BASICS OF THE BASIN
RESEARCH SYMPOSIUM

ADDRESSING THE CONDITION OF THE
LAKE PONTCHARTRAIN BASIN

MAY 26 & 27, 1994
UNIVERSITY OF NEW ORLEANS

PONTCHARTRAIN RESEARCH COMMITTEE
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Neil Armingeon Lake Pontchartrain Basin Foundation
Dr. George Flowers Tulane University
Dr. Al Knecht Urban Waste Mgt Research Center
Dr. Donald Barbe' Urban Waste Mgt Research Center--UNO
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Dr. Shea Penland Center for Coastal Energy and
Environmental Resources
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The Pontchartrain research committee (PRC) was formed in 1992 shortly after the first "Basics of the Basin" research Symposium was held. The planning committee for the first meeting formed the core membership of initial PRC. The overall mission of the PRC is to promote good science for the Pontchartrain Basin. This is accomplished by fostering an effective scientific network by symposia or other scientific forums. In addition to the Basics of the Basin Symposia, a forum addressing urban runoff was held in December, 1992. Committee members also have been called upon in an advisory capacity to various governmental and environmental groups. This committee plans to continue to be active and is willing to consider project proposals related to the basin. We will continue to work closely with the scientific community, and with environmental groups whose primary concern is the Pontchartrain Basin. We also intend to continue to hold this symposium on a bi-annual basis. WE HOPE TO SEE YOU IN 1996!

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FUNDING AND SUPPORT

Financial support for the Basics of the Basin Research Symposium was generously received by the following organizations:

U. S. Geological Survey
Lake Pontchartrain Basin Foundation
Coalition to Restore Coastal Louisiana
Center for Coastal Energy and Environmental Resources

Critical administrative support was provided by:

University of New Orleans Metrocollege
Lake Pontchartrain Basin Foundation

Special thanks go to: Anne Jakob, LouAnn Morehouse, Jeff Williams
1994 BASICS OF THE BASIN SYMPOSIUM
AGENDA

THURSDAY MAY 26, 1994

8.00 INTRODUCTORY COMMENTS
John Lopez Pontchartrain Research Committee

8.10 GREETINGS FROM UNO
Shirley Laska VICE-CHANCELLOR FOR RESEARCH UNO

====== ENVIRONMENTAL SESSION ======
Chaired by GEORGE FLOWERS

8.15 EFFECTS OF URBAN RUNOFF ON BENTHIC INVERTEBRATES: A SEARCH FOR
CAUSAL FACTORS.
Michael A. Poirrier University of New Orleans
Casey J. Rowe University of New Orleans

8.40 ANALYSIS OF FECAL COLIFORM CONCENTRATIONS OF THE SOUTH SHORE OF
LAKE PONTCHARTRAIN.
Donald E. Barbe' University of New Orleans
John C. Francis University of New Orleans
S.D. Seenappa University of New Orleans

9:05 STORM WATER CHARACTERIZATION AND DESIGN CONSIDERATIONS FOR AN
ARTIFICIAL WETLANDS SYSTEM FOR NEW ORLEANS EAST RUNOFF.
A. J. Engleande, Jr. Tulane University Dept of Environmental
Health Sciences
C. E. Oppleman Burk-Kleinpeter, Inc.

9:30 CURRENT STATUS OF THE STORMWATER TREATMENT PROJECT AT THE
BONNABEL BOAT LAUNCH IN METAIRIE, LOUISIANA.
Steve Gorin Lake Pontchartrain Basin Foundation

9:55 JEFFERSON PARISH HIGH SCHOOLS WATER QUALITY STUDY.
Robert A. Thomas Society for Environmental Education
Dinah F. Maygarden Society for Environmental Education
R. Scott Society for Environmental Education

10:20 ------- BREAK -------

10:35 ASSESSMENT OF METALS AND ORGANICS IN WATER AND SEDIMENTS IN
SELECTED SITES ALONG BAYOU TREPAGNIER.
W. J. George
Mary B. Anderson
Janet E. Preslan
Steve Adams
Tulane University School of Medicine, Departments of Pharmacology and Anatomy.
New Orleans, La.
THURSDAY continued

11:00 TRANSPORT OF HEAVY METALS INTO LAKE PONTCHARTRAIN VIA OUTFALL CANALS.
Schuang Liu
George C. Flowers
Wayne C. Ishphording
Department of Geology, Tulane U.
Department of Geology, Tulane U.
Department of Geology-Geography, University of South Alabama

11:25 AMITE RIVER WATER QUALITY TRENDS
Stephanie L. Smith
formerly with the Louisiana Department of Environmental Quality, Office of Water Resources, Baton Rouge, La.

11:50 CITIZENS' MONITORING IN THE LAKE PONTCHARTRAIN BASIN.
Clifford M. Kenwood
Lake Pontchartrain Basin Foundation

12:15 LUNCHEON PRESENTATION in Ballroom
BY
RICHARD MILLER
ANALYZING COASTAL PROCESSES:
REMOTE SENSING AND FIELD MANAGEMENT

========== ECOLOGY SESSION ==========
Chaired by ROBERT HASTINGS AND MICHAEL POIRRIER

2:00 THE OYSTER RESOURCES OF THE PONTCHARTRAIN BASIN.
Robert Ancelet
John F. Burdon
Louisiana Department of Wildlife and Fisheries
Louisiana Department of Wildlife and Fisheries

2:25 RECENT TRENDS IN WATER CLARITY OF LAKE PONTCHARTRAIN.
John C. Francis
Michael A. Poirrier
University of New Orleans
University of New Orleans

2:50 SUBMERGED AQUATIC VEGETATION: CURRENT STATUS AND RESTORATION RESEARCH
John Burns
Kris Preston
Michael A. Poirrier
University of New Orleans
University of New Orleans
University of New Orleans

3:15 BREAK

3:30 THE INTERACTING EFFECTS OF ALLOGENIC AND AUTOGENIC AGENTS ON BALDCYPRESS (taxodium distichum) IN THE LAKE PONTCHARTRAIN BASIN, MANCHAC, LOUISIANA.
Michael C. Greene
Randall S. Myers
Gary Shaffer
Southeastern Louisiana University
Southeastern Louisiana University
Southeastern Louisiana University
THURSDAY continued

3:55

WINTER POPULATION TRENDS OF SELECTED BIRD SPECIES IN THE LAKE PONTCHARTRAIN ESTUARY
Christopher G. Brantley
Bruce H. Baird
U. S. Army Corps of Engineers. Planning Division - New Orleans District

POSTER SESSION AND RECEPTION
4:30 - 6:30

THE IMPACT OF INSECT HERBIVORY ON BALD CYPRESS IN FORESTED WETLANDS.
Richard A. Goyer 
Gerald J. Lenhard
Department of Entomology, LSU

MOVEMENT OF HEAVY METAL CONTAMINATION OUT OF BAYOU TREPAGNIER
Lynn V. Koplitiz
Joy Green
Catherine Lanier
J. Dillon
Department of Chemistry, Loyola University, New Orleans, La.

WETLAND LOSS IN THE PONTCHARTRAIN BASIN
Del Britsch
Corps of Engineers New Orleans District

INVENTORY OF PROPOSED OR PLANNED PROJECTS ADDRESSING WETLAND LOSS OR SALTMWTER INTRUSION IN THE PONTCHARTRAIN BASIN.
Lia Yoste
Del Britsch
Suzanne Hawes
Bill Berry
John Lopez
Saltwater Intrusion Wetland Loss Committee for the Lake Pontchartrain Basin Foundation

ALSO ON DISPLAY WILL BE STUDENT ART FROM THE "ART ON THE LAKE" PROGRAM COORDINATED BY THE LAKE PONTCHARTRAIN BASIN FOUNDATION, ANNE RHEAMS - EDUCATION COORDINATOR, WITH THE NEW ORLEANS PUBLIC SCHOOLS GIFTED AND TALENTED PROGRAM THROUGH A GRANT FROM THE NEW ORLEANS SEWERAGE AND WATER BOARD

LAGNIAPPE
GO SEE THE R/V G. K. GILBERT RESEARCH SHIP AT THE MUNICIPAL HARBOR PROVIDED BY THE U. S. GEOLOGICAL SURVEY.
FROM 4:30 - 7:30
(see Registration desk for flyer with map and details)
FRIDAY MAY 27, 1994

MANAGEMENT ISSUES
Chairled by DONALD BARBE'

8:00 THE COASTAL WETLANDS PLANNING, PROTECTION AND RESTORATION ACT: PAST, PRESENT AND FUTURE.
Suzanne Hawes  U.S. Army Corps of Engineers, New Orleans Dist.
Pau! G. Kemp  Coalition to Restore Coastal Louisiana, Baton Rouge, La.

8:25 ARE THERE REGULATORY BARRIERS TO A CLEAN LAKE? A HOLISTIC APPROACH.
Deborah C. Barbe  UNO - Civil Engineering
Ronald G. Cheek  UNO - Civil Engineering
Donald E. Barbe  UNO - Civil Engineering

8:50 THE LAKE PONTCHARTRAIN BASIN FOUNDATION'S COMPREHENSIVE MANAGEMENT PLAN: THE PUBLIC'S VISION OF THE BASIN.
Carlton Dufrechou  Lake Pontchartrain Basin Foundation

9:15 COMPREHENSIVE ESTUARINE MANAGEMENT FRAMEWORK: THE BARATARIA-TERREBONNE CASE HISTORY.
Warren R. Flint  EnviroPlanning of New Orleans

9:40 POLLUTION PREVENTION AND ENVIRONMENTAL EDUCATION EFFORTS IN LOUISIANA.
Bill Branch
Paul Coriel
Louisiana Cooperative Extension Service, LSU Agricultural Center, Baton Rouge, La.

10:05 BREAK

10:20 THE BONNET CARRE' FRESHWATER DIVERSION: A POLITICAL HISTORY.
Nei! Armingeon  Lake Pontchartrain Basin Foundation

10:45 EFFECT OF MISSISSIPPI RIVER ON WATER QUALITY IN LAKE PONTCHARTRAIN, LOUISIANA.
Charles R. Demas
Charles R. Garrison

11:10 ALGAL GROWTH POTENTIAL IN LAKE PONTCHARTRAIN, LOUISIANA.

11:35 ASSESSMENT OF WATER QUALITY IMPACTS TO LAKE PONTCHARTRAIN BY THE BONNET CARRE' DIVERSION PROJECT.
FRIDAY continued

12:00  WATER CONTROL PERFORMANCE OF THE CAERNARVON FRESHWATER DIVERSION PROJECT.
       Burnell Thibodeaux  US Army Corps of Engineers New Orleans Dist

12:30  LUNCHEON LECTURE in the Ballroom
       BY
       MIKE HIRSHFIELD

       THE CHESAPEAKE BAY CLEANUP -
       AN ONGOING EXPERIMENT IN ECOSYSTEM MANAGEMENT

======== PHYSICAL PROCESSES SESSION =======
       Chaired by SHEA PENLAND AND JEFF WILLIAMS

2:00  VIDEO DOCUMENTATION OF SHORELINE LOSS IN LAKE PONTCHARTRAIN FROM 1984 TO 1994.
       Shea Penland  Center for Coastal Energy and Environmental Resources
       Jeff Williams  U. S. Geological Survey

2:25  SEDIMENTATION ON THE LOWER BIG CREEK IN EAST CENTRAL TANGIPAHOA PARISH: LAND USE CHANGES AS A CONTRIBUTING CAUSE, AND PERCEPTIONS ON THE PART OF CITIZENS AND THE ELECTED PARISH COUNCIL ABOUT SEDIMENTATION IN PARISH STREAMS.
       Andrew E. Whitehurst  Citizens for a Clean Tangipahoa, Baton Rouge, La.

2:50  GEOLOGIC FRAMEWORK AND PROCESSES OF THE LAKE PONTCHARTRAIN BASIN: A MULTI-DISCIPLINARY STUDY OF LOUISIANA'S PREMIER BUT TROUBLED URBAN ESTUARY.

3:15  EFFECTS OF STORM EVENTS ON SEDIMENT DISTRIBUTION PATTERNS IN NORTHERN GULF OF MEXICO ESTUARIES.
       Wayne C. Ishphording  Department of Geology-Geography, University of Southern Alabama
       George C. Flowers  Department of Earth Sciences, Tulane University

3:40  SUBSURFACE FAULT DETECTION USING SEISMIC DATA FOR HAZARDOUS-WASTE-INJECTION WELL PERMITTING: AN EXAMPLE FROM ST. JOHN THE BAPTIST PARISH, LOUISIANA.
       Edward V. Zinni  CNG, New Orleans, La.
LUNCHEON SPEAKER

THURSDAY, MAY 26 12:45

Dr. Richard L. Miller
Stennis Space Center

ANALYZING COASTAL PROCESSES:
REMOTE SENSING AND FIELD MANAGEMENT

BIOGRAPHY

Dr. Miller is an oceanographer at NASA's Stennis Space Center in Mississippi where he conducts research in various aspects of coastal processes such as physical-biological interactions at the Land/Sea interface. Dr. Miller received a B.S. in zoology at Duke University, an M.S. in Marine Sciences at Louisiana State University, an M.S. in Applied Statistics, also at Louisiana State University, and a Ph.D. in Oceanography from North Carolina State University. Dr. Miller held a post-doctorate position with the U.S.G.S. in San Francisco, Ca. before coming to Stennis Space Center in 1987.

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LUNCHEON SPEAKER

FRIDAY MAY 27
1:00

- Dr. Mike Hirshfield
Chesapeake Bay Foundation

THE CHESAPEAKE BAY CLEANUP --
AN ONGOING EXPERIMENT IN ECOSYSTEM MANAGEMENT

BIOGRAPHY

Dr. Hirshfield has been the Senior Science Advisor with the Chesapeake Bay Foundation since 1990. In that position, he provides expert scientific and policy input into the development and implementation of CBF projects. He has broad experience in a number of technical and policy areas, in particular, nonpoint source pollution, nutrient and toxic pollution, fisheries management, air quality, energy, and estuarine ecology.

Before joining the CBF, he was with the Maryland Department of Natural Resources for seven years, serving as director of the Chesapeake Bay Research and Monitoring Division and Director of the Power Research Program. Prior to working for the state, he was director of the Benedict Estuarine Research Laboratory in Southern Maryland. He received his Ph.D. in Zoology from the University of Michigan in 1977.

SPONSORED BY THE
PONTCHARTRAIN RESEARCH COMMITTEE
Oyster propagation within the Pontchartrain Basin is limited, due to salinity regimes, to four parishes: Orleans, Jefferson, St. Tammany and St. Bernard. The Louisiana oyster fishery is primarily a private lease-based industry, however, large areas of public fishing grounds such as those found in the basin provide a source of sack oysters for market and seed oysters for transplant to privately leased waterbottoms.

The public oyster grounds are discussed with emphasis on the dynamic environmental and physical conditions that are conducive to desirable oyster habitat and production. Anthropogenic and natural processes which impact the quality, distribution and production of the oyster communities of the basin are deliberated.
THE BONNET CARRE' FRESHWATER DIVERSION, A POLITICAL HISTORY


The U. S. Army Corps of Engineers (COE) has been responsible for the design and construction of numerous large-scale civil works projects. Examples of these include the Kissimmee River project in South Florida, the Tennessee-Tombigbee Waterway in Mississippi and Alabama, and the Mississippi River Gulf Outlet (MRGO) in Louisiana.

While many of these large-scale projects failed to live up to pre-construction economic expectations - and ended up harming the environment they were designed to enhance - all began with the help of a champion, or champions, in the U.S. Congress to push for authorization and subsequent funding. While the authorization process is directed by legal statute, each civil works project's origin is unique to that project. Using historical documentation, the origin of the proposed Bonnet Carre' Freshwater Diversion project is examined.

Although the proposed diversion project is located in Louisiana, it originated in coastal Mississippi as a small, localized, privately funded study. Through the next 20 years, it evolved into one of the nation's last, large Army Corp's civil works projects. Over its 50 year life, the diversion will cost the nation's taxpayers over $200 million. The history of the proposed diversion is traced with an emphasis on the political maneuvering that occurred in Mississippi during the project's formative years.
ARE THERE REGULATORY BARRIERS TO A CLEAN LAKE? A HOLISTIC APPROACH

Barbe' D. C., Cheek R. , and Barbe' D. E., University of New Orleans

In this presentation, we will consider how and why regulatory policies create barriers to a clean lake. The "Command and Control" policies of regulatory agencies focus on "end-of-the-pipe" problems and do not support long-term sustainable pollution prevention at its source. These short-term fixes do not justify long-term solutions that support a clean lake. Proactive, innovative, and flexible regulatory policies that consider adaptable, resourceful solutions will be necessary to achieve and maintain a clean lake.

Our focus will be on three areas of regulatory agencies whose actions may result in the creation of barriers to pollution prevention. First, we will examine the typical profile of a regulatory employee in terms of tenure and subject knowledge of the diverse processes under their direct control. Secondly, we will examine regulatory policies that inhibit the development and implementation of economically and environmentally sound waste reduction activities by industry. Finally, we will address the permitting process by contrasting the effects of single media, multi-media, and cross media permits and their consequences on sustainable development.

We will conclude our presentation with a discussion of a "holistic" approach to pollution prevention and its long term effect on the lake.
ANALYSIS OF FECAL COLIFORM CONCENTRATIONS ON THE SOUTH SHORE OF LAKE PONTCHARTRAIN

Barbe', D. E., Ph.D., P.E., Francis, J. C., Ph.D., and Seenappa, S. D., Department of Civil Engineering and Biological Sciences, University of New Orleans.

Lake Pontchartrain is a large shallow embayment located in the southeast part of Louisiana. The southshore of the lake has fecal coliform counts that exceed the acceptable level for primary contact recreation. The major source of the fecal coliform is believed to be urban runoff from the metropolitan New Orleans area.

The climate of the area is characterized by different precipitation/runoff mechanisms for the summer and winter seasons. Because of the combined effects of precipitation, evaporation, and transpiration, runoff is greater in the winter season resulting in higher fecal coliform counts in Lake Pontchartrain. Runoff usually is lower in the summer season and fecal coliform counts in the lake are lower.

The objective of the study was to model the relationship between fecal coliform levels and other environmental factors. Multivariate statistical analysis of historical data on fecal coliform bacteria concentrations in Lake Pontchartrain and concurrent water quality and climatic data were performed. Water quality variables included temperature and salinity. Climatic variables included wind speed and precipitation. Predictive equations were derived and compared to current data.
POLLUTION PREVENTION AND ENVIRONMENTAL EDUCATION EFFORTS IN LOUISIANA

Branch, Bill and Corell, Paul. Louisiana Cooperative Extension Service, LSU Agricultural Center, Baton Rouge, LA.

The Pollution Prevention Act of 1990 encouraged review of current practices to find alternatives which reduce negative environmental impacts. EPA Region 6 staff promote efforts addressing pollution prevention and one office is specifically focused on these efforts. Pollution Prevention Roundtables have been conducted in all five states including one in Baton Rouge in June, 1993.

Phase 1 of the stormwater provisions of the Clean Water Act (CWA) calls for development of Pollution Prevention Plans (PPP) which include sets of Best Management Practices (BMPs) to reduce contamination of runoff from certain businesses, industries and large municipalities. Phase 2 will presumably extend the requirement to more and smaller entities.

The Confined Animal Feeding Operation General Permit issued under the CWA calls for PPP containing BMPs to reduce point source discharges. The Louisiana Nonpoint Source Management Plan developed by DEQ, other agencies and industry under the CWA calls for the adoption of BMPs to reduce nonpoint source water pollution.

The Coastal Zone Act Reauthorization Amendments (CZARA) call for the development of a nonpoint source management plan. It will require adoption of "management measures" and "management practices" which are similar to BMPs. The DEQ Nonpoint Source Management Plan will coincide with the CZARA Nonpoint Source Management Plan.

Intensive efforts have been underway for 18 months by an extensive set of committees composed of agency and industry representatives to develop sets of BMPs which will reduce contamination from nonpoint source and stormwater runoff. These BMPs will be available to businesses, industries and municipalities for their use as needed.

DEQ has contracted with firms and universities to conduct educational programs with public officials, householders, farmers, foresters, land owners and small businesses on the use of BMPs to reduce contamination from runoff. Other environmental education efforts are being conducted by primary, secondary and post-secondary educational institutions, businesses and industries, public agencies, and professional, civic and social organizations. These programs improve the understanding by citizens of the need to protect the environment and reduce nonpoint source pollution.
Pollution prevention and environmental education are two efforts receiving a major investment of time and energy by a wide variety of public and private sector professionals in Louisiana. This expenditure will result in significant changes in attitudes and practices and the improvement of Louisiana's environment.
Christmas Bird Counts (CBC) provide useful data for evaluating the early winter abundance and distribution of many North American bird species. CBC data from 1988-1992 were analyzed for the 3 counts in the Lake Pontchartrain estuary: New Orleans, Reserve-Bonnet Carre, and St. Tammany Parish, Louisiana. Count circle (7.5 mile radius) locations remained unchanged throughout the period of analysis. Fourteen species that utilize open-water habitats in the area were selected for analysis based upon degree of habitat utilization and relative abundance in the estuarine system. To standardize the counts, data were converted into number of birds per party hour (Schreiber, R.W. and E.A. Schreiber, 1973, American Birds 27:711-715). Spearman rank correlation analysis indicates positive trends for 8 of the 14 species surveyed and 6 depicting negative trends. Linear regression of log transformed data reveal significant positive and negative slopes for osprey (Pandion haliaeetus) and lesser scaup (Aythya affinis), respectively. Short-term changes in the abundance of prey within the estuary are believed to be contributing to recent winter bird population trends in the estuary.
SUBMERSED AQUATIC VEGETATION IN LAKE PONTCHARTRAIN: CURRENT STATUS AND RESTORATION RESEARCH
Burns, John W., Jr., Preston, K. P. and Poirrier, Michael A.,
University of New Orleans.

Submersed aquatic vegetation (SAV) in the Lake Pontchartrain estuary has declined by >50% since 1973. Changes in adjacent land use, urban runoff and shoreline modifications are believed to be responsible for the continued decline of SAV. Meteorological events are also believed to be responsible for temporal fluctuations in SAV foliar cover. Species composition and community structure were determined at five permanent monitoring sites along five randomly placed transects during 1991, 1992 and 1993. SAV foliar cover was stratified by water depth, substrate type and the presence or absence of shell (Rangia cuneata) along each transect. In addition, SAV total aerial cover was determined for the entire littoral zone of the estuary.

Although SAV total aerial cover for the estuary during 1991 was 88 ha (217 acres), it was reduced to 26 ha (64 acres) when corrected for patchiness and bare ground within SAV beds. This represents a 17% decline in aerial cover since 1985. Meteorological events were determined to have a significant effect on SAV in Lake Pontchartrain. SAV aerial cover was reduced by 74% on the north shore after Hurricane Andrew (August 1992) and by 95% on the south shore following a severe winter storm (March 1993). SAV recovery from these storms was exemplified by an increase in foliar cover to pre Hurricane Andrew levels by July 1993. Although changes in species dominance and an increase in foliar cover occurred following these meteorological events, SAV have not recovered from anthropogenic disturbances during this study.

A cooperative effort between the University of New Orleans, Lake Pontchartrain Basin Foundation and citizen volunteer groups has been established to restore SAV in Lake Pontchartrain. A pilot study is currently underway to test transplanting techniques for Vallisneria americana in areas where historic populations have been reduced or eliminated.
EFFECT OF MISSISSIPPI RIVER ON WATER QUALITY IN LAKE PONTCHARTRAIN, LOUISIANA


During the spring flood in 1979 of the lower Mississippi River, the U.S. Army Corps of Engineers opened the gates of the Bonnet Carre' Spillway to divert some of the flood waters from the river into Lake Pontchartrain as part of the normal flood protection measures. Discharge to the lake through the Bonnet Carre' Spillway ranged from 49,000 to 250,000 cubic feet per second during the period April 20 to May 20, 1979. Concurrent with this operation, the U.S. Geological Survey analyzed daily water-quality samples from 10 locations in the lake as part of a cooperative agreement with the U.S. Army Corps of Engineers. Samples were collected from April 16 to June 14 and analyzed for physical characteristics such as pH, specific conductance, dissolved oxygen concentrations, turbidity, and color; major inorganic ions nutrients; trace metals; pesticides; fecal and total coliform bacteria; and chlorophyll.

Water-quality data collected in the lake during this 50-day period (April 16 to June 14) were compared to data collected prior to the opening of the Spillway (1974-March, 1979) and after its closure (1980-84). These comparisons indicated that diversion of Mississippi River water into Lake Pontchartrain resulted in the following water-quality changes in the lake:

- Chlorophyll a concentrations increased.
- Nutrient concentrations increased.
- Bacteria counts (both fecal and total coliform) decreased.
- Trace metal concentrations (both total and filtered) decreased.
- Concentrations of 2,4-D increased.
- Turbidity increased at 2 sites and remained the same or decreased at 3 other sites.

The observed effects of the Bonnet Carre' Freshwater Diversion on the water quality of Lake Pontchartrain during this period probably are not representative of the effects that might be expected under conditions of lower flows. The large discharges during this period (49,000 to 250,000 cubic feet per second) greatly exceeded the discharges at which the diversion structure will be operated (6,000 to 30,000 cubic feet per second).
ALGAL GROWTH POTENTIAL IN LAKE PONTCHARTRAIN, LOUISIANA.
SEPTEMBER 1993
Demcheck, Dennis K., and McGee, Benton D., U.S. Geological
Survey, Baton Rouge, La.

In the summer of 1993 the U.S. Geological Survey, U.S. Army Corps of
Engineers, and U. S. Wildlife and Fisheries conducted a water-quality
investigation of nutrient and biological conditions in Lake Pontchartrain,
Louisiana. This abstract describes one component of the study, the effect
of tributaries and the Mississippi River on algal populations.

The data collection period, for this aspect of the study, September 9-
October 1, 1993, was a period of high water temperatures and relatively
high nutrient concentrations in the Mississippi River. The dissolved nitrite
plus nitrate concentration in the river water during this period was 1.4 mg/L
(milligrams per liter) and the dissolved phosphorus concentration was 0.12
mg/L. Nutrient concentrations in the middle of the lake during this period
were much lower; the dissolved nitrite plus nitrate concentration in the lake
water was less than 0.05 mg/L and the dissolved phosphorus concentration
was 0.02 mg/L.

Algal Growth Potential (AGP) tests were performed at 18 sites in Lake
Pontchartrain and its tributaries, and at one site on the Mississippi River.
The sites selected for sampling included the major sources of inflow to the
lake, several stormwater drainage canals, and areas of the lake, were algal
blooms have occurred in the past.

In the AGP tests, the green alga Selenastrum capricornutum was added to
filtered samples of native water and these samples were inoculated with
nutrient solutions containing various concentrations nitrogen and
phosphorus. The tests were designed to determine if nitrogen,
phosphorus, or a combination of the two nutrients is limiting algal growth in
these waters. Three replicates of each nutrient addition were included in
the tests, as well as a set of untreated control samples. Algal growth in the
treated and untreated samples was monitored for 10-12 days.

A separate test was designed to simulate the mixing that will occur during
the operation of the proposed Bonnet Carre' freshwater diversion. In this
test, water from the Mississippi River and water from Lake Pontchartrain
were mixed to form two test solutions, one containing 50 percent
Mississippi River water and 50 percent lake water and the other containing
10 percent river water and 90 percent lake water. Algae from the river and
the lake waters were identified and enumerated. Triplicate samples of
water from the Mississippi River, Lake Pontchartrain, and the two mixed
solutions were then incubated for 5 days at 25 degrees Celsius under constant light. After the 5-day incubation, algae in the samples were again identified and enumerated.

The AGP results indicated that in general, the greatest algal growth occurred in those test samples amended with both nitrogen and phosphorus. Considerable less growth occurred in those samples amended with only one of these nutrients. A student's t-test indicated that the increase in algal growth resulting from the addition of nitrogen alone was not statistically significant. However, the doubling or tripling of algal numbers which occurred at most of the sites after nitrogen addition may indicate a biologically important trend.

Algae identification and enumeration indicated that water from the Mississippi River had substantially more algae species than did water from Lake Pontchartrain but mixing of river water and lake water, at least at the dilution ratios tested, would not significantly affect the total algal populations in the lake. Further study would be needed to determine the potential affect of introducing river water into the lake on algal populations under different conditions than those sampled in this study.
ASSESSMENT OF WATER QUALITY IMPACTS TO LAKE PONTCHARTRAIN BY THE BONNET CARRE FRESHWATER DIVERSION PROJECT


Lake Pontchartrain is a 616-square mile shallow estuarine embayment of the Gulf of Mexico bordering the New Orleans metropolitan area. The lake together with adjacent wetlands and waterbodies supports abundant populations of fish and shellfish. Subsidence, erosion and saltwater intrusion caused by natural processes and/or channel and levee construction have resulted, however, in the loss of wetlands and the loss and migration of fisheries and fishing grounds. The Bonnet Carre' Freshwater Diversion Project has been designed to discharge up to 30,000 cubic feet per second into Lake Pontchartrain from the Mississippi River. The resulting moderated salinity regime would greatly improve oyster production in neighboring Lake Borgne, its adjacent marshes and beyond to Mississippi Sound. Fish and wildlife productivity would be enhanced in the estuarine system, and the rates of wetlands loss would be significantly reduced.

Public awareness has recently expanded regarding Lake Pontchartrain's value as a natural resource, and of its potential for swimming and other recreational activities if stormwater pollution control and treatment measures become implemented. This has raised new concerns about whether the project's adverse water quality impacts and other undesirable effects on the lake would outweigh its positive environmental aspects. As a result, an Environmental Assessment was prepared by the U.S. Army Corps of Engineers in 1993 to supplement and update the 1984 Environmental Impact Statement. The effects of progressively restrictive point discharge permit requirements for lower Mississippi River industries and municipalities, projected Lake Pontchartrain Basin pollution reduction efforts and other important trends and developments since 1984 were considered by the Water Quality Assessment, prepared as an Appendix to the Environmental Assessment. The 1979 Bonnet Carre' Spillway diversion of up to 190,000 cfs of Mississippi River floodwaters into Lake Pontchartrain and its extensive water quality database provided an unparalleled opportunity to quantitatively estimate the water quality effects of the freshwater diversion project upon the lake. It was concluded that aside from salinity and nutrients (particularly nitrogen) water quality impacts would not be significant and that the net salinity and nutrient effects would be positive.
The Lake Pontchartrain Basin Foundation initiated the planning process for the Pontchartrain Basin Comprehensive Management Plan (CMP) in October, 1991. Public participation has been essential in the Foundation's planning process.

Phase I in the development of the CMP involved public meetings during which citizen's expressed their opinions on the conditions and needs of the Pontchartrain Basin. Issues identified by the public were grouped into five major categories.

Phase II began in March, 1992. Monthly workshops were held to address the public's five major issue categories. Two groups participated in the workshops: an Interagency Working Group made up of delegates from agencies with regulatory authority and an Advisory Group made up of delegates from civic, business, farming, fishing, environmental, industrial, and other interested groups. Participants from these groups developed alternatives to address the issues identified during Phase I.

Phase III of the planning process began in January 1994. The third and final will develop strategies for implementing the CMP, determining costs and benefits for alternatives, rank alternatives, identify lead agencies/groups, and pinpoint sources of funding.

Successful implementation of the CMP and restoration of the Pontchartrain Basin requires a partnership comprised of and supported by Federal agencies, State agencies, local agencies, businesses, private groups, and most importantly, the public.
STORM WATER CHARACTERIZATION AND DESIGN CONSIDERATIONS FOR AN ARTIFICIAL WETLANDS TREATMENT SYSTEM FOR NEW ORLEANS EAST RUNOFF

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The East New Orleans Lakefront Study addresses mitigation of storm water runoff by constructed wetlands. The study, funded by the New Orleans Levee Board and engineered by Burk-Kleinpeter, Inc., is designed to improve the water quality of the lake for recreational purposes, create new fish and wildlife habitats and add to the natural resources of the shoreline in the proximity of the project area in New Orleans East. The paper presents the results of the storm water characterization phase of the study designed to estimate pollutant loadings and expected concentrations of pollutants in discharges resulting from the St. Charles Canal in the project area. "First flush" characteristics are defined and significant parameters quantified. Emphasis is given to the bacterial quality of runoff waters from an 8,920 acre area.

Sampling commenced in August 1993, and continued through March 1994. Sampling events consisted of intensive sampling by grab and composite sampling, and background or baseline testing taken offshore during dry weather conditions. Valid storm water events required that each be preceded by 72 hours of dry weather, and be greater than or equal to a 0.1 inch rainfall. Three intensive rainfall events were sampled during the study period. Intensive sampling events and associated rainfalls are as follows: (1) September 15, 1993, 1.25 inches; (2) October 24, 1993, 2.17 inches; (3) March 9, 1994, 1.44 inches. A full scan of contaminants, including priority pollutants, metals, bacterial indices and gross parameters were conducted as appropriate. Quality assurance and quality control methods were implemented in the field and laboratory by Environmental Analytical Solutions, Inc. (EASI) personnel to ensure the accuracy and validity of the analytical results. Background sampling events were conducted once per season, of summer, fall and winter, taking place on August 26, 1993, October 5, 1993 and February 20, 1994.

Results of gross parameter pollutant concentrations were lower than had been expected as compared to pollutant discharges in other urban areas. Total suspended solids (TSS) concentrations ranged from 74 to 232 mg/l for the September sampling event, from 13 to 41 mg/l for the October sampling event and from 23 to 375 mg/l for the March sampling event. The first flush peak occurred after 40 minutes for the September sampling and returned to below baseline level after 100 minutes, exhibiting the characteristics of a "text book" first flush. October TSS values appear to have peaked after 140 minutes or just over
two hours. The peak TSS values from the March sampling event occurred at time zero. TSS values declined rapidly in the first fifteen minutes of sampling from 375 to 55 mg/l and continued to taper off to values below 30 mg/l in the third hour of sampling. The initial high TSS value may be attributed to suspended sediments and/or biological growth within the drainage canal system preceding the rainfall. The all day non-intensive nature of the rainfall event resulted in relatively low pollutant concentrations which slowly decreased over time. However, the data indicate that a first flush did exist as most graphs for the October sampling exhibit a slight downward curve at the end of the two hour sampling. Rather than the pronounced first flush demonstrated in September data, October data appear to have had an extended first flush. The March data, much like the September data, strongly indicate the first flush occurring within the first two hours of sampling.

Total organic carbon (TOC) in the September data closely mimicked TSS behavior for the same sampling event. TOC values peaked at 40 minutes and returned below baseline levels after 100 minutes. TOC values for the October sampling event peaked at 100 minutes and appeared to be on a relatively steady decline thereafter, whereas TOC values in March peaked at 30 minutes and steadily declined thereafter. Chemical oxygen demand (COD) values for the September and March sampling events behaved similarly. Biochemical oxygen demand (BOD) values remained relatively consistent between September and October data and were not focused on in the March sampling event. Total dissolved solids (TDS) values for all three sampling events diminished to levels between zero and 1500 mg/l after 60 minutes, indicating the time at which the canal was flushed with fresh rain water. Total nitrogen and organic nitrogen values varied greatly between sampling events, however, ammonia nitrogen levels were relatively constant and ranged from 0.2 to 1.9 mg/l. Total phosphorus levels exhibited first flush characteristics for all three events - returning to within 0.2 mg/l of the baseline level after 120 minutes.

No priority pollutants were identified in any of the samplings except for a trace amount of Aldrin (0.05 mg/l) detected in one sample at time zero in September. Only copper, lead and zinc were metals found to exceed recommended stringent chronic marine waters standards of 0.004 mg/l, 0.0085 mg/l and 0.005 mg/l respectively. The soluble fraction of these metals was determined using samples collected in March. Results indicate that almost all of the copper and lead concentrations were associated with the solids fraction, and only zinc remained above the chronic marine standard. Background lake concentrations for these metals were also found to be above recommended chronic marine water standards.
Indicators used by EPA and the State of Louisiana to estimate bacterial contamination of waterways are fecal coliform and enterococcus. The log mean of 5 or more samples taken over a 30-day period should not exceed 200 organisms per 100 ml, and 35 CFU, respectively. No single sample should exceed 400/100 ml for fecal coliform, and 104/100 ml for enterococcus. Enterococcus is the EPA's indicator of choice for marine waters. Baseline testing indicated enterococcus levels at or near undetectable levels within the lake as background. Enterococcus levels at times zero, 60 and 120 minutes during the September sampling were 39 CFU/100 ml, 21 CFU/100 ml and 7 CFU/100 ml, respectively. The October baseline enterococcus value was below practical quantification limit of 2 CFU/100 ml. During October sampling, initial enterococcus levels of 8 CFU/100 ml at time zero, experienced a sharp increase to 900 CFU/100 ml at time 60, and then a rapid decline to 500 CFU/100 ml over the next hour to time 120. Although the bacteria levels remained above the single sample standard of 104 CFU/100 ml after two hours, the data demonstrate a remarkable flushing effect. In addition, due to the nature of the October rainfall event as discussed earlier, these results are not surprising. March sampling results were 80 CFU/100 ml at the start of pumping with an increase to 500 CFU/100 ml at 90 minutes, and a decline to 250 CFU/100 ml at four hours. While the applicable standard is 104 CFU/100 ml, this total rainfall event would have been captured by the designed system.

Based on the use of this new bacterial indicator, achievement of the new enterococcus standard seems highly probable given proper design and operation of the wetlands treatment system to prolong contact time and effectively lower and remove bacterial numbers in response to storm flushing. The design of the wetlands treatment system has been determined to accommodate rainfall events occurring 95 percent of the time (i.e., a 2.2 inch rain). A 2 to 3 log reduction by the treatment system is expected with a 24 to 48 hour retention time, based on similar experiences in the Mid-Atlantic Region. Consequently, treated waters should be well within the bacteriological quality required.
COMPREHENSIVE ESTUARINE MANAGEMENT FRAMEWORK: THE BARATARIA-TERREBONNE ESTUARY CASE HISTORY

Flint, R. Warren, EnviroPlanning of New Orleans.

One of the toughest problems in dealing with the environment is the degree to which it is an integrated system - a delicate whole in which a change to one part affects all others. This makes it difficult to set priorities for environmental action. Therefore, strengthening foundations of decision-making for environmental protection should be a priority.

Any estuarine management decision-making process should employ a comprehensive ecosystem approach. The ecosystem approach takes account of interrelationships among water, land, air, and living organisms, and considers an integrative account of interactive and emergent effects resulting from excessive growth of population and technology. Estuarine planning and management should also encourage use of sustainable development principles as an integral part of decision-making. Sustainable development represents a quest for a healthful, productive ecosystem that values sustainable utilization and maintenance of essential ecological resources. It involves the relationship of our human social, political, and economic systems to the practical resource base that supports us and measures the impact of the social and economic present on the environmental future to indicate when collective human actions are endangering this relationship.

Any mechanism designed to assist with comprehensive management of estuarine ecosystems should seek to achieve high standards of water quality, maintain an appropriate indigenous community of fish, shellfish, and wildlife, support recreational activities, protect beneficial uses of the estuary, and balance economic needs with resource protection. Comprehensive management must also be built upon a foundation that promotes sustainable development of natural resources, recognizing that a healthy environment and a strong economy are mutually dependent. How does one go about building such an instrument for guidance in these times of fiscal insecurity and traditional governmental bureaucracy? An examination of the Case History for the Barataria-Terrebonne National Estuary Program might provide insight.

In an effort to achieve integrated resource management that is comprehensive and all-inclusive for the Barataria-Terrebonne estuarine ecosystem along the Gulf coast of southern Louisiana, the Management Conference appointed by the State of Louisiana to oversee this program developed a conceptual framework that organized and guided a planning and decision-making process for estuarine policy formulation and research.
The evolution and makeup of the resultant conceptual model will be described in detail by this presentation and its utility will be demonstrated with the use of several pressing contemporary problem-solving scenarios that this estuarine ecosystem presently faces.

The conceptual model offers a holistic view of the estuarine ecosystem by treating the following major components within its framework: natural resource characteristics, human impact problems, management and regulatory concerns, and over-arching issues that tend to link all the components together toward achieving sustainable natural resources. The description of this conceptual framework will demonstrate how the various components of the integrated estuarine system are related to one another, and how consideration of these interrelationships can assist the estuarine management process with respect to decision-making, policy formulation, and research planning.

Complex problem-solving scenarios described in the presentation will illustrate the complicated nature of any resource problem that might face the Barataria-Terrebonne system, as well as the kinds of questions that have to be asked in order to develop plans to solve these problems. The presentation of this case history will also suggest means by which one might take an ecosystemic approach to decision-making alternatives that presents a more holistic, and at the same time clearer picture of all the possible outcomes, as well as the multitude of parameters that must be considered in attempting to achieve sustainability.
RECENT TRENDS IN WATER CLARITY OF LAKE PONTCHARTRAIN
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An apparent decrease in water clarity of Lake Pontchartrain has been an environmental concern for several years. Regression analysis of the available data on Secchi disk transparency in Lake Pontchartrain from 1953 through 1993 indicates a statistically significant decrease in transparency with time.

Secchi disk transparency is influenced by both salinity and wind speed. A significant positive relationship exists between Secchi disk transparency and salinity; a significant negative relationship exists between transparency and wind speed. In addition, both variables realize pronounced annual seasonality. Salinity realizes its highest values in November and its lowest values in May. Wind speed, on the other hand, realizes its highest values in February and its lowest values in August. These seasonal effects are not equally represented in the available data set on Secchi disk transparency in Lake Pontchartrain. When the seasonal bias is removed from the data set, it no longer supports the conclusion of a statistically significant change in Secchi disk transparency from 1953 to 1993.

An unbiased data set of Secchi disk transparency in Lake Pontchartrain is available for the recent period 1987 through 1993. The data are transparency values from several stations along the Causeway bridge taken at regular monthly intervals. The seasonal effects of salinity and wind speed are thus adequately represented. These data suggest that although significant differences in transparency may exist at different sites in the lake at different times of the year, there has not been a statistically significant change in transparency over the seven-year period from 1987 to 1993.
ASSESSMENT OF METALS AND ORGANICS IN WATER AND SEDIMENTS AT SELECTED SITES ALONG BAYOU TREPAGNIER

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Bayou Trepagnier, a tributary of Bayou La Branche, drains into Lake Pontchartrain. Contamination of this Bayou with industrial pollutants has resulted in its designation by the EPA as a contaminated waterway. Recently, we have reevaluated this Bayou with respect to metals and organic pollutants at a number of locations along the length of the Bayou. Sites above and below suspected inflow locations were assessed for presence of iron, aluminum, lead, chromium, manganese, zinc, vanadium, cobalt, nickel, copper, selenium, arsenic, cadmium, and beryllium. Sediment-digests were prepared by EPA method 3050 and were analyzed by inductively coupled plasma emission spectroscopy (ICP). Sediments were found to contain significant concentrations of iron, aluminum, and lead. In water specimens taken from the same sampling sites and screened by ICP for the above metals, only iron and manganese were found to be high enough to be within detectable range. Maximum observed concentrations for iron and manganese were 2110 ppb and 622 ppb respectively.

Methylene chloride extracts of the soils from the sampling sites were analyzed by gas chromatography/mass spectroscopy. The compounds detected consisted of a broad range of saturated and unsaturated hydrocarbons and a significant quantity of elemental sulfur. Such constituents are characteristic of petroleum contamination. Absent were light-weight substituted benzenes characteristic of gasoline. Oil, grease and non-volatile petroleum constituents also were present in the soils in large quantities.

Killifish collected in Bayou Trepagnier were found to contain hydrocarbon compounds (octane, hexadecane, cycloundecane, hexene, undecene, hexacosane, heptadecane, and pentatriacontane).
CURRENT STATUS OF THE STORM WATER TREATMENT PROJECT
AT THE BONNABEL BOAT LAUNCH.
Gorin, Steve, Lake Pontchartrain Basin Foundation, Metairie, La.

Stormwater runoff pumped into Lake Pontchartrain from a network of
drainage canals is the major source of pollutants along the Orleans and
Jefferson Parish shorelines. Constructed wetlands, located on islands in
the Lake have been proposed as a possible system for treating this runoff
before it is discharged into the lake. Although constructed wetlands have
often been used for treating wastewater, their use in any area is dependent
on site specific factors. Before building an expensive island in the lake to
test the efficacy of the use of aquatic vegetation on a large scale in our
area, a pilot project on land has been designed to provide some basic data.
The objectives of this pilot project are: 1) to determine if and under what
conditions aquatic vegetation will successfully remove targeted pollutants,
2) to determine the operating and maintenance requirements and the cost
effectiveness of the system, and 3) the characterize the output from the
drainage canals that is pumped into the lake on a daily basis.
THE IMPACT OF INSECT HERBIVORY ON BALDCYPRESS IN FORESTED WETLANDS.

Goyer, R. A. and Lenhard, G. J., Department of Entomology, Louisiana State University, Baton Rouge, LA 70803.

Baldcypress, a dominant component of forested wetlands, continues to be damaged by an outbreak of an insect herbivore, the fruittree leafroller (Archips argyrospila). The focus of the population explosion of this tortricid caterpillar encompasses portions of the Pontchartrain Basin. Extensive spring-time defoliation in seasonally and permanently flooded areas has resulted in dramatic reduction in radial growth and has caused crown deterioration and tree mortality. The interaction of insect herbivory with tree stresses from environmental and man-induced causes will be highlighted in this poster presentation.
THE INTERACTING EFFECTS OF ALLOGENIC AND AUTOGENIC AGENTS ON BALDCYPRESS (TAXODIUM DISTICHUM) IN THE LAKE PONTCHARTRAIN BASIN, MANCHAC, LOUISIANA, USA.

Greene, Michael C., Myers, Randall S. and Shaffer, Gary P.
Southeastern Louisiana University, Hammond, La. 70402, USA.

In coastal Louisiana, the lack of regeneration of baldcypress/tupelogum swamp has generally been attributed to such factors as land subsidence, sea level rise, sediment deficits due to levee construction, canalization, increased salinities, waterlogging, and storms and hurricanes. Factorial experiments were undertaken to isolate the particular cause(s) of this lack. Among the variables considered were herbivory by nutria (Myocastor coypus), nutrient limitation, competition (from entangling vegetation), substrate type, and relative elevation. It was found that success was entirely dependent upon protection from nutria herbivory; unprotected trees suffered 100% mortality. It was also determined that nutrient augmentation and release from competition greatly enhanced the trees' growth rates. In subsequent studies, it was confirmed that relief from flood stress played an important role in allowing trees to become established, as did a topsoil substrate as opposed to one of sand. This study indicates that biological factors were of primary importance in restricting the natural regeneration of baldcypress seedlings while physical factors played a moderating role.
THE COASTAL WETLANDS PLANNING, PROTECTION AND RESTORATION ACT: PAST, PRESENT AND FUTURE.
Hawes, Suzanne, U.S. Corps of Engineers, New Orleans District, and Kemp, G. Paul, Coalition to Restore Coastal Louisiana, Baton Rouge, La

The Coastal Wetlands Planning, Protection and Restoration Act of 1990 also called the Beaux-Johnston Act, is the official means through which environmental damage done to Louisiana's coastal wetlands over the past century is to be corrected. It was initiated by grass-roots activism all across south Louisiana, and is now a process run by government agencies and funded by taxpayers. It is slowly and painfully evolving into a more inclusive and democratic enterprise that is revolutionizing the way environmental planning and management occurs. The Pontchartrain Basin provides one of the best stages upon which this drama is being played out. Plans for restoring the basin are reviewed and the evolution of this approach is discussed. This process, for all its current flaws, is being viewed by many as a model for the Nation if opportunities for public involvement can be increased.
Effects of Storm Events on Sediment Distribution Patterns in Northern Gulf of Mexico Estuaries

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Ten major estuaries are present along the northern border of the Gulf of Mexico from Barataria Bay in Louisiana to Apalachicola Bay in Florida. Sediment studies that have been carried out on these bays during this century indicate that most have been characterized by either relatively consistent sedimentation patterns or patterns that have shown a gradual change over the years in response to the activities of man. Bays falling into this category include Barataria Bay, Lake Pontchartrain, Mississippi Sound, Perdido Bay, Pensacola Bay, St. Andrew Bay, and St. Joseph Bay. Barataria Bay, Lake Pontchartrain, and Perdido Bay have been the subject of particularly detailed studies and well illustrate the consistency that characterizes the sediment textural patterns of some estuaries in the northern Gulf. Mobile Bay and Apalachicola Bay, in contrast, have been studied in similar detail but each of these is marked by significant changes in sediment texture which have taken place just in the last two decades. Part of the changes observed in Apalachicola Bay have resulted from the construction of numerous dams by the U.S. Army Corps of Engineers along the Apalachicola River and its tributaries. These dams markedly attenuated quantities of silt-size sediment that, historically, had been deposited in the bay. More recent changes in the bay's sediment distribution pattern, however, can be directly traced to extensive scouring that occurred during passage of Hurricane Elena, in 1985. This storm was responsible for the removal of nearly 90 million tons of sediment from the bay and returned the bay's depths to levels that were present during the early part of this century. Storm effects on Mobile Bay were even more striking. The passage of Hurricane Frederick, in 1979, removed a quantity of sediment from the bay calculated at 287 million tons (the equivalent of the deposition load of the Mississippi River each year at its mouth!). The entire bay was deepened by an average of 1.5 feet, producing average depths that were last noted in the bay in the middle 1800's.

While hurricanes are a common phenomenon in the northern Gulf of Mexico, a special set of circumstances must act for them to significantly alter bottom sediment texture patterns. Of particular importance are the storm's track, its forward movement velocity, and the bay's morphology. Lake Pontchartrain, and the several other northern Gulf estuaries mentioned previously, have been spared these special conditions and have, thus, remained relatively unchanged.
CITIZEN'S MONITORING IN THE LAKE PONTCHARTRAIN BASIN.  
Kenwood, Clifford M., Lake Pontchartrain Basin Foundation, 
Metairie, Louisiana.

According to the Louisiana Water Quality Inventory Report (305 (b)), nonpoint sources are significant contributors to Louisiana's water quality problems. Not surprisingly, nonpoint source pollution has been identified as one of the major sources of pollution in the Lake Pontchartrain Basin. One of the keys to basin-wide cleanup efforts will be the control of nonpoint sources of pollution.

Due to the unique nature of nonpoint source pollutants, it is necessary to compile data from geographically large and diverse areas. Louisiana, like most states, is able to monitor only a small percentage of the state's waterbodies. If the campaign to reduce the impacts of nonpoint pollution is to succeed, regulatory agencies will need additional help to monitor the state's surface waters through citizens' monitoring programs. These programs can provide: public education on stream water quality, hands-on activities for school children and adults to learn about clean water, and useful information to local government about the condition of their waterbodies.

The Lake Pontchartrain Basin Foundation is currently involved in citizens' monitoring programs on four north shore rivers and the south shore canal system. On the Bogue Falaya River, volunteers use a biological monitoring method (macroinvertebrate surveys) developed by the Izaak Walton League of America's Save Our Streams program. On the Tangipahoa, Tickfaw, and Natalbany Rivers, volunteers measure nutrient levels and gather water quality samples for laboratory fecal coliform analysis. On the south shore, high school students are currently involved in a canal monitoring program measuring nutrients and bacteria. Each approach has its promises and pitfalls. An analysis of each program's benefits and "workability" will be provided.
Movement of Heavy Metal Contamination Out of Bayou Trepagnier
Koolitz, Lynn Vogel, Bu Contreras, R.; Green, J.; Hopkins, E.; Lanier, C.; Smith, J. Michael and Gross, Remington, III, Department of Chemistry, Loyola University, New Orleans, LA 70118

Sediment samples have been collected from Engineer's Canal, just east of the Lower Guide Levee of the Bonnet Carre' Floodway, from early 1992 until recently. They show high levels of Pb and Zn contamination originating from a small stream which connects the canal to Bayou Trepagnier. This bayou has been noted by the LDEQ to be a contaminated soil area and has signs posted to that effect at every entrance to, or exit from, the waterway. The metal concentrations in the canal appear to be increasing with time and moving downstream (north) toward Lake Pontchartrain. A comparison of current Pb and Zn levels in the bayou with those in the canal indicates that Zn is being transported preferentially by a combination of physical, chemical, and biological means. Zinc has apparently moved faster and further along the canal. Analyses were performed by x-ray fluorescence (XRF) of the dried sediments at Tulane's Coordinated Instrumentation Facility.
Transport of Heavy Metals into Lake Pontchartrain via Outfall Canals
Liu, Schuang and Flowers, George C. Department of Geology, Tulane University, New Orleans, LA 70118; and Isphording, Wayne C. Department of Geology & Geography, University of South Alabama, Mobile, AL 36688

Bottom sediment samples collected from Lake Pontchartrain near the Duncan Canal were analyzed for total recoverable metal using ICPES. Cr, Zn, Ni, and Co levels are significantly above the average total metal values for Lake Pontchartrain, which, in general, fall below total metal values for the average shale. Metal concentrations normalized to the aluminum and iron contents of sediments indicate significant anthropogenic input of Cd, Cr, Pb, Ni, and Zn near outfall canals along the south shore of Lake Pontchartrain. The total metal concentration of sediments is controlled by sediment texture; strong positive correlations are observed between metal content and clay/organics content of the sediment. Because clay is generally winnowed out of sediments at the mouth of the canal, metal content increases with distance from the mouth of the outfall canal. Notable exceptions are sandy sediments in the mouth of the canal that contain anomalously high Cr and Ni contents. Analyses of samples taken from various depths in cores indicate that metal input into the lake from the canal is relatively constant.

Ion site partitioning analyses of sediment samples taken from the 17th St. Canal indicate that, in general, metals are partitioned into stable sites under the physicochemical conditions that exist in the outfall canals and the lake. However, reducing conditions caused by salinity stratification in the lake may increase the potential for metal release and subsequent absorption by the biota.
GEOLOGIC PROCESSES AND GEOMORPHIC CHANGES IN THE PONTCHARTRAIN BASIN: 1984-1994
Penland, Shea, LSU; and Williams, Jeff, U.S. Geological Survey

The Pontchartrain Basin is major Gulf of Mexico estuarine basin containing rich coastal wetlands and submerged aquatic habitats. The Pontchartrain Basin is of significant environmental, social, and economic importance to southeast Louisiana, in particular to the city of New Orleans. Public consensus supported by scientific information suggest that this basin has undergone significant and widespread degradation over the past century. Using aerial videotape surveys conducted in 1984 and 1994, a decade of shoreline changes are documented.

The Pontchartrain Basin is located in southeast Louisiana wedged between the Mississippi River delta plain to the south and the Pleistocene terraces of the Florida Parishes to the north. The axis of the Pontchartrain Basin trends northwest-southeast and encompasses Lake Maurepas, Lake Pontchartrain, Lake Borgne, the St. Bernard marshes, Chandeleur Sound, and the Chandeleur Islands. The habitats range from freshwater swamps and marshes in the western basin to saltwater marshes and barrier islands in the eastern basin.

Subsidence is an important geologic process impacting the Pontchartrain Basin. The highest rates of subsidence occurs along the southern half of the basin where rates average 0.5-0.7 cm/yr. In the northern half of the basin, the rates of subsidence decrease to 0.2-0.3 cm/yr. The rates of subsidence vary as a function of Holocene thickness, organic content, faulting patterns, soil type, and various human activities.

Coastal land loss is a serious environmental problem found in the Pontchartrain Basin. Shoreline erosion is consuming the margins of the lakes in the basin while wetland loss is consuming the interior swamps and marshes. Rates of shoreline erosion range between 0.4 and 0.7 meters per year along the shoreline of Lake Maurepas and Lake Pontchartrain. The highest rates of shoreline erosion are found along the Chandeleur Islands in the eastern side of the basin. The short-term rate of erosion of these islands is measured at -12.2 m per year.

Wetland loss occurs throughout the Pontchartrain Basin from Lake Maurepas to the Chandeleur Islands. Using the 15 quadrangles that cover the basin, the average rate of wetland loss can be measured at 0.12 square miles per year. The processes driving wetland loss in this basin are varied and complex. Subsidence, salt water intrusion, storms, human activities, and pollution all contribute to wetland loss.
The major changes documented for the decade of 1984 and 1994 include shoreline erosion, loss of vegetated wetlands, determination of a variety of coastal structures, loss of seagrass beds, and a general decline in the environment.
EFFECTS OF URBAN RUNOFF ON BENTHIC INVERTEBRATES: A SEARCH FOR CAUSAL FACTORS

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Storm water runoff from the metropolitan New Orleans area is pumped into Lake Pontchartrain through a system of outfall canals. Although urban runoff is regarded as the primary source of environmental contaminants in the estuary, little is known about the fate and effects of these contaminants. Past studies of infaunal invertebrate populations near the Duncan Canal in Jefferson Parish, Louisiana identified three intergrading faunal zones along a stress gradient which decreased with distance from the mouth of the canal. Zone 1, which extended out to 150 m, lacked mollusks and had more nematodes, capitellid polychaetes and oligochaetes. Zone 2, which extended out from 150 m to 400 m had higher densities of the same polychaetes, and lower densities of the mollusks. Zone 3, was a variable recovery zone in which molluscan densities increased to levels similar those found in offshore reference sites. This study demonstrated an adverse effect on the benthic invertebrate populations in Lake Pontchartrain and supports the need for management of urban runoff entering estuaries. Results could be used to monitor the effectiveness of runoff management programs.

The focus of ongoing studies is on the relative role of environmental factors associated with runoff in producing the adverse effect on invertebrate populations. Reduced salinity, low dissolved oxygen, high current velocity, and contaminants in the water and sediment may all contribute to the observed response. It is important to separate toxicity from contaminants in urban runoff from other factors such as salinity, dissolved oxygen and currents which may be easier to manage and don't have long-term environmental and health effects. Acute sediment toxicity tests were performed on sediment samples taken 100m, 300m, 800 m and 4.8km (reference site) from the canal mouth. Texadina sphinctostoma, a small benthic snail which occurs in Lake Pontchartrain, and the amphipod Hyallela azteca were used as test organisms. No acute toxicity was detected in any sediment samples with either test organism. Acute toxicity tests were run to determine the effects of dissolved oxygen concentrations below 0.5 ppm and low salinity conditions on survival of Texadina. Low dissolved oxygen and distilled water caused significant toxicity to the snails. Preliminary data indicate that low dissolved oxygen and abrupt freshwater discharges play important roles in producing adverse effects on the biota.
4 stations
1) 100 m from mouth of canal
2) 300 m from mouth of canal
3) 800 m from mouth of canal
4) 4.8 km from mouth of canal (reference site)

* no significant toxicity between any stations near the canal or between stations near the canal and the reference site for either test organism used

** no significant difference in survival between salinities ranging from 0.5 - 2.0 ppt, however significant difference between freshwater conditions and low salinity conditions

*** hypoxia has a significant effect upon survival of the snails

0.15 - 0.5 ppm

**** Hypoxia x low salinity synergism experiment determined that hypoxia has an effect upon osmoregulation of T. sphinctostoma under freshwater conditions

Kruskal-Wallis one-way analysis of variance was the statistical test used
AMITE RIVER WATER QUALITY TREND ANALYSIS.
Smith, Stephanie L., formerly with the Louisiana Department of Environmental Quality, Office of Water Resources, Baton Rouge, La., 70884.

Water quality in the Amite River has been influenced primarily by sand and gravel mining, nonpoint source pollution, urban runoff and sewage treatment plant discharges over the past decade. Twenty-eight water quality parameters were analyzed to determine the existing condition of the water quality and the trend of the past five years from 1986-1991 on the Amite River. To define parameter variation it was necessary to specify the extreme upper and lower limits of the most influential environmental factor (flow) affecting the surface water constituents analyzed. Grouping the water quality variables by flow conditions served to adjust for seasonal effects in the data; this improved accuracy in the analysis by reducing concentration variability associated with stochastic flow conditions generated by climatic changes. The parameters showing a significant increase in instream concentration were arsenic, lead, and total dissolved solids. Selected parameters were plotted by station location to illustrate concentration differences based on proximity to rural and urban areas.
WATER CONTROL PERFORMANCE OF THE CAERNARVON FRESHWATER DIVERSION PROJECT

Freshwater diversion has become the solution to a host of problems plaguing Louisiana's coastal zone - channelization, levee construction, subsidence, mineral exploitation, and sea level rise to name a few. These problems have caused a chain reaction throughout the estuaries thereby causing wetland loss, saltwater intrusion and related problems in the coastal ecology and hydrology. The Caernarvon Freshwater Diversion project was conceived to alleviate the deleterious effects of the above problems by enhancing marsh productivity and wildlife habitat and increasing oyster productivity through the controlled introduction of fresh water to manage the estuarine salinity regime.

This paper will explore the Corp's role in this cost shared project, evaluate the structure's performance since it became operational in 1991, and provide an overview of the monitoring programs implemented before and after construction. In addition the paper will detail the development of the operational model for this unique and timely environmental project.
SCHOOLS WATER QUALITY STUDY
Thomas, R.A.; MaVarden, D.F.; and Scott, R. Society for Environmental Education, New Orleans, JEFFERSON PSH HIGH

Urban runoff, or nonpoint source pollution, entering Lake Pontchartrain via the drainage canals from the streets, parking lots and yards Jefferson Parish is known to be the single most serious pollution source for the south shore. This project, funded by a grant from the Sierra Club and sponsored by the Society for Environmental Education, set out to educate Jefferson Parish High School students about the drainage system and the substances that drain into it and the techniques used to assess the quality of the water and the health of the ecosystem.

Three high schools were involved: East Jefferson High sampled at the mouth of the Suburban Canal; Grace King High sampled at the mouth of the Bonnabel Canal; and Riverdale High sampled at the mouth of the Elmwood Canal. At each site, samples were taken from the canal side and the lake side of the pump station and the results compared to observe effects of urban runoff on the lake water. The students conducted all the tests under the supervision of their teachers and staff from the Society for Environmental Education.

Weekly samples were taken over a four week period beginning Sept. 17, 1993. All sampling took place in the late afternoon. The following parameters were measured using water quality testing kits from LaMotte and HACH companies: pH, salinity, dissolved oxygen, turbidity, nitrate, phosphate and water temperature. In addition, biochemical oxygen demand and total coliform were measured, the latter at the Elmwood site only.

During the month of September 1993, the New Orleans area experienced drought conditions, which affected the results of the project because little or no water drained from the streets of Jefferson Parish into the canals and the canal waters were not entering the lake. However, the students were able to collect valuable baseline data and are currently repeating the procedure to investigate the values of the parameters in different weather conditions.

The findings of this initial study indicate that the water quality at the mouth of the drainage canals in Jefferson Parish is relatively good. The levels of dissolved oxygen were well above the minimum standard at all times. However, the levels of total coliform at the mouth of the Elmwood Canal was above the maximum standard and this may be used as an indicator that bacteria levels could be above acceptable levels.
SEDIMENTATION ON LOWER BIG CREEK IN EAST CENTRAL TANGIPAHOA PARISH: LAND USE CHANGE AS A CONTRIBUTING CAUSE, AND PERCEPTIONS ON THE PART OF CITIZENS AND THE ELECTED PARISH COUNCILMEN ABOUT SEDIMENTATION IN PARISH STREAMS

Whitehurst, Andrew E., Citizens for a Clean Tangipahoa, Baton Rouge, La.

Lower Big Creek in central Tangipahoa Parish has exhibited signs of increased sedimentation since approximately 1958. Loss of persistent pools below the former Russelstown bridge site (1958-1978), and above the site (1978-1992) coupled with a generalized widening, loss of canopy, and loss of depth are most likely due to sedimentation from changing land use patterns in the Big Creek drainage basin. The changes along lower Big Creek have resulted in a deterioration in fish habitat and a near total loss of recreational swimming holes for people.

Temporary (timber harvest) and permanent (pasture creation) land use changes have been driven by market forces on the dairy and timber industries to varying degrees since the primary land use change in the area - the removal of the longleaf pine which ended around 1918.

An informal passive survey of one user group was deployed in sporting goods stores in Amite and Hammond to explore perceptions of the sedimentation problem parishwide. There is evidence that participation in the survey was limited due to reluctance of citizens to record responses on a local and delicate issue.

The elected Tangipahoa parish council has been unable to fully enforce its present logging ordinance and apparently would not support additional logging regulations (Best Management Practices) which may help ease the sedimentation problems in Parish Streams.

Williams, S. Jeffress, U.S. Geological Survey. 914 National Center
Reston, VA 22092

The Lake Pontchartrain Basin, located on the eastern side of the Mississippi River flood plain, is a major Gulf of Mexico estuary/wetland complex of considerable environmental and economic importance to the south-central Louisiana region, especially New Orleans. Public consensus supported by limited scientific information suggests that the basin, especially Lake Pontchartrain, has undergone significant and widespread degradation over the past half century.

The U.S. Geological Survey (USGS) undertook an evaluation of the critical problems affecting the basin and developed a multi-year plan of study, which identified several key environmental issues and recommended strategic actions necessary to improve scientific understanding of the basin's geologic character and relevant estuarine processes.

Major environmental issues identified in the study plan are:

- Sediment and water pollution from urban and agricultural sources.
- Lakeshore erosion and loss of wetlands and grassbeds.
- Saltwater intrusion from canals and navigation waterways.
- Effects of past long-term commercial shell dredging.
- Potential effects of Bonnet Carre' water diversion.

After acceptance of the plan, a multi-disciplinary study of the Pontchartrain Basin was initiated by the USGS in October 1993. Funding for the first year permits only a reconnaissance level of effort to assess existing geologic data and information and to start addressing the following five tasks detailed in the plan:

- Geologic Framework: Delineate shallow geologic character of the basin, including the potential for faulting, subsidence measurements, and detailed assessments of shell dredging activities.

- Shoreline Mapping: Use very high-resolution remote sensing instruments as well as historic maps and photography to produce large-scale maps and computer databases of geomorphic changes.
o **Contaminated Sediments:** Conduct geochemical analyses on suites of lakebed sediments to quantify contaminated sediments, map their aerial distribution, and determine the sources, transport pathways, and depositional sinks for fine-grained sediments and pollutants.

o **Computer Circulation Modeling:** Use 3d models to simulate circulation patterns and sediment flux within the basin.

o **Information Transfer/Education Outreach:** Provide interim results to the public and planners involved in efforts to restore and protect the Lake Pontchartrain Basin.

This study is an important extension of recent USGS field studies of barrier island erosion and wetland loss processes in the Mississippi River deltaic plain. Not only will it address specific issues, but its results combined with results from previous studies will provide a more comprehensive scientific understanding of processes affecting the entire Mississippi River deltaic plain.
INVENTORY OF PROPOSED OR PLANNED PROJECTS ADDRESSING WETLAND LOSS OR SALTWATER INTRUSION IN THE PONTCHARTRAIN BASIN.

Yoste, Lia; Britsch, D.; Hawes, S.; Berry, B.; and Lopez, J.
Saltwater Intrusion Wetland Loss Committee for the Lake Pontchartrain Basin Foundation.

As part of the final phase of developing the Comprehensive Management Plan for the Lake Pontchartrain Basin Foundation, the saltwater intrusion/wetland loss committee has compiled the known projects addressing wetland loss or salt water intrusion within the basin. The Pontchartrain basin is split into three sub-basins. The upper and middle basin is the Maurepas basin to the land bridge between Lakes Borgne and Pontchartrain. The Lower basin is from this land bridge to just west of the MRGO. The Breton Basin is from the MRGO to the Mississippi River. The current approximate inventory of project types is distributed as the following:

<table>
<thead>
<tr>
<th>Project Type</th>
<th>Upper&amp;Mid</th>
<th>Lower</th>
<th>Breton</th>
</tr>
</thead>
<tbody>
<tr>
<td>Artificial Reefs</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Freshwater Diversion</td>
<td>8</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Hydrologic Modification</td>
<td>3</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Hydrologic Restoration</td>
<td>12</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>Marsh Creation</td>
<td>6</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>Marsh Management</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Outfall Management</td>
<td>0</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Sediment Diversion</td>
<td>2</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Shoreline Protection</td>
<td>13</td>
<td>16</td>
<td>1</td>
</tr>
<tr>
<td>Sediment Trapping</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Vegetative Trapping</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Barrier Island Restoration</td>
<td>1</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>Major Hydrologic Barrier</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

These projects reflect largely those inventoried in the CWPPRA planning, but also include those suggested outside of that planning program. We will continue to inventory projects as we are aware of them. The saltwater intrusion/wetland loss committee will attempt to develop a long-term strategy for the LPBF in regards to these projects.
SUBSURFACE FAULT DETECTION USING SEISMIC DATA FOR HAZARDOUS-WASTE-INJECTION WELL PERMITTING: AN EXAMPLE FROM ST. JOHN THE BAPTIST PARISH, LOUISIANA. 
Zinni, Edward V., CNG, New Orleans La.

The Covington aquifer is utilized as a major source of drinking water for east St. John the Baptist Parish, Louisiana. A recent subsurface geologic study by Herbert and Hanson (1991) suggested that the Covington aquifer might communicate hydrologically with two hazardous-waste-injection reservoirs thus putting the freshwater Covington aquifer in danger of contamination. This paper describes the use of integrating seismic-reflection and electric well-log data to determine the possibility of hydrologic communication between the Covington aquifer and the hazardous-waste-injection reservoirs.

Cross-sections, net-sand isopachs and structure maps are constructed for three hazardous-waste-injection reservoirs and the Covington aquifer. Four previously undetected normal faults bisect the three injection reservoirs and the Covington aquifer. The presence of these faults significantly increases the possibility of communication by acting as conduits and allowing vertical migration of fluids along the fault planes or causing juxtaposition of sand against sand and allowing leakage to occur across the fault planes. In addition, the upper injection reservoir is part of a fluvial system that occasionally scour down into the Covington aquifer, depositing sand from the injection reservoir interval directly on the Covington aquifer sand. Therefore, the injection reservoir is in stratigraphic contact and possibly hydrologic communication with the Covington aquifer.

The injection of liquid-hazardous-waste into these reservoirs could jeopardize not only the water quality of the Covington aquifer but possibly other shallow freshwater aquifers should vertical migration occur along the fault planes. Without the use of seismic data the risk of contaminating underground sources of drinking water would not have been properly assessed.
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17523 BASICS OF THE BASIN '94
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