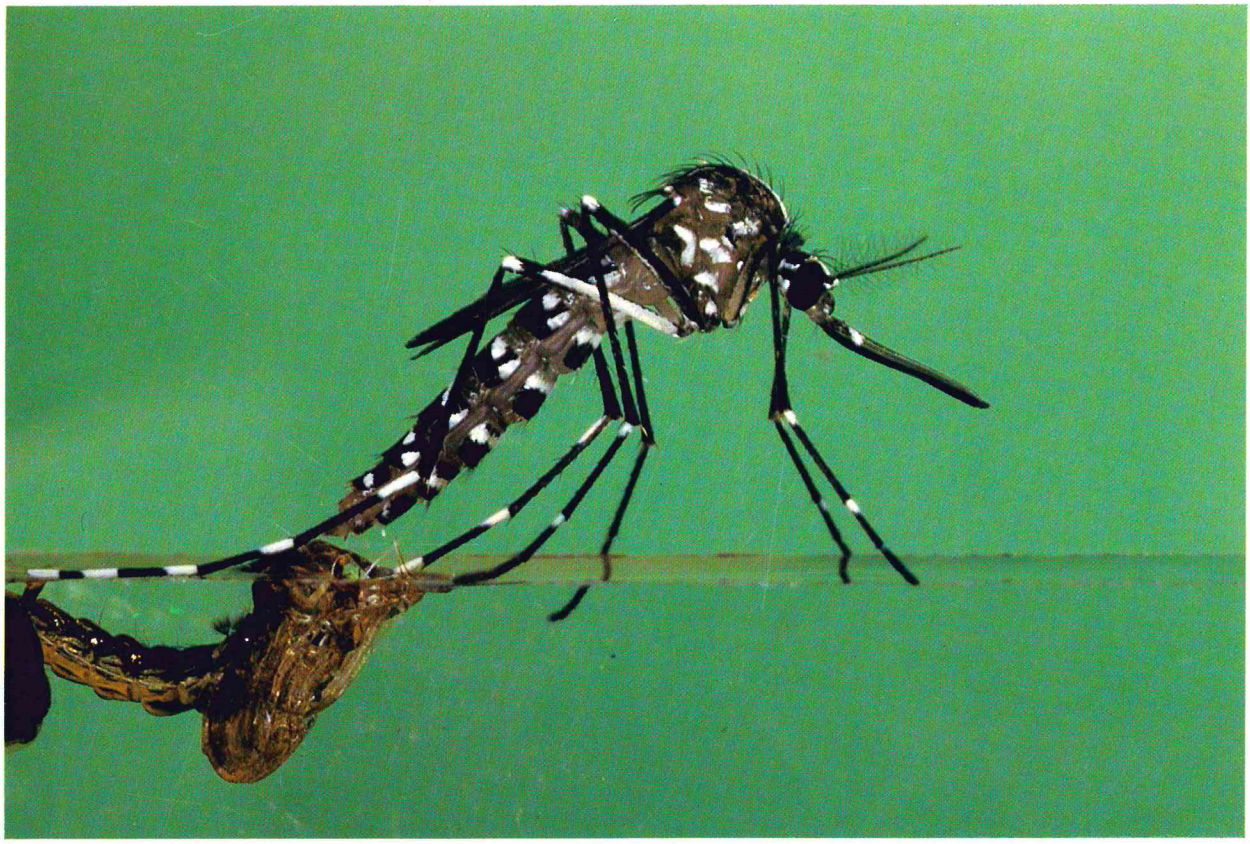
ANNUAL REPORT

1995

NOMCB

NEW ORLEANS MOSQUITO CONTROL BOARD



Aedes albopictus by C. J. Leonard

Discovered in New Orleans in 1986, the Asian tiger mosquito, *Aedes albopictus,* continues to thrive in New Orleans and is now our number one pest and potential vector mosquito.

CITY OF NEW ORLEANS

NEW ORLEANS MOSQUITO CONTROL BOARD
ANNUAL REPORT
1995

Mayor Marc H. Morial

Dr. Rodney Jung, Chairman

Edgar S. Bordes, Administrator

Councilmember Ellen Hazeur

Shiela Webb

Florence Schornstein

Dr. Kenneth Boutte

Dr. Ann Anderson

Dr. Roy Hemelt

Dr. Harold Scott

Oscar Medrano

6601 Lakeshore Drive / New Orleans, LA 70126 / (504)241-2370 / FAX: (504)244-4662

ANNUAL REPORT

1995

DIRECTOR'S REPORT

EDGAR S. BORDES

Mosquito production is a response to favorable climatological conditions that include warm temperatures and abundant moisture, either rainfall or high tides. The past five or six years have been a climatological advantage for mosquito production and a control challenge to the City of New Orleans Mosquito Control Board. Mild winter conditions, that have not produced a killing frost in the past five years, could possibly enhance arbovirus activity in the wild bird population throughout the entire Gulf South.

Warm winter conditions and abundant spring rainfall was a reminder of the past year when St. Louis Encephalitis virus was present in the New Orleans area. Encephalitis surveillance for the past year was modified to expand the use of sentinel chicken cages placed in areas of virus activity from the prior year. After several meetings with State and Federal Public Health Officials, we decided to concentrate on the sentinel chickens and reduce the wild bird trapping in the urban areas of the City of New Orleans.

Final site selections for locating the sentinel chickens were made with input from the staff of New Orleans Mosquito Control, the State of Louisiana Public Health Laboratory and the Centers for Disease Control. Eighteen four-bird chicken cages were deployed

throughout the city. The majority of the locations are at fire stations that are strategically located in the areas of previous SLE activity. We appreciate the cooperation of the New Orleans Fire Department, the fire stations that housed the sentinel birds, Captain Harold Funk and Superintendent Warren McDaniel.

Record rainfall during the month prior to the start of the St. Louis Encephalitis season was a problem that had to be addressed. Rainfall records set during the month of May include the wettest month since the National Weather Service started keeping records--21.18 inches fell at New Orleans International Airport. The other record set was a new maximum rainfall in a 24 hour period--18.42 inches recorded in the University of New Orleans rain gauge.

Excessive rainfall creates a unique problem in the older areas of the City with raised houses. The area under these houses traps water and will create extensive breeding habitat for Culex salinarius (SLE vector). This problem worsens with the passage of time because these mosquitoes will breed and spread to the surrounding area. When a positive bird blood was collected in the Lower Ninth Ward of the City during the month following the record rainfall, the entire area was treated by ground and aerial equipment.

Container-breeding mosquitoes, primarily Aedes albopictus, continued to dominate as the major urban pest mosquito in the City of New Orleans. Larval and adult Aedes albopictus were field collected every month of the year. Source reduction and public education were our primary weapons used to reduce the numbers of these recently imported pest mosquitoes. Additional help in the battle to control albopictus was placed on line when the State of Louisiana Department of Environmental Quality began their program to recycle waste tires. Major tire piles are being addressed but we are still lacking a system to address the waste tires in the back yards of the general citizenry.

Public education efforts were again directed to the 225 public and private schools in Orleans Parish. Letters were mailed informing science teachers about the mosquito control program and the educational material that is available to the schools. In addition to the teachers guide for elementary and high schools that companion the five VHS tapes that are available to the teachers, mosquito rearing

kits that include mosquito eggs and the food to rear these mosquitoes are also available as classroom teaching aids.

New Orleans Mosquito Control Board employees participated in numerous events that involved our Public Education display. This display consists of video, slides, and live displays of cyclops, turtles, minnows and predacious mosquito larvae. The display was utilized at the Mayor's Earth Day Celebration, Earth Fest at the Audubon Zoo, Spring Garden Show at City Park, Town Meetings, Science Teachers Convention, Universities, High Schools, Elementary Schools and numerous environmental group gatherings.

Biological control programs of the New Orleans Mosquito Control Board were expanded and enhanced by the presence of Dr. Gerald Marten. Gerry Marten pioneered the production and application of larvivorous copepods as an effective biocontrol agent for container-breeding mosquitoes. During his six year tenure at New Orleans Mosquito Control, he was also responsible for the development of larvicidal algae as a mosquito larval control agent. Additionally, he introduced the use of juvenile turtles as an effective mosquito control agent in confined water-holding areas. Gerry Marten has accepted a full professorship position at a University in Koba, Japan. We will miss his expertise and his contacts with biological control researchers around the world. We will remain in contact with biological control personnel in other states, Honduras, Israel, Indonesia and Viet Nam. We will continue to work with these countries to foster the use of biological control agents and cooperate with these groups to develop new and effective biocontrol agents.

Successful mosquito control is dependent upon the efforts of many individuals that dedicate their time and efforts into building a program that is cost effective, responsive to the public and safe for the environment. Source reduction is the most effective mosquito control methodology that any program can employ. In times past when we were more optimistic, we called source reduction activities, permanent control. Not all source reduction work is permanent, but as compared to using repeated pesticide applications the management of the mosquito breeding habitat is infinitely more effective. The Mayor of the City of New Orleans, the Chief Administrative Officer, the Administration, the City Council, the Mosquito Control Board Members and the citizens of the City of New

Orleans are unanimous in their support of the "least toxic" mosquito control efforts of our program. We are committed to the continuation of these efforts and we thank our supporters for their encouragement.

We would like to express our condolences on the passing of Mr. George W. Parker, Jr. on May 9, 1995 and recognize his thirteen years of dedicated service as a member of the New Orleans Mosquito Control Board. The memorial included in this annual report will recognize the contributions of Mr. George Parker to the citizens of New Orleans by his years of service on the Mosquito Control Board.

In Memorium

George Washington Parker, Jr.
April 9, 1911 - May 9, 1995

GEORGE W. PARKER JR.

George Washington Parker Jr., a retired teacher and school administrator, died Tuesday of cancer at Pendleton Memorial Methodist Hospital. He was 84. Mr. Parker was born in Napoleonville and lived in New Orleans for 51 years. He received a bachelor's degree from Dillard University and a master's degree from Atlanta University and also studied at Tulane, New York and Louisiana State universities. He was a staff sergeant in the Army during World War II. He was the former alumni secretary of Dillard University, organizer of the Division of Continuing Education at Southern University at New Orleans, former principal of Moultrie High School in Georgia and former state director of fine arts in Georgia. He was a member of Bethany United Methodist Church, Phi Beta Sigma fraternity, the Kiwanis Pontchartrain Club and the New Orleans Mosquito Control Board. Survivors include his wife, Carrie Biggs Parker; a son, George Washington Parker III; a daughter, Danetta Parker Saul; three brothers, Warren, William and Lloyd Parker; four sisters, Estoria Thompson, Blanche Hollis, Amanda Bowers and Angnetta Burroughs; and four grandchildren. A funeral will be held Saturday at 11 a.m. at Lawless Memorial Chapel on the Dillard campus, 2601 Gentilly Blvd. Burial will be in Mount Olivet Cemetery.

Be it resolved that the members of New Orleans Mosquito Control Board express their condolences on the passing of Board Member

Mr. George W. Parker, Jr.,

and recognize his many years of dedicated service to the New Orleans Mosquito Control Board. Mr. Parker, appointed by Mayor Dutch Morial in 1982, often offered thought provoking and challenging ideas. He was unselfish and frequently reminded us of the importance of recognizing the accomplishments of others.

ENTOMOLOGICAL REPORT -

MICHAEL CARROLL

January, 1995 was unseasonably warm. January and February are usually the peak months for Culiseta inornata (winter mosquito); however, this species represented only 5% of January's New Jersey light trap catch and 7% of February's catch. This is the sixth winter that temperatures in the city have not gone below 30° F (major freeze in 1989). Although Aedes albopictus (Asian tiger mosquito) is not attracted to our light traps, citizen complaints revealed the presence of these adults indoors in January--can you spell diapause? As is usually expected, Culex resturans (the "winter sal") was the dominant species during the first two months.

Activity greatly increased in March with a large brood of the fresh floodwater mosquito, Aedes vexans. High rainfall (10" versus the 102 yr. 5"), a 0.8:10 male/female ratio and larval collections confirmed local breeding. In past years, it has not been uncommon for large numbers of this species to "migrate" in from up to hundreds of miles from here. Warm temperatures and increased human activity required ground and aerial adulticiding as well as larviciding.

April was an equally interesting month, entomologically speaking. Coquillettidia perturbans (the salt and pepper mosquito) was our majority species. This univoltine species (one brood per year) had disappeared from our collections by June. Very high male/female adult ratios at two light trap locations allowed us to find and eliminate some major breeding sites (typically fresh water cattail wet areas). Journal reports show that Eastern Equine Encephalitis (EEE) has been isolated from females of this species, but its role in transmission is yet unclear. Warmer weather zapped Culex resturans from 30% the previous month to 4% this month.

Record rainfall in early May (18-21" in one 24 hr. period!) produced more large broods of Aedes vexans. Rapid and aggressive larviciding response by our field personnel successfully abated

what could have been a major pest mosquito problem. The large increase in water volume in impounded fresh marshes diluted the natural aquatic predator populations, allowing Anopheles crucians and Culex salinarius to dominate the month's catches.

The Ae. vexans "echos" from the May rains kept the populations of this species above normal through June, July and August. By July, heat and high densities of aquatic predators controlled most of our "natural" species. The major problem species was Aedes albopictus, a serious container breeding pest and potential disease problem. Although not attracted to visible light traps, two-thirds of our traps caught this species where they were likely resting.

Cooler September temperatures brought the return of Culex salinarius. Near drought conditions kept most other species in abeyance, resulting in a "quiet" month.

October and November saw large broods of Aedes vexans, Ae. sollicitans (saltmarsh mosquito) and Culex salinarius. High winds kept us from adulticiding on several occasions; however when we were able to get the trucks and aircraft out, the treatments were very effective.

Fortunately, December temperatures were unseasonably cold and winds brisk, with lows in the mid to low 30's on about one third of the nights. This gave the administrative staff time to whittle down the mounds of "back burner" paper piles that had accumulated for months.

FIELD OPERATIONS -

STEPHEN SACKETT

Looking back to 1994 with the problems of SLE in New Orleans, one of the major goals for 1995 was to reduce the probability of a similar outbreak occurring again. The flood of May '95 did nothing to ease our anxiety, with over 20" of rain falling during a 3-day period. Many of the elevated housing projects which were foci for the '94 SLE transmission were flooded, significantly increasing the habitat for Culex quinquefasciatus. "Quink" larvae were also collected from open fields where decomposing organic material formed an attractive hay infusion. Larviciding and adulticiding activities were pushed into high gear, even incorporating personnel from HANO (Housing Authority of New Orleans) to assist in inspecting and treating the city housing developments. Other mosquito species, including Aedes albopictus, Ae. vexans, Cx. Nigripalpus, Cx. Salinarius, and Anopheles crucians, also showed elevated populations resulting from the floodwater.

Container-breeding mosquitoes, primarily Ae. Albopictus, continued to reign as the dominant urban pest mosquitoes in New Orleans. Larval and adult albopictus were field-collected every month of the year with the mild winter that we experienced. Source reduction and public education were our primary weapons against this species, but hand-held ULV foggers with Permanone (permethrin) were utilized in some yards where mosquito populations were high.

The state program to centralize and recycle waste tires was made a reality this year, utilizing the $2 per tire fee collected by DEQ to handle parish and residential tires, promiscuous tire piles, and roadside clean-up. Contractors appear to be doing a good job in eliminating the major tire sites, but the City does not yet have a system to pick up waste tires from individuals. Residential tires must be delivered by the owner to one of three holding areas in the City, making it difficult for the program to have a significant impact on back-yard mosquito breeding.

New Orleans Mosquito Control Board personnel participated in numerous events at the Audubon Zoo, City Park, universities and

other environmental gatherings, educating the public about mosquito control techniques and demonstrating the various biological control agents that we utilize. Cyclops, native minnows, Toxorhynchites, and turtles were all viewed with amazement as they devoured larvae by the hundreds. We stress that environmentally-friendly methods are used whenever possible, and encourage homeowners to participate in reducing mosquito breeding.

ENCEPHALITIS SURVEILLANCE -

C. J. LEONARD

St. Louis Encephalitis is a viral disease that has symptoms similar to influenza in most cases. The disease has no cure and is fatal in approximately 5% of cases; the very old and the young are at greatest risk from this disease. Birds are the normal hosts. Mosquitoes transmit the virus from bird to bird and occasionally to humans. The Mosquito Control Board had conducted a survey of bird blood for the past 28 years as an early warning of virus activity.

Wild bird surveillance was not able to predict St. Louis Encephalitis activity in New Orleans during 1994. Continuing urbanization of Orleans Parish has made wild bird sampling ineffective. Sufficient quantities of wild birds were not being captured in the center of the City. After meetings with the State Laboratory, and the Centers for Disease Control, the surveillance program was redesigned to solve this problem.

Sentinel chickens were used as the primary surveillance tool. Cages were constructed of coated wire. Each cage held four chickens in separate compartments. Keeping the chickens in separate compartments eliminated the chickens preying on each other. Automatic feeders and waterers were provided.

Since the 1994 outbreak was caused by mosquitoes breeding under

buildings in the City's public housing projects, we sought help from the Housing Authority in placing the sentinel birds. The Housing Authority agreed to place birds under some of the buildings. Some cages were built for this purpose, but the Housing Authority changed their minds, and other arrangements had to be made. We suddenly had no locations to put our sentinels.

The New Orleans Fire Department was very helpful. They allowed us to place sentinel birds at 12 Fire Stations around the parish. Fire Department personnel helped to care for the chickens, and kept them even though we had some problems with the cages. We are grateful to Chief Warren McDaniel and Captain Harold E. Funck for their assistance.

We had intended to use the comb stick method of phlebotomy that was recommended by the CDC. The comb of the chicken is stuck with a lancet and blood is collected on a paper strip. This is a fast and easy method that can be done with very little training. The State Lab did not accept this method, so the blood was collected the old way with a syringe.

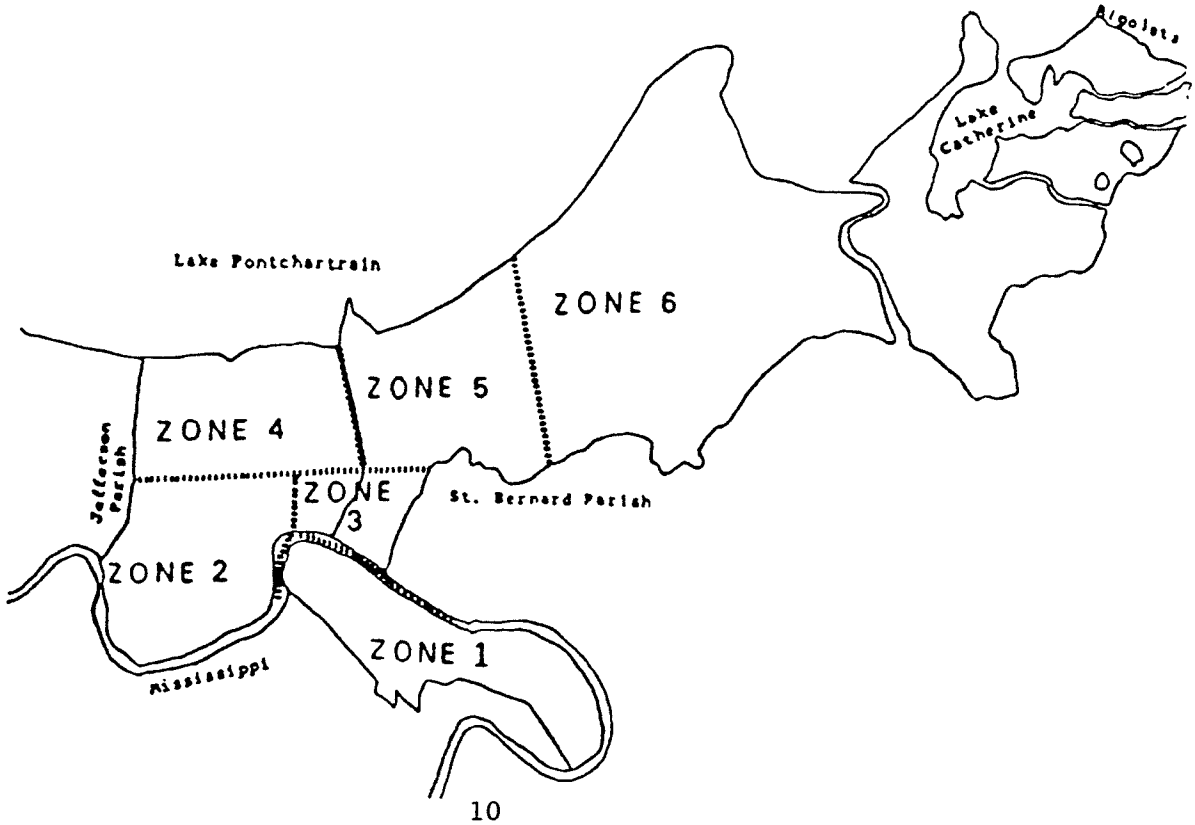
Two summer inspectors were trained in phlebotomy and assigned to this program. Wild bird traps were checked five days per week, and the chickens were bled each week. The wild bird traps were reduced in number and eventually eliminated. The chicken cages needed to be checked at least twice each week to maintain their food and water. At some locations the landowners would care for the birds; at others they would do nothing. Finding locations for traps was difficult in urban New Orleans.

Eighteen chicken cages were deployed in Orleans Parish. Locations were selected for proximity to past virus activity. Nine hundred three (903) samples were tested this year; eight hundred nine (809) were sentinel birds. One positive SLE sample from an adult female sparrow was found on June 6. There was no other evidence of virus activity this year.

The change from wild bird sampling to sentinel birds should provide sufficient samples from the urban areas to warn us of virus activity. The wild bird traps will be discontinued; we will deploy additional sentinel birds next year.

1995 ENCEPHALITIS SURVEILLANCE

SPECIES		Z	O	N	E			
	1	2	3	4	5	6	Tot	Pos
BLUE JAY		2	1		1		4	
BRONZED COWBIRD		2			5	1	8	
BROWN HEADED COWBIRD		3			1	1	5	
CHICKEN	138	222	129	234	58	28	809	
MOCKINGBIRD			1		4		5	
MOURNING DOVE		2	6		1	1	10	
RED WING BLACKBIRD					10		10	
SPARROW		12	16	5	10		43	1
OTHER					8	1	9	
TOTALS:	138	243	153	239	98	32	903	1



SOURCE REDUCTION -

BROOKS HARTMAN

Source Reduction personnel were assigned to the City Park Dredge project for most of 1995. In June, personnel assisted Boh Bros. Construction Company in the placement of 3,500 pound sand bags at two locations within the lagoon system, between Dreyous Drive and Victory Avenue. This sand bagged area has worked well as a containment area for silt-laden effluent that has been pumped in with the amphibious excavator and dredge head attachment since dredging commenced in July.

Dredging will bring the lagoon back to the original depth improving drainage, thus reducing mosquito breeding habitat. In addition to improving the water quality, it will allow the new fish population to feed on mosquito larvae.

Dredging is being conducted at a moderate pace to insure that most silt material is being removed from the lagoon floor. At this point, we can report that dredging operations in the City Park Lagoon have been a huge success thus far. Dredging will continue into 1996 until completed.

The backhoe and dozer were also active in area R-1 (Michoud Blvd., I-10 Service Road-Lake Forest Blvd., and Oak Island Apartment Complex). As reported last year, this area is about 150 acres in size and has been a mosquito breeding site for many years. The R-1 Area has good drainage at this time, but will need additional ditching in the future.

About 600 mosquito breeding automobile tires were removed from the R-1 Area and disposed of. Hopefully, efforts in the R-1 Area will reduce mosquito populations as this area is near schools, shopping centers, commercial and existing residential and other proposed developments.

Monitoring of all source reduction sites in Orleans Parish will be done on a regular schedule during the coming year with the assistance of the inspection crew.

AVIATION OPERATIONS -

JOSEPH RIEDL

Aircraft missions increased again this year in the Britten Norman (twin-engine) Islander and the Grumman (single-engine) Ag-Cat. Most of the adulticiding was conducted over the New Orleans East area and extended to Fort Pike, Lower Algiers was also covered. Malathion at 3 ounces per acre was dispensed from the Islander and Scourge at 1 ounce per acre used in the Ag-Cat. No serious problems were encountered with the machines and they remain ready to spray should be need arise. The airplanes were also used on surveillance, test and proficiency flights.

Aircraft maintenance continued throughout this period. Annual inspections (as required by the F.A.A.) were completed. The heater on the Islander was overhauled. On the same airplane, the wheels were disassembled and checked. Several bearings were replaced and the nose wheel was stripped and repainted. An oil temperature gauge was replaced and the communication radios were repaired. The R.H. generator and voltage regulator was replaced and all new ignition harnesses were installed on the engines.

Our shop was also busy working on the Ag-Cat. Both batteries were replaced in it and a new communications radio was installed. Several airworthiness directives and service bulletins were complied with on both airplanes, as well as routine cleaning and preventive maintenance. The spray systems were cleaned and maintained and calibration and droplet tests were routinely carried out. Nozzle tips were replaced at regular intervals. The airplanes are in a excellent state of maintenance.

Before the spraying season started, as is usual, the public was notified of our continued intentions to adulticide in the Orleans areas and insurance renewal was acquired. Flight physicals were taken and cholinesterase checks made. Pilot proficiency was maintained, surveillance flights for obstructions were made and all necessary paperwork was checked to be up to date. The airplanes were ready when needed. This was in line with preparations made every year.

At the hangar, the building was kept clean and in order. Ground support equipment was regularly checked and maintained. Spare parts and hardware were stored for easy access and grass was cut and the trees and shrubs trimmed. Scheduled door lubrication requirements were met.

Aircraft records and files were kept up to date. Manual revision and inspection micro fiche were inserted as received. I attended the Louisiana Mosquito Control Workshop to renew my aerial applicator's license, the Gulf South Aviation Maintenance Seminar to renew Inspection Authorization and the Islander's Engineering Course.

PUBLIC EDUCATION -

C. J. LEONARD

At the New Orleans Mosquito Control Board, public education efforts are mainly directed at schools. A letter was sent to 225 public and private schools in Orleans Parish. This letter informed science teachers about the Mosquito Control program and educational material that we can make available to schools. Schools can receive, on request, a VHS tape containing five programs.

"THE MOSQUITO PROBLEM"
"INTEGRATED PEST MANAGEMENT"
"MOSQUITO CONTROL SCIENCE AT WORK"
"COPEPODS - BIOLOGICAL CONTROL THAT WORKS!"
"FORMOSAN TERMITE - THE UNSEEN DESTROYER"

Teacher's guides for elementary and high schools are also available, along with mosquito eggs and food, and instructions on how to hatch the eggs and grow the larvae in the classroom. The price of videotapes is now low enough that the schools are told to keep the tape in hope that they will use it several times.

A presentation on Public Education, prepared for the LMCA workshop, was presented on February 22, 1996. The presentation covered the use of print and video media in public education and dealing with the public, specifically, how to handle telephone complaints. Video examples were used to illustrate the talk.

A Public Education display was set up for several events, including the Earth Fest at Audubon Park, the Spring Garden Show at City Park, two town meetings and the Louisiana Science Teachers Convention. The Science Teachers Convention was a good opportunity to create awareness among the teachers that help us to deliver our message.

The display consisted of a display board, a video on biological control and brochures on mosquito control. Several new custom made plexiglass tanks were used to display copepods, turtles, mosquito fish, and predaceous mosquitoes. A video camera was included to project pictures of copepods on a monitor. The displays were staffed by several of the inspectors, and were very well received.

Video of several ongoing projects was done. In addition to video and slides of termites, video and slides of the dredge project in City Park was done.

Several classes visited the facility this year, including a continuing education class for physicians from Tulane University. The classes were held in our training room and the display including various predators was sometimes included.

A video about butterfly rearing and public education efforts was prepared for the Director to use at a meeting. Larvae and pupae in the lab was also photographed.

Copies of several of our video programs were made for the Government Access Channel.

Slides were sent to Canada and the United States to be used in several publications. The original slides were copied and the copies were sent along with a bill for copying and handling.

A public education tape was prepared for the Rodent Control Division of the Health Department. The program was written by Rodent Control employees, and videography and editing was done by

Mosquito Control. The 10 minute video was completed in about three working days.

The slide files were rearranged and cataloged in slide boxes. The old system where every slide was described and placed on video proved too cumbersome to maintain. The new system divides the slides into 160 categories. Most categories contain just a few slides, while some categories contain up to 60. This system will be much easier to maintain while still making it simple to locate a slide.

A camera and monitor was set up for the dredge which will allow the operator to see what is happening at the end of the dredge pipe, 1500 feet away. Without a camera to monitor the flow, a man is required to be at the end of the pipe to communicate with the operator by radio. I used our 8mm camcorder, and purchased a monitor. A camera will be requisitioned to replace the one that is now being used on the dredge project.

Specifications were written for new computer equipment to be used by the staff and public education. Existing computers are quite old and have been in need of replacement for some time. For instance, the central processing unit (CPU) in some of our IBM compatibles are not 486, not 396, not even 286, they are 8088 processors. New computers have many uses in public education. Computers are capable of controlling video machines and manipulating video data in ways that other machines can not do. Specifications were written in February. However, because of delays in purchasing and the new computer based purchasing system, we are still using our old computers.

BIOLOGICAL CONTROL -

GREGORY THOMPSON

Copepods in Tires

Previous research has demonstrated that larvivorous copepods (cyclops) provide an effective control for container-breeding mosquitoes. Despite their known effectiveness at providing mosquito control, the costs of the labor-intensive activity of individually treating each tire has greatly limited any practical use of cyclops throughout the city.

This year we examined the persistence of cyclops beyond a single mosquito breeding season and the broadcast spraying of cyclops. Multi-year control of mosquitoes from a single treatment and/or an inexpensive means of treating entire tire piles would greatly lower the overall costs of treatment.

We first looked at the question of whether a single treatment of cyclops can provide multi-year control of mosquitoes. Six years ago, two tire piles located in a wooded area of East New Orleans received an introduction of Macrocyclops albidus. These tire piles remained untouched, except by the rooting of armadillos and wild pigs, until this summer. We examined the two tire piles for the presence of cyclops and found cyclops to be present in 84% of the water-containing tires. In contrast, an untreated control tire pile used as a monitor had cyclops in only 4% of its tires. These were natural populations, probably introduced from the surrounding ditches during occasional flooding. These results demonstrate that a single introduction of cyclops has the potential of providing multi-year mosquito control.

Cyclops have, in the past, been introduced into containers, such as tires, by pouring or by using a hand sprayer with its nozzle removed. Use of this labor-intensive means of cyclops introduction was considered necessary because any nozzle capable of creating the high pressure needed to broadcast cyclops over a wide area resulted in the death of the cyclops.

This year, using a truck mounted "Scorpion" sprayer on loan from St. Tammany Parish Mosquito Control, we successfully treated tire piles with cyclops through broadcast spraying. The Scorpion sprayer was successful in delivering living cyclops to tires because a stream of cyclops-containing water was dispersed into an existing moving stream of air. In tire piles, mosquito breeding and larval development has been shown to occur in only the top 3 layers. Cyclops were found to be present in 98% of tires in the mosquito production layers (with an average of 5 adults per tire) after a pile of 500 tires received a spraying with cyclops from only 1/2 of a production tray (less than 10,000 adult cyclops).

These results suggest that a single treatment of cyclops broadcast from a truck-mounted sprayer can provide low cost mosquito control in tire piles. Our biological control lab is capable of producing enough cyclops to treat 25,000 tires per month.

Juvenile Turtles

Predation by juvenile turtles on Culex quinquefasciatus larvae can substantially reduce the production of these mosquitoes from septic ditches. Turtles also show great promise in controlling Aedes aegypti (yellow fever mosquito) when the turtles are introduced into water-holding facilities such as cisterns. In many places around the world where water must be stored for use, people must choose between having water with its associated container-breeding mosquitoes or no water at all. The presence of a single turtle in a water-holding container can eliminate mosquito larvae from that container.

However, because turtles are alternate hosts for Salmonella, it is conceivable they could contaminate the water and replace one nuisance/health problem with another. Last summer we initiated an evaluation of Salmonella in turtles to determine whether we can expect a Salmonella problem if turtles are used for mosquito control.

We have concluded (April, 1995) that it is high unlikely that the use of turtles for mosquito control will create a risk of human Salmonella infection. A human must simultaneously ingest thousands of Salmonella bacteria to become infected, while worst-case concentrations of Salmonella in ditches or portable water

containers should be so low that no more than a few Salmonella cells could be ingested.

Nonetheless, it will be prudent to monitor Salmonella where turtles are used for mosquito control, at least until we have more information on what happens under field conditions.

Larvicidal Algae

This year, the potential for mosquito control of eight different species of algae was examined. Two species, Scenedesmus abundans and Kirchneriella irregularis, prevented adult development when offered as pure cultures. Field tests are planned to introduce each alga into mosquito breeding containers and to determine the conditions necessary for its maintenance at high concentrations.

Mosquito Colonies

We have continued to refine and streamline our colony maintenance procedures. Colonies of Aedes aegypti, Ae. albopictus, Anopheles quadrimaculatus, Culex quinquefasciatus are constantly maintained for research purposes. A manual, including previous and current mosquito rearing techniques, is nearing completion. This manual will provide both recipes (how-to's) for colony maintenance and an institutional memory of previous techniques.

Public Outreach

Our bio-control staff have had an opportunity this year to participate in important public education efforts by staffing the traveling mosquito control display and presenting information on the biological control of mosquitoes. Public interest in how mosquitoes can be controlled is strong, particularly in how they can be controlled biologically. Our already excellent educational display was made even better through the addition of raised plexiglass cages. These cages made for easier viewing of our biological control animals. Easier viewing was very important because our booth was always the most visited display at public events such as the Audubon Zoo's Swamp Fest and the Garden Club's Fall Garden Show.

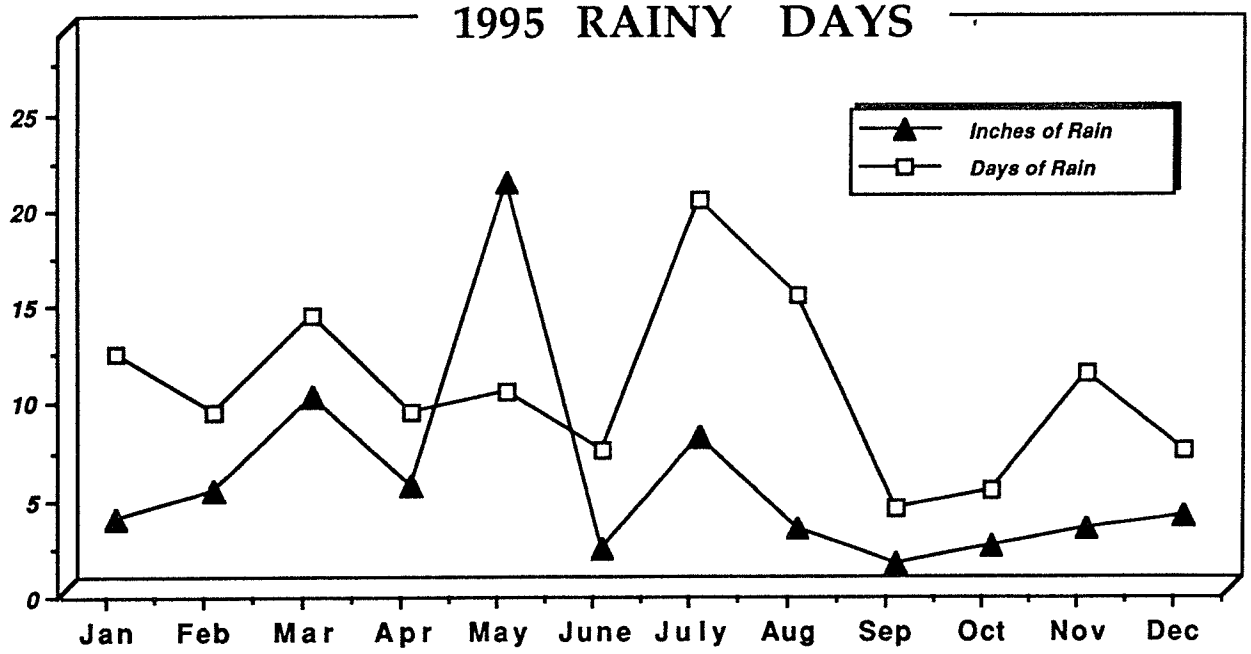
Butterfly Rearing

In cooperation with Audubon Zoo's "Butterflies in Flight Exhibit", we have instituted a butterfly rearing program which has provided the staff with additional knowledge on insect ecology and has the potential of generating a continuing source of revenue. We have established reproducing laboratory colonies of two local butterfly species. The well known Monarch (Danaus plexippus) and the Gulf Fritillary (Dione vanillae). The Gulf Fritillary is a beautiful local butterfly with wings that are brilliant orange on the top and silver on the bottom. We are working with butterfly gardeners and native plant societies to plant butterfly nectar and larval host plants. Little work has been published on the development and maintenance of laboratory colonies of butterflies. Our work will be useful to colony operators in general and should be extremely useful to those groups planning to establish laboratory colonies of threatened or endangered species of butterflies.

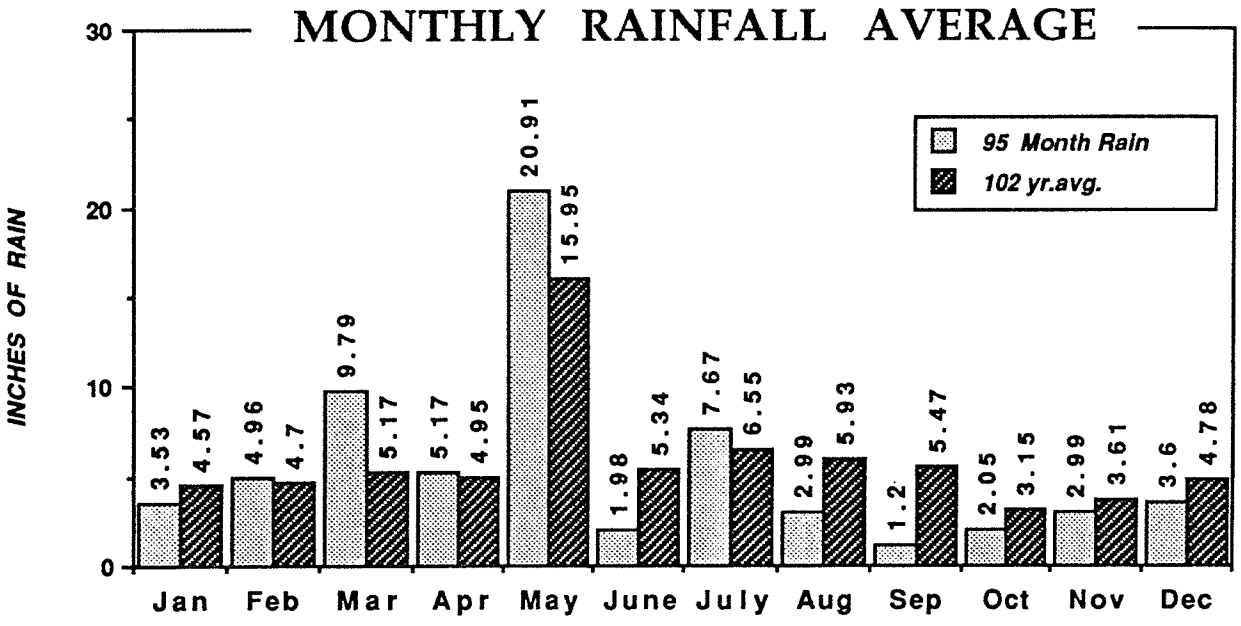
International Cooperation

Due to the departure of Dr. Gerry Marten for a professorship at a university in Koba, Japan, we lost the advantage of his long-term personal relationship with biological control researchers around the world. However, Mieu Nguyen, who accompanied Dr. Martin on a recent trip to Southeast Asia, is still part of our staff. We remain in contact with researchers in Honduras, Israel, Indonesia, and Viet Nam and are looking forward to future cooperative efforts.

* * * *

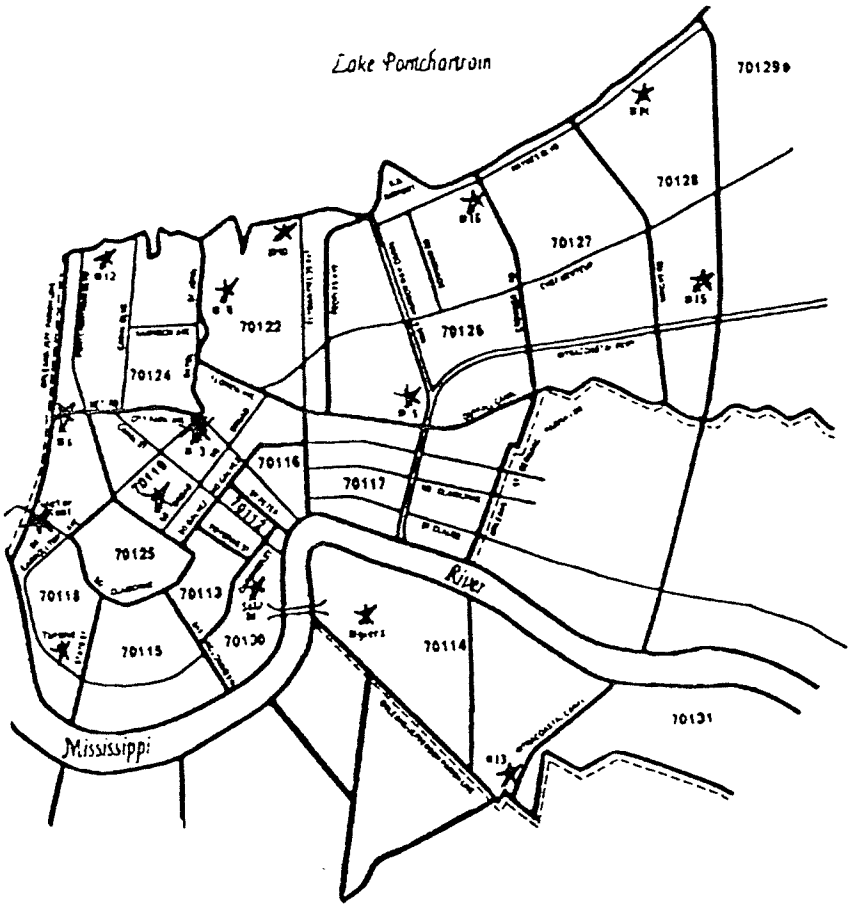


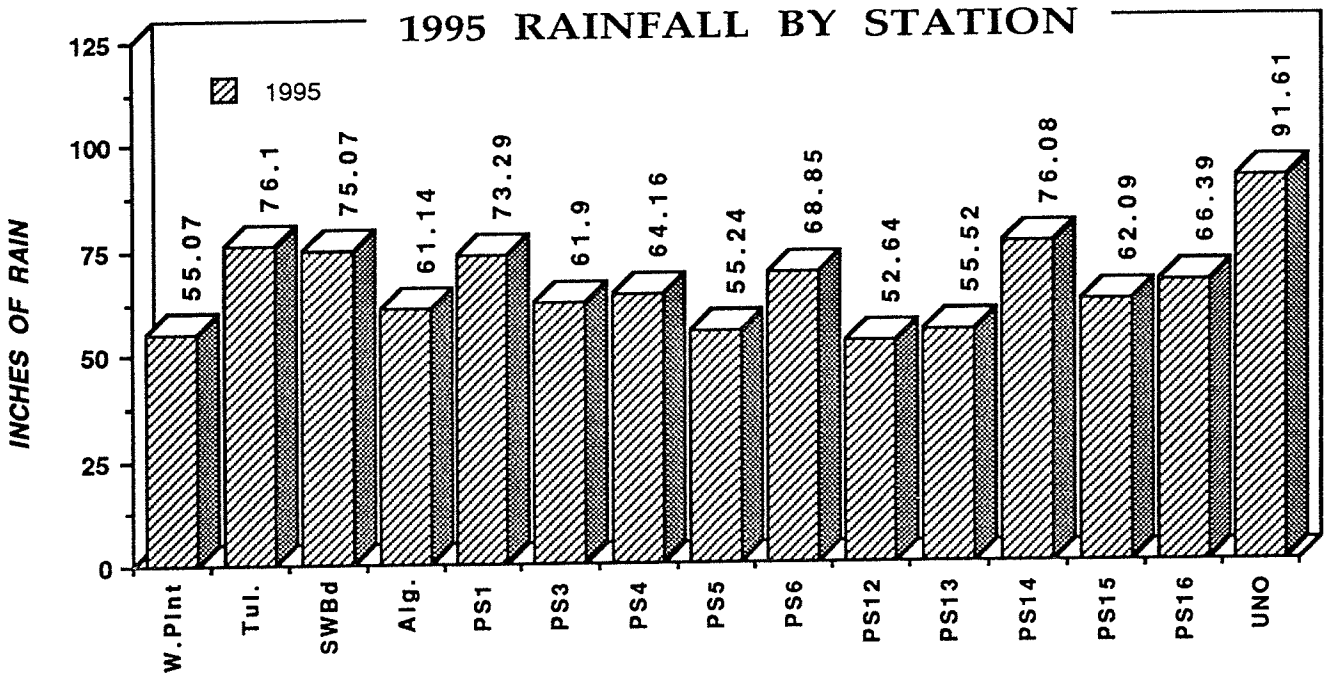
Measurable rain fell on 123 days during 1995. The highest intensity rainfall for a 24 hour period totalled 18.42" and was recorded on May 8th by the UNO gauge.



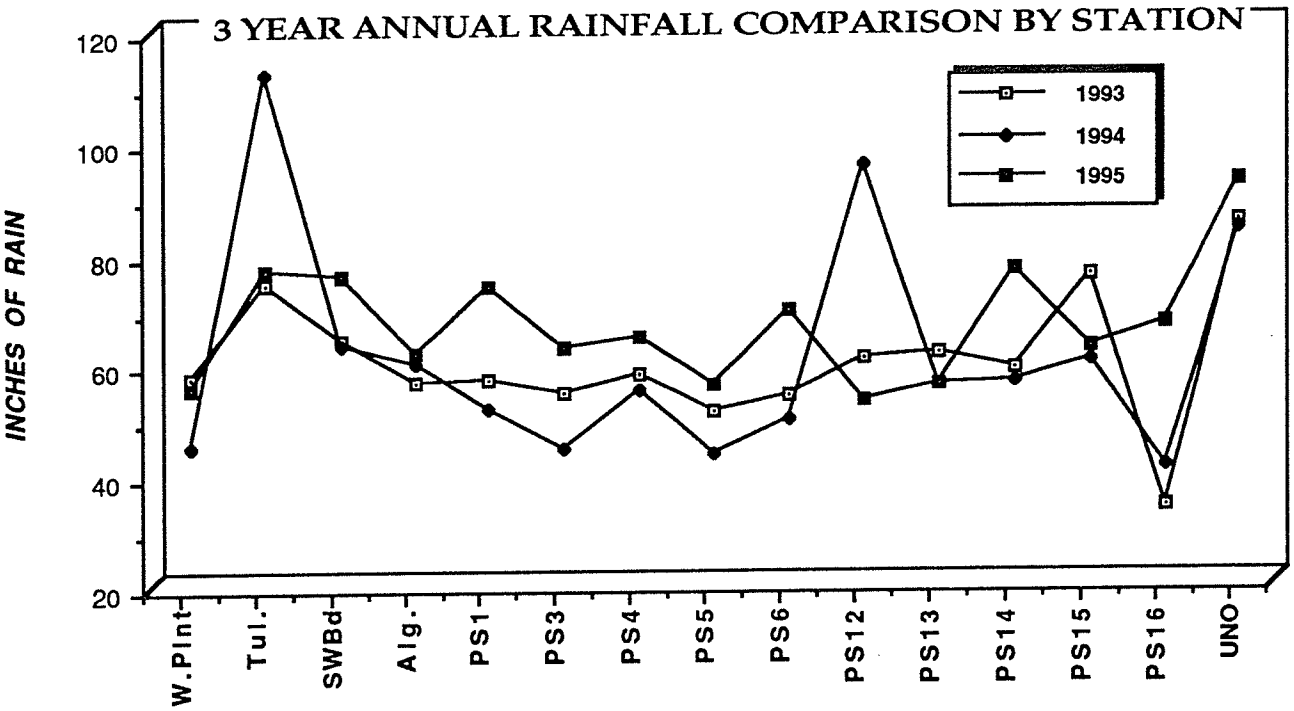
The composite average rainfall of 66.84" for the 12 months of 1995 is 12.48" more than recorded in 1994 and 7.64" above the 102 year average.

STATIONS	LOCATION
N.O. Water Plant	8801 Spruce St.
Tulane University	8623 St. Charles Ave.
Sewerage & Water Board	625 St. Joseph St.
Algiers Water Plant	1120 Elmira St.
D.P.S. No. 1	2501 So. Broad St.
D.P.S. No. 3	2251 No. Broad Ave.
D.P.S. No. 4	5700 Warrington Dr.
D.P.S. No. 5	4841 Florida Ave.
D.P.S. No. 6	345 Orpheum St.
D.P.S. No. 12	7223 Ponchartrain Blvd.
D.P.S. No. 13	4201 Tall Spruce Dr.
D.P.S. No. 14 (Jahncke)	12200 Hayne Blvd.
D.P.S. No. 15	Gulf Intracoastal Waterway
D.P.S. No. 16 (St.Charles)	7200 Wales St.
U.N.O.	University of New Orleans-LakeFront





The average precipitation recorded at the 15 stations determines the city's daily rainfall as measured by the Sewerage and Water Board.



The average annual rainfall in 1995 was 62.19" as compared to 53.88" in 1994 and 59.55" in 1993.

1995 Annual Light Trap Collection

#	Location	Male	Female	Aes	Aev	ANc	ANq	Cxq	Cxs	Uran	Cxe	Cxn	Csl	Cxr	Ae	Cqp	Ps	Days
1	Willow Drive	314	7111	0\5	42\1900	16\210	0\161	0\6	211\3974	7\99	0\28	0\117	3\156	34\437			0\14	102
2	Tall Pines	470	2928	0\1	91\1542	1\26	1\27	0\2	181\658	0\41	2\8	6\25	2\45	182\537	0\1		4\16	102
3	Norland Avenue	230	1304		70\456	5\27	4\11	0\6	81\130	1\544	0\2	1\10	1\12	65\97	1\6		0\1	102
4	Olivier Street	248	1140		50\515	4\29	2\18	3\35	150\299	0\19		4\9	1\13	28\193	3\5	0\3	3\2	102
5	Seine Street	81	725		23\423	1\6	0\3	0\5	38\157	0\12		0\4	2\14	10\85	1\6	0\3	2\5	102
6	Rodent Control	132	398		30\162	1\20	1\8	4\6	67\107	0\21		1\1	1\7	25\58	1\5		1\3	102
7	Louire Street	19	59		12\37			0\1	7\8	0\1		0\1	0\6	0\5				102
8	S Saratoga Street	45	151		10\62	0\1		0\2	32\36	0\7	0\1	0\1	0\5	3\32	0\2	0\1		102
9	LA Avenue	438	1217		89\512	3\26	0\1	15\102	258\327	0\13	0\1	1\5	9\15	52\206	6\8		1\1	102
10	Hillary Street	99	543		27\292	2\13	0\4	3\13	44\96	0\6	0\1	0\2	1\15	20\89	0\6	0\2	2\4	102
11	Audubon Zoo	444	2477		114\1171	18\44	5\75	5\83	230\666	1\72	1\34	5\48	2\25	49\233	7\9	0\3	7\14	102
12	Trafalgar	251	2676		75\1801	5\39	0\19	0\25	132\418	0\15	0\12	0\11	0\45	36\272	3\5	0\3	0\11	102
13	City Park	266	1103	0\1	149\604	4\18	2\22	2\7	65\155	2\46	0\8	3\22	0\29	36\169	2\13	0\1	0\8	102
14	S. Genois Street	13	67		6\40	1\2	0\1	1\3	2\7					2\8	0\6			102
15	Longuevue Grden	415	2551		204\1385	11\40	0\9	2\44	133\567	6\37	2\20	8\36	0\49	49\353	0\8		0\3	102
16	Killdeer Street	319	895		107\354	8\23	0\25	0\7	135\214	7\47	1\3	0\9	6\39	51\165	1\3	0\3	3\3	102
17	Louisville Street	226	1155	0\1	114\754	3\17	0\28	1\4	65\144	5\26		1\7	6\22	27\137	4\7	0\5	0\3	102
18	Pontchartrain Pk	50	248	0\1	19\159	1\1\		0\2	21\53	0\1	0\2		0\2	8\26	1\0		0\1	102
19	Acacia Street	81	224		36\155	2\3		1\8	30\20	0\11	0\1	0\4	1\3	4\7	7\10		0\2	102
20	Werner Drive	445	1143		79\635	5\11	2\2	18\17	282\265	1\22	1\16	32\71	0\17	25\74	0\10	0\1	0\2	102
21	Lil A'Corn	306	1698	0\1	94\883	9\39	0\4	1\11	135\313	1\33	0\1	3\7	7\180	55\202	0\7	0\3	1\14	102
22	Vincent	1004	4825	0\2	321\1840	28\155	4\50	0\14	368\1103	5\197	0\20	29\57	6\92	73\605	0\4	162\606	8\79	102
23	Vil. DeL'Es.	260	1697		110\873	5\26	2\30	0\1	61\396	0\29	0\10	1\24	4\51	69\178		6\63	2\11	102
24	Resthaven Mem.	225	2153	0\6	10\245	8\41	0\51	13\28	168\1173	1\72	0\5	0\25	5\49	19\416	1\11	0\17	0\11	102
25	Joe Madere's	469	4589	0\11	78\269	79\447	0\73	0\6	228\2132	17\1085	5\124	42\140	0\17	19\247	0\8	1\13	0\17	102
26	Lk, Barrington	152	317	0\1	71\150	1\9	0\1	0\1	62\64	0\20		0\4	5\19	11\32	2\6	0\4	0\6	102
27	Irish Bayou	322	3364	0\2	33\126	121\802	0\7		114\1211	1\695	0\16	0\25	6\68	45\385	0\3	2\16	0\8	102
28	Ft. Macomb Rd.	523	5547	0\40	93\451	113\2244	0\61	0\1	210\1990	1\196	0\6	2\60	8\89	84\376	7\10	1\6	1\17	102
29	Green Ditch	276	4516	44\194	23\333	84\1855	1\21	0\15	102\1651	0\131	0\11	0\11	0\95	10\116	5\14	4\39	3\36	102
30	Rigolets	284	1978	5\63	43\333	100\488	0\9	0\10	104\791	1\41	0\4	12\25	7\60	10\87	1\29	0\8	1\30	102
31	Lake Forest	815	2968		192\1570	11\157	1\5	0\3	382\707	1\33	1\10	0\15	9\54	204\362	1\7	9\34	4\10	102
32	Oak Island	655	6691		47\562	106\802	32\143		129\566	18\27	0\10	2\44	1\87	49\543		270\3906	1\1	102
33	Brazilliere Island	317	4257	5\145	15\89	117\1529	0\12	0\12	175\1936	1\190	0\3	1\31	0\232	0\19	1\11	0\19	2\29	102
	Total	10194	72715	54\474	2477\20683	873\9150	57\881	69\480	4402\22334	80\3789	13\351	154\851	93\1612	1354\6751	55\224	455\4759	55\365	
	%			0.7	28.4	12.6	1.2	0.7	30.7	5.2	0.5	1.2	2.2	9.3	0.4	6.5	0.5	