PROJECT COMPLETION REPORT

A Water Quality Training Program for the
Louisiana Cooperative Extension Service

By

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and
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Prepared for

United States Department of the Interior

LOUISIANA WATER RESOURCES
RESEARCH INSTITUTE

Louisiana State University
Baton Rouge, LA 70803

September 1989

A WATER QUALITY TRAINING PROGRAM FOR THE LOUISIANA COOPERATIVE EXTENSION SERVICE

A WATER QUALITY TRAINING PROGRAM FOR THE LOUISIANA COOPERATIVE EXTENSION SERVICE

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Baton Rouge, LA 70803

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DISCLAIMER

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ABSTRACT

A Water Quality Training Program For The Louisiana Cooperative Extension Service

Brenda G. Kelly and Bill Branch,
Project Coordinators

September 1989

The Information Transfer Program of the Louisiana Water Resources Research Institute, in conjunction with the Louisiana Cooperative Extension Service (LCES), developed a water quality training program for the state and parish staff of LCES. The purpose of the training program was to help LCES staff, through improving technical competence and availability of specialized information, more effectively and efficiently meet the citizens' requests for information and promote their understanding of water quality issues.

Seven one-day workshops were planned. To date, four workshops have been conducted at LCES district offices in Alexandria, Shreveport, Tallulah, and Baton Rouge (two districts combined meetings here). Other workshops are scheduled for fall, 1989. The workshops focused on drinking water issues, and included topics as natural ingredients to water quality, water quality standards, health effects of water quality, man's insults to water quality, the economics of water quality, home treatment devices, and area agency responsibilities over water quality. Presenters were experts from universities, and state and federal governmental offices in-state. Presently 220 LCES staff members have participated in the workshops.

Future plans include development of the workshop materials into a water quality reference manual, conductance of additional workshops, and developments and implementation of additional materials and programs on other water quality issues.

ACKNOWLEDGEMENT

The investigators wish to thank the Louisiana Cooperative Extension Service (LCES) state office for its cooperation in and financial assistance to this water quality training program. The LCES provided transportation to workshops, equipment for use in presentations, extensive graphics and duplication services for preparation of workshop handouts and visuals, and staff time to assist in many aspects of the program development and implementation.

To the staff of the LCES district and parish offices, thanks is extended for their eagerness to participate in the program and for their constructive feedback following each workshop.

A special thanks is extended to members of the LCES state staff and to representatives of state and federal agencies who contributed presentations during each of the training programs. Especially the presentations of Dr. Karem Behm (water conservation and economics), Dr. Claudette Reichel (home water treatment devices), and Saraleen Seals (health effects of water quality), are greatly appreciated.

TYPICAL WORKSHOP AGENDA

LOUISIANA
COOPERATIVE
EXTENSION SERVICE
LOUISIANA STATE UNIVERSITY AGRICULTURAL CENTER

Knapp Hall
Baton Rouge, LA 70803-1900
504 388-4141

December 8, 1988

TO: All Cenla Area Extension Personnel

RE: Water Quality Meeting, December 15, 1988

Attached is an agenda and information relating to the Cenla Area Water Quality Meeting scheduled for December 15, 1988 in the Nursing School Auditorium at LSU-Alexandria. This has been prepared for you in advance by Mr. Bill Branch.

Plans are being made for lunch at the cafeteria in the Student Union building on the campus. The cost will be approximately five dollars ($5.00). Refreshments will be available in the lobby of the nursing building during the breaks.

Please try to be on time for the meeting since we will have a heavy schedule for the day. This meeting has been designed to assist you with water quality work in your parish when we start preparing the program and plan of work for FY 90.

Sincerely,

Leland Scoggins

Leland Scoggins
Associate District Agent
Cenla Area

LS/gr

Enclosure

cc: Vice-Chancellor Loupe
Dr. Karen Behm
Mr. Bill Branch
Dr. Lowell McCormick
Dr. Jack Bagent

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WATER QUALITY, CONSERVATION AND MANAGEMENT
TRAINING SESSION NO. 1
DRINKING WATER QUALITY AND AGENCY RESPONSIBILITY
NURSING SCHOOL AUDITORIUM
LSU ALEXANDRIA
9:15 am - 3:30 pm
DECEMBER 15, 1988

- Introduction and Administrative Details - Dr. Leland Scoggins

- Importance of Water Quality, Conservation and Management

  Economic Issues - Dr. Karen Behm
  Health Issues - Sara Seals

- Louisiana's Hydro-Geology - Brenda Kelly

  Geology
  Surface Water Basins
  Ground Water Aquifers
  Hydrologic Cycle
  Soils

- Water Quality - Bill Branch

  Standards
  Status
  Threats
  Testing

- Point-of-Use Water Treatment - Dr. Claudette Reichel

- Agency Responsibilities - Bill Branch, Moderator

  Michael Caze - DHH
  John Impson - DAF
  Bob Paul - DEQ
  Tom Ashby - DEQ
  Bo Bolourchi - DOTD
  J. B. LeRay - ASCS
  Harry Hawthorne - SCS

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WATER QUALITY, CONSERVATION AND MANAGEMENT

TRAINING SESSION NO. 1

- Introduction & Administrative Details - Leland C. Scoggins, District Agent
  Cenla Area

  Reason for Training - Prepare LCES staff to conduct water quality educational programs

  Attendance - LCES, SCS, ASCS, DHH, DEQ, DOTD, DAF, S&WCD

  Lunch and Coffee Break

  Materials - Mimeographs available cover topics in more detail than presentations. Updated materials to follow. Waste management topics to be covered in later training sessions. Special topics by telelearning.

  Evaluation -

- Importance of Water Quality, Conservation and Management - Karen S. Behm, Specialist, Family Resource Management

  Health Issues

  - Carcinogens
  - Infant Mortality due to Nitrates
  - Intestinal Illness and Parasites
  - Sodium, Salts, Copper, Lead
  - Pesticides and Chemicals

  Industry, Power and Transportation

  - Need large quantities of acceptable quality water in uninterruptible supply.
  - Soil erosion causes sedimentation which increases cost of maintaining water ways.
  - Louisiana has two of five largest ocean ports.

Irrigation

Largest user of groundwater.

Essential to survival and production of many alternative crops.

Insurance of productivity for traditional crops.

Much naturally occurring Louisiana groundwater of too poor quality for irrigation of sensitive crops (sodium and salts).

Aquaculture/Marine Fisheries

Good water quality essential to productivity.

Poor water quality prevents harvesting (bacteria) or increases cost of processing (purging)

High ammonia level in groundwater can kill fish.

Flooding

Louisiana leads nation in number of claims for flood damages, and in number of repetitive claims, even though it is 2nd in number of flood insurance policies and 3rd in dollar amount of insurance.

Recreation

Important source of revenue.

Agriculture is one of contributors to loss of recreational use of surface water.

- Louisiana's Hydro-Geology - Brenda Kelly, Assistant Director, Louisiana Water Resources Research Institute

Geology

55% of Louisiana is a natural flood plain.

Soils primarily laid down by rivers over thousands of years.

Relatively recent (geologically speaking) coverage by saltwater accounts for frequent occurrence of high salt levels in ground water and salt domes.

Surface Water Basins

State divided into twelve basins.

Groundwater Aquifers

State supplied by nine major aquifers.

Hydrologic Cycle

Total water supply is static.

Water cycles between phases and media.

Groundwater is source of 40% of surface water during low flow conditions.

Surface water supplies groundwater through aquifer recharge areas.

Soils

Frequent occurrence of heavy clays limit vertical movement of groundwater.

Horizontal layers of coarse sands encourage horizontal flow.

Leaching and surface runoff potential varies with soil type, cover and slope.

- Water Quality - Bill Branch, Specialist, Engineering

Standards

Maximum Contaminant Levels (MCL)

Human toxicology data.

Animal toxicology data.

No observable effect level.

Water provides 20% exposure.

Average adult water consumption 2 liters/day.

Primary Pollutants

Pose health risk.

Secondary Pollutants

Esthetic concerns.

- Bacteria
  - Indicator - fecal coliform, eschericia coli
  - Pathogens - Salmonella, Listeria, Typhoid, Hepatitis, Vibrio
- Parasites - Giardia

Status

- Surface Waters
- Ground Water
- Public Water Supply
- Private Wells

Threats

- Point Source Discharges
- Non-Point Source
  - Agriculture, Forestry, Mining, Urban Septic Tanks, Irrigation
  - Sediment - 211 million tons/year (U.S.)
  - Bacteria
  - Nutrients - 1.4 million tons/year (U.S.)
  - Pesticides - 0.03 million tons/year (U.S.)

Water well construction and closure of abandoned wells

- Seismic wells, back flow prevention, cross-connections

Testing

- pH
- Inorganics
  - Sodium, Chlorides
  - Copper, Lead
- Organics
  - Acids
  - Chemicals
  - Pesticides

Bacteria

Fecal Coliform

Labs

Private

Public

- Point-of-Use Treatment - Claudette H. Reichel, Specialist, Housing

Water Softener

Calcium and magnesium replaced by sodium

Iron

De-Ionization

Filters

Mechanical

Carbon

Reverse Osmosis

Distillation

Bottled Water

Chemicals

Chlorine/chloramines

Iodine

Acid

Lime

Polymers

Ultra-Violet

Management

Maintenance

System Design

- Agency Representatives

  LA Department of Health and Hospitals (DHH) - Michael Caze, Regional Engineer

    Public Water Supply

    Private Wells

    Septic Systems

    Publicly Owned Treatment Works

    Milk Sanitarians

    Food Processing

    Restaurants

    Public Health

  USDA Soil Conservation Service (SCS) - Harry Hawthorne, State Engineer

    Watershed Program

    Resource Conservation and Development

    Waste Management Design

    Farm Plans

  USDA Agricultural Stabilization & Conservation Service (ASCS) - J. B. LeRay

    Provisions of 1985 Farm Bill

      Swampbuster/Sod buster

      Cost Sharing

      Filter Strips

  USDA Forest Service

  USDA Environmental Protection Agency (USEPA)

  LA Department of Environmental Quality (DEQ)

    Office of Water Resources

      Point Source

      Non-Point Source

      Groundwater

- Office of Solid and Hazardous Waste
  - Solid Waste
  - Hazardous Waste
  - Underground Storage Tank
- Office of Air and Nuclear
  - Radon
  - Odors, smoke, steam, dust

LA Department of Agriculture & Forestry (DAF)

- Pesticides
- Soil and Water Conservation Committee
- Livestock Sanitary Board
- Inspection Services
  - Slaughter Houses
  - Produce

LA Department of Transportation & Development (DOTD) - Zahir "Bo" Bolourchi

- Office of Public Works
  - Water Well Registration
  - Water Well Driller Licensing
  - Abandoned Water Wells
  - LA Water Resources Information Center (LAWRIC)

LA Department of Natural Resources (DNR)

- Office of Conservation
  - Oilfield Waste Regulation
  - Underground Injection Control

Soil and Water Conservation Districts

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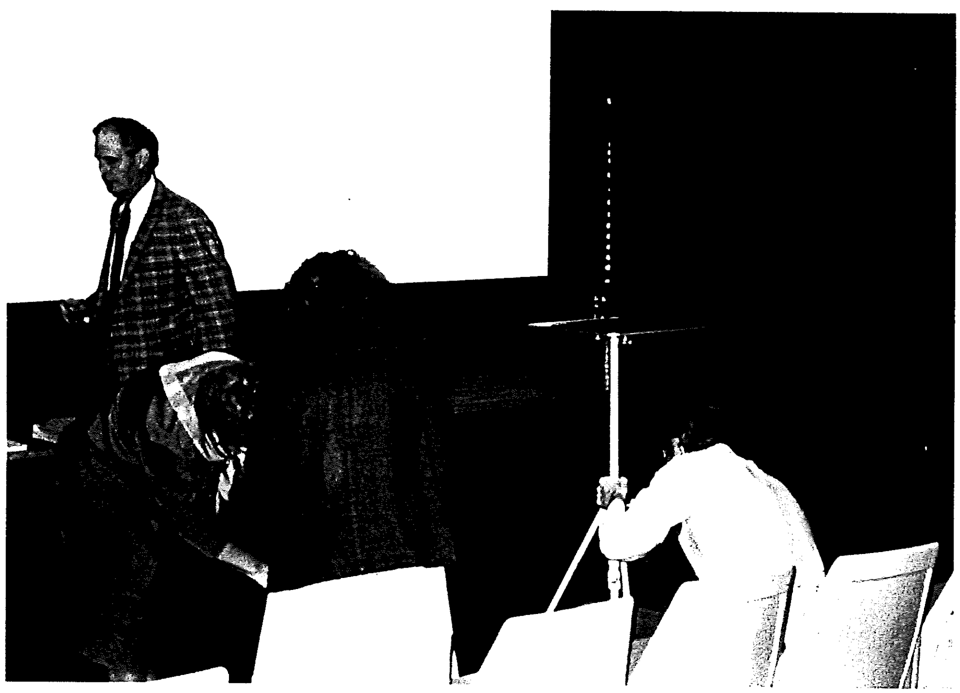
WATER QUALITY, CONSERVATION AND MANAGEMENT
TRAINING SESSION NO. 1
DRINKING WATER QUALITY AND AGENCY RESPONSIBILITY
LSU AGRICULTURAL CENTER BUILDING
ROOM 212
10:00 A.M. - 4:30 P.M.
FEBRUARY 27, 1989

- Introduction and Administrative Details - Dr. Stanley Lamendola
- Importance of Water Quality, Conservation and Management

  Economic Issues - Dr. Karen Behm
  Health Issues - Sara Seals

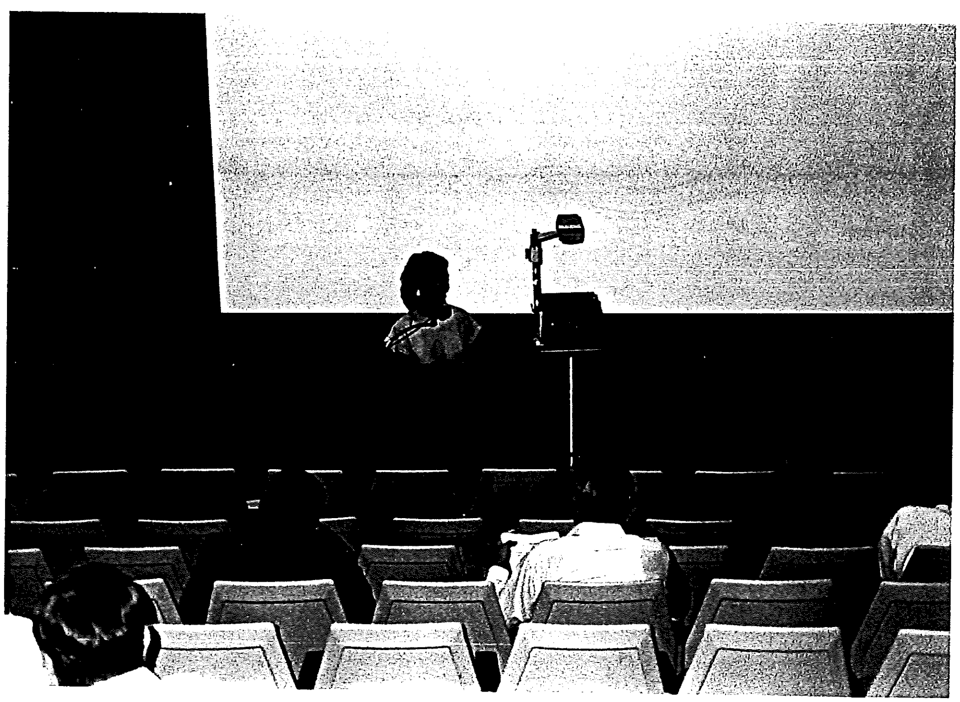
- Louisiana's Hydro-Geology - Brenda Kelly
- Water Quality - Bill Branch
- Point-of-Use Water Treatment - Dr. Claudette Reichel
- Agency Responsibilities - Bill Branch, Moderator

Saralene Seals



SHREVEPORT WORKSHOP
May 1989

Bill Branch



Dr. Claudette Reichel

SHREVEPORT WORKSHOP

May 1989

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HANDOUT MATERIALS

Session I

INTRODUCTION & ECONOMICS

Speaker: Dr. Karem Behm
La. Cooperative Extension Service

LOUISIANA COOPERATIVE EXTENSION SERVICE
LOUISIANA STATE UNIVERSITY AGRICULTURAL CENTER

Knapp Hall
Baton Rouge, LA 70803-1900
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REPORT OF THE LOUISIANA COOPERATIVE EXTENSION SERVICE ON WATER QUALITY - A CRITICAL ISSUE

Water quality is an important issue to the state of Louisiana. Our petro-chemical industry and our agricultural, silvicultural, aquacultural and marine fisheries industries are our primary sources of employment and income. Each needs large quantities of high quality water, and has considerable water pollution potential.

Disposal of oilfield and hazardous wastes generated in Louisiana and other states through incineration and underground injection is a major industry. This leads to concerns about drinking water quality, especially when reports of high cancer rates and miscarriages are published.

Nearly half of the contiguous land mass of the United States drains through Louisiana. One third of our drinking water comes from surface sources, such as the Mississippi River, after extensive and expensive treatment. Spills from barge traffic and accidental releases from chemical plants lining the river frequently cause health concerns.

High quality groundwater is hard to find. Most of our surface water users do so because of high groundwater salinity. Irrigation wells have been abandoned for the same reason. The high solids and sodium contents of the water was killing the irrigated crops. Some of our public water supplies from groundwater sources have solids and sodium content in excess of 1,000 ppm and 200 ppm respectively. Over 200,000 households depend on private dug or drilled wells for drinking water. Few of these wells have ever been tested. Our frequent flooding provides opportunities for surface water contamination of those wells and their aquifers. There are numerous abandoned oilfield, seismic, industrial and domestic wells which have not been properly plugged and offer additional opportunities for groundwater contamination.

Over 600 improperly constructed dumps have ceased to operate during the last eight years because they did not meet current groundwater protection standards. There is concern that pollutants are leaking out of these sites into aquifers.

Our oyster beds are closed all too frequently to suit our fishermen. Inadequately treated sewage is the usual cause. One of our major scenic rivers, the Tangipahoa, was closed to contact sports in 1988 because of high coliform levels. Municipal sewage discharges, a slaughter house, and many domestic and agricultural sources discharge into the river and its tributaries.

LOUISIANA COOPERATIVE EXTENSION SERVICE (LCES) PROGRAMS

LCES's educational programs have stressed water quality, conservation and management for many years. We conduct agricultural chemical application training to improve applicator and equipment performance. We test soil samples and recommend fertilizer application rates. We test irrigation water samples and advise growers of potential problems.

You can help by preventing soil erosion. Maintaining a good vegetative cover on the soil helps reduce the amount of erosion. Avoiding applications of fertilizers and pesticides before a rain will help reduce the amount of chemicals washed into streams. Never throw organic matter such as leaves and grass clippings into the water. They require oxygen for their decomposition and may lower oxygen levels enough to kill fish in the stream.

Why Should We Be Concerned About Water Conservation?

Louisiana gets 50 - 60" of rainfall each year. The problem comes with distribution. Sometimes we have floods and sometimes we have droughts. In some areas we are using groundwater faster than it is being replenished. Some of our aquifers are declining and water must be pumped from greater depths. When this happens the water quality may also decrease.

Saltwater intrusion occurs when groundwater is removed faster than it is replenished in coastal areas. Saltwater, which is heavier than freshwater, moves in and is picked up by pumps and delivered to a water supply. Drought causes freshwater flows to be reduced and saltwater intrusion increases.

Finally, water conservation saves money. The less water we use, the less we have to pump, treat, test and distribute. The less we use, the less wastewater we have to treat and dispose of properly.

What Can I Do About Water Conservation?

At home, you can take a quick shower instead of filling the bathtub. There are also "low flow" shower heads and faucet restrictors which cut water consumption. New toilets are available which use much less water. Use a bucket and sponge to wash the car instead of letting the hose run all the time. A leaking faucet wastes many gallons of water every day. Repair kits are inexpensive and readily available.

Drip irrigation is an inexpensive and easy way to water shrubs, trees, flowers and gardens and uses much less water than watering with sprinklers or a hose. A well-designed sprinkler system can save water (and time) as compared with the use of a hose and portable sprinklers.

What Have I Got To Do With Water Management?

Management includes all of the things we do that affect our use of water. The amount of water we use, the things we use water for and the things we put into water, are under our control. There is no new water supply for this earth. The water we use today is the same water that's been on earth for thousands of years. "The Water Cycle" illustrates how water is transformed from one phase to another. We can manage our every-day lives to protect our water supplies. That makes each citizen responsible for managing water. That is a great responsibility. Exercise it wisely!

Our Agricultural Waste Management Committee includes representatives of regulatory agencies and advises producers and processors of best management practices for waste and wastewater management. We provide research data to regulatory agencies to assist them in their efforts to improve water quality.

We talk to individuals and groups about proper well construction and protection and septic system siting and operation. We advise local governments on public water supply and waste management.

Many of our 4-H Agents help youth pursue natural resource protection and water quality-related educational projects. LCES has been an active participant in developing Louisiana's litter prevention programs. Many of our 4-H Agents and youth participate in a well-publicized "Beach Clean Up" program and in "Trash Bash."

NEED FOR ADDITIONAL RESOURCES

Drinking Water Educational Program

An intensive educational program is being implemented to inform rural cities about the quality of drinking water being consumed by the 200,000 households using untested wells and to demonstrate proper treatment and protection techniques. Levels of health-related pollutants, such as sodium, chlorides, nitrate and bacteria need to be measured to develop a data base from which to plan corrective actions. Problem wells identified need to be inspected to determine if and how they can be properly sealed. Appropriate point of use treatment practices or alternative sources of water need to be recommended. Abandoned wells need to be located and properly plugged to protect our aquifers. Water quality education programs are being greatly expanded to increase the level of water technology understanding of youth, adults, and public officials. Once they understand the technology, they will be able to make better informed decisions concerning their individual and community actions related to water quality.

Agricultural, Aquacultural, Silvicultural, and Marine Fisheries Water Management

LCES is expanding its efforts to provide water management information to our producer and processor clients. Water supply and wastewater discharge problems can be reduced by reducing consumption. Simple input metering and output testing can provide data to demonstrate water conservation and wastewater minimization to dairymen, irrigators, slaughter house operators, and sweet potato canners, for example. This reduces demand on acceptable quality water, reduces costs of treating wastewater, and increases profitability for producers and processors.

Agricultural and Silvicultural Wastewater Recycling

LCES's efforts to assist municipalities and light industries as well as agricultural producers and processors in recycling non-hazardous wastewater and sludges through agricultural and silvicultural cropping systems is being expanded. In many cases we have helped reduce pollutant loading on streams and volume of wastes going into landfills as well as costs of operation for businesses and taxpayers, while providing a source of plant nutrients and irrigation water to the grower at little or no cost. These efforts have been endorsed by regulatory agencies who refer business and municipal leaders to us for assistance.

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WATER QUALITY, CONSERVATION AND MANAGEMENT

Bill Branch

Why Is Water Important To Us?

Water is essential to life. We can get by without food for several days. We may be uncomfortable and feel weak, but we can survive. We cannot live more than a day or so without water. We only drink about 2 quarts a day, but use much more than that - 80 gallons per day including water for bathing and other uses! Louisiana's total water usage averages 2,500 gallons per person per day.

Much of the food we eat is water and a lot of water is needed to produce our food. Irrigation is the largest use of water in the United States and most of it is used to produce food. Some irrigation produces fiber for clothing and some is used for lawns and flower production.

Water helps keep us cool. A summer shower can lower outside temperatures several degrees. We feel much cooler when we get rained on or when we jump into a swimming pool or lake. Clouds help shield us from the sun and make it cooler. Clouds are composed of water vapor. Perspiration is your body's way of cooling itself. The evaporation makes you feel cooler.

Water produces electricity. Hydro-electric power is generated by water which turns turbines which turn generators to produce electricity. The least expensive electricity is usually that generated from water power. The city of Vidalia, Louisiana is building a hydro-electric plant which will generate low cost electricity. Water is needed for cooling other types of electric generating plants using coal, oil, gas or nuclear energy for fuel. Hot water escaping from deep wells (geo-thermal) is used for generating power in some parts of the country..

Water provides the least expensive method of transportation for bulk commodities, such as coal, grain and minerals. Barge transportation on the Mississippi River is much less expensive than rail or truck transportation. New Orleans and Baton Rouge are among the five largest ocean-freight ports in the United States because of all the coal, grain and minerals that come down the Mississippi River.

Water provides jobs. Louisiana harvests more seafood than any other state. Menhaden, oysters, shrimp, crab and fin fish harvesting, processing and marketing are important industries employing many people. We grow a lot of catfish, bait fish, alligators, turtles, and crawfish in ponds and we harvest many tons of fish from our freshwater rivers, lakes and swamps. Louisiana is the number one fur producing state and most of the production is from the Atchafalaya Basin, our largest wetland area.

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NITRATE AND DRINKING WATER

Trisha Bender
Pre-Med, LSU

Nitrogen is a vital part of our environment comprising 78% of the air we breathe. Plants use nitrogen to form amino acids and proteins which are necessary for plant growth and animal consumption. Nitrogen needs to be converted to ammonium (NH^{+4}) or nitrate (NO_{3-}) by physical, chemical and biological reactions in the soil and water in order for plants to use it.

Although nitrogen is an essential element, high concentrations of nitrate in the soil can lead to ground water contamination with subsequent adverse human and animal health problems. Because nitrate is water soluble, it can be leached into groundwater which is used for human and animal consumption. This occurs when the soil contains more nitrate than plants can use because of naturally occurring nitrate or waste disposal activities and excess nitrogen fertilization. Additional sources of nitrate leaching include septic tank leachfields and livestock and poultry operations. The Louisiana Department of Agriculture and Forestry has detected nitrate in water taken from a well used for a beef cattle operation. The level of nitrate was 54 ppm which is above the health standard of 45 ppm.

A human health problem caused by excess nitrate is known as the "blue-baby syndrome." In an infant's stomach, nitrate is converted to nitrite (NO_{2-}) which is highly toxic. When the nitrite reaches the blood stream, it attacks the iron in hemoglobin and changes it into methemoglobin. Methemoglobin prohibits the red blood cells from carrying oxygen. Eventually, after more hemoglobin is converted to methemoglobin, symptoms of oxygen starvation occur. If more than half of the hemoglobin is changed, death is highly probable.

Nitrate is not the sole cause of methemoglobinemia. Factors such as the type of hemoglobin found only in the fetus, general infant health, inherited metabolic differences, and the extent of breast feeding as opposed to feeding with formula mixed with well water are involved in the potential for nitrate-induced methemoglobinemia. Children over the age of six months can handle the nitrate without this problem.

In 1986, two infants in South Dakota developed methemoglobinemia. The first died a month after symptoms developed because of lack of medical attention. The second recovered by changing source of drinking water after early diagnosis.

Not only are humans affected by nitrate poisoning, but so are animals such as cows or sheep. The effect of nitrite on the red blood cells in their blood system (cells becoming oxygen deficient) is the same as in humans. Nitrate poisoning is due to microorganisms in the first stomach which changes nitrate to nitrite. If the animal's diet is sufficient and it is in good health, the poisonous nitrite is quickly converted to ammonium and later used in protein-building. But, if cows or sheep consume extreme amounts of nitrate too quickly, the nitrite cannot be converted to ammonium and will build up to very poisonous levels which can eventually end in animal mortality. Every year, some livestock die from nitrate poisoning.

Fortunately, there are things that can be done to prevent such tragedies. For example, animals could be fed low-nitrate foods. Although they will eat plants that contain some nitrate, this would not increase the level of nitrite in the animal significantly. Different feeding methods also change nitrate concentrations in feed, such as hay or hay crop silage. These contain little nitrate because forage grasses and legumes (alfalfa, red clover, etc.) are naturally low in nitrate. In the home, nitrate can be diluted or removed by distillation. Unfortunately, those procedures are too expensive for the livestock water supplies. Local contamination from a livestock holding area or septic tank may be prevented by proper location of wells, by establishing good drainage away from the well and sufficiently sealing the well. A contaminated well may have to be abandoned and properly plugged.

Nitrogen is an important element of our environment. High concentrations of nitrogen (in the form of nitrate) in groundwaters can affect human and animal lives. If steps are taken to limit the amount of nitrogen getting into our drinking water these tragedies can be avoided.

Session II

HEALTH EFFECTS OF WATER QUALITY

Speaker: Saralene Seals
La. Cooperative Extension Service

Cooperative Extension System

Health Effects of Drinking Water Contaminants

Water Quality Fact Sheet 2

Judith C. Stewart
Extension support aide

Ann T. Lemley
associate professor
College of Human Ecology
Cornell University

Sharon I. Hogan
communications consultant

Richard A. Weismiller
soil and water resource specialist
Department of Agronomy
The University of Maryland

Chemical contaminants occur in drinking water supplies throughout the United States, ranging from barely detectable amounts to levels that could possibly threaten human health. Determining the health effects of these contaminants is difficult, especially since researchers are still learning how chemicals react in the body to damage cells and cause illness.

Possible Chronic Health Effects

Toxic doses of chemicals cause either acute or chronic health effects. An acute effect usually follows a large dose of a chemical and occurs almost immediately. Examples of acute health effects are nausea, lung irritation, skin rash, vomiting, dizziness and even death.

The levels of chemicals in drinking water, however, are seldom high enough to cause acute health effects. They are more likely to cause chronic health effects—effects that occur long after exposure to small amounts of a chemical. Examples of chronic health effects include cancer, birth defects, organ damage, disorders of the nervous system, and damage to the immune system.

Evidence relating chronic health effects to specific drinking water contaminants is limited. In the absence of exact scientific information, scientists predict the likely adverse effects of chemicals in drinking water using laboratory animal studies and, when available, human data from clinical reports and epidemiological studies. The possible chronic health effects of the chemicals listed in this fact sheet are conservative estimates; rarely based on documented human health effects.

Setting Standards

In setting standards for drinking water contaminants, regulators estimate the concentration of a contaminant that a person can drink safely over a lifetime. These calculations are based on all available toxicological information and allow a generous safety margin. The following chart lists contaminants currently regulated by U.S.

Written and produced by Cornell University and The University of Maryland under the sponsorship of the USDA Extension Service. Logo by Hector Gonzales, The University of Arizona Office of Agricultural Sciences Communications. These cooperating agencies' programs are open to all citizens without regard to race, color, sex, handicap, religion, age or national origin.

Environmental Protection Agency (EPA) standards as well as those proposed for EPA regulation by 1989.

The EPA standard for drinking water, the Maximum Contaminant Level (MCL), is the highest amount of a contaminant allowed in drinking water supplied by municipal water systems. The MCL is set as close as possible to the Maximum Contaminant Level Goal (MCLG), which is a preliminary standard set but not enforced by the EPA. MCLG's are health goals based entirely on health effects, but MCL's also take into consideration the feasibility and cost of analysis and treatment of the regulated contaminant. Although often less stringent than the corresponding MCLG, the MCL is set to protect health.

Contaminants are regulated when: they occur in drinking water supplies; they are expected to threaten public health; and they can be detected in drinking water by current laboratory methods. The EPA will continue to set standards for many other drinking water contaminants not listed in this fact sheet which meet these criteria.

Regulated Contaminants[a]

Inorganics

Contaminant	Source	Possible chronic health effects
Arsenic	rocks and soil; may contaminate commercial phosphates in fertilizers and laundry detergents; pesticide residues; smelting, glass making, and coal mining.	skin and lung cancer; liver and kidney damage. MCL: 0.05 mg/L MCLG: 0.05 mg/L
Asbestos	corrosion of asbestos-cement pipe in water distribution systems; manufacture of cement products, paper, floor tiles, paint, caulking, textiles and plastics.	lung cancer; gastrointestinal cancer when swallowed fibers exceed 10um. MCL: — MCLG: 7.1 million fibers (>10um long)/liter
Barium	rocks and soil; coal and gas mining; coal burning; diesel fuel combustion and jet fuel; paints, bricks and tiles.	hypertension and heart damage. MCL: 1.0 mg/L MCLG: 1.5 mg/L
Cadmium	rocks, coal, and petroleum; byproduct of mining, smelting, refining and electroplating; discarded batteries, paints, and plastics; corrosion of galvanized pipe; landfills and industrial waste sites; fertilizers and sewage sludge.	kidney damage. MCL: 0.010 mg/L MCLG: 0.005 mg/L
Chromium	rocks and soil; mining sites; chrome plating, cement production; waste incineration; contaminated laundry detergent and bleaches; septic systems.	liver, kidney and lung damage. MCL: 0.05 mg/L MCLG: 0.12 mg/L
Copper	rocks and soil; coal burning; iron and steel production; industrial and sewage treatment plant wastes; corrosion of brass and copper pipes.	anemia; digestive disturbances; liver and kidney damage. MCL: 1.3 mg/L MCLG: 1.3 mg/L

[a] The units of measurement are milligrams per liter (mg/L), micrometers (um) and picoCuries (pCi).

Inorganics (continued)

Contaminant	Source	Possible chronic health effects
Fluoride	rocks and soil; industrial wastes.	mottling of teeth; bone damage. MCL: 4.0 mg/L MCLG: 4.0 mg/L
Lead	rocks and soil; corrosion of lead pipes and lead-soldered pipe joints; combustion of leaded gasoline; smelter emissions and discarded storage batteries.	brain and nerve damage, especially in children; kidney damage; digestive disturbances; blood disorders; hypertension. MCL: .005 mg/L MCLG: 0 mg/L
Mercury	soil and rocks; mining, smelting, coal burning; electrical equipment and fungicides.	brain and nerve damage; kidney damage; birth defects and skin rash. MCL: 0.002 mg/L MCLG: 0.003 mg/L
Nitrate	soils and mineral deposits; fertilizers, sewage and animal wastes.	Methemoglobinemia in infants. MCL: 10 mg/L nitrate-nitrogen 45 mg/L nitrate MCLG: 10 mg/L nitrate-nitrogen 45 mg/L nitrate
Selenium	soil and shales; coal burning, mining. smelting; manufacture of glass, paints, and drugs; fungicides and feed additives.	growth inhibition; skin discoloration; dental and digestive problems; liver damage and psychological disorders. MCL: 0.01 mg/L MCLG: 0.045 mg/L
Silver	soil, coal, and mineral deposits; ore mining and manufacture of alloys; photographic procedures and jewelry making;	agyria, a permanent blue-gray discoloration of skin, mucous membranes and eyes. MCL: 0.05 mg/L MCLG: —

Organics

Contaminant	Source	Possible chronic health effects
Acrylamide	drinking water treatment residue; well drilling; food production and processing; paper making and textile manufacturing.	cancer and nervous system effects. MCL: — MCLG: 0 mg/L
Alachlor	agricultural herbicide.	cancer; damage to eyes and liver. MCL: — MCLG: 0 mg/L
Aldicarb	agricultural insecticide.	cholinesterase inhibition. MCL: — MCLG: 0.009 mg/L

Organics (continued)

Contaminant	Source	Possible chronic health effects
Benzene	leaking underground fuel storage tanks; industrial wastes; manufacture of pesticides, detergents and solvents.	leukemia and other cancers; nerve, lung, and kidney damage; blood disorders and reproductive effects. MCL: 0.005 mg/L MCLG: 0 mg/L
Carbofuran	agricultural insecticide.	Cholinesterase inhibition; reproductive and immune system effects. MCL: — MCLG: 0.036 mg/L
Carbon Tetrachloride	chemical disposal sites, contaminated soils, and landfills; aerosol sprays; cleaning agents and coolants; laundry and dry-cleaning operations.	cancer; central nervous system depression; liver and kidney damage. MCL: 0.005mg/L MCLG: 0 mg/L
Chlordane	insecticide; hazardous waste sites.	cancer; nerve and liver effects. MCL: — MCLG: 0 mg/L
2,4-D	agricultural herbicide and aquatic weeds control.	liver and kidney damage; skin irritations and muscle effects. MCL: 0.01 mg/L MCLG: 0.07 mg/L
Dibromochloropropane (DBCP)	soil fumigant.	cancer; kidney and liver damage; infertility. MCL: — MCLG: 0 mg/L
p-Dichlorobenzene	dye and pesticide manufacturing.	liver and kidney damage; blood disorders. MCL: 0.075 mg/L MCLG: 0.075 mg/L
1,2-Dichloroethane	vinyl manufacturing; drycleaning solvent, metal degreasers, and adhesives; gasoline additive.	cancer; central nervous system depression; kidney and liver damage; lung and heart damage. MCL: 0.005 mg/L MCLG: 0 mg/L
1,1-Dichloroethylene	industrial solvent, cleaning and degreasing agent.	central nervous system depression; liver, kidney and heart damage. MCL: 0.007 mg/L MCLG: 0.007 mg/L
cis and trans 1,2-Dichloroethylene	transformed from other chlorinated hydrocarbons in drinking water supplies; industrial cleaning and degreasing agents.	liver and kidney damage. MCL: — MCLG: 0.07 mg/L

Organics (continued)

Contaminant	Source	Possible chronic health effects
1,2-Dichloropropane	industrial solvent and cleaning agents; dry cleaning fluid components, soil fumigants.	liver and kidney damage. MCL: — MCLG: 0.006 mg/L
Endrin	insecticide and rodenticide.	liver and nervous system effects: birth defects. MCL: 0.0002 mg/L MCLG: —
Epichlorohydrin	resin and rubber product manufacturing; contamination of materials used to process food and treat or store drinking water.	cancer; central nervous system, lung, liver and kidney effects; damage to male reproductive organ. MCL: — MCLG: 0 mg/L
Ethyl benzene	hazardous waste sites and styrene production.	nerve, brain, liver and kidney effects. MCL: — MCLG: 0.68 mg/L
Ethylene dibromide	pesticide and soil fumigants; leaded gasoline additives.	cancer; liver, kidney, nervous system, gastrointestinal, and reproductive effects. MCL: — MCLG: 0 mg/L
Heptachlor/Heptachlor Epoxide	insecticide and hazardous waste sites.	cancer; liver damage and central nervous system effects. MCL: — MCLG: 0 mg/L
Lindane	pesticides.	liver and kidney damage. MCL: 0.004 mg/L MCLG: 0.0002 mg/L
Methoxychlor	insecticides.	nervous system, kidney, and liver effects. MCL: 0.10 mg/L MCLG: 0.34 mg/L
Pentachlorophenol (PCP)	herbicides and insecticides; water contact with PCP-treated wood; industrial waste sites.	liver and kidney damage; nervous system, immune system, and reproductive effects; blood disorders. MCL: — MCLG: 0.22 mg/L
Polychlorinated Biphenyls (PCBs)	hazardous waste sites; disposal and manufacture of electrical transformers, electromagnets, fluorescent lights and plastic.	cancer; liver damage. MCL: — MCLG: 0 mg/L
Styrene	manufacture of plastics, synthetic rubbers, resins, and insulators.	liver damage. MCL: — MCLG: 0.14 mg/L

Organics (continued)

Contaminant	Source	Possible chronic health effects
Tetrachloroethylene	industrial metal, textile, and dry cleaning solvent.	cancer; liver and kidney damage; central nervous system depression. MCL: pending MCLG: pending
Toluene	paint, oil, resin manufacturing; leaking fuel storage tanks; jet fuel.	central nervous system depression; kidney damage MCL: – MCLG: 2.0 mg/L
Toxaphene	insecticides.	cancer, liver and kidney damage. MCL: 0.005 mg/L MCLG: 0 mg/L
2,4,5-TP (Silvex)	herbicides.	liver and kidney damage. MCL: 0.010 mg/L MCLG: 0.052 mg/L
1,1,1-Trichloroethane	hazardous waste sites; industrial solvent and degreasers; drycleaning solvents.	central nervous system depression; liver and cardiovascular damage. MCL: 0.20 mg/L MCLG: 0.20 mg/L
Trichloroethylene (TCE)	hazardous waste sites; drycleaning solvent; manufacturing of chemicals and drugs.	cancer; nervous system depression and heart effects; liver and kidney damage. MCL: 0.005 mg/L MCLG: 0 mg/L
Total Trihalomethanes	formed when residual chlorine in treated drinking water combines with naturally occurring organic matter.	cancer; heart, lung, kidney and liver damage. MCL: 0.100 mg/L MCLG: –
Vinyl Chloride	manufacturing of plastics and synthetic rubber; corrosion of plastic pipes and soldering.	cancer; central nervous system depression; liver, reproductive, and digestive tract effects; birth defects. MCL: 0.002 mg/L MCLG: 0 mg/L
Xylene	leaking underground fuel storage tanks; manufacturing of chemicals and drugs.	nervous system and reproductive effects. MCL: – MCLG: 0.44 mg/L

Microbial Pathogens

Contaminant	Source	Possible chronic health effects
Coliform Bacteria (an indicator organism for fecal coliform, strepto-coccal, and other patho-genic bacteria).	sewage, animal wastes; backflow or improper pipe connections in water systems; improperly sealed or con-structed wells.	gastroenteritis, salmonella infection, dysentery, typhoid fever and cholera. MCL: <1/100 ml MCLG: 0 mg/L
Giardia lamblia	sewage and animal wastes.	giardiasis (a gastrointestinal infection causing diarrhea, abdominal cramps, and gas). MCL: – MCLG: 0 mg/L
Viruses	sewage	gastroenteric and other viral diseases; hepatitis. MCL: – MCLG: 0 mg/L

Radioactive Elements

Contaminant	Source	Possible chronic health effects
Gross Alpha Particles	natural decay of uranium in rocks and soil.	cancer; bone and kidney damage. MCL: 15 pCi/L MCLG: –
Radium-226, -228	natural decay of uranium in rocks and soil	bone cancer; bone and kidney dam-age; birth defects. MCL: 5 pCi/L MCLG: pending
Radon	decay of uranium in soils and rocks.	lung cancer, when released as a gas and inhaled. MCL: pending MCLG: pending
Uranium	soil and rocks	cancer and kidney damage. MCL: pending MCLG: pending

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LOUISIANA COOPERATIVE EXTENSION SERVICE
LOUISIANA STATE UNIVERSITY AGRICULTURAL CENTER

SODIUM IN DRINKING WATER

CONSEQUENCES OF VARIOUS CONCENTRATIONS OF SODIUM

0 - 20 mg/l	Considered ideal level for drinking water Allows individuals on Strict Sodium Restricted diet (500 mg/d or 1/2 gram/d) to drink water without problems
20 - 100 mg/l	Individuals on Strict Sodium Restricted diet (500 mg/d or 1/2 g/d) should not use such drinking water. They represent about 0.9% of the population
100 - 250 mg/l	Not for individuals on Strict Sodium Restricted diet (500 mg/d or 1/2 g/d) Individuals on Moderate Sodium Restricted Diet (1000 mg/d or 1 g/d) must keep food intake of salt to a strict minimum or use an alternate water source Contributes up to 25% of the sodium intake in the mild or conservative diet for the general population, (2000 - 4500 mg/d). This would require individuals to watch sodium intake from food versus from water
250 - 500 mg/l	Individuals on **STRICT or MODERATE DIET** should not use such drinking water Individuals on MILD **DIET** (2000 mg/d or 2 g/d) can still use such water, but would have to watch carefully sodium intake from food Contributes up to 50% of **CONSERVATIVE DIET OF GENERAL POPULATION** making such a difficult to be realistically applied to a large number of individuals

300 - 500 mg/l	Taste Threshold, the water starts tasting salty Not for Strict, Moderate or Mild restriction diet Not for conservative diet as recommended for general population
3,000 - 5,000 mg/l	Some reported episodes of acute symptoms: exacerbation of chronic congestive heart failure (consumption of water at levels of 4,200 mg/l and 3,500 mg/l)
Total Dissolved Solids	Levels of 2,000 - 4,000 mg/l of dissolved salts are not palatable, may not quench thirst, and may have laxative action on new users Levels of 5,000 mg/l or more of total salts were reported as bitter and acted as a bladder and intestinal irritant Waters containing greater than 4,000 mg/l of total salts are generally considered unfit for human consumption

NOTE: Dissolved solids up to the following limits should not interfere with the indicated uses.

Domestic water supply	1,000 mg/l
Irrigation	700 mg/l
Stock watering	2,500 mg/l
Fresh water fish and aquatic life	2,500 mg/l

10,000 mg/l of sodium contained in seawater

National Center for Health Statistics estimates that 2.8% of Americans are currently on low-sodium diets prescribed for reasons of illness. This includes the strict (500 mg/d), moderate (1,000 mg/d) and the mild (2,000 mg/d) diets.

Source: State of Louisiana, Department of Health and Human Resources

Made Available by Saralene B. Seals, Extension Associate, Nutrition/Health

Louisiana State University Agricultural Center, H. Rouse Caffey, Chancellor
Louisiana Cooperative Extension Service, Denver T. Loupe, Vice-Chancellor and Director
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Session III

GEOHYDROLOGY AND WATER QUALITY MONITORING

Speaker: Brenda Kelly
La. Water Resources
Research Institute

WATER QUALITY AND THE NATURAL ENVIRONMENT

Handout

Water Quality, Conservation and Management
Training Program

<u>Co-Sponsors</u>:
Louisiana Cooperative Extension Service
Louisiana Water Resources Research Institute

WATER QUALITY PARAMETERS
Monitored Monthly by DEQ

Physical

temperature
turbidity
conductivity
true color
total solids
total suspended solids

Chemical

arsenic
cadmium
chromium
copper
mercury
lead
nitrate and nitrite nitrogen
total Kjeldahl Nitrogen
total phosphorous
chemical oxygen demand
sulfates
chlorides
pH
dissolved oxygen
salinity
alkalinity
hardness
total dissolved solids
total organic carbon

Biological

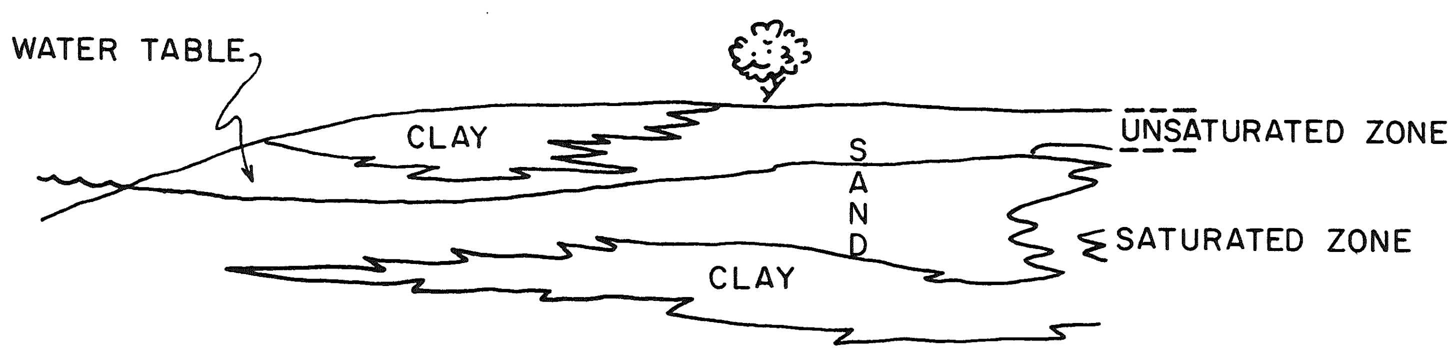
coliform bacteria

PROCESSES THROUGH WHICH WATER QUALITY CHANGES OCCUR

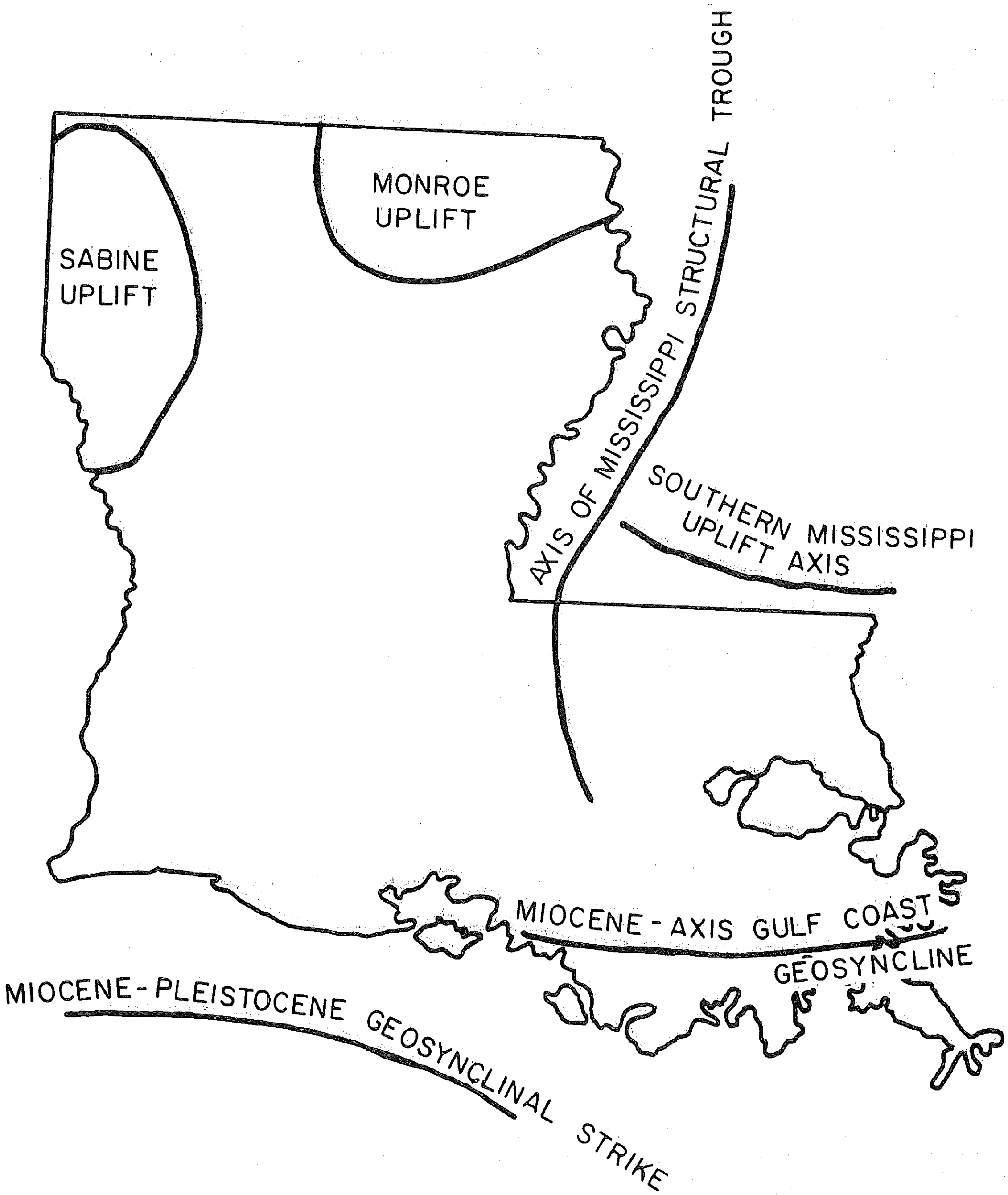
- Physical weathering and erosional processes
- Chemical interaction

  hydration
  hydrolysis
  oxidation
  carbonation
  solution

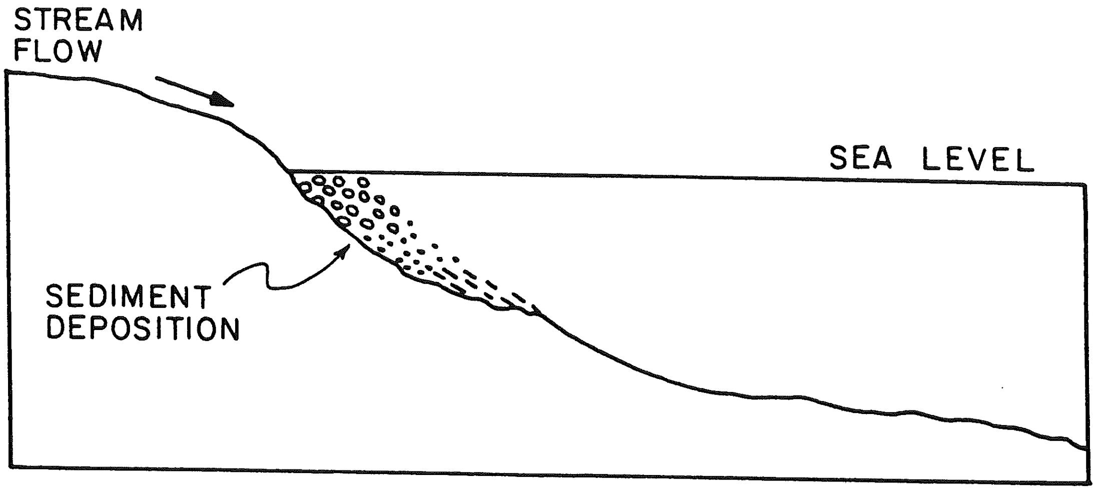
- Biological processes



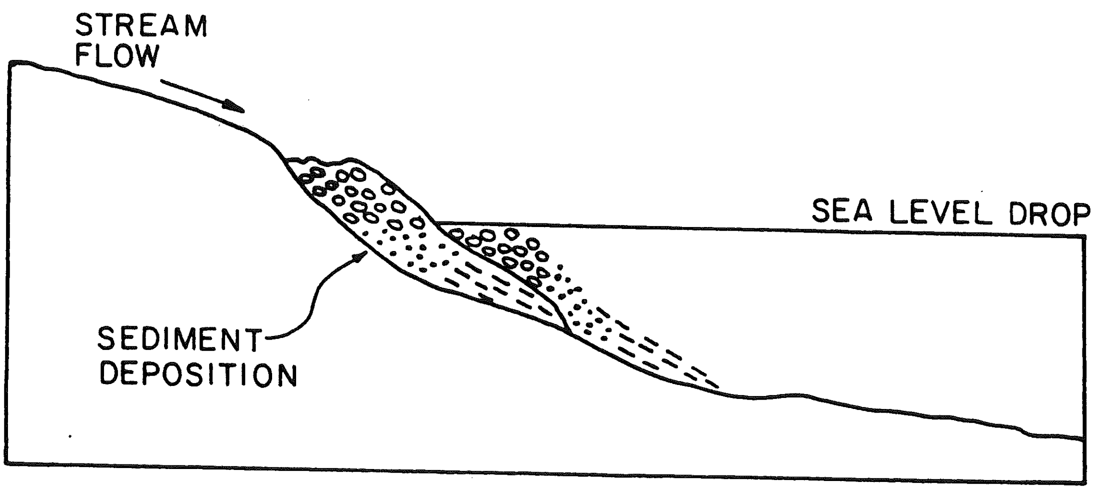
RESULTING SUBSURFACE PROFILE



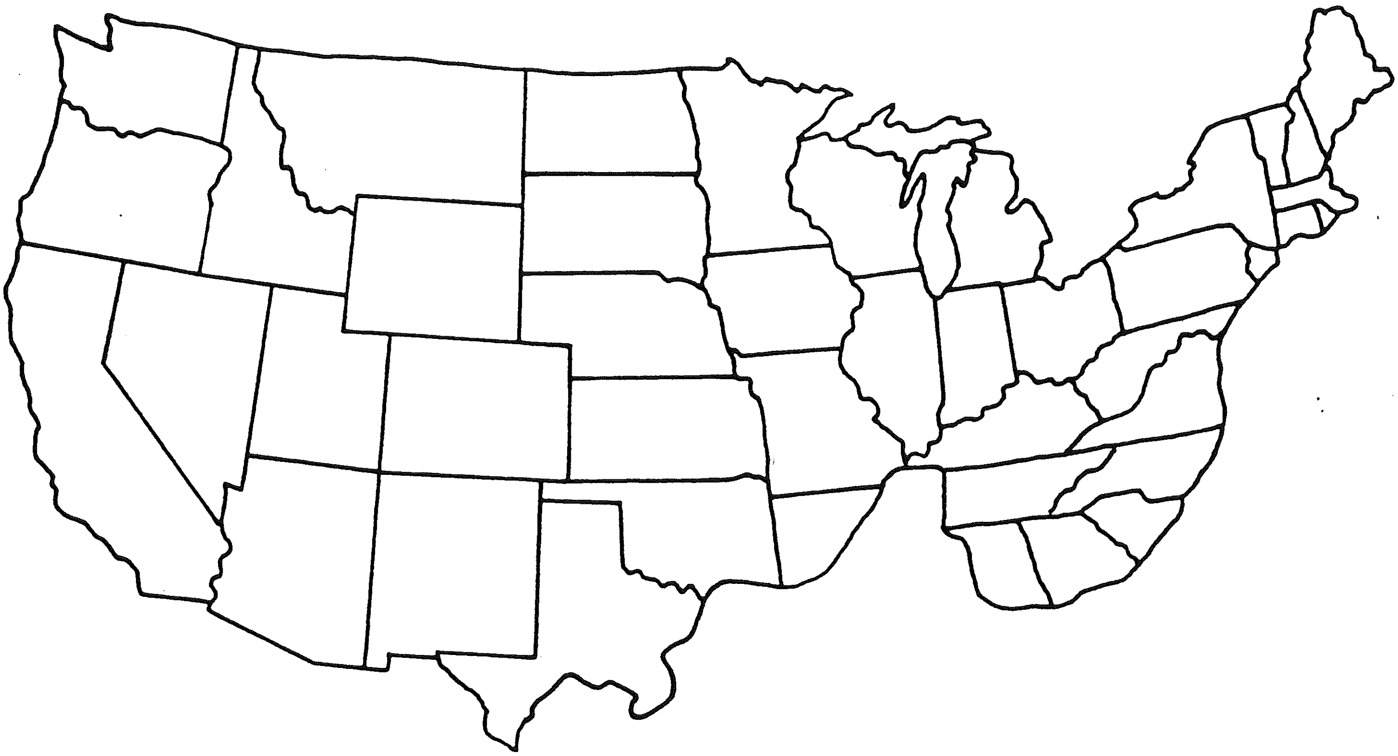
GEOLOGIC FEATURES IMPACTING WATER FLOW, PARTICULARLY GROUND WATER



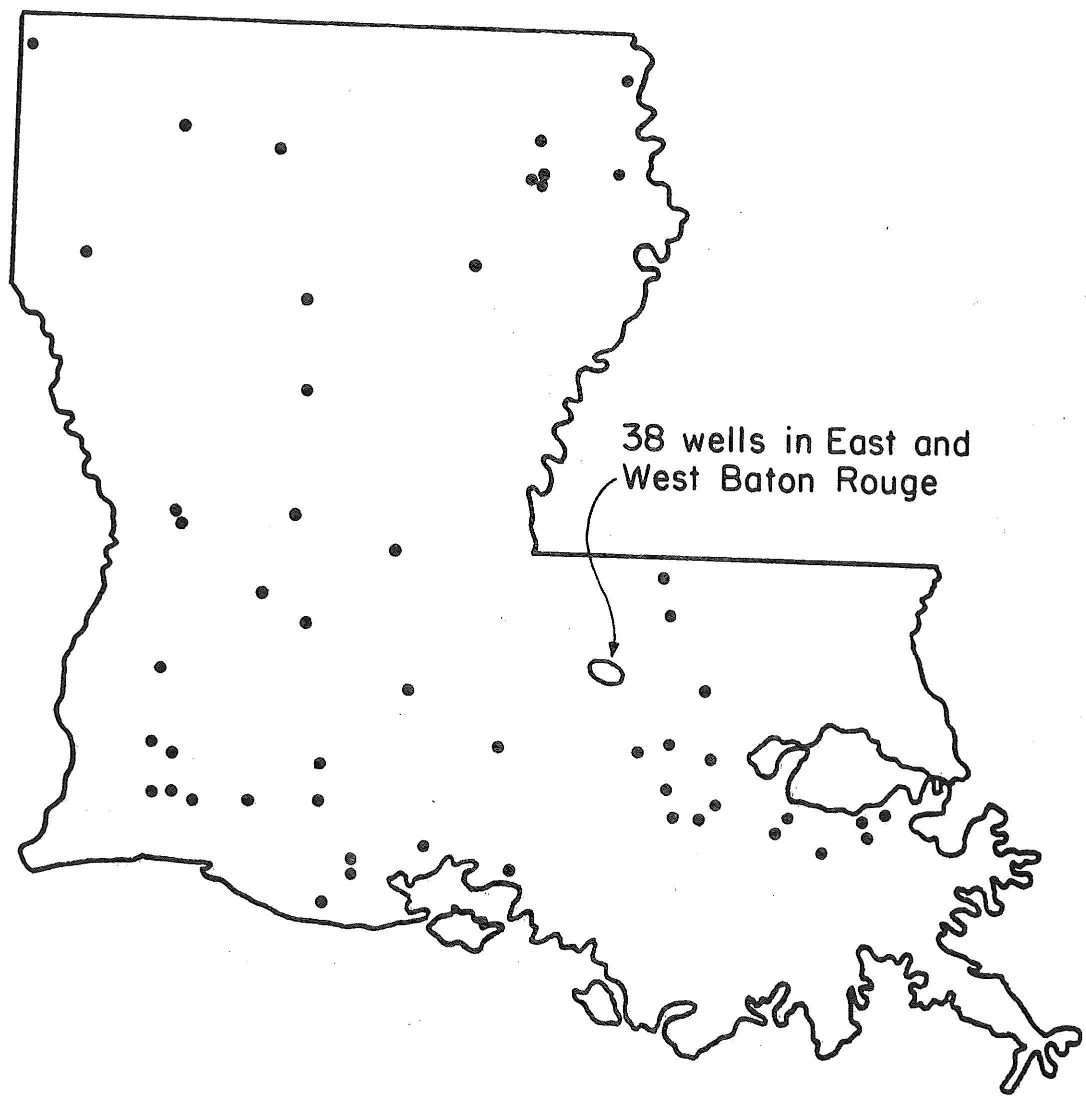
THE BEGINNING OF THE DELTA BUILDING PROCESS



IMPACT OF SEA LEVEL FLUCTUATIONS
ON THE DELTA BUILDING PROCESS



THE UNITED STATES IN EARLIER
GEOLOGICAL HISTORY



USGS GROUND WATER MONITORING STATIONS

WHAT PRIVATE CITIZENS CAN DO TO HELP PROTECT GROUND WATER

Here are some steps you can take to help protect ground water in your own area.

* Become familiar with your local ground-water resources. Do you know which aquifer supplies your community's water system and private wells? How many people use it, and for what purpose?

* Become familiar with the common sources of ground-water contamination. Which of these activities take place in your community? How are they controlled?

* Find out how your community disposes of waste products. What waste products are used or produced by large industries in your area? How are toxic substances used, handled, or stored? Is there a special program for the disposal of household products such as solvents, empty paint cans or pesticide containers? Are septic tank ordinances adequate to protect ground water?

* Find out how extensively pesticides and fertilizers are used in your area. Follow label directions when you use pesticides and fertilizers yourself.

* Learn the procedures for reporting emergency spills or other kinds of contamination that may threaten water supplies. Do local agencies have contingency plans for responding to accidental spills or leaks of toxic substances?

* Find out who is responsible for managing local ground-water supplies. Participate in local water planning and conservation initiatives.

* Become familiar with State programs and activities to protect ground water. What chemicals are regulated by the State? Does the State have a ground-water classification system? Has the State developed programs to control sources of contamination? Attend and participate in public meetings and hearings on ground-water issues.

* Determine if existing ground-water protection authorities are adequate. Find out if there are local ordinances that provide ground-water protection. Is there an effective enforcement program to penalize polluters? Who should you call to report incidents of illegal waste disposal?

Excerpt from "Protecting our Ground Water", a brochure published by the U.S. Environmental Protection Agency, Office of Public Affairs, September 1985.

Session IV

WATER QUALITY STANDARDS & MAN'S IMPACTS ON WATER QUALITY

Speaker: Bill Branch
La. Cooperative Extension Service

OTHER HANDOUT MATERIALS
DEVELOPED FOR FUTURE WORKSHOPS

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REVIEW OF WATER QUALITY TERMS

Activated Carbon Filter: A filter made of carbon particles containing numerous pores and channels which trap contaminants as water passes through; not effective for heavy metals, bacteria, nitrates, and dissolved minerals; most effective for organic compounds and general taste and smell problems.

Alkalinity: A measure of the ability of a water to neutralize acids. Alkalinity results from the chemical reactions of water with naturally occurring soil and atmospheric materials, and imparts to the water an ability to resist changes in quality (buffering capacity). Low alkalinities indicate a limited ability to resist change, while high alkalinity imparts a bitter taste to the water and contributes to solids deposition that can clog pipes.

Alluvium: Sand, silt, or similar detrital material deposited in flowing water, or the permanent unconsolidated deposits thus formed.

Aquifer: A water-bearing geological formation composed of sand, gravel, permeable rock, or rock with cracks and fractures that occurs beneath the earth's surface. An aquifer may be bounded above or below by less permeable formations, and may or may not intersect (outcrop) the surface.

Arsenic: A toxic metal that is particularly harmful to man and higher animals because of its bioaccumulative characteristics in the food chain. Though present in the natural environment in minute quantities, significant concentrations can come from mining, industrial and agricultural sources.

Artesian Aquifer: An aquifer confined between less permeable materials from which water will rise above the bottom of the overlying confining bed if afforded an opportunity to do so.

Barium: A toxic metal. Though present in the natural environment in minute quantities, significant concentrations can come from mining, industrial and agricultural sources.

Biochemical Oxygen Demand (BOD): A measure of the quantity of dissolved oxygen, in milligrams per liter, necessary for the decomposition of organic matter by micro-organisms, such as bacteria.

Brackish Water: Water with more than 250 mg/l chloride.

Cadmium: A toxic metal that is particularly harmful to man and higher animals because of its bioaccumulative characteristics in the food chain. Though present in the natural environment in minute quantities, significant concentrations can come from

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mining, industrial and agricultural sources.

Chemical Oxygen Demand (COD): A test used to measure the concentration of nonbiodegradable organics, as organic insecticides and herbicides, present in water. It is a widely used measure of the pollutional strength of domestic and industrial wastes. Other analyses must be applied to identify a specific organic.

Chloride: A compound in which chlorine is combined with another element. High concentrations cause a salty taste and may be a problem for persons with certain health conditions.

Chlorination: The proccess of treating water with chlorine to kill bacteria and ensure satisfactory disinfection.

Chlorine:

Chromium: A toxic metal. Though present in the natural environment in minute quantities, significant concentrations can come from mining, industrial and agricultural sources.

Coliform bacteria: A group of bacteria from (or like those from) the colon or digestive tract of humans and other warm-blooded animals. The presence of coliform bacteria in well water may indicate contamination by surface water or faulty septic systems.

Conductivity (also Specific Conductance): Conductivity is a measure of a water's ability to carry an electrical current. It is temperature dependent and is used in water quality analyses to obtain a rapid estimate of dissolved solids content. A physical water quality parameter.

Confined Aquifer: A formation beneath the earth's surface that is saturated with water and enclosed by less permeable layers; the water is under pressure and may rise above the overlying confining bed if given an opportunity to do so.

Confining Bed: A geologic formation or stratum beneath, above, and surrounding an aquifer which, because of its position and its low permeability relative to the material in an aquifer, causes a hydrostatic head to be created or retained in the basin.

Copper: A non-toxic metal commonly found in natural waters. Man's activities also contribute to the quantities present in water.

Discharge: The movement of water from an aquifer to springs, seeps, marshes, streams, or flowing or pumping wells.

Dissolved Oxygen (DO): The oxygen dissolved in water, wastewater, or other liquid, usually expressed in milligrams per liter, or percent of saturation.

Distillation: A process to purify water in which water is heated to steam and the steam is collected and condensed back to water. Some contaminants are left behind when the water turns to vapor, but others may condense with the steam.

Drainage Area: An area of land from which direct surface runoff from precipitation normally drains by gravity into the surface stream above a specific point.

Drinking Water Standards: Standards that define allowable concentrations of coliforms and certain chemicals, physical characteristics, and radioactivity in drinking water. They are prescribed by federal, state, or local authorities and also contain sampling, monitoring, and reporting requirements. Primary standards set limits designed to protect human health. Secondary standards are also set, and are established for the aesthetic (taste, color, etc.) maintenance of drinking water.

Effluent Limited (EL): Any segment of a stream where water quality is meeting and will continue to meet applicable water quality standards or where there is adequate demonstration that water quality will meet applicable standards after the application of effluent limitations required by the Clean Water Act as amended.

Fecal Coliform: A group of bacteria that are present in the colon or digestive tract of humans and other warm-blooded animals. Their concentrations are expressed as numbers of colonies per 100 ml of water sample. The presence of coliform bacteria in water may indicate contamination by surface water or faulty septic systems. They are used as a common indicator of biological pathogens, although not pathogenic themselves.

Fluoride: A metal present in limited quantities in surface water. Higher concentrations in ground water can be encountered in some regions. In large quantities, fluoride is toxic to humans and to other animals. Excessive intakes can result in discoloration of teeth (mottling) and bone fluorosis and other skeletal abnormalities. Small concentrations are beneficial to the formation of harder, stronger teeth that are more resistent to decay.

Groundwater: Water beneath the earth's surface in a layer of rock or soil called the saturated zone because all openings are filled with water; the water that supplies wells and springs.

Hardness: A physical-chemical characteristic of water, i.e. the concentration of metallic cations present in water. Hardness is the result of metal ions commonly present in the natural environment, primarily the salts of calcium and magnesium, such as bicarbonates, carbonates, sulfates, chlorides, and nitrates. Hardness causes curdling and increased consumption of soap, staining of clothes and fixtures, scaling in boilers, damage in some industrial processes, and sometimes objectionable taste. Hardness may also have a laxative effect and may be beneficial to the cardiovascular system.

Hazardous Waste:

Hydraulic Conductivity: The rate of flow of water in gallons per day through a cross section of one square foot at a standard temperature; a measure of permeability.

Hydrologic Cycle: The circuit of water movement from the atmosphere to the earth and return to the atmosphere through various stages or processes such as precipitation, runoff, infiltration, percolation, storage, evaporation, and transpiration. Also called WATER CYCLE.

Infiltration: Process of water moving into the ground, subsurface soil, and rocks from the surface.

Lead: A toxic metal. Though present in the natural environment in minute quantities, significant concentrations can come from mining, industrial and agricultural sources.

Mercury: A toxic metal that is particularly harmful to man and higher animals because of its bioaccumulative characteristics in the food chain. Though present in the natural environment in minute quantities, significant concentrations can come from mining, industrial and agricultural sources.

Metals: Naturally occurring and harmful to human health when present in excessive amounts. Metals that are harmful in small quantities are labeled toxic; all others are considered nontoxic. Sources include dissolution of natural deposits and discharges of domestic, industrial and agricultural wastes.

Natural Levee: A low, alluvial ridge adjoing the channel of a stream, composed of sediment deposited by floodwater that has overflowed the banks of the channel. It is common to streams that flow through alluvial valley land.

Nitrate and Nitrite Nitrogen: Measures the products of organic nitrogen decomposition present in water. Nitrite is an intermediate product that is highly toxic to aquatic organisms and is seldom present in concentrations exceedings 1 mg/l. Nitrate is a nontoxic end product.

Parts Per Million (ppm):

Permeability: The capacity of a rock or rock material to transmit a fluid. Also known as specific yield.

Pesticides: Chemical compounds used to control the growth of undesirable plants and animals. Major categories of pesticides include insecticides, miticides, fungicides, herbicides, and rodenticides.

pH: A measure of alkalinity or acidity. The pH scale ranges from 0 to 14, with 7 representing neutrality, numbers higher than

7 indicating alkalinity, and numbers lower than 7 indicating acidity. The number is the negative logarithm of the concentration of hydrogen ions. Hydrogen ions are always present in natural waters, and their concentration, as measured by pH, affects the equilibrium between most chemical species, the effectiveness of water treatment processes, the potential of water to be corrosive, the suitability of water to support living organisms, and most other quality characteristics of water.

Porosity: The quality of being porous, or full of pores or openings; a measure of the amount of open space in a material or of the water storage capacity of a substance.

Recharge: The flow of water into the saturated zone; the return of water to an aquifer.

Recharge Area: The area where an aquifer outcrops or comes to the land surface which is the entry point for rain or surface water into the aquifer.

Reverse Osmosis: A filter process which forces water through membranes that allow water but not dissolved chemicals to pass through. The process is used to remove contaminants in water and can be used to desalinate salty groundwater.

Runoff: The part of the precipitation that runs off the surface of a drainage area and reaches a stream or other body of water, a drain or sewer.

Salinity: (1) The relative concentration of dissolved salts, usually sodium chloride, in a given water. It is often expressed as mg/l chlorine. (2) A measure of the concentration of dissolved mineral substances in water.

Silver: A toxic metal that is particularly harmful to man and higher animals because of its bioaccumulative characteristics in the food chain. Though present in the natural environment in minute quantities, significant concentrations can come from mining, industrial and agricultural sources.

Sulfates: Occurs in natural waters and wastewater. Can produce an offensive odor or taste. Consuming water with high concentrations may have laxative effects, but produces no significant danger to public health.

Temperature: Water temperature is a physical water quality parameter that affects other water quality parameters and the rate of chemical and biological reactions.

Total Dissolved Solids (TDS): A measure of matter dissolved in water. It consists mainly of inorganic salts, small amounts of organic matter, and dissolved gases. TDS impacts the aesthetics of a water, and may restrict the water's use for select intended uses. The solid materials present may be harmful to human health or may impair use particularly for agricultural and some industrial uses.

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Total Kjeldahl Nitrogen: A measure of organic nitrogen (unassimilated protein from plant and animal matter) present in water. Organic nitrogen is a nutrient for aquatic organisms.

Total Organic Carbon:

Total Phosphorus: A measure of organic and inorganic phosphorus present in water. Since phosphorus is a nutrient, its presence in water is indicative of the potential biological productivity of that water. Maintenance of phosphorus levels are important to natural waters as well as industrial and municipal wastewaters.

Total Solids: A physical water quality parameter that measures the combined total of the dissolved and suspended solids material in water. The test can be run to determine the amount of organic matter present and for the detection of radical changes in water density that would adversely impact wastewater treatment. Other water quality tests can more easily detect such changes.

Total Suspended Solids: A physical water quality parameter that measures the amount of sediment suspended in a stream. Its determination is extremely valuable in the analysis of polluted waters, and is also used to evaluate the strength of domestic wastewaters and the efficiency of treatment units.

Toxic Waste:

True Color: Color is a physical characteristic that is due to vegetable or organic extracts present in water as colloidial or suspended matter. Color is an important consideration for aesthetics, for certain industrial processes, and for an indicator of need for disinfection.

Turbidity: Turbidity is a measure of light transmitting properities of water. It results from the presence of suspended or colloidal material in the water. Turbidity impacts aquatic life and is an important consideration in the aesthetics, filterability, and disinfection of drinking water. Turbidity is a physical water quality parameter.

Unconfined Aquifer: A water-bearing formation under the earth's surface not confined by an overlying impermeable layer. The height of the water in unconfined aquifers is referred to as the water table.

Water Pollution: The presence in water of impurities in such quantity and of such nature as to impair the use of the water for a stated purpose.

Water Quality: The chemical, physical, and biological characteristics of water with respect to its suitability for a particular purpose. The same water may be acceptable for one purpose or use, and unacceptable for another, depending on its characteristics and the requirements for the particular use.

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Water Quality Standards: Requirements established by governmental authority to prevent or abate water pollution. Standards levels vary for different uses with any use involving human consumption or human contact having more stringent standards.

Water Table: The level below which the soil or rock is saturated with water; the upper boundary of the saturated zone.

Watershed: The area from which all flowing water will drain to the same stream or river.

TABLE 2.1

Summary of the Important Chemical and Biological Impurities Found in Water

ORIGIN	IMPURITY: Ionic and Dissolved — Positive ions	IMPURITY: Ionic and Dissolved — Negative ions	IMPURITY: Colloidal	IMPURITY: Suspended	IMPURITY: Gases
Contact of water with minerals, soils, and rocks	Calcium (Ca^{+2}) Iron (Fe^{+2}) Magnesium (Mg^{+2}) Manganese (Mn^{+2}) Potassium (K^{+}) Sodium (Na^{+}) Zinc (Zn^{+2})	Bicarbonate (HCO_3^{-}) Carbonate (CO_3^{-2}) Chloride (Cl^{-}) Fluoride (F^{-}) Nitrate (NO_3^{-}) Phosphate (PO_4^{-3}) Hydroxide (OH^{-}) Borates ($H_2BO_3^{-}$) Silicates (H_3SiO_4) Sulfate (SO_4^{-2})	Clay Silica (SiO_2) Ferric oxide (Fe_2O_3) Aluminum oxide (Al_2O_3) Magnesium dioxide (MnO_2)	Clay, silt, sand, and other inorganic soils	Carbon dioxide (CO_2)
The atmosphere, in rain	Hydrogen (H^{+})	Bicarbonate (HCO_3^{-}) Chloride (Cl^{-}) Sulfate (SO_4^{-2})		Dust, pollen	Carbon dioxide (CO_2) Nitrogen (N_2) Oxygen (O_2) Sulfur dioxide (SO_2)
Decomposition of organic matter in the environment	Ammonium (NH_4^{+}) Hydrogen (H^{+}) Sodium (Na^{+})	Chloride (Cl^{-}) Bicarbonate (HCO_3^{-}) Hydroxide (OH^{-}) Nitrite (NO_2^{-}) Nitrate (NO_3^{-}) Sulfide (HS^{-}) Organic radicals	Vegetable coloring matter, organic wastes	Organic soil (topsoil), organic wastes	Ammonia (NH_3) Carbon dioxide (CO_2) Hydrogen sulfide (H_2) Hydrogen (H_2) Methane (CH_4) Nitrogen (N_2) Oxygen (O_2)
Living organisms in the environment			Bacteria, algae, viruses, etc.	Algae, diatoms, minute animals, fish, etc.	Ammonia (NH_3) Carbon dioxide (CO_2) Methane (CH_4)
Municipal, industrial, and agricultural sources and other human activity	Inorganic ions, including a variety of heavy metals	Inorganic ions, organic molecules, color	Inorganic and organic solids, coloring matter, chlorinated organic compounds, bacteria, worms, viruses	Clay, silt, grit, and other inorganic solids; organic compounds; oil; corrosion products; etc.	Chlorine (Cl_2) Sulfur dioxide (SO_2)

Source: Adapted in part from Refs. [2.1] and [2.7].

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PRIMARY STANDARDS

MAXIMUM CONTAMINANT LEVEL

(MCL)
(PPM)

Inorganic Contaminant	MCL	Inorganic Contaminant	MCL
Arsenic	0.05	Lead	0.05
Barium	1.	Mercury	0.002
Cadmium	0.01	*Nitrate (N)	10. (NO_3 45.)
Chromium	0.05	Selenium	0.01
Fluoride	0.4, (Temp) (0.7-1.8),(1.4- 2.4)	Silver	0.05

Organic Contaminant	MCL	Organic Contaminant	MCL
Endrin	0.0002	2, 4-D	0.1
Lindane	0.004	2, 4,5-TD (Silver)	0.01
Methoxychlor	0.1	Total Trihalomethanes	0.1
Toxaphene	0.005		

*Total Coliform 1 colony/100 ml water sample

Volatile Organic Chemicals (8) 0.002 - 0.075 ppm

Radio Nuclides (3) 5 - 50 pCi/L

Turbidity 1 - 5 Turbidity Units (ntu)

"Immediate threat to health"

SECONDARY STANDARDS

Chlorides	250	Manganese	0.05
Copper	1	Sulfate	250
Fluoride	2	Total Diss. Sol.	500
Iron	0.3	Zinc	5
Color	15 Color Units	pH	6.5 - 8.5

WATER HARDNESS

	grains/gallon	ppm
SOFT	1	17.1
HARD	7	119.7

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Drinking Water

Maximum Contaminant Levels
(July 1988)

Coliform Bacteria	1 colony per 100 milliliters as monthly average
Turbidity	1.0 nephelometric turbidity unit as monthly average
Inorganic Chemicals	**Milligrams Per Liter**
Arsenic	0.05
Barium	1.0
Cadmium	0.01
Chromium	0.05
Lead	0.05
Mercury	0.002
Nitrate	10.0
Selenium	0.01
Silver	0.05
Organic Chemicals	**Milligrams Per Liter**
Endrin	0.0002
Lindane	0.004
Methoxychlor	0.1
Toxaphene	0.005
2,4-D	0.1
2,4,5-TP Silvex	0.01
Total Trihalomethanes	0.1 milligrams per liter as annual average
Secondary Contaminants	
Chloride	250.0 mg/l
Copper	1.0 mb/l
Color	15 units
Total Dissolved Solids	500.00 mg/l
Hydrogen Sulfide	0.05 mg/l
Iron	0.3 mg/l
Manganese	0.05 mg/l
Odor	3 Threshold Number
Phenols	0.001 mg/l
Sulfate	250.0 mg/l
Zinc	5.0 mg/l

Radionuclides	Picocuries Per Liter
Gross Alpha Particles	15
Radium	5
Gross Beta Particles	50
Strontium 90	8
Tritium	20,000
Iodine 131	3

Sodium	20.0 milligrams per liter as an optimum level

Volatile Synthetic Organic Chemicals	Milligrams Per Liter as Annual Average
Benzene	0.005
Carbon Tetrachloride	0.005
1,2-Dichloroethane	0.005
Trichloroethylene	0.005
para-Dichlorobenzene	0.075
1,1-Dichloroethylene	0.007
1,1,1-Trichoroethane	0.2
Vinyl Chloride	0.002

Source: Kentucky Cooperative Extension Service

Made Available by Saralene B. Seals
Extension Associate, Nutrition/Health

Louisiana State University Agricultural Center, H. Rouse Caffey, Chancellor
Louisiana Cooperative Extension Service, Denver T. Loupe, Vice-Chancellor and Director
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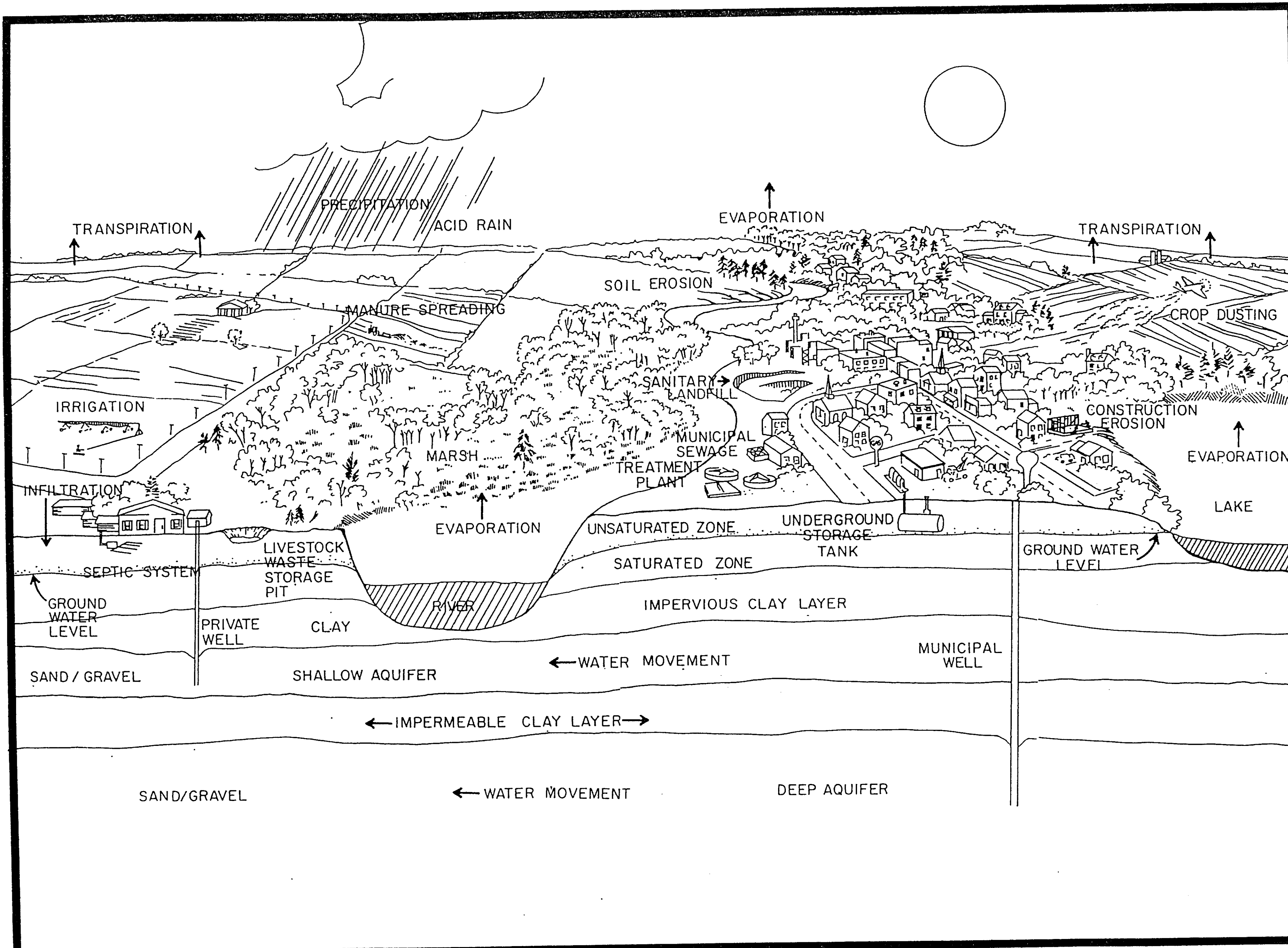
TRANSPIRATION
PRECIPITATION
ACID RAIN
EVAPORATION
TRANSPIRATION
SOIL EROSION
MANURE SPREADING
CROP DUSTING
IRRIGATION
SANITARY LANDFILL
CONSTRUCTION EROSION
MUNICIPAL SEWAGE TREATMENT PLANT
MARSH
EVAPORATION
INFILTRATION
LAKE
EVAPORATION
UNSATURATED ZONE
UNDERGROUND STORAGE TANK
LIVESTOCK WASTE STORAGE PIT
SEPTIC SYSTEM
SATURATED ZONE
GROUND WATER LEVEL
RIVER
GROUND WATER LEVEL
IMPERVIOUS CLAY LAYER
PRIVATE WELL
CLAY
MUNICIPAL WELL
WATER MOVEMENT
SAND / GRAVEL
SHALLOW AQUIFER
IMPERMEABLE CLAY LAYER
SAND/GRAVEL
WATER MOVEMENT
DEEP AQUIFER

Session V

HOME TREATMENT DEVICES FOR PROTECTING DRINKING WATER

Speaker: Dr. Claudette Reichel
La. Cooperative Extension Service

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WATER TESTING

If a client is interested in testing a private well, for inorganics or organics, refer them to local or national labs. Companies which sell and service water treatment equipment will usually perform limited water testing. Yellow page listings may include:

Water Companies - Bottled, Bulk, Etc.
Water Filtration and Purification Equipment
Water Pollution Control
Water Softening and Conditioning Equipment, Service and Supplies
Water Treatment Equipment, Services and Supplies
Water Well Drilling Equipment and Supplies
Water Well Drilling and Service

Companies which do lab tests for the water and wastewater industry can perform the widest range of analyses. They are used to working with other companies rather than individuals. Your client needs to specify which elements are to be tested for since labs usually price a package of tests for a flat rate, many of which are of little value to most families. If a family member is on a sodium-restricted diet, the water should be tested for sodium. If an infant under six months of age is in the household, the water should be tested for nitrate. If the water well is near a landfill, dump, underground injection well or chemical storage site, specific chemicals or elements should be tested for. For other elements, check with the family doctor. Such labs may be listed in the Yellow Pages under:

Water Pollution Control
Engineers - Environmental
Engineers - Geotechnical
Engineers - Sanitary
Environmental Consultants
Environmental and Ecological Services

There are also national water testing labs which do a wide range of analyses. One such lab is Watercheck which tests for 50 or more elements and chemicals for about $70 (1-800-458-3330) and Water Test (1-800-426-8378) which has a similar program.

The Louisiana Department of Agriculture and Forestry and the U. S. Geological Survey conduct a limited water well testing program. USEPA will be testing wells in the Louisiana parishes for pesticides as part of a national survey. These programs are limited because of available funding.

JWB/gr

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TAP OR BOTTLED WATER?

Bill Branch

Americans are spending billions of dollars annually on bottled water. Some prefer bottled water for drinking and cooking because it looks, smells, and tastes "better" than water from their own well or water supply. Water is an excellent solvent, so it naturally acquires tastes, smells, and colors from the rocks, soils and organic matter with which it comes in contact. A particular water's "character" depends on its source, and any treatment it may have received before being consumed.

About one third of Louisiana's drinking water comes from surface sources, such as the Mississippi River. It is treated to remove sediment and chlorinated to kill bacteria before being delivered. The source and the treatment affect the taste, color and smell of the water.

The rest of our drinking water comes from wells. Most of our groundwater is relatively high in salts and minerals. Unless a person is on a salt or sodium restricted diet, these naturally occurring minerals are not usually harmful and have been associated with improved health in some research studies.

Some of the salts and minerals can be removed from water by "point of use" treatments such as filtration, distillation and reverse osmosis. Household units installed under a sink to remove solids from the water used for drinking and cooking (not bathing or washing dishes or clothes) may cost $200.00 to $700.00 initially and $20.00 to $100.00 annually for maintenance, depending on water volume and type of unit. Many restaurants use filtration units for water used to make coffee or soft drinks.

The cost of point-of-use treatment should be compared to the cost of bottled water if you are not satisfied with the tap water you are consuming.

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HOUSING

DRAFT

Matching Water Quality Problems with Point-of-Use Treatments

Home water treatment devices are not all alike. Likewise, there is no device that solves all water quality problems. Careful match making is needed to choose the appropriate treatment system for the particular combination of pollutants.

Following is a guide to the types of water treatment techniques which can be effective in reducing the level of certain contaminants. It is important to realize however, that a device may decrease the level of a substance but not completely eliminate it. Also, each device needs consistant maintenance to be effective.

PROBLEM	Point-of-Use Treatment						
	Fiber Filter	Activated Carbon Filter*	Reverse Osmosis	Distil-lation	Ion Exchange* (Water Softener)	Ultra-violet Purifier	Other or combina-tion of methods
Chlorine		X	X	X			
Poor taste		X	X	flat			
Rotten egg odor							X
Other odors		X	X	X			
Turbidity	X	(X)		X			
Dissolved iron (metallic taste)			X	X	X		
Oxidized iron (rust)		X	(X)	X			X
Bacterial iron (slime)			(X)	X			X
Hard water (calcium, magnesium)			X	X	X		

PROBLEM	Point-of-Use Treatment					
	Fiber Filter	Activated Carbon Filter*	Reverse Osmosis	Distillation	Ion Exchange* (Water Softener)	Ultraviolet Purifier	Other or combination of methods
Manganese			(X)	X	X		X
Arsenic			X	X			
Total THMs (chloroform)		X					
Nitrates			X	X			
Asbestos			X	X			
Pesticides		X	?	?			
Industrial/ household chemicals		X	?	?			
Lead			X	X			
Mercury			X	X			
Floride			X	X			
Giandia cysts			(X)	X			
Viruses			(X)	X		X	X
Sodium			X	X			
Coliform bacteria			(X)	X		X	
	$10 – 150	$150 - 300 + Maintenance	300 - 600	$200 - 700	300 - 800		

*Not all types of this device are equally effective on all indicated problems. Care must be taken to choose the correct type.

"X" = can significantly alleviate the problem.

"(X)" = can alleviate this problem, but not recommended.

"?" = removes some, but not all types of the substance.

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Session VI

AGENCY RESPONSIBILITIES FOR WATER QUALITY

Speakers: Bill Branch
Brenda Kelly
Staff Members of Various Local, State & Federal Agencies

WATER FACT SHEET

U.S. GEOLOGICAL SURVEY, DEPARTMENT OF THE INTERIOR

U.S. GEOLOGICAL SURVEY GROUND-WATER STUDIES IN LOUISIANA

GROUND-WATER ISSUES

Ground water is available in most of Louisiana, and is suitable for most uses. In 1985, 1,450 million gallons per day of ground water was withdrawn in Louisiana—54 percent for irrigation and aquaculture, 21 percent for industry, 19 percent for public supply, 4 percent for rural domestic and livestock, and 2 percent for power generation.

Although the quantity and quality of ground-water resources generally are adequate, there are accompanying concerns. Principal issues related to ground water in Louisiana are:

- Ground-water availability;
- Ground-water quality;
- Saltwater encroachment;
- Movement and fate of contaminants from hazardous waste sites, landfills, and pits; and
- Contamination from agricultural practices.

U.S. GEOLOGICAL SURVEY PROGRAMS

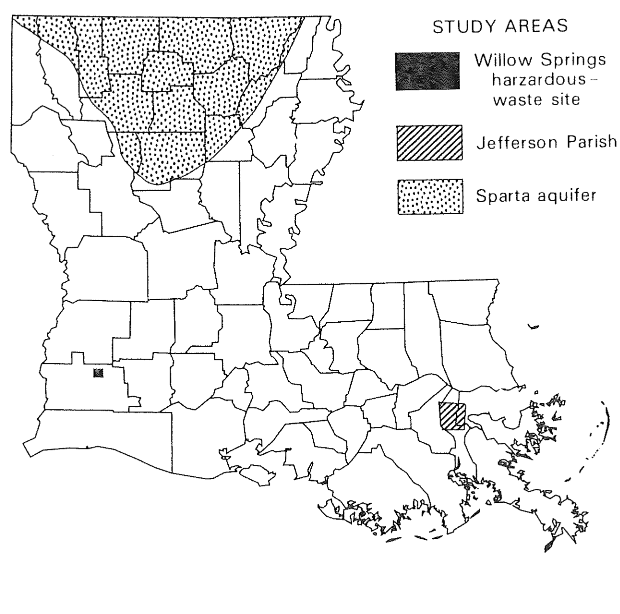
The U.S. Geological Survey (USGS), established in 1879, is the principal source of scientific and technical expertise in the earth sciences within the Federal government. USGS activities include research and services in the fields of geology, hydrology, and cartography. The mission of the Water Resources Division of the USGS is to develop and disseminate information on the Nation's water resources.

Water-resources activities of the USGS in Louisiana consist of collecting water-resources data, and conducting interpretive hydrologic investigations and research on current water issues. The USGS maintains offices in Baton Rouge and Ruston. In cooperation with Federal, State, and local agencies, the USGS has systematically collected ground-water data in Louisiana since 1938, and, in 1988, maintains a statewide network of 625 wells to monitor fluctuations in water levels, 40 wells to monitor organic chemicals, and 210 wells to monitor inorganic constituents.

Results of ground-water studies are used by Federal, State, and local agencies to assess ground-water resources, detect and define pollution and water-supply problems, estimate future conditions before development or land-use changes, and plan management strategies. Three examples of studies that relate to ground-water issues in Louisiana are discussed in the following sections.

Contamination of Ground Water at Willow Springs Hazardous-Waste Site

The USGS, in cooperation with the Louisiana Department of Transportation and Development (LDTD), is studying contamination of ground water at the Willow Springs hazardous-waste site in Calcasieu Parish near Lake Charles. The study indicates the presence of waste plumes in the 70 to 90 feet of low-permeability sediments above the shallow sand of the Chicot aquifer. The Chicot aquifer is the principal source of ground water in southwestern Louisiana, provides about 42 percent of the total ground water withdrawn in the State, and has been proposed for designation as a ''sole source aquifer' by the U.S. Environmental Protection Agency. The orientation of the plumes is consistent with the general direction of ground-water flow from unlined lagoons through the low-permeability sediments to the shallow sand. Although much of the contamination is confined to the low-permeability sediments overlying the shallow sand of the Chicot aquifer, chloride concentrations exceeding 100 milligrams per liter and some organic pollutants are present within the shallow sand. The information from this study will be useful to State and Federal agencies in understanding the movement of contaminants in ground water. This study also will be useful to management agencies for determining



THE PRIMARY RESPONSIBILITIES OF THE MAJOR STATE AND LOCAL AGENCIES REGARDING GROUND WATER PROTECTION

State

Environmental Quality: Ground water protection, regulation of hazardous and solid waste sites, remediation of abandoned hazardous waste sites, regulation of underground storage tanks, and remediation of contaminated ground water. The programs are carried out in compliance with the federal Resource Conservation and Recovery Act; the Comprehensive Environmental Response, Compensation, and Liability Act; the Water Pollution Control Act of 1972; the Clean Water Act of 1977; and the Louisiana Environmental Affairs Act of 1979, as amended.

Agriculture and Forestry: Controls use of pesticides and provides information on proper use. House Bill No. 1926 of the 1988 Legislature establishes a program to monitor levels of pesticides in the waters of the state. This bill requires that when the Commissioner of Agriculture and Forestry determines that pesticides in the waters of the state pose a threat to human health or the environment, the Commissioner shall: (1) issue a protective order limiting, restricting, or prohibiting the application of a pesticide; (2) communicate his findings, (3) participate in issuing remedial orders in accordance with cooperative agreements, and (4) participate in issuing public communications in accordance with appropriate governmental agencies.

Health and Hospitals: Maintain standards for and monitor quality of water from public supplies and general public health (e.g., bacterial contamination of rural domestic wells, commercial fisheries, recreational water); also regulates water bottling companies.

Natural Resources: The two largest agencies under Natural Resources are the Louisiana Geological Survey and the Office of Conservation. The Louisiana Geological Survey conducts geologic and hydrologic research. The Office of Conservation is a regulatory agency charged with regulating all aspects of the oil and gas industry. Under the Office of Conservation is the Injection and Mining Division, which regulates underground injection wells and surface and subsurface mining.

Transportation and Development: The primary water-related agency under DOTD is the Office of Public Works (OPW). The Water Resources Section (WRS) of OPW is charged with effective administration, conservation, and development of the ground water resources of the state; regulates the water well licensing, construction and registration programs; enforces water well regulations regarding abandoned water wells; is charged with procurement, storage, and dissemination of water-resources

ASCS

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Lois B. Partney ...473-7729

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Johnnie LaFleur ...473-7728

LOUISIANA ASCS COUNTY EXECUTIVE DIRECTORS

*		PARISH	ADDRESS	CITY	ZIP CODE	AREA CODE	PHONE	CED
5	001	Acadia	Box 970	Crowley	70527	318	783-2061	R. Monceaux
3	003	Allen	Box 428	Oberlin	70655	318	639-2385	J. Chaumont
4	005	Ascension	Box 149	Donaldsonville	70346	504	473-8446	D. Safford
4	007	Assumption	Box 65	Napoleonville	70390	504	369-6765	M. Gaudet
2	009	Avoyelles	P. O. Box 475	Marksville	71351	318	253-9235	L. Lamartiniere
3	011	Beauregard	Box 312	DeRidder	70634	318	463-7001	D. Vidrine
1	013	Bienville	Box 235	Arcadia	71001	318	263-2207	Ralph Laffitte
1	015	Bossier	Box 217	Benton	71006	318	965-2185	D. Bernard
1	017	Caddo	P. O. Box 7099	Shreveport	71137	318	226-5465	A. Palmer
5	019	Calcasieu	1400 Hwy. 14, Suite C	Lake Charles	70601	318	436-5020	Kirk Moore
3	021	Caldwell	P. O. Box 309	Columbia	71418	318	649-2432	Bret Burns
5	023	Cameron	1400 Hwy. 14, Suite C	Lake Charles	70601	318	436-5020	Kirk Moore
2	025	Catahoula	Box 217	Harrisonburg	71340	318	744-5213	Robert Bradley
1	027	Claiborne	USDA Office Bldg.	Homer	71040	318	927-3826	G. Dickerson
2	029	Concordia	Box 686	Ferriday	71334	318	757-4870	M. A. Pearce
3	031	DeSoto	Box 311	Mansfield	71052	318	872-4814	Craig McCain
4	033	E. Baton Rouge	Box 338	Denham Springs	70726	504	389-0267	Theo Levert
2	035	East Carroll	205 N. Hood St.	Lake Providence	71254	318	559-2640	Ronald Ford
4	037	East Feliciana	Box 125	Clinton	70722	504	683-8955	Robert Helmer
5	039	Evangeline	Box 480	Ville Platte	70586	318	363-6602	Don Brouillette
2	041	Franklin	209 Fair Ave.	Winnsboro	71295	318	435-9424	Harry Mock
3	043	Grant	P. O. Box 296	Colfax	71417	318	627-3751	Jerry Ursery
5	045	Iberia	P. O. Box 10108	New Iberia	70562	318	369-3234	R. Boudreaux
4	047	Iberville	420 Peters St. Rm #1	Plaquemine	70764	504	687-2184	Joel Ducote
1	049	Jackson	Box 396 Fed. Bldg.	Jonesboro	71251	318	259-3306	Ralph Laffitte
4	051	Jefferson	Box 198, Courthouse	Edgard	70049	504	497-3311	J. Dufresne
5	053	Jefferson Davis	2422 Port Drive	Jennings	70546	318	824-0968	Gerald Moore
5	055	Lafayette	Box 2189	Lafayette	70502	318	264-6601	James Trahan
4	057	Lafourche	Box 191	Thibodaux	70302	504	446-6226	Richard Folse
3	059	LaSalle	P. O. Box 1362	Jena	71342	318	992-2302	Tommy Stephens
1	061	Lincoln	Fed. Bldg.	Ruston	71270	318	255-2826	Doug Davidson
4	063	Livingston	Box 338	Denham Springs	70726	504	389-0267	Theo Levert
2	065	Madison	122 N. Cedar	Tallulah	71282	318	574-4158	Michael May
1	067	Morehouse	P. O. Box 1157	Bastrop	71220	318	281-1561	James Conley
3	069	Natchitoches	405 Bienville St.	Natchitoches	71457	318	352-7100	Wiley Hunter
4	071	Orleans	Box 198, Courthouse	Edgard	70049	504	497-3311	J. Dufresne
1	073	Ouachita	Box 1057	West Monroe	71291	318	387-0753	J. Andrews
4	075	Plaquemines	Box 198, Courthouse	Edgard	70049	504	497-3311	J. Dufresne
2	077	Pointe Coupee	180 East Main	New Roads	70760	504	638-7746	James R. Franklin
3	079	Rapides	3730 Government St.	Alexandria	71302	318	473-7710	A. K. Chapman
3	081	Red River	Box 310	Coushatta	71019	318	932-4231	W. Waltman
1	083	Richland	903 Ray St.	Rayville	71269	318	728-2081	W. Vondenstein
3	085	Sabine	300 Pico St.	Many	71449	318	256-2292	D. Carnline
4	087	St. Bernard	Box 198, Courthouse	Edgard	70049	504	497-3311	J. Dufresne
4	089	St. Charles	Box 198, Courthouse	Edgard	70049	504	497-3311	J. Dufresne
4	091	St. Helena	Box 336	Greensburg	70441	504	222-4385	C. Edwards
4	093	St. James	Box 149	Donaldsonville	70346	504	473-8446	D. Safford
4	095	St. John	Box 198, Courthouse	Edgard	70049	504	497-3311	J. Dufresne
5	097	St. Landry	Box 151	Opelousas	70570	318	948-8288	A. J. Foret
5	099	St. Martin	114 Courthouse St.	Breaux Bridge	70517	318	332-2811	L. Thibodeaux
5	101	St. Mary	Courthouse Rm. 313	Franklin	70538	318	828-0493	H. Rushing
4	103	St. Tammany	Box 937	Covington	70433	504	892-3921	R. Passman
4	105	Tangipahoa	P. O. Box 247	Amite	70422	504	748-8751	C. Edwards
2	107	Tensas	Box 1	St. Joseph	71366	318	766-3502	Peter Gunter
4	109	Terrebonne	Box 143	Houma	70360	504	872-1591	M. Gaudet
1	111	Union	Box 485	Farmerville	71241	318	368-3081	D. Davidson
5	113	Vermilion	Box 310	Abbeville	70511	318	893-5781	F. Broussard
3	115	Vernon	3360 Lk. Chas. Hwy.	Leesville	71446	318	239-2341	D. Carnline
4	117	Washington	Courthouse	Franklinton	70438	504	839-5687	R. Passman
1	119	Webster	Box 785	Minden	71055	318	377-1871	James Loftin
4	121	W. Baton Rouge	Box 498	Port Allen	70767	504	389-0310	Joel Ducote
2	123	West Carroll	Box 307	Oak Grove	71263	318	428-9303	Don Murray
4	125	West Feliciana	Drawer 160	St. Francisville	70775	504	635-3694	Robert Helmer
3	127	Winn	Box 367	Winnfield	71483	318	628-4586	Jerry Ursery

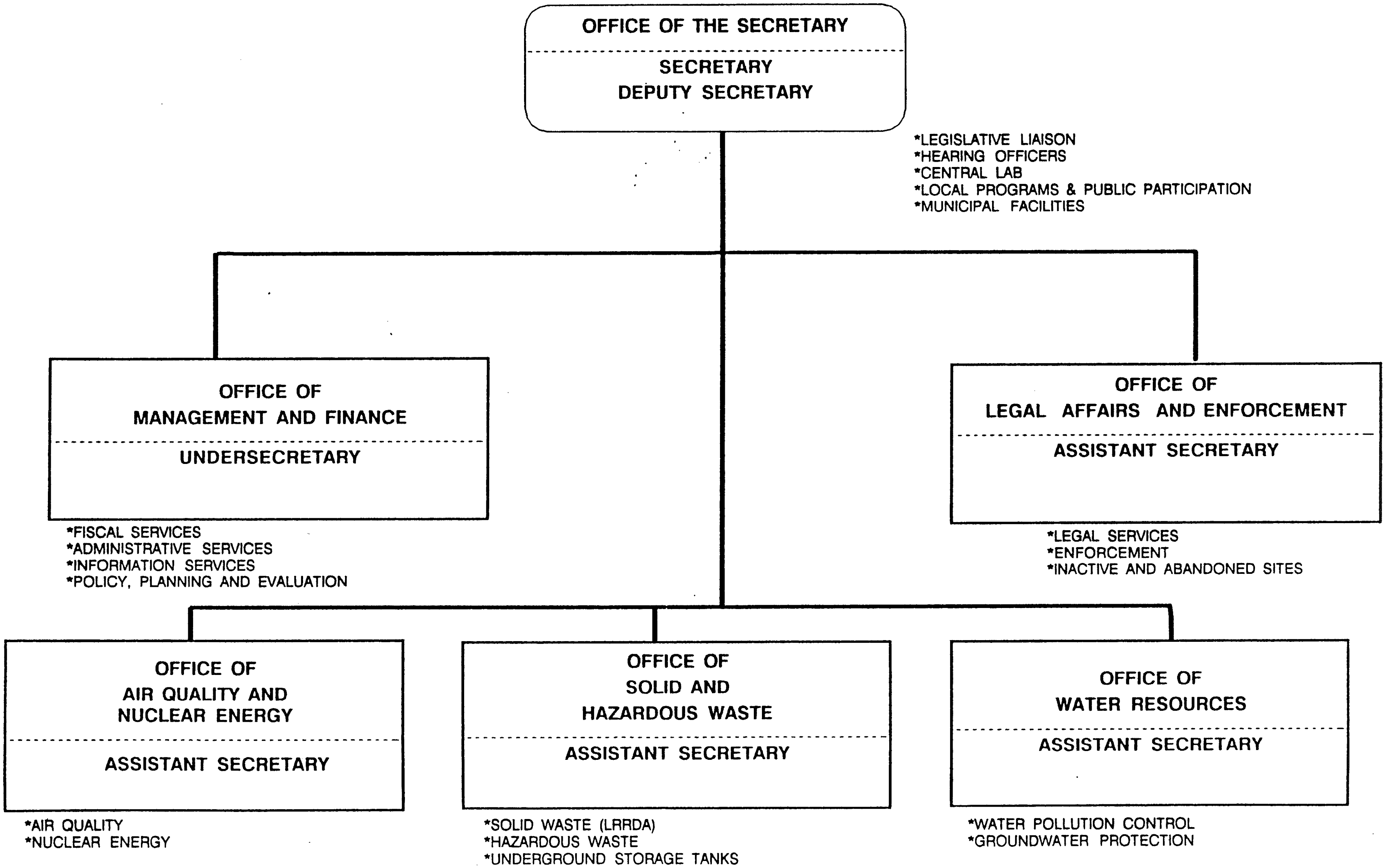
*These numbers designated parishes of each District Director as shown below.

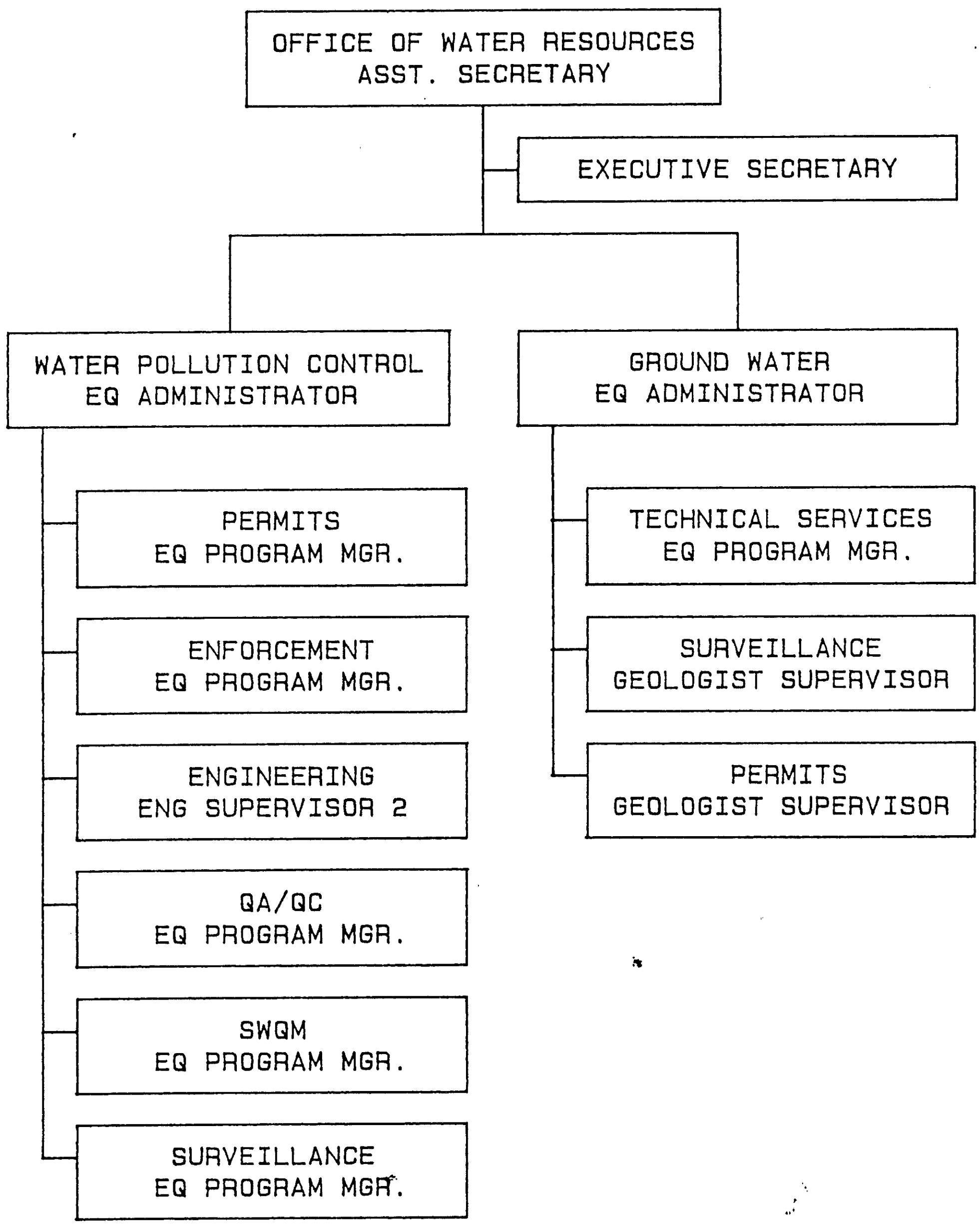
1	Curtis [illegible] Tubbs	ASCS Office - Ruston	North
2	Ernest [illegible] Armstrong	ASCS Office - St. Joseph	Northeast
3	William [illegible] Rush	ASCS Office - Natchitoches	Central
4	James [illegible] Harvey	ASCS Office - St. Francisville	Southeast
5	Thomas [illegible] McClelland	ASCS Office - Crowley	Southeast

Revised - 06/16/88

LOUISIANA PERSONNEL DIRECTORY. December, 1988. U.S. Department of Agriculture, Soil Conservation Service (Copies also distributed).

LOUISIANA
DEPARTMENT OF ENVIRONMENTAL QUALITY




OFFICE OF WATER RESOURCES
ASST. SECRETARY
EXECUTIVE SECRETARY
WATER POLLUTION CONTROL
EQ ADMINISTRATOR
GROUND WATER
EQ ADMINISTRATOR
PERMITS
EQ PROGRAM MGR.
ENFORCEMENT
EQ PROGRAM MGR.
ENGINEERING
ENG SUPERVISOR 2
QA/QC
EQ PROGRAM MGR.
SWQM
EQ PROGRAM MGR.
SURVEILLANCE
EQ PROGRAM MGR.
TECHNICAL SERVICES
EQ PROGRAM MGR.
SURVEILLANCE
GEOLOGIST SUPERVISOR
PERMITS
GEOLOGIST SUPERVISOR

DEPARTMENT OF ENVIRONMENTAL QUALITY

OFFICE OF WATER RESOURCES

REGIONAL OFFICES

REVISED 2/87

SOUTHEAST REGION:

St. Tammany
St. Bernard
Plaquemines
Jefferson
Orleans
St. Charles
St. John the Baptist
St. James
Washington

CAPITAL REGION:

Tangipahoa
St. Helena
Livingston
East Baton Rouge
West Baton Rouge
Ascension
E. Feliciana
Iberville
Pointe Coupee
W. Feliciana

NORTHWEST REGION:

Red River
DeSoto
Bienville
Claiborne
Caddo
Webster
Bossier

CENTRAL REGION:

Vernon (Upper Half)
Rapides
Avoyelles
Concordia
LaSalle
Grant
Natchitoches
Sabine
Catahoula
Winn

LAFOURCHE REGION:

Terrebonne
Lafourche
Assumption
St.Martin (Lower Section)
St. Mary - East of Wax Lake Outlet
Lower Jefferson (Grand Isle)

NORTHEAST REGION:

Union
Morehouse
Richland
Madison
Lincoln
Jackson
Ouachita
Franklin
Tensas
Caldwell
E. Carroll
W. Carroll
Madison

ACADIANA REGION:

St. Martin (Upper Section)
Iberia
St. Mary - West of the Wax Lake Outlet
St. Landry
Evangeline
Vermilion
Acadia
Lafayette

SOUTHWEST REGION:

Jefferson Davis
Cameron
Calcasieu
Beauregard
Allen
Vernon (Lower Half)

DEPARTMENT OF ENVIRONMENTAL QUALITY
OFFICE OF WATER RESOURCES
REGIONAL OFFICES

CAPITAL REGIONAL OFFICE

11720 Airline Highway
Baton Rouge, La. 70817
Phone # (504) 295-8900
Linc. 8/426-8900

ACADIANA REGIONAL OFFICE

100 Eppler Road
Lafayette, La. 70505
Phone # (318) 265-5584
Linc. 8/328-5584

NORTHWEST REGIONAL OFFICE

1525 Fairfield Ave.
Shreveport, La. 71101-4388
Phone # (318) 226-7476
Linc. 8/521-7476

SOUTHWEST REGIONAL OFFICE

P. O. Box 3047 (70602)
1155 Ryan St.
Lake Charles, La. 70602
Phone # (318) 491-2082
Linc. 8/361-2082

NORTHEAST REGIONAL OFFICE

804 North 31st. St.
Monroe, La. 71211
Phone # (318) 362-5439
Linc. 8/266-5439

P. O. Box 8475
Monroe, La. 71211

SOUTHEAST REGIONAL OFFICE

3945 N. I-10 Service Rd/West
Metairie, La. 70002
Phone # (504) 838-5365
Linc. 8/637-5365

P. O. Box 8427
Metairie, La. 70011

GSRI LABORATORY

8618 GSRI Avenue
Baton Rouge, La. 70808
Phone # (504) 765-2405
Linc. 8/427-2405

LAFOURCHE REGIONAL OFFICE

302 Barataria St.
Lockport, La. 70374
Phone # (504) 568-8699
532-6206
Linc. 8/621-8699

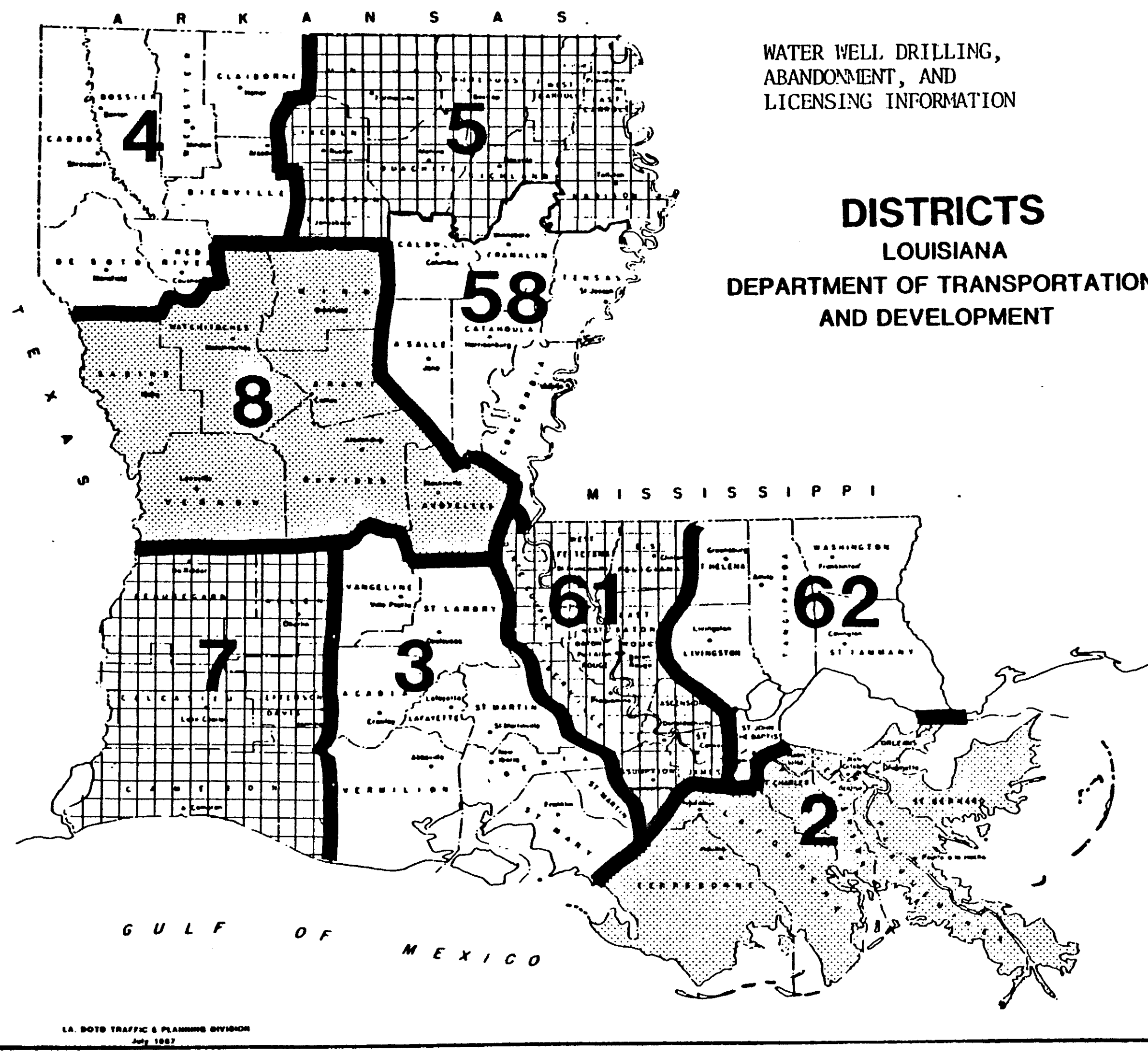
CENTRAL REGIONAL OFFICE

P. O. Box 278
Tioga, La. 71477
Phone # (318) 487-5656
8/221-5656

WATER WELL DRILLING,
ABANDONMENT, AND
LICENSING INFORMATION

DISTRICTS

LOUISIANA
DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT



DOTD DISTRICT CONTACTS

2	Geneva Grille - New Orleans (504) 283-3418
3	Bill Fontenot - Lafayette (318) 233-7404
4	H. R. Pearson - Shreveport (318) 746-6100
5/58	Paul Colquette - Monroe (318) 343-2811
7	B. J. (Joe) Landry - Lake Charles (318) 439-2406
8	Sidney Bertheaud - Alexandria (318) 443-2553
61	C. J. Gaudin - Baton Rouge (504) 231-4104
62	Bobby Womack - Hammond (504) 345-7390

BATON ROUGE HEADQUARTERS
WATER RESOURCES SECTION STAFF
(504) 379-1434
Z. "Bo" Bolourchi, Chief
Clyde Carlson
Darrell Locker
Mike Dore'
Trudy Dupuy

Address Correspondence to:
Department of Transportation and Development
Attn: Chief, Water Resources Section
P. O. Box 94245
Baton Rouge, LA 70804-9245

ROSTER OF SANITARIANS

This roster includes: Parish Health Units, Sanitarian Regional Managers, Milk and Dairy Unit, Food and Drug Unit, Seafood Unit, Insect and Vector Unit(Fee Unit), and Regional Laboratories.

*Sanitarian Parish Manager's name is underlined.

ACADIA PARISH
530 West Mill St.
P. O. Drawer 1289
Crowley, LA 70527-1289
(318) 783-9025
LINC 328-5304

J. Russell Boudreaux
Albert Johnston
Rayford Robin

ALLEN PARISH
601 Fifth St.
P. O. Drawer 160
Oberlin, LA 70655
(318) 639-4390
LINC 361-2066

Ricky Mahaffey

ASCENSION PARISH
201 Opelousas St.
P. O. Box 389
Donaldsonville, LA 70346
(504) 473-8380
(504) 644-4582(Gonzales)

Russell Gautreaux
Ronald Nettles

ASSUMPTION PARISH
Highway 1008
P. O. Drawer 9
Napoleonville, LA 70390
(504) 369-6031

Ellen Finger

AVOYELLES PARISH
109 Government St.
Marksville, LA 71351
(318) 253-4528

Jerry Smith
Sam Smith

BEAUREGARD PARISH
203 West Third St.
P. O. Box 327
DeRidder, LA 70634-0327
(318) 463-4486
LINC 361-2080

Bruce McFatter
Ron Yule

BIENVILLE PARISH Corner Chestnut & Beech Sts. P. O. Box 276 Arcadia, LA 71001 (318) 263-2125 LINC 521-7621	Ray Harmon
BOSSIER PARISH 700 Benton Rd. P. O. Box 5608 Bossier City, LA 71111 (318) 741-7314 LINC 530-7317	Dennis Dans Elaine Butler Randall (Scott) Green
CADDO PARISH 1866 Kings Hwy. P. O. Box 3008 Shreveport, LA 71133-3008 (318) 227-5222 LINC 521-5222	James Ricks Ron King Raymond Brauer John Allen Edwina Wise McKinley Kenner James David Myers
CALCASIEU PARISH 721 Prien Lake Rd. Lake Charles, LA 70602 (318) 478-6020 LINC 367-1165	Amilcar Torres Mary Diaz Kenneth Lewis Kent Veazey Janet Piper B. J. Read Godswill Ogbanga Otto Gray
CALDWELL PARISH HC 74, Box 28 Columbia, LA 71418 (318) 649-2393	Gregory Horne
CAMERON PARISH Marshall & Louise Sts. P. O. Box 930 Cameron, LA 70631 (318) 775-5368	
CATAHOULA PARISH 309 Short St., 1st Floor P. O. Box 240 Harrisonburg, LA 71340 (318) 744-5261	Dennis Dosher

CLAIBORNE PARISH 624 West Main St. Homer, LA 71040 (318) 927-6127 LINC 521-7431	James Gomilla
CONCORDIA PARISH 905 Mississippi Ave. P. O. Box 826 Ferriday, LA 71334 (318) 757-8632	Donnie McDonald
DESOTO PARISH 120 McEnery St. P. O. Box 312 Mansfield, LA 71052 (318) 872-0472 LINC 521-7467	Jimmy Brown
EAST BATON ROUGE PARISH 353 N. 12th St. P. O. Box 3017 Baton Rouge, LA 70821 (504) 342-1734 LINC 421-1734	Grey Moy T. H. Alford Barrie Edgar Mary Dixon Gilda Fisher Rayfield Jones Robert Crain David Bailey Shelia Butler Evelyn Owens Grafton Cooper
EAST CARROLL PARISH 407 Second St. Lake Providence, LA 71254 (318) 559-2012	Wayne Driver
EAST FELICIANA PARISH Marston St. P. O. Box 227 Clinton, LA 70722 (504) 683-8551	Peter Ricca
EVANGELINE PARISH 415 West Cotton St. P. O. Box 369 Ville Platte, LA 70586 (318) 363-1135 LINC 328-5299	Steve Tate Joe Soileau

FRANKLIN PARISH 704 Jackson St. P. O. Box 547 Winnsboro, LA 71295 (318) 435-7516	Truman McDaniel
GRANT PARISH 506 Main St. P. O. Box 232 Colfax, LA 71417 (318) 627-3133	Jerry Brevelle
IBERIA PARISH 121 West Pershing St. New Iberia, LA 70560 (318) 364-4514 LINC 328-5186	Michael Stockstill Robert Freeman Mitchel Dutile
IBERVILLE PARISH 1100 Meriam St. P. O. Box 444 Plaquemine, LA 70765-0444 (504) 687-9021	Marliese Samuel
JACKSON PARISH 319 Sixth St. P. O. Box 66 Jonesboro, LA 71251 (318) 259-6601	Donald Lazarus
JEFFERSON PARISH 111 N. Causeway Blvd. P. O. Box 652 Metairie, LA 70001 (504) 838-5140 LINC 637-5140 (504) 861-6521(Harvey) LINC 632-6500	J. Betty DiMiceli Frank Allo Charles Johnson Stanley Howat Brenda Williams William Senac Ragus Legendre Lubomir Boneff Winifred Worley George Borden John Saladino Lynell Ringo Stacey Williams Deborah Facen
JEFFERSON DAVIS PARISH 314 Church St. P. O. Box 317 Jennings, LA 70546 (318) 824-2193 LINC 361-2646	Don Miller

LAFAYETTE PARISH 2100 Jefferson St. Building B Lafayette, LA 70501 (318) 265-5616 LINC 328-5616	Kenneth Duhon Amy Broussard Kenneth Arceneaux Deborah LeBlanc Verettia Navarre Stanley Clause
LAFOURCHE PARISH 801 East Seventh St. P. O. Box 876 Thibodaux, LA 70302 (504) 447-0921	Terry Bourgeois, Acting Kenneth Jeffus
LASALLE PARISH 305 N. First St. P. O. Box 17 Jena, LA 71342 (318) 992-4842	Donald McMillin
LINCOLN PARISH 405 East Georgia Ave. P. O. Box 869 Ruston, LA 71273-0869 (318) 255-3141 LINC 521-7695	Clyde Aycock Stephen Colvin
LIVINGSTON PARISH 361 So. Magnolia St. P. O. Box 365 Livingston, LA 70754 (504) 686-7829	John Sziber Sandra Sibley Charles Methvien
MADISON PARISH 606 Depot St. Tallulah, LA 71282-3884 (318) 574-3311	
MOREHOUSE PARISH 1006 N. Washington Bastrop, LA 71220 (318) 281-0751	Billy Griffis
NATCHITOCHES PARISH 625 Bienville St. Extension P. O. Box 489 Natchitoches, LA 71457 (318) 357-3132 LINC 226-3136	Michael Deason Rita Cobb

ORLEANS PARISH 4948 Chef Menteur Hwy., Suite 701 New Orleans, LA 70126 (504) 942-8283	Jo Anna McLean Habeeb M. Habeeb Richard Heidloff Celia Turner Burma Smith Jerry Green Walter Pichon Joy Freeman Gary Lopinto Ardell Walters Sonja Thomas Marnita Day Marlene Tullier Kenneth Lanier Patricia Mondy
OUACHITA PARISH 2913 DeSiard St. P. O. Box 4460 Monroe, LA 71211-4460 (318) 362-3400 LINC 261-3400	Arthur Fisher George Ineichen Tommy Fuller Margaret Stokes
POINTE COUPEE PARISH Hospital Road P. O. Box 460 New Roads, LA 70760 (504) 638-7320	Thomas E. (Ted) Davis
RAPIDES PARISH 1200 Texas Ave. P. O. Box 4087 Alexandria, LA 71301 (318) 487-5281 LINC 221-5282	T. J. Speir, Acting Lee Taylor Michael Dowty Gary Laborde D. Gary Lincecum
RED RIVER PARISH 2015 Red Oak Rd. P. O. Drawer 628 Coushatta, LA 71019 (318) 932-4087 LINC 521-7314	M. D. Cannon
RICHLAND PARISH 205 S. Eugene St. P. O. Box 666 Rayville, LA 71269 (318) 728-4441	Louis Ladart

SABINE PARISH
245 Highland Dr.
P. O. Box 398
Many, LA 71449
(318) 256-9203
LINC 221-5049

C. Quinton Corley
Dorothy Small

ST. BERNARD PARISH
2712 Palmisano Blvd., Bldg. C
Chalmette, LA 70043
(504) 278-7410
LINC 639-7415

William Hippler
Joseph Musso

ST. CHARLES PARISH
Corner of Post & Ellington Sts.
P. O. Box 1330
Luling, LA 70070
(504) 785-2014

Richard Anzalone
Margaret Becnel
Kenneth Dolhonde

ST. HELENA PARISH
N. Second St.
P. O. Box 428
Greensburg, LA 70441
(504) 222-6178

Alan Lard

ST. JAMES PARISH
504 Louisiana Ave.
P. O. Box 387
Lutcher, LA 70071
(504) 869-4441

Jack Bates

ST. JOHN PARISH
343 Central Ave.
P. O. Drawer "P"
Reserve, LA 70084-0515
(504) 536-3535

Sidney Becnel

ST. LANDRY PARISH
308 W. Bloch St.
P. O. Box 552
Opelousas, LA 70571-0552
(318) 942-9736
LINC 328-5305

G. Wiley Sylvester
Donald Dupre
Jody Guidry
John S. Guillory

ST. MARTIN PARISH
415 St. Martin St.
St. Martinville, LA 70582
(318) 394-3097
LINC 328-5734

Alfred Potier
Carl Wininger

ST. MARY PARISH
1000 Perret St.
P. O. Box 582
Franklin, LA 70538
(318) 828-0410
(504) 385-1470(Morgan City)

Joan Adams
Timothy Boyd

ST. TAMMANY PARISH
639 N. Theard St.
P. O. Box 239
Covington, LA 70434
(504) 893-6208
LINC 652-6208
(504) 646-6448(Slidell)
LINC 640-6448

William Hathaway
William DeBlanc
G. Lewis Brown
Raymond Mendel
Poppi Waskom

TANGIPAHOA PARISH
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P. O. Box 278
Amite, LA 70422
(504) 748-8151
LINC 651-3858
(504) 549-5055(Hammond
LINC 651-5055

Robert Egnew
James Harper
Harold Hodges
Debra Lambert
Joseph Costa

TENSAS PARISH
133 Plank Rd.
P. O. Box 77
St. Joseph, LA 71366
(318) 766-3513

L. Wayne Penton

TERREBONNE PARISH
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P. O. Box 309
Houma, LA 70361
(504) 857-3601
LINC 641-3601

Richard Parro
Teri Cavalier
J. Leonard Pecanty
Kevin Hewitt

UNION PARISH
1002 Marion Hwy.
P. O. Box 516
Farmerville, LA 71241
(318) 368-3156

Robert Albritton

VERMILION PARISH
401 South St. Charles St.
Abbeville, LA 70510
(318) 893-1443
LINC 328-5722

J. Russell Boudreaux
Sarite Stelly
Susan Trahan

VERNON PARISH 406 W. Port Arthur Blvd. P. O. Box 1471 Leesville, LA 71496-1471 (318) 239-6551 LINC 361-2328	Robert Westmoreland Karen Nash John Self
WASHINGTON PARISH 626 Carolina Ave. Bogalusa, LA 70427 (504) 732-2510 LINC 621-2582 (504) 839-5646(Franklinton) LINC 621-8968	Gaylon Alford W. E. Knight Drew Stevens Dawn Mizell
WEBSTER PARISH 111 Murrell Ave. P. O. Box 814 Minden, LA 71058-0814 (318) 377-1294 LINC 521-5277 (318) 539-4314 or 9878(Springhill)	David Jeane David Gardner
WEST BATON ROUGE PARISH 685 Louisiana Ave. P. O. Box 227 Port Allen, LA 70767 (504) 342-7528	McDonald Volentine
WEST CARROLL PARISH Koerner & Beale Sts. P. O. Box 306 Oak Grove, LA 71263 (318) 428-9361	Nathan Hill
WEST FELICIANA PARISH 120 Feliciana St. P. O. Box 1928 St. Francisville, LA 70775 (504) 635-3644	J. Kilren Vidrine
WINN PARISH 201 S. Laurel St. P. O. Box 111 Winnfield, LA 71483 (318) 628-2148	W. Tom McConnell

SANITARIAN SERVICES SECTION

Frank L. Deffes, Jr., Chief
325 Loyola Ave., Rm. 206
P. O. Box 60630
New Orleans, LA 70160
(504) 568-5181
LINC 621-5181

SANITARIAN PROGRAM MANAGERS

METROPOLITAN - REGION I Barry L. Blue 3308 Tulane Ave. Marine Bldg., 5th Floor New Orleans, LA 70119 (504) 826-2415 LINC 634-2415	Jefferson Orleans St. Bernard St. Tammany
CAPITOL - REGION II Clifton Murphy 1220 Main St. P. O. Box 3633 Baton Rouge, LA 70821 (504) 342-1625 LINC 421-1625	Ascension East Feliciana Livingston St. Helena Washington West Feliciana East Baton Rouge Iberville Pointe Coupee Tangipahoa West Baton Rouge
TECHE - REGION III Teda Boudreaux 206 E. Third St. P. O. Box 1359 Thibodaux, LA 70301 (504) 447-9016	Assumption St. Charles St. John Lafourche St. James Terrebonne
ACADIAN - REGION IV Hugh Winston 302 Jefferson, Room 612 Lafayette, LA 70501 (318) 265-5324 LINC 328-5324	Acadia Iberia St. Landry St. Mary Evangeline Lafayette St. Martin Vermilion
SOUTHWEST - REGION V Carl LeJeune 4240 Legion St. P. O. Box 16826 Lake Charles, LA 70616 (318) 491-2037 LINC 361-2037	Allen Calcasieu Jeff. Davis Beauregard Cameron

<u>CENTRAL - REGION VI</u> Larry Amberg 1335 Jackson St. P. O. Box 4027 Alexandria, LA 71301 (318) 487-5265 LINC 221-5265	Avoyelles Concordia LaSalle Vernon Catahoula Grant Rapides Winn
<u>NORTHWEST - REGION VII</u> James Greene 1525 Fairfield Ave., Rm. 566 Shreveport, LA 71101-4388 (318) 226-7439 LINC 521-7439	Bienville Caddo DeSoto Natchitoches Sabine Bossier Claiborne Lincoln Red River Webster
<u>NORTHEAST - REGION VIII</u> Steve McAdams 2913 Betin St. P. O. Box 6118 Monroe, LA 71211-6118 (318) 362-5224 LINC 266-5224	Caldwell Franklin Madison Ouachita Tensas West Carroll East Carroll Jackson Morehouse Richland Union

MILK AND DAIRY UNIT

Richard F. Graham, Administrator
325 Loyola Ave., Room 206
P. O. Box 60630
New Orleans, LA 70160
(504) 568-5118
LINC 621-5118

REGIONAL MILK SANITARIANS

NORTHERN REGION
Harold Doyle
1335 Jackson St.
P. O. Box 4027
Alexandria, LA 71301
(318) 487-5183
LINC 221-5183

SOUTHEAST REGION
Gary Cazaubon
303 E. Oak St.
P. O. Box 606
Amite, LA 70422
(504) 748-8193
LINC 651-3891

SOUTHWEST REGION
Vacant
1220 Main St.
Baton Rouge, LA 70821
(504) 342-1541
LINC 421-1541

SURVEY OFFICER
Dulance Reed
St. Landry Parish Health Unit
308 W. Bloch St.,P. O. Box 552
Opelousas, LA 70571-0552
(318) 942-9736
LINC 328-5305

REGIONAL MILK FIELD SANITARIANS

Al Mancuso
Lezette Earhart
John Mangiaracina
3308 Tulane Ave.
Marine Bldg., 5th Floor
New Orleans, LA 70119
(504) 826-2416 or 2417
LINC 634-2416 or 2417

Judi Dans
1525 Fairfield Ave., Rm. 566
Shreveport, LA 71101-4388
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LINC 521-7478

Michael Farace
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Baton Rouge, LA 70821
(504) 342-0991
LINC 421-0991

John Lee
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P. O. Box 6118
Monroe, LA 71211-6118
(318) 362-5232
LINC 266-5232

John W. Fontenot
302 Jefferson, Rm. 612
Lafayette, LA 70501
(318) 265-5311
LINC 328-5311

Craighton Lacombe
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Lake Charles, LA 70616
(318) 491-2040
LINC 361-2040

Bruce Champion
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P. O. Box 4027
Alexandria, LA 71301
(318) 487-5183
LINC 221-5183

AMITE MILK OFFICE

303 E. Oak St.
P. O. Box 606
Amite, LA 70422
(504) 748-8193
LINC 651-3891

John Mendow
H. Rufus Williams
Harry Goynes
Rachel Harrington
Delos Thompson
Ed Kelley

FOOD AND DRUG UNIT

William D. Swiler, Administrator
325 Loyola Ave., Rm. 414
P. O. Box 60630
New Orleans, LA 70160
(504) 568-5401
LINC 621-5401

CENTRAL OFFICE FOOD AND DRUG SANITARIANS

Steve Hayden, Chief Inspector
Tony Vaccarella
Claude Lewis

Terrance Pattison
Andrew Messina
William MacMillan, Pharmacist

REGIONAL FOOD AND DRUG SANITARIANS

Cecil Ballard
1220 Main St.
P. O. Box 3633
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LINC 421-1610

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LINC 521-7432

William Harris
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Lafayette, LA 70501
(318) 265-5311
LINC 328-5311

Wayne McCartney
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P. O. Box 6118
Monroe, LA 71211-6118
(318) 362-5248
LINC 266-5248

SEAFOOD UNIT

Charles C. Conrad, Administrator
325 Loyola Ave., Rm. 204
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New Orleans, LA 70160
(504) 568-8227 or 5406
LINC 621-8227 or 5406

CENTRAL OFFICE SEAFOOD SANITARIANS

Guy J. Brupbacher, Jr.

REGIONAL SEAFOOD SANITARIANS

David Guilbeau
302 Jefferson, Rm. 612
Lafayette, LA 70501
(318) 265-5311
LINC 328-5311

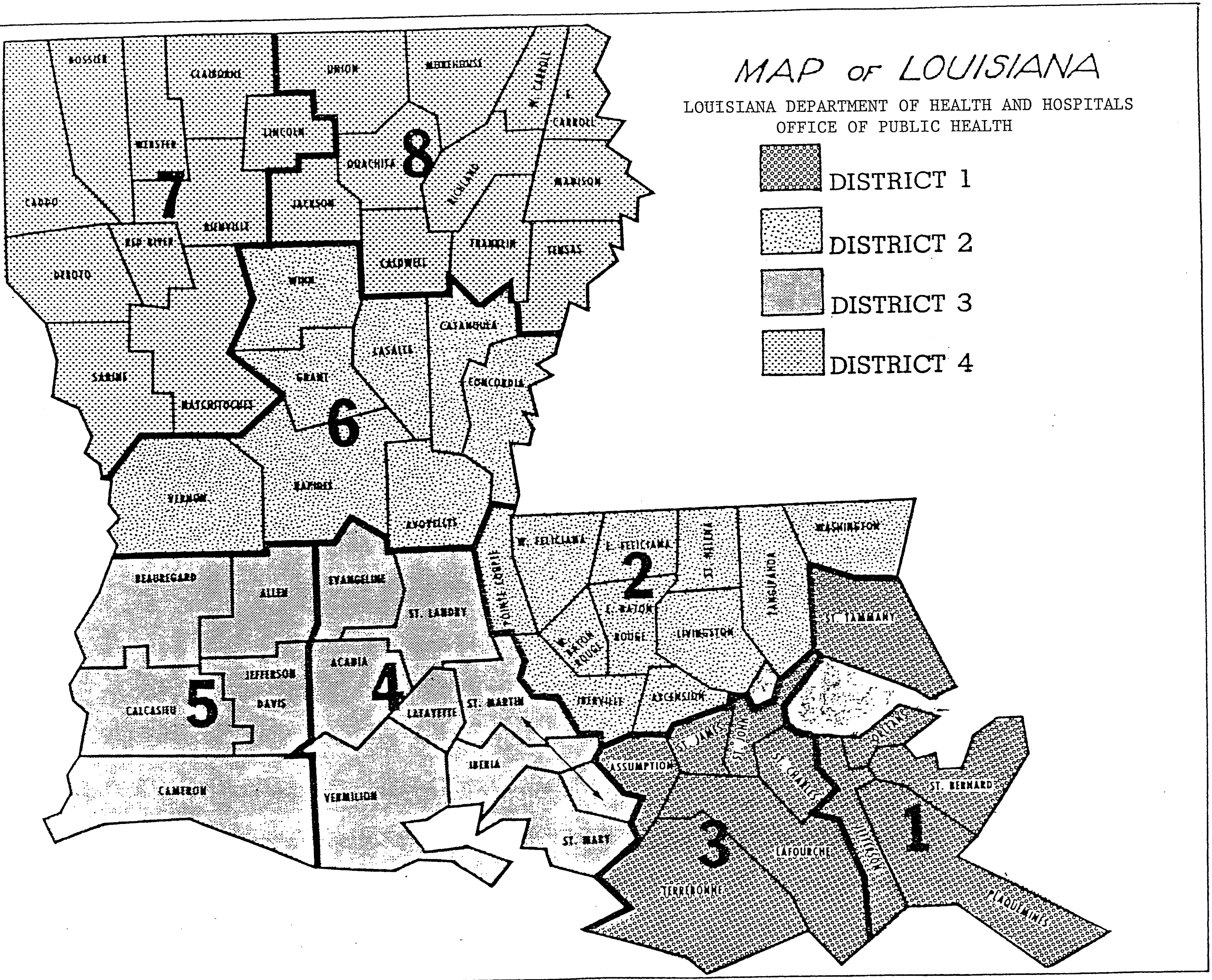
Claudette Skellham
206 E. Third St.
P. O. Drawer 1359
Thibodaux, LA 70301
(504) 447-9016

INSECT AND VECTOR UNIT & FEE UNIT

Charles H. Anderson, Administrator
325 Loyola Ave., Rm. 311
P. O. Box 60630
New Orleans, LA 70160
(504) 568-5139
LINC 621-5139

ENGINEERING SECTION ROSTER

CENTRAL OFFICE, NEW ORLEANS P.O. Box 60630 New Orelans, LA 70160 (504) 568-5100 Linc 621-5100	William J. Hughes, Chief Engineer T. J. Ray, Administrator/SDWP George Robichaux, Sewage Administrator Leslie LeMon Larry Fox, Certification Officer
METROPOLITAN REGIONAL OFFICE-REIGON 1 3308 Tulane Avenue New Orleans, LA 70119 (504) 568-2921 Linc 634-2400	R. Douglas Vincent, District Engineer Fred Corliss, Regional Engineer Gus Gatzke, Regional Engineer Effie Michaels, Water Program Supervisor
CAPITOL REGIONAL OFFICE-REGION 2 1220 Main Street Baton Rouge, LA 70821 (504) 342-1616 Linc 421-1616	James Antoon, Water Program Supervisor Lewis Carpenter, Plans Review
ACADIAN REGIONAL OFFICE-REGION 4 302 Jefferson - Room 612 Lafayette, LA 70501 (318) 265-5311 Linc 328-5311	Don Guidry, Water Program Supervisor
CENTRAL REGIONAL OFFICE-REGION 6 1335 Jackson Street Alexandria, LA 71301 (318) 487-5262 Linc 221-5262	Michael Cazes, Regional Engineer
NORTHWEST REGIONAL OFFICE-REGION 7 1525 Fairfield Avenue-Rm 566 Shreveport, LA 71101 (318) 226-7470 Linc 521-7470	Perry Watson, District Engineer Wayne Mulig, Regional Engineer Glynn Shelton, Water Program Supervisor
NORTHEAST REGIONAL OFFICE-REGION 8 2913 Betin Street Monroe, LA 71211 (318) 362-5222 Linc 261-5222	Robert Driggers, Regional Engineer Jay Hill, Water Program Specialist


MAP of LOUISIANA
LOUISIANA DEPARTMENT OF HEALTH AND HOSPITALS
OFFICE OF PUBLIC HEALTH
DISTRICT 1
DISTRICT 2
DISTRICT 3
DISTRICT 4
1
2
3
4
5
6
7
8
BOSSIER
CLAIBORNE
UNION
MOREHOUSE
W. CARROLL
E. CARROLL
WEBSTER
LINCOLN
OUACHITA
RICHLAND
MADISON
CADDO
BIENVILLE
JACKSON
FRANKLIN
TENSAS
RED RIVER
CALDWELL
DESOTO
WINN
CATAHOULA
LASALLE
GRANT
CONCORDIA
SABINE
NATCHITOCHES
VERNON
RAPIDES
AVOYELLES
WASHINGTON
W. FELICIANA
E. FELICIANA
ST. HELENA
TANGIPAHOA
POINTE COUPEE
BEAUREGARD
ALLEN
EVANGELINE
ST. LANDRY
E. BATON ROUGE
W. BATON ROUGE
LIVINGSTON
ST. TAMMANY
ACADIA
JEFFERSON DAVIS
CALCASIEU
LAFAYETTE
ST. MARTIN
IBERVILLE
ASCENSION
ST. JAMES
ST. JOHN
ST. CHARLES
ORLEANS
ST. BERNARD
ASSUMPTION
IBERIA
CAMERON
VERMILION
ST. MARY
TERREBONNE
LAFOURCHE
JEFFERSON
PLAQUEMINES

LOUISIANA COOPERATIVE EXTENSION SERVICE
LOUISIANA STATE UNIVERSITY AGRICULTURAL CENTER

Knapp Hall
Baton Rouge, LA 70803-1900
504 388-4141

LOUISIANA WATER DATA REFERRAL DIRECTORY

Bill Branch

Anyone searching for data concerning Louisiana's water resources may need a copy of the Louisiana Water Data Referral Directory, published by the Louisiana Water Resources Information Center (LAWRIC). The directory contains information on two of LAWRIC's computer files.

The Water Data File describes water resource by various agencies and explains how to obtain the data. Computer software needed to manipulate the data and hardware used are included in the file.

The Projects in Progress File describes water resource research projects in progress in 1985. Key words, study objectives and progress reports are included.

Directories are available for $10.00 and annual updates for $2.00. Persons interested in obtaining a Directory should contact LAWRIC at (504) 379-1478.

LAWRIC also has a Bibliographic File listing water related reports and documents published on Louisiana topics and a Geographic Referencing File listing locations of water data collecting stations used by various state and federal agencies in Louisiana.

The LAWRIC staff are aware of research and development involving water resources throughout Louisiana and are a good source of information referrals for anyone working in that area.

WORKSHOP EVALUATION PROCESS

LOUISIANA COOPERATIVE EXTENSION SERVICE
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WATER QUALITY, CONSERVATION AND MANAGEMENT
TRAINING SESSION NO. 1
EVALUATION

This presentation was intended to introduce you to some of the technology involved with drinking water quality and to the agencies with water quality responsibility. Please tell us how well we did that and which subjects need more or less explanation. Any comments which will help us know what you need to support your water quality programming would be appreciated.

TOPIC	COVERAGE		
	Adequate	Not Enough	Too Much
Importance			
-Economic Issues	______	______	______
-Health Issues	______	______	______
Hydro-Geology			
-Geology	______	______	______
-Surface Water	______	______	______
-Ground Water	______	______	______
-Hydrologic Cycle	______	______	______
-Soils	______	______	______
Water Quality			
-Standards	______	______	______
-Status	______	______	______
-Threats	______	______	______
-Testing	______	______	______
Point of use	______	______	______
Agency Responsibilities	______	______	______

Comments:

WATER QUALITY, CONSERVATION AND MANAGEMENT
TRAINING SESSION NO. 1
EVALUATION RESPONSES

Total Responses - 17.

Topic	Coverage		
Importance	Adequate	Not Enough	Too Much
Economic	17		
Health	16	1	
Hydro-Geology			
Geology	11	1	5
Surface Water	13	1	2
Ground Water	13	2	2
Hydrologic Cycle	13	1	2
Soils	13	2	2
Water Quality			
Standards	15	2	
Status	15	2	
Threats	15	2	
Testing	15	2	
Point of Use	14	2	1
Agency Responsibilities	13	1	2

Comments: (7/15)

1. Agency responsibilities too lengthy. Reference sheets sufficient.
2. A little much - some I did not understand.
3. Good info.
4. Very good.
5. Too much material for one day.
6. Many of the words used were ones I wasn't familiar with. The information on pesticides, turbidity, etc., was difficult to understand. If an Extension agent can't understand some of the information, it would be difficult to inform clients. Too much info was presented.
7. Tried to cover too much in one day. Hard to comprehend so much information. Good handout materials.
8. Majority of training sessions excellent. One presentation included terms such as : "Way more bad things", "stuff", "critters", and "little jobs" which did very little to increase technical knowledge of drinking water quality.