990, Baton Rouge, LA.

M.S. Theses/Ph.D. Dissertations: None.

SYNOPSIS

Project Number: 04

Start: 09-01-89
End: 08-31-90

Title: The Importance of Denitrification to the Efficiency of Wastewater Treatment in Forested Wetlands.

Investigator: Robert R. Twilley
Dept. of Biology
University of Southwestern LA
Lafayette, LA 70504

COWRR: 5D

Congressional District: 7th

Descriptors: Wastewater, Nitrogen, Denitrification, Wetlands

Problem and Research Objectives:

Wastewater, even after secondary treatment, contains high concentrations of nutrients that can cause eutrophication of receiving waters and deterioration of water quality. Therefore, there has been much interest in the use of natural wetlands as a simple and energy-efficient means of removing nutrients from wastewater. This study is concerned with quantifying the rates of nitrogen loss from a forested wetland, which is scheduled to receive secondary effluent in September 1990, located in Thibodaux, Louisiana. High concentrations of nitrogen are expected to be a major constituent of the discharged effluent from the city's sewage treatment facility. Direct denitrification, the reduction of nitrate to nitrogen gas, is a key process by which nitrogen is permanently lost to the atmosphere; however, this process is somewhat limited by the low concentrations of nitrate that are typically found in secondary sewage. Organic-nitrogen and ammonium are predominate in typical secondarily treated wastewater, therefore, in order for denitrification to occur these nitrogen species must first be oxidized to nitrate via nitrification. By maximizing rates of nitrate production, it is believed that maximum loss of nitrogen from wetlands can be achieved.

Methodology:

Water quality measurements of inflow and outflow, storage of nutrients in plant and sediments (litter fall, sediment cores), and plant productivity (tree growth) were monitored as part of the matching effort in this study with LSU, DEQ, and City of Thibodaux. In the field, dissolved oxygen, temperature, pH, Eh and conductivity were measured. Nutrient analyses were done using standard methods outlined by the Environmental Protection Agency (1979) and the Louisiana Department of Environmental Quality. Analyses described in Standard Methods for the Examination of Water and Wastewater (American Public Health Association 1985) were used for chlorophyll and biological oxygen demand (BOD). The City of Thibodaux carried out analysis of BOD, fecal coliforms, and

priority pollutants. LSU measured hydrology, burial, plant growth, and other water quality parameters. These calculations determine mass balances based on input, export, burial and plant storage of nutrients, and were compared with estimates of denitrification from the study.

Intact sediment cores from stations in the flooded, ridge, and control areas of the study site were incubated under near ambient conditions in the laboratory to simulate the response of each soil type to wastewater enrichment. Problems associated with substrate and dissolved oxygen depletion in batch core experiments were remedied by a flow-through design in which an autoanalyzer pump (Cole Palmer) delivers the experimental solutions from reservoirs at controlled flow rates (mL/min) through influent and effluent lines connected to the cores.

Denitrification in sediments was determined by measuring rates of $^{15}N_2$ production from either $^{15}NO_3$ or $^{15}NH_4$ amended cores. This method allows for the determination of the relative importance of NO_3 produced from nitrification of NH_4 to total denitrification rates. Thus more descriptive details of the processes involved in sediment denitrification may be elucidated compared to methods using total fluxes of ambient N_2 plus N_2O. The ^{15}N content of all materials was analyzed by emission spectrometry using the Dumas technique for sample preparation.

Nitrogen fixation was determined on intact sediment cores from each site using the acetylene reduction technique. Acetylene is also reduced to ethylene by the enzyme nitrogenase and can be used as a measure of nitrogen fixation. In addition, the conversion of N_2O to N_2 is blocked by acetylene, and the accumulation of N_2O is a measure of the denitrification rate. Thus cores amended with acetylene can render measurements of both denitrification and nitrogen fixation by the combined assay of N_2O and ethylene by gas chromatography (GC) during term incubations. Headspace samples from each core were sampled and assayed for N_2O by GC. A survey of the major macrofauna is made by sieving core samples from each station through 500 um sieves.

Principal Findings and Significance:

The utilization of a wetland for tertiary treatment of wastewater is based on the ability of the wetland to act as a nutrient sink (i.e., inputs exceed outputs). The processes that are most influential in the cycling of nutrients within wetland ecosystems are uptake, burial, storage and gaseous exchange with the atmosphere. Although each of these processes contribute to the net loss of nutrients from the system, the latter three represent a temporary immobilization since the nitrogen does in fact continued to exist within the boundaries of the system. However, the gaseous exchange of some nutrients, such as nitrogen, represents a permanent loss to the atmosphere. Since nitrogen does in fact exist in a gaseous phase, the most advantageous mechanism for permanent loss of excess nitrogen is to the atmosphere via

denitrification.

The focus of this study is to determine the rates of denitrification in the Thibodaux study site under present (untreated) conditions as well as determine the rates that can be expected upon the release of nitrogen-rich effluent. Intact sediment cores are collected from the site and transported to the laboratory where enrichment studies are performed. Nitrogen enrichment is equivalent to that of the projected loading rate expected from input of the effluent. Rates of denitrification are determined on both temporal and spatial scales.

The results of this experiment will be of use to the planners, developers, and operators of the Thibodaux wastewater treatment facility by providing them with information necessary to maximize the efficient removal of nitrogen from the system. By treating sediments with high concentrations of nitrate, we can determine whether or not these sediments at least have the capacity to handle the projected loading rates. This is a most basic question relative to the success of this project. A more functional question deals with the loss of nitrogen via two alternate pathways: the direct utilization of nitrate loaded into the wetland (direct denitrification) and the utilization of nitrate produced in-situ via nitrification (coupled nitrification-denitrification). By simulating these pathways in the laboratory utilizing intact sediment cores we can determine the conditions which maximize for the removal of nitrogen. These results can in turn be implemented into the development and implementation of the treatment system.

Publications and Professional Presentations:

Twilley, Robert, "Denitrification in Wastewater Treatment in Forested Wetlands", Presented at Seventh Annual LA Water Resources Symposium, October 30-31, 1990, Baton Rouge, LA.

M.S. Theses: R.G. Boustany, M.S. in Biology in progress, expected 1991, University of Southwestern Louisiana.

Ph.D. Dissertations: None.

SYNOPSIS

Project Number: 05

Start: 09-01-89
End: 08-31-90

Title: Field Testing of Rock-Reed Filters for Small Domestic Wastewater Flows

Investigators: Dr. Marty E. Tittlebaum
Civil Engineering Dept., LSU
Associate Professor

Donna G. Skipper
C.E. Dept., LSU
Ph.D. Candidate

COWRR: 5D

Congressional District: Sixth

Descriptors: Rock filter, aquatic plants, wastewater treatment

Project and Research Objectives:

The problem is the need for low-cost, low-maintenance wastewater treatment systems which will produce high quality effluent for rising effluent requirements. Rock-reed filters appear to fulfill this need; however, established design criteria are lacking. Thus, the research objective of this project is to determine sizing requirements for small rock-reed filter systems in order to meet specified effluent requirements.

Methodology:

Three bench-scale rock filters containing 2 feet of gravel were used in this investigation. These filters measured 5 feet long and 1-1/2 feet wide. Two of the filters were planted with *Sagittaria lancifolia* and *Scirpus validus*, while the third filter was an unvegetated control filter. During the study, a synthetic wastewater was applied to the filters in a continuous-flow mode. Following a constant loading rate of 4.96 g/day/sq.meters during a preliminary study, an 80-day experiment was run on the filters using eight combinations of two flow rates (80 and 140 ml/min) and four influent BOD5 concentrations (28, 78, 107, and 51 mg/l), each combination remaining constant for ten days. Parameters measured during this study include five-day biochemical oxygen demand, chemical oxygen demand, total Kjeldahl nitrogen, ammonia, nitrate, air and water temperature, pH of the influent and effluent wastewaters, influent and effluent flow rates, oxidation/reduction potential, dissolved oxygen, and plant biomass and nitrogen content.

Principal Findings and Significance:

In the preliminary portion of this study, average BOD5 mass removal rates were 75%, 60%, and 44% for the *Scirpus, Sagittaria,* and control systems, respectively, after over a month at a BOD5 surface loading of 4.96 g/day/sq. meters. Following the preliminary study,

the eight combinations of hydraulic and organic loadings resulted in surface loadings from 4.63 to 30.96 g/day/sq. meters. Overall average BOD5 removal percentages during this latter portion of the study were 69%, 57%, and 47% for the *Scirpus, Sagittaria,* and control systems, respectively. No relation was found between BOD5 applied and removal of BOD5. ORP and DO measurements within these systems indicated no free oxygen available at any depth; however, nitrification may occur in the thin aerobic zone surrounding the plant root. TKN removal was higher in the plant systems relative to the control, with the *Scirpus* system achieving a higher overall removal than the *Sagittaria* system. These results establish the treatment enhancement of plants in a rock filter system, particularly the *Scirpus*. Furthermore, they contribute an estimate of the organic and nitrogen removal expected by this type of system.

Publications and Professional Presentations:

Skipper, D.G., M.E. Tittlebaum, and W.H. Zachritz, (submitted), "A Bench-Scale Rock-Plant Filter Investigation", Water Research.

Skipper, D.G. and M.E. Tittlebaum, "Rock-Plant Filter Study and Design Model" presented at the Technology Forum on Artificial Marsh/ Rock Filter Treating Municipal Wastewater, April 18, 1990 in Baton Rouge, LA.

Skipper, D.G. and M.E. Tittlebaum, "Field Testing of Rock/ Reed Filters for Small Domestic Wastewater Flows" presented at Louisiana's Environment in the 1990's, November 14-16, 1989, Baton Rouge, LA.

Skipper, D.G. and M.E. Tittlebaum, "Loading Criteria of Rock-Reed Filters for Small Domestic Wastewater Flows", Presented at the Seventh Annual LA Water Resources Symposium, October 30-31, 1990, Baton Rouge, LA.

Ph.D. Dissertations:

Skipper, D.G.,(to be submitted, 1990), "Rock-Plant Filter Study and Design Model", Ph.D. dissertation, Dept. of Civil Engineering, LSU.

M.S. Theses: None.

INFORMATION TRANSFER ACTIVITIES

The information transfer activities of the Institute were continued during Fiscal Year 1989.

Reorganization under the new Director included continuing the documentation of all works published during the history of the Institute. Water resources news and information of the Institute, previously only partially documented, has been compiled and will be annually updated. The updated list provides ordering information for requesting water resources information and publications and is found in Appendix A. A water resources bulletin board is maintained to announce upcoming meetings, job opportunities for both students and faculty, award opportunities for students, and calls for papers. The library has been cataloged and is regularly updated by computer database, and the Institute is participating in distribution on campus of NTIS abstracts.

A major information transfer activity of the Institute for FY 1989 was co-sponsorship of three conferences as detailed in Appendix B. The Director serves as a steering committee member for each of the conferences. Participation in these events provided a mechanism to communicate the research plans and accomplishments of the Institute. The November 1989 Conference provided a session for the Institute to present results of FY 88 projects and highlights of planned work for FY 89. Between 175 and 250 persons were in attendance daily. The Institute annually co-sponsors the "Ground Water Seminar", working closely with several Louisiana Departments, private companies, AWRA, other Louisiana State University units, and the USGS District Office in Baton Rouge. Presentations comprising the session moderated by the Institute Director were solicited from outside the current Institute projects, which enhances information transfer both to and from the Institute into related areas. Approximately 120 professionals attended this one day event. The October 1990 conference, with approximately 150 professionals in attendance (50 attending the LWRRI session) included FY 89 project presentations and FY 90 plans. An overview of the Institute was given by the Director in the morning session of the first day to the full audience. USGS representatives and Advisory Board members were present to receive presentations from the investigators. These three events provided an ongoing dialogue with researchers, agencies, and the public.

The Institute's staff has, in FY 1989, maintained emphasis on acquainting Louisiana's research community with the research funding opportunities through the U.S. Geological Survey Sections 104 and 105 research programs. Announcements for both research programs were widely distributed to Louisiana's colleges and universities and to research organizations throughout the state. In addition, public announcements were made at professional and faculty meetings to encourage wide participation in the programs. Table 1 depicts this participation in response to the announcements.

Table 1. Louisiana's Participation in Section 104 and 105 Research Programs, Proposals Submitted

Year	Section 104	Section 105
1989	14	8
1990	11	6

Presentations by the Director have been given to a number of organizations to help acquaint these audiences with the activities of the Institute. The Director annually attends NAWID, UCOWR (Research Committee member) and other professional meetings to discuss Institute and Program activities.A Strategic Plan (Appendix F) for the Institute was prepared for the University and the LA Board of Regents to establish goals and milestones. To implement this program, a significant effort must be maintained in information transfer. Via input from the restructured Advisory Board (Appendix E) new contacts with a focus in nonpoint pollution prevention research will be briefed on Institute activities for FY 1991 cooperation.

Future information transfer activities include the development of a brochure about the Institute and the regular circulation of the Institute's newsletter "Intracoastal Waterways". This new newsletter is in preparation and must be approved by LSU Public Relations Office before release.

To assist in these transfer activities and administrative tasks, the College of Engineering provided the Institute with an IBM Personal System/2 Computer and Printer. The College added a laser printer and additional memory to this system in FY 89.

TRAINING ACCOMPLISHMENTS

The LWRRI is committed to training science and engineering students to assume leadership roles in current and future water resources and environmental problem solving. Research projects that incorporate extensive student training elements in the proposed research are given preferential consideration over proposed research involving faculty participation only. Table 2 summarizes the student training benefits of the current program.

Table 2. Training Accomplishments

	Academic Level				
	Undergraduate	Master's Degree	Ph.D. Degree	Post-Ph.D.	Total
Field of Study					
Chemistry					
Engineering					
Agricultural Civil Environmental Soils Systems Other*	1		1		2
Geology	1	1			2
Hydrology					
Agronomy					
Biology	1	1			2
Ecology					
Fisheries, Wildlife and Forestry					
Computer Science					
Economics					
Geography					
Law					
Resource Planning					
Other (specify)					
TOTAL	3	2	1		6

* Less than 6 students in any one field of study.

APPENDIX A

Publications List

PUBLICATIONS

OF THE

LOUISIANA WATER RESOURCES RESEARCH INSTITUTE

Dr. W. David Constant
Director

2401-A CEBA Building
Louisiana State University
Baton Rouge, Louisiana 70803
Telephone: (504) 388-8508

November 1989

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LWRRI PUBLICATIONS: Bulletins

Handbook of Basic Water Law	Bulletin 1	June 1966
The Measurement and Comparison of Costs for Alternative Water Replacement Projects	Bulletin 2	October 1966
Salt-Water Encroachment Into Aquifers	Bulletin 3	October 1968
Water-Resources Manpower Supply and Demand Patterns to 1980	Bulletin 4	May 1970
The Present and Future Ground-Water Supply of the Baton Rouge Area	Bulletin 5	February 1970
Subsidence and Ground-Water Offtake in the Baton Rouge Area	Bulletin 6	October 1970
An Economic Reappraisal of the Toledo Bend Multiple-Purpose Water Project	Bulletin 7	October 1970
Geochemical Hydrology of the Baton Rouge Aquifers	Bulletin 8	March 1972
The Mississippi River - A Water Source for Texas?	Bulletin 9	March 1973
Cyclic Storage of Fresh Water in Saline Aquifers	Bulletin 10	May 1975
Aquifers as Processing Plants for the Modification of Injected Water	Bulletin 11	August 1980
If the Old River Control Structure Fails?	Bulletin 12	September 1980
Alternate Water Sources for the Baton Rouge - New Orleans Industrial Corridor	Bulletin 12A	September 1980
A Change in the Course of the Lower Mississippi River: Description and Analysis of Some Economic Consequences	Bulletin 12B	September 1980

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LWRRI PUBLICATIONS: Technical Reports

The Recent Alluvium of Thomas and Duncan Points	Technical Report 1	June 1967
The Present and Future Ground Water Supply of the Baton Rouge Area	Technical Report 2	Sept 1967
A Summer Limnological Study of Lake Pontchartrain, Louisiana	Technical Report 3	Sept 1968
Physical, Chemical, Bacterial, and Plankton Dynamics of Lake Pontchartrain, Louisiana	Technical Report 4	Sept 1969
Epifaunal Invertebrates as Indicators of Water Quality in Southern Lake Pontchartrain, Louisiana	Technical Report 5	May 1975
Demonstration Project to Store Fresh Water in a Saline Water-bearing Formation: City of Houma, Louisiana	Technical Report 6	Feb 1979
Water Related Problems in the Coastal Zone of Louisiana	Technical Report 7	Nov 1980
Plan of Study for Evaluating the Effects of Lignite Mining in Louisiana on Water Resources	Technical Report 8	Aug 1981
Use of Twin Wells and Water-Source Heat Pumps for Energy Conservation in Louisiana	Technical Report 9	Dec 1981

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LWRRI PUBLICATIONS: GT Series

The Flood Control Capabilities of the Atchafalaya Basin Floodway	Bulletin GT-1	April 1967
Hydrology of Neogene Deposits in the Northern Gulf of Mexico Basin	Bulletin GT-2	April 1969
Economic Aspects of Ground-Water Basin Control	Bulletin GT-3	February 1970
Geohydrology of the Shallow Aquifers of Baton Rouge, Louisiana	Bulletin GT-4	October 1969
Possible Failure of the Low-Sill Control Structure at Old River, Louisiana: Economic and Physical Consequences	Bulletin GT-5	July 1976

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PROJECT COMPLETION REPORTS

TITLE	AUTHOR(S)	QUANTITY
Algae Removal by Induced Air Flotation (May 1982)	Tittlebaum, Holtman	5
Application to the Principle of Maximum Entropy (POME) to Hydrologic Frequency Analysis (1984)	Singh, Rajagopal	18
Biodegradation of Hazardous Chemical Wastes (1984)	Pelon, Murray	28
Biological Removal of Chlorinated Hydrocarbons from Water (Oct 1985)	Templet	19
Chemical Quality of Surface and Sediment Pore Water in Louisiana and Mississippi Estuaries (Oct 1973)	Snowden, Otvos	1
A Continuum Mechanics Approach to Streamflow Modeling (July 1983)	V. Singh, S. Prasad, L. Ubertini	2
Co-treatment of Water Softening and Wastewater Sludges (May 1982)	Bowie, Gautreaux	6
Development of a Methodology for Evaluating Waste Disposal Sites (August 1982)	J. Hill, R. Malone, S. R. Alston	14
Development of a Simplified Chlorinated Hydrocarbon Screening Technique for Water and Sediment (August 1984)	Templet	8
A Discrete Kernel Model for Simulation of Multilayered Aquifers (1984)	Illangasekare	17
The Dispersion of Continuously Injected Effluents in Open Cannels (Feb 1973)	Harrison, Wehe	3

PROJECT COMPLETION REPORTS (Cont.)

TITLE	AUTHOR(S)	QUANTITY
Effect of Diverting Mississippi River Water To Texas on Sedimentation in the River (March 1974)	Alawady	2
Effect of Viscosity Ratio on the Recovery of Fresh Water Stored in Saline Aquifers (April 1977)	Kimbler, Whitehead	10
Fate of PCB and Dioxin in Louisiana's Aquatic Environment (Sept 1983)	Pardue, DeLaune, Patrick	6
Floodwater Nutrient Processing in a Louisiana Swamp Forest Receiving Agriculture Runoff (Dec 1981)	Kemp, Day	1
A Geomorphic Approach to Hydrograph Synthesis, with Potential for Application to Ungaged Watersheds (June 1983)	V. Singh	4
Hydraulic Conductivity of Rockfill (July 1983)	A. A. Hannoura, K. McManis	35 Vol I 5 Vol II
Information Dissemination for a Better Understanding of Louisiana's Water Resources (Sept 1984)	Worm	7
An Investigation Into the Removal of Algae by Fine Sand/Silt Filtration (Nov 1981)	Naghavi, Malone	8
Mathematical Models for Ungaged Watersheds with Potential for Quantifying the Effect of Land Use Changes on Streamflow (Oct 1984)	Singh	3

PROJECT COMPLETION REPORTS (Cont.)

TITLE	AUTHOR(S)	QUANTITY
A Method of Determining the Quality of Irrigation Water to Achieve Optimum Growth of Bottomland Hardwoods in North Louisiana (Feb 1970)	Wilson, Miller, Banks	1
A Multivariate Approach to the Investigation of Nutrient Interaction in Barataria Basin, Louisiana (April 1983)	A. Witzig, J. Day	10
Nutrient Assimilation Capacity of Shallow Coastal Lakes (1983)	Delaune, Smith, Patrick, Sarafyan	8
Optimum Treatment for Coal Pile Runoff in Louisiana (August 1984)	Hendershot, Tittlebaum	5
Oxidation of Trace Contaminants in Drinking Water (Dec 1985)	F. Groves	20
Prediction of Hydrothermal Regimes in the Proposed Darlington Reservoir (Sept 1986)	Field	2
Radioactivity in Mississippi River Water (April 1977)	Iddings, Knaus	5
Reaeration Rate Estimation Using the LAG in Dissolved Oxygen Concentration (Jan 1983)	M. Waldon	4
Reclamation of Polluted Farm Ponds (July 1977)	Robbins, Nelson	19
Reliability Analysis of BOD Kinetics in a Small Southern Stream Governed by the Discharge of an Oxidation Pond (1981)	Crane, Malone	3

PROJECT COMPLETION REPORTS (Cont.)

TITLE	AUTHOR(S)	QUANTITY
Role of Mycorrhizae in Land Application of Municipal Wastewaters (August 1983)	J. Robbins	5
Sucrose Removal From Cane Sugar Mill Waste Streams by Ion Exchange (Oct 1976)	F. Groves	12
THM Precursors Removal From Surface Waters Using Ozone-Hydrogen Peroxide Oxidation (July 1982)	Fernandes	10
A Trophic State Index for the Louisiana Coastal Zone (April 1983)	A. Witzig, J. Day	4
Wastewater Treatment by Ligand Exchange (June 1983)	F. Groves	5
Water Quality Variation in the Potable Water of Grand Isle, Louisiana During Periods of Water Shortage (Feb 1983)	M. B. Walsh, R. Malone, E. Dantin	5

Water Quality Variation in the Potable Water of Grand Isle, Louisiana During Periods of Water Shortage (Feb 1983)	M. B. Walsh, R. Malone, E. Dantin	5
A Multivariate Stochastic Flood Analysis Using Entropy (October 1986)	Vijay P. Singh, P.K. Krstanovic	3
Reduction of Trihalomethane and Other Chlorinated Hydrocarbons in Drinking Water	B. Boyden J.B. Fernandes	
Use of Stable Nitrogen Isotopes in Determining Nitrogen Sources Entering Louisiana Surface Waters	R.D. DeLaune C.W. Lindau W.H. Patrick	
Rock-Reed Filters for Treatment of Small Domestic Wastewater Flows	R.F. Malone	
Identification of High-Risk Atmospheric and Surface Conditions for Urban Flash Flooding in Louisiana (December 1989)	K. Hirschboeck	
Pathways, Mechanisms, and Rates of Solute Transport Across the Base of the Fresh Water Zone, South Louisiana (October 1989)	J. Hanor	
Determination of Rock-Reed Filter Volume Requirements for Small Domestic Wastewater Flows (October 1989)	M. Tittlebaum	
A Water Quality Training Program for the Louisiana Cooperative Extension Service (October 1989)	B. Kelly B. Branch	
Nature and Rates of Bacterial Metabolism in the Aquifers of Southeastern Louisiana	P. Aharon	
Aquaculture/Marine Fisheries Process Wastewaters	J. Bankston	
The Importance of Denitrification Efficiency of Wastewater Treatment in Forested Wetlands	R. Twilley	
Field Testing of Rock/Reed Filters for Small DOmestic Wastewater Flows	M. Tittlebaum	

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LWRRI THESES

TITLE	AUTHOR	QUANTITY
Analog Simulation of Anisotropic Permeability (May 1974)	Ronald E. Rinard	1
Black Willow (Salix Nigra Marsh) as a Bioaccumulator of Radioactive Pollutants in Fresh Water Ecosystem (Dec 1976)	Lynn R. Curry	1
The Design, Construction, and Testing of Consolidated Anisotropic Sand Models (May 1972)	D. L. Hinners	1
Dispersion & Gravity Segregation of Miscible Fluids in Porous Media for Stratified Radial Flow Systems (Jan 1968)	Anil Kumar	2
Effect of Dip on the Subsurface Storage or Disposal of Fluids in Saline Aquifers (August 1975)	Joseph A. D'Amico	1
Effect of Failure of the Old River Control Structure on Municipal and Industrial Water Supplies (May 1977)	Howard J. Redmond	1
The Effect of Flux & Gravitational Forces on Miscible Displacement in a Thin Homogeneous Bed (August 1973)	Walid J. Esmail	1
The Effect of Mixed Zone Length on the Growth of Viscous Fingers During a Miscible Displacement (August 1977)	Calvin C. Barnhill	1
Effect of Viscosity Ratio on the Recovery of Fresh Water Stored in Saline Aquifers (Dec 1975)	Bipin K. Agrawal	1

LWRRI THESES (Cont.)

TITLE	AUTHOR	QUANTITY
Environmental Factors Affecting the Properties & Precipitation of Coloring Colloids in Aquatic Habitats (August 1973)	Billy R. Bordelon	1
Enzyme Process Design for Water Treatment (Dec 1976)	Steven W. Johnston	1
An Evaluation of Twin Wells for Use with Water Source Heat Pumps (May 1981)	Joseph R. Buller	1
Experimental Study of Multi-Cation Diffusion in an Artificial Quartz Sandstone (Dec 1974)	Ronald K. Stoessell	2
Geological Factors Influencing Recharge to the Baton Rouge Ground-water System, with Emphasis on the Citronelle Formation (August 1967)	Brian E. Parsons	2
The Influence of Brackish-Water Intrusion on Macro-invertebrate Associations of the Lower Tchefuncte River, Louisiana (August 1975)	Maureen M. Mulino	2
Investigation of the Technical Feasibility of Storing Fresh Water in Saline Aquifers (August 1966)	Omar J. Esmail	1
Measurement of & Calibration for Gamma Spectroscopy of Mississippi River Water (August 1976)	Orren W. Williams	1
The Relationship Between the Presence of Dissolution Features at the Salt-Caprock Interface & Saline Plumes in Aquifers Surrounding Salt Domes (Dec 1982)	Martin L. Wouch	2

LWRRI THESES (Cont.)

TITLE	AUTHOR	QUANTITY
The Simulation of Whole Core Permeameter Flow Geometry (August 1974)	Louis O. Chemin Jr.	1
A Study of the Technical and Economic Feasibility of Using Sewage Effluent for Irrigation in Lincoln Parish (August 1967)	Robert P. Cantrell	5
A Study of the Technical and Economic Feasibility of Using Sewage Effluent for Irrigation in Quachita Parish (Nov 1968)	Fernando A. Calvo	2
A Technique for Irrigating Bottomland Hardwood Trees with Papermill Effluent in North Louisiana (May 1970)	Ishtiaq Ahmed	6
The Transport of Chlorinated Hydrocarbons in Dilute Aqueous Solution Through Saturated Cohesive Deposits of Southern Louisiana (August 1987)	Laqique Haider	1
Unequal Density Miscible Displacement in Thin Homogeneous Tilted Beds (Dec 1971)	Thomas R. Painter	1
The Use of Bounding Wells to Control Flux in Underground Water Storage Projects (August 1974)	Edmond J. Langhetee	1
The Use of Bounding Wells to Counteract the Effects of Gravity in Dipping Aquifers (May 1978)	Thomas E. Williams	1
Use of Bounding Wells to Negate the Effects of Gravity and Pre-Existing Groundwater Movement in Dipping Aquifers Used for Storage (August 1979)	Paul J. Abadie	1

LWRRI THESES (Cont.)

TITLE	AUTHOR	QUANTITY
Zonation of Lake Pontchartrain Invertebrates in a Polluted New Orleans Outfall Canal (August 1978)	Michael F. Rayle	2

LWRRI DISSERTATIONS

TITLE	AUTHOR	QUANTITY
Discharge Model of the Mississippi River Evaluation of the Impact of Diversion of Water to Texas (May 1972)	O. Arguello	1
Economic Aspect of Ground-Water Basin Control (May 1979)	Larry Falk	1
Storage of Fresh Water in Saline Aquifers Using a Well Field (August 1974)	W. Whitehead	1
Geochemical Hydrology of Ground Water in Baton Rouge, Louisiana (Jan 1971)	Rashid A. Khan	3
Movement in an ACHM Overlay in the Vicinity of Overlaid Joints on a PCC Pavement (1978)	Terry J. Dantin	1

APPENDIX B

Research Symposium Programs

ANNOUNCEMENT OF FALL 1989 CONFERENCE

"LOUISIANA'S ENVIRONMENT IN THE 1990'S"

Strategies to Control Toxics
Changing Perspectives and Opportunities in Water Resources Management
November 14-16, 1989 (2 1/2 days)
BELLEMONT HOTEL, GREAT HALL
7370 Airline Highway, Baton Rouge, LA

sponsored by:

La. Dept. of Environmental Quality
(La. Chapter) American Water Resources Association
La. Water Pollution Control Association
La. Water Resources Institute
La. Chemical Association
La. Association of Business & Industry

General Session:

DEQ Environmental Update
Offices of the Secretary, Air & Nuclear Energy, Water Resources, Hazardous and Solid Waste, Legal & Enforcement

Concurrent Sessions:

- **Strategies to Control Toxics in Water**
  Risk-Based vs. Technology-Based Approaches to Water Quality Regulations and Monitoring Capabilities (Bio-Monitoring & Toxicity Reduction Evaluations)
- **Assessment, Modeling and Communication of Risks**
- **Pollution Prevention/Waste Minimization Techniques**
  Source Reduction, Waste Reduction and Recycling Alternatives
- **Water Resources Management**
  Federal & State Agency Roles, Water Project Updates, Water Resources Research Reports
- **Coastal Restoration**
- **On-line Monitoring of Discharges**

Conference Planning Committee:

AWRA — Paul Kemp
LWPCA — Pat Jordan
LWRI — David Constant
LCA — Henry T. Graham, Jr.
DEQ — Robert Hannah
Exhibitors — Ken Keffer (504) 893-7920
Registration — Jim Joyce or Terry Snell (504) 835-4252

LOUISIANA'S ENVIRONMENT IN THE 1990'S
BELLEMONT HOTEL GREAT HALL
DAY 1 November 14, 1989

8:00 a.m. - Registration Begins, (Rotunda)
Exhibits Open (Ballrooms 1 & 2)
(Refreshments in the Exhibit Area)

General Session
DEQ Environmental Update
Ballroom 3

9:00 a.m. - Welcome, Introduction
Glen Daigre, President, La. AWRA
Henry Graham, Jr., President, LWPCA

9:10 a.m. - Keynote Address - Office of Water Resources Activities
Maureen O'Neill, Asst. Secretary DEQ

9:30 a.m. - Office of the Secretary Activities

10:10 a.m. - Question & Answer

10:30 a.m. - BREAK (Refreshments/Visit Exhibits - Ballrooms 1 & 2)

11:00 a.m. - Office of Air Quality & Nuclear Energy Activities
Mike McDaniel, Asst. Secretary DEQ

11:20 a.m. - Office of Solid & Hazardous Wastes Activities
Tim Hardy, Asst. Secretary DEQ

11:40 a.m. - Question & Answer

12:00 noon - Lunch - (Ballroom 4)
Guest Speaker - Dan Borne', President
Louisiana Chemical Association

Afternoon General Session - Ballroom 3

1:30 p.m. - Citizens Environmental Activities
Leonard Knapp, Chairman, DEQ Citizens Advisory Panel

1:50 p.m. - Safe Drinking Water Program Activities
Jay Ray - Dept. of Health & Hospitals

2:10 p.m. - Office of Conservation Activities
James H. Welsh - Dept. of Natural Resources

2:30 p.m. - Question & Answer

2:50 p.m. - Overview of Conference Concurrent Sessions

3:00 p.m. - BREAK (Refreshments/Visit Exhibits - Ballrooms 1 & 2)

3:00 p.m. - Poster Session Begins (Exhibit Area, Ballrooms 1 & 2)

4:00 p.m. - Adjourn

4:00 p.m. - Hospitality Hour Begins (Exhibit Area, Ballrooms 1 & 2)

LOUISIANA'S ENVIRONMENT IN THE 1990'S
Bellemont Hotel Great Hall
DAY 2 November 15, 1989

8:00 a.m. - Registration Begins (Rotunda)
Exhibits Open (Ballrooms 1 & 2)
(Refreshments in the Exhibit Area)

Concurrent Session On Strategies to Control Toxics in Water
Morning Session

9:00 a.m. - Introduction of Session - Moderator

9:10 a.m. - Development of Risk-Based Water Quality Standards to Control Toxics 304(1)
Cheryl Overstreet, EPA Region VI

9:40 a.m. - Development of Risk-Based Water Quality Standards
Dugan Sabins, DEQ

10:10 a.m. - Question & Answer

10:30 a.m. - BREAK (Refreshments/Visit Exhibits - Ballrooms 1 & 2)

11:00 a.m. - Implementing 304 (1) in Permitting and EPA Biomonitoring Policy
Robert Vickery, Aquatic Biologist, EPA Region VI

11:30 a.m. - Toxicity Reduction Evaluations
Drew Fillingame, C.K. Associates

12:00 noon - Lunch (Ballroom 4)
Guest Speaker on Coastal Restoration
Senator Ben Bagert

Concurrent Session on Risk Assessment
Afternoon Session

1:30 p.m. - Introduction of Session - Moderator

1:40 p.m. - What is Risk Assessment?
Dr. Luann White
Tulane University School of Public Health & Tropical Medicine

2:00 p.m. - Risk Modeling
Jacqueline "Ruddie" Clarkson
J.M. Montgomery Consulting Engineers

2:20 p.m. - Case Study of Risk Assessment
Dr. Barbara Shane, LSU Inst. for Envir. Studies

2:40 p.m. - Question & Answer

3:00 p.m. - BREAK (Refreshments/Visit Exhibits - Ballrooms 1 & 2)

3:30 p.m. - Quantitative Risk Assessment - National Perspective
Dr. Robert Sielken, Sielken and Associates

4:00 p.m. - Predicting Flow, Time of Travel & Mixing Zones
Mike Waldon, USL Center for Inland La. Water Studies

4:30 p.m. - Adjourn

4:30 p.m. - Hospitality Hour (Exhibit Area, Ballrooms 1 & 2)

LOUISIANA'S ENVIRONMENT IN THE 1990'S
Bellemont Hotel Great Hall
DAY 2 November 15, 1989

8:00 a.m. - Registration Begins (Rotunda)
Exhibits Open (Ballrooms 1 & 2)
(Refreshments in the Exhibit Area)

Concurrent Session on Pollution Prevention/Waste Reduction
Morning Session

9 a.m. - Introduction of Session - Moderator

9:10 a.m. - EPA's Pollution Prevention Program
John Atcheson, EPA Pollution Prevention Office, Washington, D.C.

9:30 a.m. - EPA's Pollution Prevention Research Program
Paul Randall, EPA Risk Reduction Engineering Laboratory, Cincinnati, Ohio.

9:50 a.m. - Chemical Release Reduction Policy
Ann Mason, Chemical Manufacturers Association

10:10 a.m. - Panel Discussion
Question & Answer

10:30 a.m. - BREAK (Refreshments/Visit Exhibits - Ballrooms 1 & 2)

11:00 a.m. - Development of a Waste Reduction Program
Rosalind Segesta, LSU Hazardous Waste Research Center

11:20 a.m. - Overview of Waste Reduction Research in La.
Dr. Louis Thibodeaux, LSU Hazardous Waste Research Center

11:40 a.m. - Question & Answer

12:00 noon - Lunch (Ballroom 4)
Guest Speaker on Coastal Restoration - Senator Ben Bagert

Concurrent Session on Pollution Prevention/Waste Reduction
Afternoon Session

1:30 p.m. - Introduction of Session - Moderator

1:40 p.m. - Managing A Waste Reduction Program
William B. Beck, E.I. DuPont

2:00 p.m. - Dow's Waste Reduction Always Pays Program (WRAP)
Chris Hamm, Dow Chemical

2:20 p.m. - Source Reduction, Process Modifications to Reduce Wastes
Ken Nelson, Dow Chemical

2:40 p.m. - Question & Answer

3:00 p.m. - BREAK (Refreshments/Visit Exhibits - Ballrooms 1 & 2)

3:30 p.m. - Justifying Waste Reduction Projects
Ken Schroeder, ERM Southwest

3:50 p.m. - New Technologies in Waste Reduction and Recycling Alternatives
Dr. Douglas Hahn, Woodward-Clyde Consultants

4:10 p.m. - Question & Answer

4:30 p.m. - Adjourn

4:30 p.m. - Hospitality Hour (Exhibit Area, Ballrooms 1 & 2)

LOUISIANA'S ENVIRONMENT IN THE 1990's
Bellemont Hotel Great Hall
DAY 2 November 15, 1989

8:00 a.m. - Registration Begins (Rotunda)
Exhibits Open (Ballrooms 1 & 2)
(Refreshments in the Exhibit Area)

Concurrent Session on Water Resources Management
Morning Session

9:00 a.m. - Introduction of Session - Moderator

9:10 a.m. - La. Port Development
Ed Breckwoldt, Dept. of Transportation & Development

9:30 a.m. - Groundwater Resources
Bo Bolourchi, Dept. of Transportation & Development

9:40 a.m. - Federal Projects in Louisiana
Dave Grouchy, Dept. of Transportation & Development

9:50 a.m. - La. Water Resources Information Center
Sharon Balfour, Dept. of Transportation & Development

10:00 a.m. - La. Statewide Flood Control Program
Curtis Patterson, Dept. of Transportation & Development

10:20 a.m. - Question & Answer

10:30 a.m. - BREAK (Refreshments/Visit Exhibits - Ballrooms 1 & 2)

11:00 a.m. - La. Scenic Rivers Program
M.B. "Blue" Watson, Dept. of Wildlife and Fisheries

11:20 a.m. - Wetlands Determination
Dr. Thomas Davidson, U.S. Corps of Engineers, New Orleans

11:40 a.m. - Coastal Restoration
Dave Chambers, Dept. of Natural Resources

12:00 noon - Lunch (Ballroom 4)
Guest Speaker on Coastal Restoration - Senator Ben Bagert

Concurrent Session on River-Management for Coastal Wetlands Restoration
Afternoon Session

1:30 p.m. - Introduction of Session - Moderator
Dr. G. Paul Kemp, Coalition to Restore Coastal La.

1:40 p.m. - Recent Developments in Wetlands Loss Research
Del Britsch, Waterways Experiment Sta., Corps.

2:00 p.m. - EPA Initiatives on Wetlands Loss and Restoration
Norm Thomas, EPA, Region VI

2:20 p.m. - Creative Engineering Approaches to Wetlands Restoration
Dr. Joseph Suhayda, Dept. Civil Eng., LSU

2:40 p.m. - Case Study in Sediment and Water Diversion for Wetlands Restoration
Mr. Jack Mager, P.E., Brown & Root Construction

3:00 p.m. - BREAK (Refreshments/Visit Exhibits - Ballrooms 1 & 2)

3:30 p.m. - River Management for Wetlands Restoration
Capt. Richard Gorski, U.S. Corp of Engineers

4:00 p.m. - Panel Discussion - Question and Answer

4:30 p.m. - Adjourn

4:30 p.m. - Hospitality Hour (Exhibit Area, Ballrooms 1 & 2)

LOUISIANA'S ENVIRONMENT IN THE 1990's
Bellemont Hotel Great Hall
DAY 3 November 16, 1989
Concurrent Session on
On-line Monitoring of Discharges
Morning Session

9:00 a.m. - Introduction of Session - Moderator

9:10 a.m. - DEQ Policy on On-line Monitoring
Gary Aydell, DEQ

9:30 a.m. - Industry Perspective to On-line Monitoring
George Stanko - Shell Development Company

9:50 a.m. - On-line Monitoring Research
Ed Overton, LSU Institute for Env. Studies

10:10 a.m. - Panel Discussion
Question & Answer

10:30 a.m. - BREAK (Rreshments)

Panel Discussion: On-line Monitoring Instrumentation

10:50 a.m. - Richard Durham, Dow Chemical

11:10 a.m. - James A. Grote, Tekmar Company

11:30 a.m. - Ulrich Goekler, ES Industries

11:50 a.m. - Larry Maley, Ionics, Inc.

12:10 p.m. - Question & Answer

12:30 p.m. - Adjourn

Concurrent Session on
Risk Communication and Risk Management

9:00 a.m. - Introduction of Session - Moderator

9:10 a.m. - Decision-Marker's Perspective
Daniel J. Fiorino, EPA Office of Policy Analysis, Washington, D.C.

9:40 a.m. - Risk Communications & Risk Management
Vicki Arroyo, DEQ Policy & Planning

10:00 a.m. - Citizen's Approach
Eloise Wall, CFACE, LEAN

10:20 a.m. - Industry Approach
Mike Hayes, Vista Chemical

10:40 a.m. - Panel Discussion
Question & Answer

11:00 a.m. - Adjourn

LOUISIANA'S ENVIRONMENT IN THE 1990's
DAY 3 November 16, 1989
Concurrent Session On
Water Resources Research Papers
Fiscal Year 1988 Projects

9:00 a.m. - Introduction of Session - Moderator

9:10 a.m. - Identification of High-Risk Atmospheric and Surface Conditions for Urban Flash Flooding in Louisiana.
Dr. Katherine Hirschboeck, LSU Geography Dept.

9:30 a.m. - Pathways, Mechanisms, and Rates of Solute Transport Across the Base of the Fresh Water Zone, South Louisiana
Dr. Jeffery S. Hanor, LSU Geology Dept.

9:50 a.m. - A Water Quality Training Program for the Louisiana Cooperative Extension Service
Bill Branch - La. Cooperative Extension Service
Brenda Kelly - La. Water Resources Research Institute

10:10 a.m. - Determination of Rock Reed Filter Volume Requirements for Small Volume Domestic Wastewater Flows
Dona Skipper, LSU Civil Engineering Dept.

10:30 a.m. - BREAK (Refreshments)

Fiscal Year 1989 Projects

10:50 a.m. - Field Testing of Rock/Reed Filters for Small Domestic Wastewater Flows
Dr. Mary Tittlebaum & Donna Skipper,
LSU Civil Engineering Dept.

11:00 a.m. - Nature and Rates of Bacterial Metabolism in the Aquifers of Southeastern Louisiana
Dr. Paul Aharon, LSU Geology Dept.

11:10 a.m. - Aquaculture/Marine Fisheries Process Wastewaters
Dr. J. David Bankston
La. Cooperative Extension Service

11:20 a.m. - The Importance of Denitrification to Efficiency of Wastewater Treatment in Forested Wetlands
Dr. Robert Twilley, USL Biology Dept.

Other Research

11:30 a.m. - Fate and Effect of Produced Waters in the Estuarine Environment
Dr. A.T. Knecht and Dr. M. Porrier
UNO Center for Bio-organic Studies

12:00 noon - Adjourn

November 14 - 16, 1989
Registration Form

Name/Title _____

Company/Agency _____

City _____ State _____ Zip _____

Registration Fees		Early Registration (By Oct. 30, 1989)	Late or On-Site Registration
Member:	☐ AWRA (La.)	$65	$85
(check if applicable	☐ LWPCA	$65	$85
Non-Member:		$85	$105
*Exhibitor (includes 1 full registration)		$250	
Additional Exhibitors (Exhibit Area Only)		$10 each	

In order to assist in determining attendance at the concurrent sessions, please indicate which concurrent session you will most likely attend (non-binding preference). Please check one.

DAY 2 Morning Session

- ☐ Strategies to Control Toxics
- ☐ Pollution Prevention
- ☐ Water Resources Management

DAY 2 Afternoon session

- ☐ Risk Assessment
- ☐ Waste Reduction
- ☐ Coastal Restoration

DAY 3 Morning Session

- ☐ On-line Monitoring of Discharges
- ☐ Risk Communication & Management
- ☐ Water Resources Research Reports

Please make check payable to LWPCA.
Contact Jim Joyce or Terry Snell at (504) 835-4252 for further registration information.

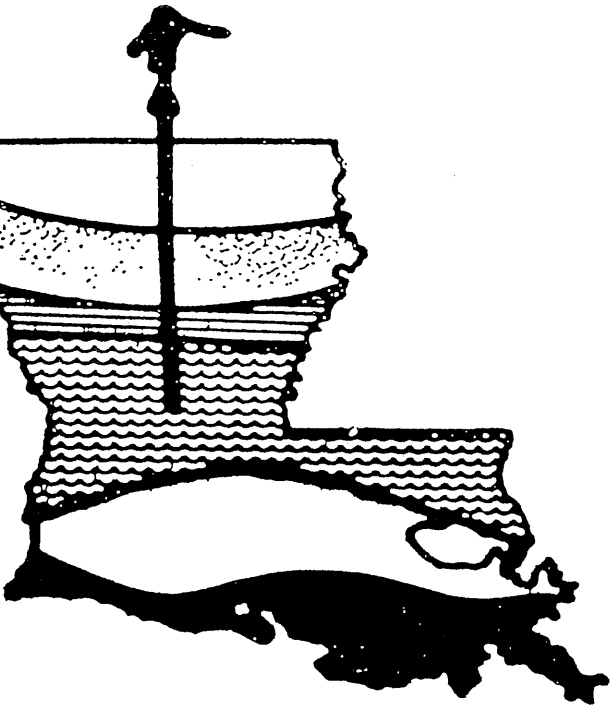
*Contact Ken Keffer at (504) 893-7920 for exhibitor information.

PLACE STAMP HERE

Jim Joyce
James M. Montgomery Consulting Engineers
3501 North Causeway Boulevard, Suite 300
Metairie, Louisiana 70002

1990 GROUND WATER SEMINAR

Ground Water Protection in Louisiana: Data Evaluation and Management, Assessment, and Remediation



May 3, 1990

Holiday Inn South
Airline & I-12
Baton Rouge, Louisiana

OBJECTIVES:

- To provide timely and accurate information about the latest technological advancements
- To identify and assess new issues and concerns, recent developments, and new problems facing Louisiana
- To enhance our understanding of the advances in the manipulation and presentation of large data sets for their evaluation and management
- To provide a forum for the transfer of knowledge between professionals who are often on different sides and expressing different points of view on particular environmental issues

WHO SHOULD ATTEND:

The seminar is designed for professionals involved in the multidisciplinary aspects of ground water management, regulation, and research in the State.

SEMINAR STEERING COMMITTEE:

Dean Adrian, Department of Civil Engineering, LSU

Z. "Bo" Bolourchi, LA Department of Transportation & Development

David Constant, La. Water Resources Research Institute

George H. Cramer, Environmental Materials, Inc.

Dhamo S. Dhamotharan, Woodward-Clyde Consultants

Bradford Hanson, Louisiana Geological Survey

John W. Impson, La. Department of Agriculture & Forestry

Darwin Knochenmus, United States Geological Survey, Chairman

Edward Martin, United States Geological Survey

Bobby Savoie, La. Department of Health & Hospitals

FORMAT:

The seminar is planned as a forum where participants can gather information and knowledge as well as present their views. Experts in each field will present basic information and describe the state-of-the-art. Each session will be followed by a question-and-answer period.

REGISTRATION:

Pre-registration fee $65 (postmarked by April 21, 1990). Late registration and payment on the day of seminar $75. Fee will cover the cost of luncheon. Special rate for students $30.

SPONSORS:

- American Water Resources Association
- Environmental Materials, Inc.
- Louisiana Department of Agriculture & Forestry
- Louisiana Department of Environmental Quality
- Louisiana Department of Health & Hospitals
- Louisiana Department of Transportation & Development
- Louisiana Geological Survey
- Louisiana State University
  Louisiana Water Resources Research Institute
  Hazardous Waste Research Center
  Department of Civil Engineering
- United States Geological Survey
- Woodward-Clyde Consultants

1990 GROUND WATER SEMINAR -- Ground Water Protection in Louisiana: Data Evaluation and Management, Assessment, and Remediation

Holiday Inn South, Airline & I-12, Baton Rouge, Louisiana
MAY 3, 1990

PROGRAM

THURSDAY, MAY 3, 1990

8:00 a.m. REGISTRATION

8:30 a.m. WELCOME & INTRODUCTION

Darwin Knochenmus
Seminar General Chairman, District Chief, U.S. Geological Survey

Opening Remarks
Vickie Arroyo, Director
Division of Policy and Planning
La. Dept of Environmental Quality

Session I: DATA EVALUATION

9:00 a.m. Moderator: Dhamo S. Dhamotharan, Vice President, Woodward-Clyde Consultants

- Georgia Bryant, Chief Environmental Epidemiologist, Office of Public Health, La. Dept. of Health & Hospitals, 'Data Evaluation from a Health Point-of-View'

- ~~Robert Montgomery, Associate,~~ Woodward-Clyde Consultants, 'Evaluation of Data Uncertainty at Hazardous Waste Sites'

- Don Lierman, Senior Environmental Engineer, BASF Corp, La. 'Evaluating Validity of Monitoring Data - An Industrial Perspective'

10:15 a.m. Coffee Break

Session II: DATA MANAGEMENT

10:45 a.m. Moderator: Z. "Bo" Bolourchi, Chief, Water Resources Section, La. Dept. of Transportation and Development

- William Alley, Research Hydrologist U.S. Geological Survey, Reston, VA 'USGS National Water Quality Assessment Program'

- Edward Martin, Supervisory Hydrologist U.S. Geological Survey, 'Use of GIS in Ground Water Analysis'

11:45 a.m. Lunch Break

Session III: SITE ASSESSMENT

1:00 p.m. Moderator: George Cramer, Vice President, Environmental Materials, Inc.

- Larry Bone, Environmental Manager NPC Services, 'Petro Processors--Site Assessment and Remediation'

- Charles Whitten, Geologist, Waterways Experiment Station, Corps of Engineers, 'The Use of Water Level Measuremenis for In-Situ Assessments'

- David Zalodek, Program Manager, Nuclear Energy Division, La. Dept. of Environmental Quality, 'Program on Naturally Occurring Radioactive Materials'

2:30 p.m. Coffee Break

Session IV: GROUND WATER REMEDIATION

3:00 p.m. Moderator: David Constant, Director Louisiana Water Resources Research Institute

- Martin Rowland, Senior Environmental Engineer and David M. Thompson, Martin Marietta, 'Ground Water Treatment with Ultraviolet Light and Hydrogen Peroxide'

- Danny D. Reible, Associate Professor of Chemical Engineering, LSU, 'Subsurface Processes--Implications for In-Situ Remediation'

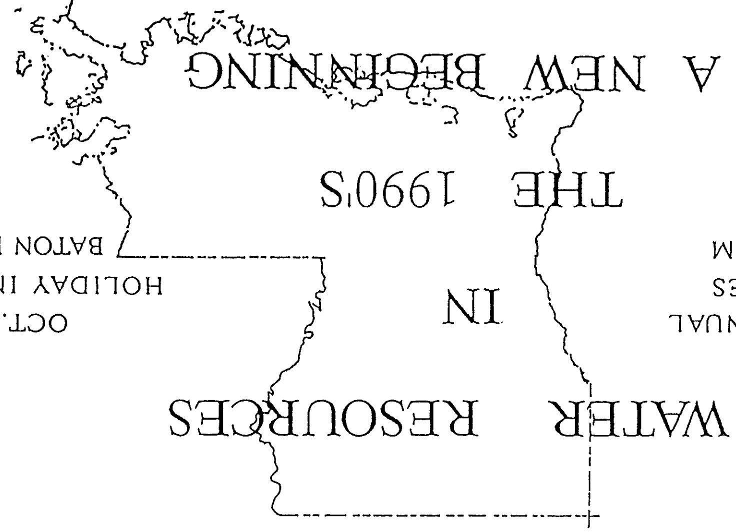
- Mark E. Zappi, Environmental Engineer Waterways Experiment Station, Corps of Engineers, 'Compatibility of Soil-Bentonite Slurry Wall Backfill Mixtures with Contaminated Ground Water'

4:30 p.m. Closing Remarks

Bobby Savoie, Environmental Consultant, La. Dept. of Health & Hospitals

4:45 p.m. Social Event
Hosted by the Woodson Companies
Lafayette, Louisiana

THE SEVENTH ANNUAL
WATER RESOURCES
SYMPOSIUM



OCT. 30-31, 1990
HOLIDAY INN SOUTH
BATON ROUGE, LA.

U.S. GEOLOGICAL SURVEY

WATER RESOURCES DIVISION
P.O. BOX 66492
BATON ROUGE, LOUISIANA 70896

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Louisiana State University
Baton Rouge, LA 70803

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SYMPOSIUM STEERING COMMITTEE:

Gary Aydell, Louisiana Department of Environmental Quality

Sharon Balfour, Louisiana Department of Transportation and Development

Jan Boydstun, Louisiana Department of Environmental Quality

Brenda Brunner, Louisiana Cooperative Extension Service

David Constant, Louisiana Water Resources Research Institute

Glen Daigre, Louisiana Division of Administration, Office of Planning and Budget

Rod Emmer, Coastal Environments Inc.

G. Paul Kemp, Woodward-Clyde Consulants

Edward H. Martin, U.S. Geological Survey, Chairman

Dale Nyman, U.S. Geological Survey, Retired

Mike Waldon, Louisiana Department of Environmental Quality

Brochure prepared by Cheryl Johnson and Lisa Farrar, U.S. Geological Survey

Seventh Annual Louisiana Water Resources Symposium

October 30-31, 1990, Holiday Inn South
Baton Rouge, Louisiana

Program

Tuesday, October 30, 1990

8:00 a.m. REGISTRATION

8:30 a.m. Plenary Session: "Water Resources in the 1990's - Changes and Progress," Moderator: Ed Martin, Symposium Chairman, USGS

Welcome and Introduction, Paul Kemp, President, Louisiana Section AWRA, Woodward-Clyde Consultants

"Pertinent Water Issues," Dr. Paul Templet, Secretary, Louisiana Department of Environmental Quality

"Louisiana's Role in Coastal Restoration," Ronald J. Gomez, Sr., Secretary, Louisiana Department of Natural Resources

10:00-10:30 BREAK

"Wetlands Protection," Glen Eugster, Chief Outreach State Program Staff, Office of Wetlands Protection, U.S. EPA, Washington, D.C.

"1991 National AWRA Conference, New Orleans, LA," Russ Wagner, AWRA National Conference Chairman, USGS, Bay St. Louis, MS

11:30-1:00 LUNCH IN THE ATRIUM

1:00 p.m. Concurrent Session: "The Mississippi River, Living Next to a Giant," Moderator: Max Forbes, Hydrologist, USL

"Deepening the Mississippi River Navigation Channel," Joe Dicharry, Project Manager, U.S. Army Corps of Engineers, New Orleans, LA; and Mervin Morehiser, Consultant to LA-DOTD, Harahan, LA

"Saltwater Intrusion in the Lower Mississippi River," Cecil Soileau, Chief, Hydrology and Hydraulics Branch, U.S. Army Corps of Engineers, New Orleans, LA

"Transport and Mixing of Pollutants in the Mississippi River - Upland Areas to the Lower Reach," Robert Meade, Hydrologist, USGS, Lakewood, CO

2:30-3:00 BREAK

"Trends in Water Quality of the Mississippi River," Nancy Rabalais and R. Eugene Turner, LA Universities Marine Consortium

Low Head Power Generation for the Mississippi Delta - A Case Study," Ralph L. Laukhuff, Executive Vice President, Forte and Tablada, Inc.

1:00 p.m. Concurrent Session: Progress Reports of the Louisiana Water Resources Research Institute, David Constant, Director

"Bacterial Metabolism in the Aquifers of Southeastern Louisiana," Paul Aharon, LSU

"Aquaculture/Marine Fisheries Process Wastewaters," Bill Branch, Louisiana Cooperative Extension Service, LSU

"Denitrification of Waste Water Treatment in Forested Wetlands," Robert Twilley, USL

"Field Testing of Rock-Reed Filters for Wastewater Flows," Marty Tittlebaum, LSU

2:30-3:00 BREAK

"Use of Wetlands for Wastewater Treatment," John W. Day, Jr., Stephen C. Farber, LSU

"Use of Soil Biofilter Beds for Treating High Organic, Low Toxicity Wastewater," R.D. DeLaune, J.H. Pardue, and W.H. Patrick, Jr., LSU

"Studies on the Uptake, Accumulation, and Metabolism of 2,4-Dichlorphenol and Pentachlorophenol by Lemna Gibba," Harry E. Ensley and John T. Barber, Tulane University

"Colloidal Gas Aphrons for Soil Washing and Groundwater Remediation," Dipak Roy, LSU

4:00-till SOCIAL EVENT
Woodward-Clyde Consultants, Sponsor

Wednesday, October 31, 1990

8:30 a.m. Concurrent Session: "Groundwater Supply and Contamination," Moderator: Dale Nyman, Retired, USGS

"Overview of Underground Storage Tank Regulations," George Gullett, Environmental Coordinator, LA-DEQ

"Public Water Supply Compliance with LA-DHH Regulations," Jay Ray, Program Manager, Office of Public Health, LA-DHH

"Extent of Organic Contamination of Louisiana's Aquifers," Dan Tomaszewski, Hydrologist, USGS, and Z. "Bo" Bolourchi, Chief, Water Resources Division, LA- DOTD

10:00-10:30 BREAK

"Overview of the Groundwater Protection Division," Louis Johnson, Administrator, Groundwater Protection Division, LA-DEQ

"Petro Processors--An Update," Robert G. Bolger, President, NPC Services, Inc.

"Plugging and Abandonment of Oil Wells," Ed Buford, Petroleum Engineer Division Manager, Office of Conservation, LA-DNR

8:30 a.m. Concurrent Session: "NonPoint Source Problems and Solutions," Moderator: Jan Boydstun, Environmental Quality Specialist, LA-DEQ

"Nonpoint Source Educational Activities," Brenda Bruner, Louisiana Cooperative Extension Service, LSU

"Comparisons of Best Management Practices for Rice Cultivation," Sam Feagley, Dept. of Agronomy, LSU

"Effects of Forestry on Wildlife and Fisheries," Fred Bryan, Director, Louisiana Cooperative Fish and Wildlife Research Unit, LSU

10:00-10:30 BREAK

"Meeting the Requirements of EPA's New Stormwater Rules for Cities," Ann Hoos, Hydrologist, USGS, Nashville, TN

"Overview of USDA's Water-Quality Initiatives," Kent Milton, Resource Conservationist, SCS, Alexandria, LA

11:30-1:00 LUNCH IN THE ATRIUM

1:00 Concurrent Session: "Pollution Prevention and Reduction," Moderator: Maureen O'Neill, Assistant Secretary, Office of Water Resources, LA-DEQ

"Effects of Brine Discharges from Oil and Gas Production," Kerry St. Pe', Regional Coordinator, Office of Water Resources, LA-DEQ, Lockport, LA

"On-Line Monitoring Task Force," Randy Collard, Research Manager for Engineering Sciences, Dow Chemical USA, Plaquemine, LA

"Coast Guard's Role in Pollution Prevention," Lt. Commander Ken Keane, Assistant Chief , Port Operations Dept., Captain of the Port, New Orleans, LA

2:30-3:00 BREAK

"Recycling," Wilma Subra, President, Subra Company, New Iberia, LA

"Issues and Priorities in Louisiana's Waste Minimization Program," Maurice Knight, State Policy and Planning Administrator, LA-DEQ

1:00 Concurrent Session: "Coastal Louisiana," Moderator: G.Paul Kemp, Project Scientist, Woodward-Clyde Consultants

"Synoptic Water Quality Survey of the Mermentau River," Dennis Demcheck, Hydrologist, USGS

"National Estuary Program," Dugan Sabins, Environmental Quality Coordinator, LA-DEQ

"Louisiana Coastal Restoration Plan," Bill J. Good, Acting Administrator, Coastal Restoration Division, LA-DNR

2:30-3:00 BREAK

"Where Do We Go From Here?" -- Panel Discussion

APPENDIX C

State Advisory Board

STATE ADVISORY BOARD
Louisiana Water Resources Research Institute

Purpose: To assist the Director, Louisiana Water Resources Research Institute (LWRRI), in identifying water resources research needs for the State of Louisiana.

Membership: Board members represent the water resources professional communities of the State of Louisiana, and are selected for their knowledge of water resources management or research. The Board consists of 13 members who are appointed by the President, LSU. Each member represents a distinctly different water resources focus area and serves a 5 year term.

Requirements: Each member shall participate in the annual meeting of the Board. This meeting shall be called by the Institute Director and shall be held at the convenience of all Board members.

Benefits: An opportunity to guide the research activities of Louisiana Water Resources Research Institute.

An opportunity to communicate with fellow water resources professionals in the state, sharing ideas and expressing research needs.

Service to Louisiana.

MEMBERSHIP
STATE ADVISORY BOARD

Number of Representatives	Agency or Interest Group	Representatives
2	City/Parish Government	
	o Mayor, New Orleans	Sidney Barthelemy
	o Mayor, Shreveport	John Hussey
3	Federal Government Agencies	
	o US Army Corps of Engineers	Arthur Williams, Maj. Gen. Mississippi River Div.
	o US Dept. of Agriculture	Harry Hawthorne Soil Conservation Service
	o US Geological Survey	Darwin Knochenmus District Chief
1	Industry	Jerry Daigre Dow Chemical Co. Plaquemine
2	Professional Organizations	
	o American Water Resources Assn. - Louisiana Chapter	Glen Daigre, President Baton Rouge
	o Louisiana Marine Consortium	Don Boesch, Director Chauvin
4	State Agencies	
	o Dept. of Environ. Quality	Maureen O'Neill Asst. Sec.
	o Dept. of Health & Hospitals	Bobby Savoie Environmental Consultant
	o Dept. of Natural Resources	Chip Groat, Director La. Geological Survey
	o Dept. of Transportation & Development	Neil Wagoner, Secretary
	University	Bobby Price, Director Water Resources Center, La. Tech Univ., Ruston

13 Members

APPENDIX D
University Advisory Board

UNIVERSITY ADVISORY BOARD
Louisiana Water Resources Research Institute

Purpose: To develop specific task-oriented Request for Proposals statements from the research needs listing identified by the State Advisory Board

To assist the Director in prioritizing the identified research areas

To identify potential investigators who can participate in the priority research areas

To identify and promote areas where cooperative research programs can be developed between LWRRI and other campus organizations

Membership: Board members are selected from the Louisiana State University faculty, and are selected for their knowledge of the active participation in an area of water resources research. The Board consists of eight members appointed by the President, LSU. Each member represents distinctly different water resources focus area and serves a 5 year term.

Requirements: Each member shall participate in the annual meeting of the Board. This meeting shall be called by the Director, Louisiana Water Resources Research Institute, and shall be held at the convenience of all Board members.

Benefits: Service to LSU

Service to Louisiana

An opportunity to guide the research activities of Louisiana Water Resources Research Institute.

An opportunity to communicate with fellow water resources professionals in the university and state, sharing ideas and expressing research needs.

UNIVERSITY ADVISORY BOARD MEMBERSHIP

Number of Representatives	Discipline	Representatives
1	Agriculture	Hussein Selim Dept. of Agronomy
1	Biological Science	Not Yet Designated
1	Business	Steve Farber Dept. of Economics
1	Engineering	W. David Constant Director, LWRRI Dept. of Chem. Engr.
1	Physical Sciences	Robert Muller Dept. of Geography
3	Special Research Interests . Coastal Studies . Environmental Studies . Wetlands Resources	 John Day Ed Overton, Director Flora Wang
8 Members		

APPENDIX E

Restructured FY 1990 Institute Advisory Board

1990 LOUISIANA WATER RESOURCES RESEARCH INSTITUTE
ADVISORY BOARD

Mr. Harold Gorman (for Mayor Barthelemy)
Ex. Director
New Orleans Sewerage and Water Board
625 St. Joseph Street
New Orleans, LA 70165

Colonel Richard Gorski, Commander
U.S. Army Engineer District, New Orleans
P.O. Box 60267
New Orleans, LA 70160-0267

Dr. Bobby E. Price, Director
P.O. Box 10348
Ruston, LA 71270

Mr. Neil Wagoner, Secretary
Mr. Z. "Bo" Bolourchi
LA DOTD
P.O. Box 94245
Baton Rouge, LA 70804

Mr. Harry Hawthorne
U.S. Department of Agriculture
Soil Conservation Service
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Alexandria, La 71301

Mr. Rod Emmer
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Dr. Darwin Knochenmus
Mr. Ed Martin
Geological Survey - WRD
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Dr. Michael Dagg
LUMCON
Chauvin, LA 70344

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Baton Rouge, LA 70804

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Baton Rouge, LA 70896-6094

Dr. Brad Hanson
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LSU
Baton Rouge, LA 70803

Dr. John W. Day
Coastal Ecology Institute
LSU
Baton Rouge, LA 70803

Dr. Flora Wang
Center for Wetland Resources
LSU
Baton Rouge, LA 70803

Dr. Ralph Portier
Institute for Environmental Studies
18 Atkinson Hall, LSU
Baton Rouge, LA 70803

Dr. Stephen Farber
Department of Economics
LSU
Baton Rouge, LA 70803

Project Officer - D. Briane Adams
U.S. DOI
USGS, WRD, SR
Office of Regional Hydrologist
Richard B. Russell Federal Building
75 Spring Street, S.W., S. 772
Atlanta, GA 30303

APPENDIX F

Strategic Plan of the Institute

LOUISIANA WATER RESOURCES RESEARCH INSTITUTE

MISSION

To foster and support research on those areas of highest priority for Louisiana, including hydrologic problems unique to Louisiana, quality of both surface and ground waters, treatment of water and wastewater, and wetlands management.

GOAL 1

Promote reauthorization of 1984 Water Resource Research Act to continue support through FY 1994.

Procedure

- Continue to meet current program requirements (reporting, applications, etc.).
- Through University officials and the National Association of Water Institute Directors, promote reauthorization.

Assessment

- Successful reauthorization will maintain the LWRRI program.

GOAL 2

Focus research program on specific research areas or a geographic area (example: nonpoint pollution) to build reputation of expertise connected with LWRRI. This will enhance external funding interest in LWRRI.

Procedure

- Focus program via input from Advisory Board and Director contacts.
- Restructure advisory boards and reduce size of this advisory group from current 20 members to 10-12.
- Contact state agencies and foundations regarding interest in the focused program.

Assessment

- Review focus of Institute each year.
- Maintain contacts regarding information on "hot" environmental topics with impact on water resources.
- This goal should bring in external funding if successful. It is anticipated that a focused program will interest outside sources of funding as reputation builds.

GOAL 3

Coordinate LWRRI efforts with those of other environmental research units. Obtaining funding for this infrastructure is essential. Magnitude of funding will depend on expansion of current efforts.

Procedure

- Enhance coordination (currently in place between some environmental units) with other units on campus. This coordination should also include the state, region, national program activities, such as other WRRI's, EPA Centers and Labs, NSF Centers, etc.
- Establish an environmental "umbrella" organization devoted to environmental problems and waste management within the College of Engineering to coordinate efforts, including activities of other environmental research units on campus.

Assessment

- Successful coordination and support should result in obtaining grants of significant size for conducting studies in a multidisciplinary fashion.
- This effort should also obtain funding for much-needed space for laboratories and environmental research facilities.

GOAL 4

Build research staff within LWRRI to expand beyond current "pass-through" organization.

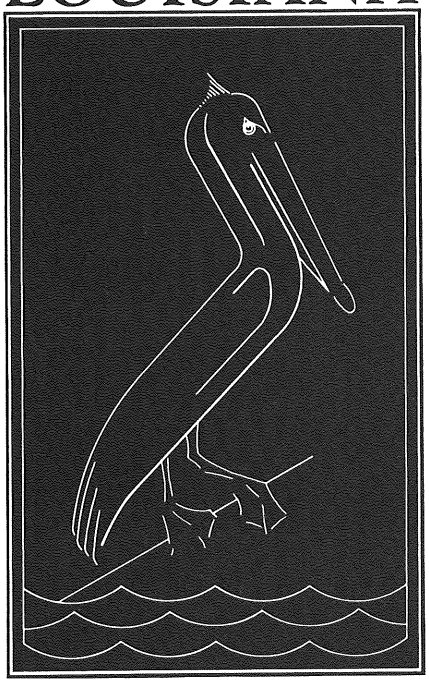
Procedure

- Meeting Goals 1,2, and 3 will establish the base for this goal. An expanded program will enable the use of research personnel within LWRRI to complement efforts of researchers in departments.

Assessment

- Evaluate first three goals to meet requirements for Goal 4.
- An expanded, coordinated program will still reflect the second goal, working in a focused area to gain a strong base of expertise and excellent reputation.

LOUISIANA



Water Resources Research Institute

3418 CEBA
Louisiana State University
Baton Rouge, Louisiana 70803
(504) 388-8508