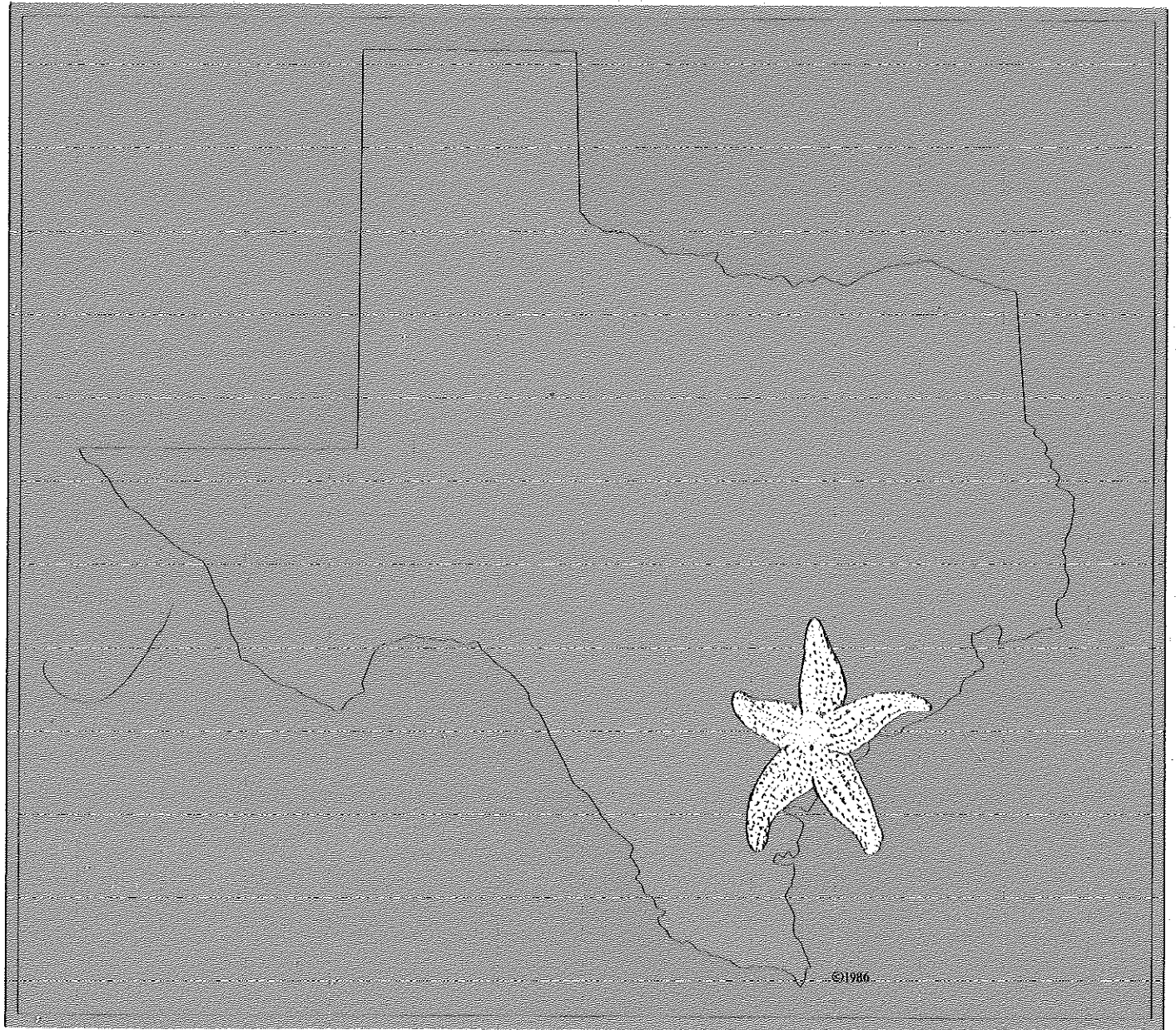


Texas Coastal Cleanup Report



**Marine Debris on the Texas Coast
April 1987, September 1987, April 1988
with Summary Data from other Coastal States
Recommendations and Updates**



**Prepared by
Center for Environmental Education**

© 1988

This report was prepared by:

Kathy O'Hara, CEE Marine Biologist

Linda Maraniss, CEE Director Gulf Coast States Regional Office

Suzanne Iudicello, CEE Legal Associate

Rose Bierce, CEE Director of Publications

Jill Perry, CEE Art Director

Valerie Thatcher, Layout and Production

Our thanks to the Texas Coastal Cleanup Steering Committee for their review and comments on the draft report.

We especially wish to thank the members of the Offshore Operators Committee who collectively provided support for publication of this report:

Amoco Production Company

Chevron, U.S.A., Inc.

Cities Service Oil and Gas Corporation

CNG Producing Company

Conoco, Inc.

Exxon Company, U.S.A.

Marathon Oil Company

Mobil Exploration and Producing U.S.A., Inc.

Shell Offshore, Inc.

Standard Oil Production Company

Sun Exploration and Production Company

Tenneco Oil Exploration and Producing

Texaco, Inc.

In addition, we owe our gratitude to the following foundations, corporations, and state agencies who assisted CEE in making the 1987 Texas Coastal Cleanup Campaign a successful reality:

Rockwell Fund, Inc.

Dow Chemical, U.S.A.

Trull Foundation

The Eugene McDermott Foundation

ARCO Oil and Gas Company

The LBJ Family Foundation

Shell Oil Company

Harris and Eliza Kempner Fund

Ruth McLean Bowman Bowers Foundation

Harry S. and Isabel C. Cameron Foundation

Lower Colorado River Authority

Tandy Corporation

Exxon Company, U.S.A.

The Society of Plastics Industry, Inc.

Cities Service Oil and Gas Corporation

Sun Exploration and Production Company

Boating Trades Association of Texas

Swift Independent Packing Company

Texas Adopt-A-Beach Program

Texas Hotel and Motel Association

Waste Management, Inc.

TABLE OF CONTENTS

Executive Summary	3
Foreword	9
Acknowledgements	11
Introduction	13
Organization of the Texas Coastal Cleanup	17
Cleanup Activities on September 19, 1987	21
Results	25
Sources of Debris	32
Distribution of Debris	41
Drums	46
Entanglement	47
Results of the April 25, 1987 Great Texas Trash-Off	50
Optional Cleanups 1987	56
Results of the April 23, 1988 Great Texas Trash-Off	59
Comparison of Texas Debris from September 1986 to April 1988	67
Other Statewide Cleanups	69
Conclusions	83
Recommendations	86
Proclamations and Recognition	105
Appendices	i

EXECUTIVE SUMMARY

The Center for Environmental Education (CEE), a conservation organization dedicated to protecting marine wildlife and their habitats, organized the largest beach cleanups in American history along the Texas coast in 1986 and 1987. Two important goals of both cleanups were to create public awareness of the problems caused by marine debris, and to collect data on the types and quantities of debris found on the Texas coastline. Both statewide events were coordinated from CEE's regional office in Austin, Texas.

Largely due to the tremendous success of the 1986 cleanup, the Texas General Land Office has launched an Adopt-A-Beach program where volunteers supplied with CEE data cards clean beaches during CEE's annual beach cleanup in September, and two additional times each year. Since CEE's first statewide beach cleanup in September 1986, three additional statewide cleanups have taken place on the Texas coastline: April 1987, September 1987, and April 1988. During these four Saturday morning events approximately 733 tons of debris were removed from Texas beaches.

This report details the results of CEE's 1987 Texas Coastal Cleanup conducted on September 19, 1987 and the results of cleanups conducted under the Texas Adopt-A-Beach program. In addition, data collected from beach cleanups in other states is provided.

More than 7,000 volunteers participated in CEE's 1987 Texas Coastal Cleanup on September 19, at seventeen coastal sites extending from the Louisiana border to Mexico. Volunteers filled more than 17,020 trash bags with an estimated 309 tons of debris. They covered a distance of 157 miles.

Each debris item collected was recorded under the major headings of plastic, styrofoam, glass, metal, paper and wood. A total of 382,878 pieces of debris were recorded. The composition of materials collected during CEE's 1987 cleanup are nearly identical to CEE's 1986 Texas Coastal Cleanup. The total number of plastic items (including styrofoam) collected in 1987 surpassed all other categories, totalling 66 percent of all debris items. Metal and glass items accounted for 11 and 13 percent of the total, respectively. Degradable items of paper and wood were significantly less abundant, constituting 7 percent and 3 percent respectively of all items collected.

Determination of sources of the debris was difficult in that a large portion of the trash collected included bags, bottles, and a multitude of other items that may be generated by either ocean or land-based sources. In order to help identify source of debris, volunteers were asked to record items that had labels or company names. More than 200 foreign label items were recorded. Many of these items can be attributed to dumping by foreign merchant ships. Countries of origin included Arabia, Argentina, China, Denmark, France, Germany, Italy, Jamaica, Japan, Singapore, Sweden, Thailand, United Kingdom, Venezuela, Vietnam, and many other countries.

Several items listed on the data card served as indicators of debris generated by a particular offshore source. For example, items such as hardhats and fishing nets were chosen on the basis of their known association with offshore petroleum and fishing activities conducted in the Gulf. These items were grouped under the categories of cargo, galley-type wastes, operational goods, and fishing gear. Cargo associated wastes which included large pieces of plastic sheeting, wooden pallets, and crates were most frequently at Padre Island National Seashore and the Bay City area cleanups. Egg cartons, milk jugs, and plastic vegetable sacks were categorized as galley type wastes and, as in 1986, were found to be most abundant at Matagorda Island as compared to all other zones. Since Matagorda Island is virtually inaccessible to the public except by boat, the abundance of these wastes at this zone indicates offshore sources. Operational goods included 9-track "write-enable" rings used during seismic recording and other computer activities, hardhats, light bulbs, and fluorescent light tubes, and plastic strapping bands. Again, Matagorda Island had the largest percentage of operational goods. Fishing gear, including nets, buoys, monofilament fishing line, and light sticks, commonly used on shrimp vessels, were recorded most frequently at Port Aransas and Corpus Christi.

In addition to identifying ocean sources of debris, in 1987 several indicator items were used to identify possible land-based sources. For example, plastic tampon applicators and diapers were used to indicate possible sewage-associated wastes although diapers could also be left behind by beach goers. The greatest concentration of sewage-associated wastes were found in Boca Chica and South Padre and could be attributed to either beach goers or to inadequate sewer systems perhaps in areas of Mexico. Another item, plastic syringes, was used to indicate whether medical wastes were a problem in Texas, since they have been a major problem in other areas of the United States.

In addition, although it was not possible to identify a particular indicator item for debris generated by landfills, or entrainment from rivers, a specific incident occurred in 1987 which indicates that entrainment may be a major contributor to the problem.

An industrial plant in Mexico was dumping its trash on the banks of the Rio Grande, and was found to be responsible for hundreds of plastic bags found at the Sabal Palm Bird Sanctuary, near Brownsville. In addition, of the more than 200 items were with foreign labels, 76 percent noted labels from Mexico. This is a problem that has not yet been addressed in Texas--how much debris found in Texas originates from inadequate land-based solid waste disposal practices carried out across the border in Mexico?

CEE's 1986 report addressed the problem of 30 and 55-gallon drums that come ashore on the Texas coastline, but the problem persists. In 1987, Padre Island Seashore staff reported that a total of 120 drums were found on Padre Island National Seashore--10 more than 1986. Seventy-two of these drums contained a chemical but many were not labeled as to what the contents were. Therefore, although educational efforts have been initiated by the petroleum industry to address the marine debris problem, and there has been an overall decrease in activity of offshore petroleum operations in recent years, the problem of drums has not been adequately addressed. For example, it should be determined whether drums are coming from sources other than the petroleum industry.

The entanglement of marine wildlife in debris is a serious problem and was a major focus of the cleanup. During the past two years, 60 sea turtles were found on beaches between Mustang and North Padre Island entangled in debris or were found to have ingested marine debris. The most common items found to cause entanglement were fishing line, nets, vegetable sacks and rope while plastic bags and sheeting were the most common item ingested. Unfortunately, these were also the most prevalent items of debris found during the cleanup. In March 1988, a two year old female minke whale stranded on Matagorda Peninsula was reported to have died due to plastic sheeting in her digestive tract. During the cleanup volunteers reported a dolphin, two sea turtles, more than twenty birds, and numerous fish and crabs stranded on the beach. Entanglement appeared to be the cause of death in several cases.

On April 25, 1987 3,556 volunteers participated in a statewide beach cleanup organized by Keep Texas Beautiful as part of the Texas General Land Office's Adopt-A-Beach program. They covered approximately 150 miles of beach and collected 139.12 tons of debris. A total of 94,147 debris items were recorded. Not surprisingly, the total number of plastic items (including styrofoam) once again surpassed all other types of materials, constituting 58 percent of all debris items recorded.

In addition to participating in CEE's September beach cleanup and Keep Texas Beautiful's April cleanup, participants in the Texas General Land Office's Adopt-A-Beach Program are encouraged to conduct one additional cleanup. In 1987, data was collected from optional

cleanups held at Sargent Beach, Galveston, Corpus Christi, and South Padre. One interesting finding from the South Padre cleanup may indicate the success of a new anti-litter program adopted by Cameron County Parks and Recreation. The percentage of glass found at South Padre had dropped from 37 percent to less than 11 percent in just six months.

Finally, on April 23, 1988, 4,522 volunteers participated in a second statewide beach cleanup organized by Keep Texas Beautiful as part of the Adopt-A-Beach program. They covered approximately 158 miles of beach and collected 159.3 tons of debris. Once again, the total number of plastic items (including styrofoam) was higher than all other types of materials, constituting 63 percent of all debris items recorded.

Data collected during CEE's first statewide cleanup provided the first, most comprehensive assessment of beach debris ever collected in the United States. This information was essential in developing strategies to address the debris problem not only in Texas, but also on a national level. The information was used in Congressional testimony on several occasions and provided documentation supporting the need for U.S. ratification of Annex V of the MARPOL Treaty. Annex V, which will go into effect on December 31, 1988, will prohibit all ships and offshore structures from disposing of plastics into the ocean.

CEE's two-year-old data base on marine debris in Texas will not only serve as a baseline for evaluating the effectiveness of Annex V once it comes into force, but also the results of state and local initiatives to mitigate the debris problem.

Although it will require several years of data collection to determine if any changes have occurred in the types of debris found on the Texas coastline, some interesting trends are appearing in the types and amounts of debris collected. In particular, the majority of debris found on Texas beaches is plastic. It will be of particular interest to note whether the amount of plastics decreases after Annex V comes into effect. In addition, the amount of metal, glass, paper, and wood debris items have shown similar patterns of abundance throughout the four cleanups.

In fall of 1987, 19 states including Texas held beach cleanups during a period designated as COASTWEEKS. Cleanups held in Mississippi, Louisiana, and North Carolina used CEE data cards, or a similar version. Standardized data collection helps to assess the regional variation in coastal debris. Information on local debris problems are important for decision makers because solutions developed in one part of the country may not be applicable in other areas. Therefore, CEE has established a National Beach Cleanup Data Base for all statewide beach cleanups beginning with those conducted during COASTWEEKS '88 (September 17-October 10). Cleanup organizers will be furnished with CEE data cards. CEE will then compile and analyze the results

from all the COASTWEEKS cleanups in a nationwide report. Fortunately, Annex V of the MARPOL Treaty will prohibit the disposal into the sea of all plastics from ships at sea. Although much needs to be done to ensure that Annex V is enforced, the focus of citizen action must now also turn to land-based sources of marine debris. Beach goers, practices at landfills, plastics manufacturing and processing plants, and the technological limitations of our wastewater treatment systems all contribute to the waterborne litter that eventually makes its way to marine and coastal areas.

One way CEE plans to direct citizen and government attention to land based sources of debris is to hold a major conference on the environmental quality of the Gulf of Mexico. Slated for November 1988 in Galveston, the meeting will bring together scientists, agency decision makers, environmental activists, municipal officials and interested citizens.

The positive actions and new programs resulting from the Texas beach cleanups have demonstrated that grassroots citizen action leads to widescale government action--from towns and counties all the way to the Congress. CEE hopes that increasing public awareness of the other sources of debris and pollution in the Gulf, will lead to new efforts to stop land-based sources of beach debris and other types of marine pollutants.

As a result of CEE's 1986 Texas cleanup, twenty-nine recommendations were offered in CEE's 1986 Texas Coastal Cleanup Report with the hope that permanent solutions to the beach debris crisis would result from the cooperative efforts and abilities of all parties involved. Since that time, much progress has been made in Texas and nationwide including U.S. ratification of Annex V, the new Texas Adopt-A-Beach program, and many other programs and activities on the part of federal and state government, industry and other groups to address the marine debris problem. Present governmental issues that should be addressed include special area designation of the Gulf of Mexico under Annex V, improved waste disposal facilities at all Gulf ports, evaluation of state litter laws, expanded and continued support for research, and continued efforts to increase public awareness. The collection of national standardized data over time is essential for understanding specific debris problems in different parts of the country, and for evaluating the effectiveness of specific measures implemented to reduce debris. In addition, U.S. and Mexican governments should improve regulations and monitoring of all U.S. companies operating along the Mexican border. Industry issues that should continue to be addressed by the plastics, oil and gas, maritime industries and commercial and recreational fishing groups include implementation of policies to conform with Annex V, educational efforts to inform their members, and continued involvement and support for marine debris

programs. Ports, docks and marinas should provide adequate waste disposal facilities and assist in the distribution of educational materials. In general, continued cooperation among government, industry, environmental groups and others in efforts relating to education and public awareness should be encouraged.

FOREWORD

In June 1988, an exciting event took place on Mustang Island, TX; ninety-five Kemp's ridley sea turtle hatchlings were released from the site where they were deposited as eggs, two months earlier. This was the first known ridley nesting on Mustang Island in 25 years. As they struggled down to the sea, one turtle became temporarily stalled trying to negotiate a piece of a plastic bag. Someone remarked "his first plastic" and I realized that yes, that was his (or her) first plastic, but probably not its last. Over half of all loggerhead sea turtles stranded dead on Mustang Island in 1987 had plastic in their guts.

We were able to protect these eggs during the incubation and make sure that all the hatchlings got to the sea unmolested by predators. However, we cannot protect them from their natural predators once they get to the sea and precious few of the 95 will survive those obstacles to reach maturity and possibly return to Mustang Island. But what can we do about the added hazard of the millions of pieces of plastic floating out there?

CEE and its annual Texas Coastal Cleanup can and does help. Thousands of people see for themselves how insidious the problem is when they clean a section of the beach each September. Information from CEE's data cards help us identify sources of litter, and the voice



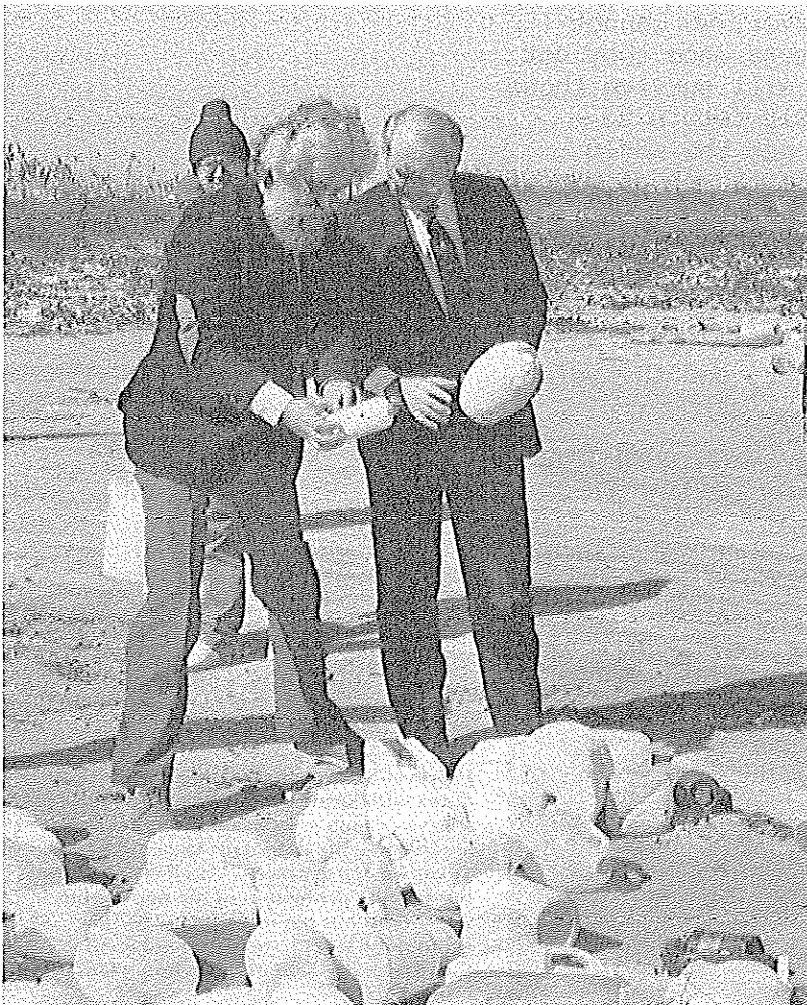
University of Texas Oceanographer Tony Amos with stranded minke whale found on a Texas beach March, 1988. Mr. Amos has studied marine debris on Mustang Island, Texas for ten years. His concern for wildlife and the protection of the marine environment has benefited many people around the world. He is a friend to all those who care about these important issues.

that comes from the people will be heard by our legislators who already are fighting the problem of dumping at sea with new international regulations. When I saw that day-old turtle (weighing in at under one ounce) encountering a plastic bag, it reminded me of the piece of plastic bag, also weighing in at under an ounce, that killed a 2 ton, 18 1/2 foot long juvenile minke whale that stranded on Matagorda Peninsula earlier this year.

I am writing this on July 4. I have just come back from a survey of Mustang Island Beach. We cannot blame all of our plastic and litter problems on offshore dumping. On this holiday weekend not just one or two, but hundreds, maybe thousands of people have littered the beaches and streets of our little town of Port Aransas. Most of these are youthful litterers who don't know, or care, what they are doing. It has become commonplace to leave stuff on the beach when you go home. The reasoning may be something like this--"After all, the beaches were pretty trashy before we came here. What difference will our trash make?" A lot! Help prevent these tragedies. Make our beaches and fourths of July sparkle again. Give the turtles and whales a bit more of a chance to survive in that great ocean out there.

A.F. Amos

Anthony F. Amos
The University of Texas at Austin
Marine Science Institute
Port Aransas, Texas



Tony Amos with U.S. Senator Phil Gramm on a Texas beach.

ACKNOWLEDGEMENTS

The story of stopping marine debris, Texas style, continues to be one of good news, cooperation, and hard work. For years Texans watched their beautiful beaches become spoiled by garbage washing in from the Gulf of Mexico. The problem increased year by year, and the questions became more urgent. What were the real sources of the debris? What could be done to keep the shorelines clean?

In an effort to focus public attention on the debris problem and possible solutions, the Center for Environmental Education conducted the first statewide beach cleanup in September 1986. More than 2,770 volunteer Beach Buddies came to the coast to help collect beach debris. To everyone's amazement, in just three hours they picked up 124 tons of trash from 122 miles of beach.

Those volunteers came to show their support for a healthy marine environment. Public awareness of the problem increased, creating waves of excitement among individuals across the state and a spirit of cooperation from several state agencies. We are grateful for the coverage provided by the Texas press, which has played a major role in getting the message to the public.

The success of that first cleanup led to new state and national programs, and brought together the government agencies and private industries that deal with the issues of trash at sea. We are moving closer to our ultimate goal: practical and permanent solutions for keeping the marine environment clean.



Center for Environmental Education's Regional Director Linda Maraniss and Land Commissioner Garry Mauro at a Press Conference before the 1987 Texas Coastal Cleanup.



Linda Maraniss and Sue Barnett from the Austin office of the Center for Environmental Education and Commissioner Garry Mauro at the Corpus Christi beach cleanup, September 1987.

We thank all of you who have worked so hard to bring about these changes. Special thanks go to Land Commissioner Garry Mauro and his staff, who set up the statewide Adopt-A-Beach program and worked for passage of Annex V of the MARPOL Treaty, which was ratified in December 1987. Thanks, also to Senator Lloyd Bentsen, Senator Phil Gramm, Representative Kika de la Garza, Representative Jim Wright, and other members of the Texas Congressional delegation who supported that historic agreement.

On September 19, 1987 more than 7,000 Beach Buddies collected 309 tons of marine debris from 157 miles of Texas coastline. These volunteers are special people. Many drove for hours to reach the coast by 9 a.m. Teachers, landfill operators, and others worked without pay on their Saturday off. For three hours volunteers worked in the hot sun picking up other people's trash. Why?

We are lucky in Texas. We can enjoy beautiful barrier islands, hundreds of miles of sandy beaches, and rare birds that migrate to our coast for a mild winter. The Gulf of Mexico is home to a wonderful variety of marine life, including whales, dolphins, sea turtles and many species of fish.

Recreational boaters, commercial and sport fishermen, and families on vacation love the beauty of the Texas gulf coast. This marine beauty is ours to protect for now, for ever. Why help? Why not?

To everyone who helped, who cared and offered support, thank you very much.

Linda Maraniss

Linda Maraniss
Director, CEE Gulf States Regional Office
State Coordinator, 1986 and 1987 Texas Coastal Cleanups

INTRODUCTION

For many years Texans have expressed their concern over the concentrations of litter along the Texas shoreline. Beach debris is unsightly. It is also costly for coastal communities burdened with repeated cleanup costs. In 1987, it was estimated that Texas coastal cities and counties spent more than \$14 million just to pick up trash off the beaches.

Aside from the aesthetic problems, beach debris poses a threat to public health and safety, and to wildlife. But litter on Texas beaches is just an indicator of even greater amounts of litter offshore in the Gulf of Mexico. Out here, marine debris can foul propellers and cause vessel disablement, endangering human safety. But debris also kills marine wildlife. Each year thousands of marine mammals, sea turtles, seabirds, and fish die because they become entangled in debris items such as rope, nets, and monofilament fishing line, or from ingesting items like plastic bags and sheeting, mistaking them for food.

The Center for Environmental Education (CEE) is a conservation organization dedicated to protecting marine wildlife and their habitats and conserving coastal and ocean resources. In 1986 and 1987 CEE turned this concern into action by organizing the largest beach cleanups in American history along the Texas coast. In 1986, more than 2,700 people collected 124 tons of debris. In 1987, 7,158 volunteers collected 309 tons of debris. Both cleanups received extensive media coverage in Texas and across the nation, creating greater public awareness about the extent of the problem. As a result of CEE's efforts, the Texas General Land Office has launched an Adopt-A-Beach program where volunteers supplied with CEE data cards clean beaches three times a year. This report details the results of CEE's 1987 Texas Coastal Cleanup and the findings from data collected under Texas' Adopt-A-Beach program. In addition, data collected from beach cleanups in other states is provided.

Data on beach debris collected during CEE's first statewide cleanup provided the first, most comprehensive assessment of beach debris ever collected in the United States. This information was essential in developing strategies to address the debris problem not only in Texas, but also on a national level. The information was used in Congressional testimony on numerous



Center for Environmental Education's marine biologist Kathy O'Hara. Kathy is the author of several reports on marine debris and entanglement.

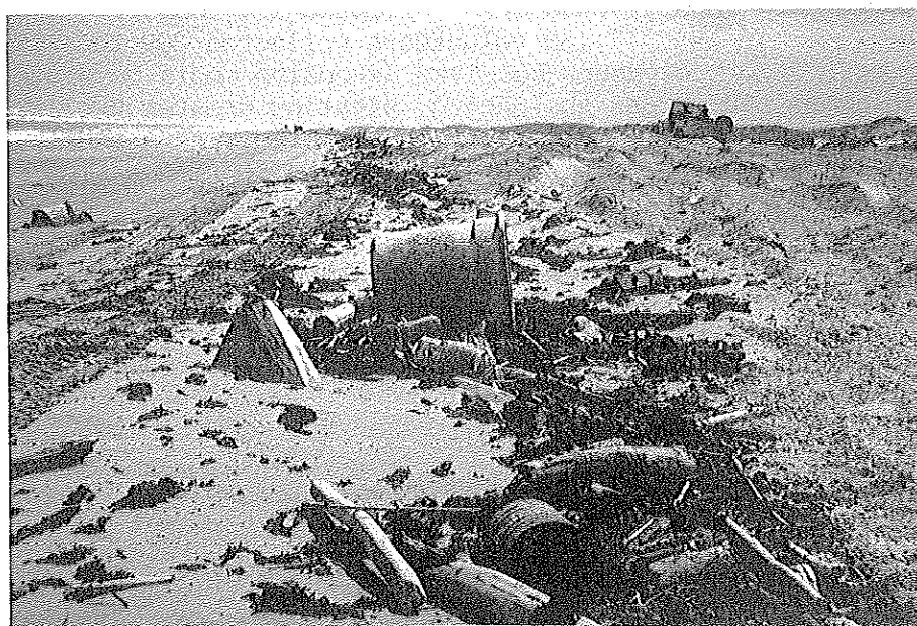
occasions. It helped to show that plastic wastes are a significant component of debris in the marine environment and provided documentation supporting the need for U.S. ratification of Annex V of the MARPOL Treaty.

Late in 1987, the United States ratified Annex V and it will go into effect in December 1988. Annex V will prohibit the disposal of all plastics into the ocean, and require that vessels carry their plastic trash into port for proper disposal. The kinds of trash regulated by Annex V are listed in Table 1.

Besides giving its nod of approval to Annex V, Congress also passed a measure in December 1987 that will implement Annex V provisions in our waters. This law, the Marine Plastic Pollution Control Act of 1987 (MPPRCA), prohibits the disposal of plastics at sea by U.S. vessels effective December 31, 1988, the date on which Annex V enters into force. Additionally, it prohibits the disposal of plastics by any vessel within U.S. waters out to 200 miles.

Unfortunately, most laws governing ocean-based activity have major enforcement problems. Since it is impossible to patrol ocean waters, which cover more than two-thirds of the earth's surface, it is necessary to create incentives to comply with the law, and to provide vessel waste handling and reception facilities that are both easily accessible and economically practical. Such strengthening measures were incorporated into the MPPRCA.

The law will require certain vessels to display placards to notify crew and passengers of the requirements of Annex V and to keep a log book on garbage disposal. An entry in the log is required each time vessel garbage is offloaded at port, or handled onboard by incineration or some other means. The MPPRCA also requires certain U.S. vessels to develop a shipboard waste management plan specifying how it plans



Marine debris at Padre Island National Seashore the day before the September 1987 Texas Coastal Cleanup.

LINDA MARANISS

MARPOL Annex V

Summary of At-Sea Garbage Disposal Limitations

Garbage Type	All Vessels	Offshore Platforms & Assoc. Vessels**
Plastics—includes synthetic ropes and fishing nets and plastic garbage bags	Disposal prohibited	Disposal prohibited
Floating dunnage, lining, and packing materials	> 25 miles off shore	Disposal prohibited
Paper bags, glass, metal bottles, crockery and similar refuse	> 12 miles	Disposal prohibited
Paper, rags, glass, etc. communitied or ground*	> 3 miles	Disposal prohibited
Food waste communitied or ground*	> 3 miles	> 12 miles
Food waste not communitied or ground	> 12 miles	Disposal prohibited
Mixed refuse types	***	***

* Communitied or ground garbage must be able to pass through a screen with mesh size no larger than 25 mm.

** Offshore platforms and associated vessels includes all fixed or floating platforms engaged in exploration or exploitation of seabed mineral resources, and all vessels alongside or within 500m of such platforms.

*** When garbage is mixed with other harmful substances having different disposal or discharge requirements, the more stringent disposal requirements shall apply.

to comply with the provisions of Annex V. Although the types of vessels required to comply with these regulations has not yet been determined, it is expected that all large commercial vessels will be included.

The law also requires ports and terminals to have adequate facilities for collecting shipboard wastes. In addition, although naval and other public vessels are exempt from restrictions, the law requires the Navy and Coast Guard to bring their vessels into full compliance with Annex V regulations within the next five years.

One element of the law that encourages citizen aid in enforcement is a reward provision. This allows the courts to award a portion of criminal penalties or civil fines assessed against the violator to the person who gave the information that led to a conviction or assessment of a penalty. Under the Act, it is even possible for private citizens to bring actions against violators, or against the government if enforcement agencies fail to carry out their responsibilities under the law.

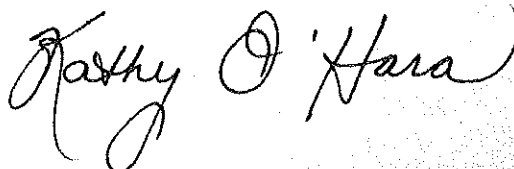
However, data collected during beach cleanups showed that plastic is not the only type of waste found

on the Texas coastline. Thousands of pieces of glass, metal, and wood also come from offshore sources. Annex V allows for the disposal of glass and metal as long as it is dumped at distances at least 12 miles from shore. But there is an aspect of MARPOL that would offer additional protection to the Gulf. Regulation 5 of Annex V sets out procedures for disposal of garbage within what are termed "special areas," of which there are presently five: the Mediterranean Sea, the Baltic Sea, the Black Sea, the Red Sea, and the Persian/Oman Gulf. Some of the criteria used to show that these areas are extremely susceptible to long-term buildup of ocean debris include the infrequent flushing actions of tides and currents, and the intensity and type of maritime traffic. Because of this susceptibility to ocean debris, these areas are designated as no dumping zones where no garbage of any type may be discharged from a vessel.

The Texas General Land Office commissioned CEE to produce a report on the Gulf of Mexico. CEE's report indicated that the Gulf qualified as the type of semi-enclosed body of water needing special international protection. Subsequently, the State of Texas formally requested that the Gulf of Mexico be designated a special area under Annex V of MARPOL. The U.S. delegation to the International Maritime Organization has indicated its interest in pursuing this avenue through amendment to Annex V.

Therefore, the information given in this report is important for many reasons. For one, the data base that has been established on debris in Texas over the past two years will not only serve as a baseline for evaluating the effectiveness of Annex V once it comes into force, but also the effectiveness of state and local initiatives to mitigate the debris problem. In addition, this report provides additional information on non-plastic debris that can be used in evaluating the potential for designating the Gulf as a special area under Annex V.

However, even special area designation focuses only on curbing ocean sources of debris. Information gathered in beach cleanups around the Gulf shows that debris generated by land-based sources also contributes to the marine debris problem. These hard-to-trace sources of litter that eventually finds its way to coastal marine areas will be the next target of citizen, state, and local action.



Marine Biologist and
Director
of CEE National
Marine Debris Data Base

ORGANIZATION OF THE TEXAS COASTAL CLEANUP

CEE's 1987 Texas Coastal Cleanup was held at 17 beaches from Boca Chica near the Mexican border to Sea Rim Park near the Louisiana state line. The September 19 event was held during COASTWEEKS, a national event dedicated to focus attention on our fragile and unique coastal areas. Seventeen volunteer zone captains, working with Adopt-A-Beach county coordinators, organized the cleanups at the local level. Coordinators worked most of the summer planning a safe and well organized event. Their responsibilities ranged from locating first aid volunteers and finding free landfill sites and garbage trucks, to conducting interviews with their local press. Some zone captains planned beach parties after the cleanup and arranged for free soft drinks and hot dogs. The coordinators played a major role in the success of the cleanup and deserve a great deal of credit for orchestrating the largest cleanup in the nation.

"Be a Beach Buddy" was again the slogan that appeared on 4,000 bright orange and blue posters advertising the event. Four thousand brochures were also distributed throughout the summer, listing the beaches to be cleaned and the names and phone numbers of area zone captains. Also included was a listing of 30 coastal hotels offering Beach Buddy discounts to volunteers. These discounts helped to encourage participants living as far from the coast as Dallas, Austin, and San Antonio. The brochure also discussed the marine debris problem and possible solutions.

The Lower Colorado River Authority printed the posters free, as a donation. The Texas Hotel Motel Association and the Adopt-A-Beach program helped defray some of the printing costs of the brochure. The Texas Attorney General's Office printed "safety first" cards for all volunteers. "Be a Beach Buddy" t-shirts were also provided. The Adopt-A-Beach program printed certificates of thanks from CEE and the Land Office for all volunteers. CEE provided large blue and orange "I'm a Beach Buddy" buttons as a thank-you for a job well done.

CEE invited radio stations in Texas to sponsor a Beach Litter Blues song writing contest. As they did in 1986, radio station KSTE in Corpus Christi sponsored a contest and the winners, Mike Cross and Dicky Neely, sang "Don't Trash those Texas Beaches," during a beach



Kim McAdams, Director of Brazoria County Parks and "zone captain" for local beach cleanups.

DOW CHEMICAL



party held after the cleanup at the Holiday Inn at North Padre Island.

The Texas media played a major role in the success of the cleanup. CEE mailed 11 press releases during the summer. Several magazines reported on the debris problem in Texas including Business Week, Newsweek, and U.S. News and World Report, as well as Texas Parks and Wildlife, Texas Shores, and Texas Fisherman. More than 200 articles appeared in Texas papers between February and November 1987. Thirty-five editorials devoted to the problem appeared in state papers throughout the summer. Two editorial cartoons ran in the Brownsville Herald and the San Antonio Express News. Even national cartoons on the topic of marine debris appeared, including Hazel, Gumdrops, and Berry's World. Several newspapers outside Texas ran front page stories about the invasion of trash on our beaches including the Los Angeles Times and the New York Times. The General Land Office issued press releases and radio PSAs promoting the Adopt-A-Beach program and the September cleanup.

Linda Maraniss, state coordinator for the cleanup, was interviewed on several radio stations and by television news reporters. She appeared on "Central Texas," produced by Channel 7 in Austin, "K-98 Magazine," hosted by Michael Oppenheimer, and was a guest with Land Commissioner Garry Mauro on Austin CableVisions's "Texas Politics," hosted by Dave McNeely. Ms. Maraniss also presented information on the results of the Texas Coastal Cleanup at the U.S. Minerals Management Service's Take Pride Task Force meeting at Padre Island National Seashore in June 1987, and at the November 1987 Minerals Management Service's 8th Annual Information Transfer Meeting in New Orleans.

Although the Texas Coastal Cleanup Steering

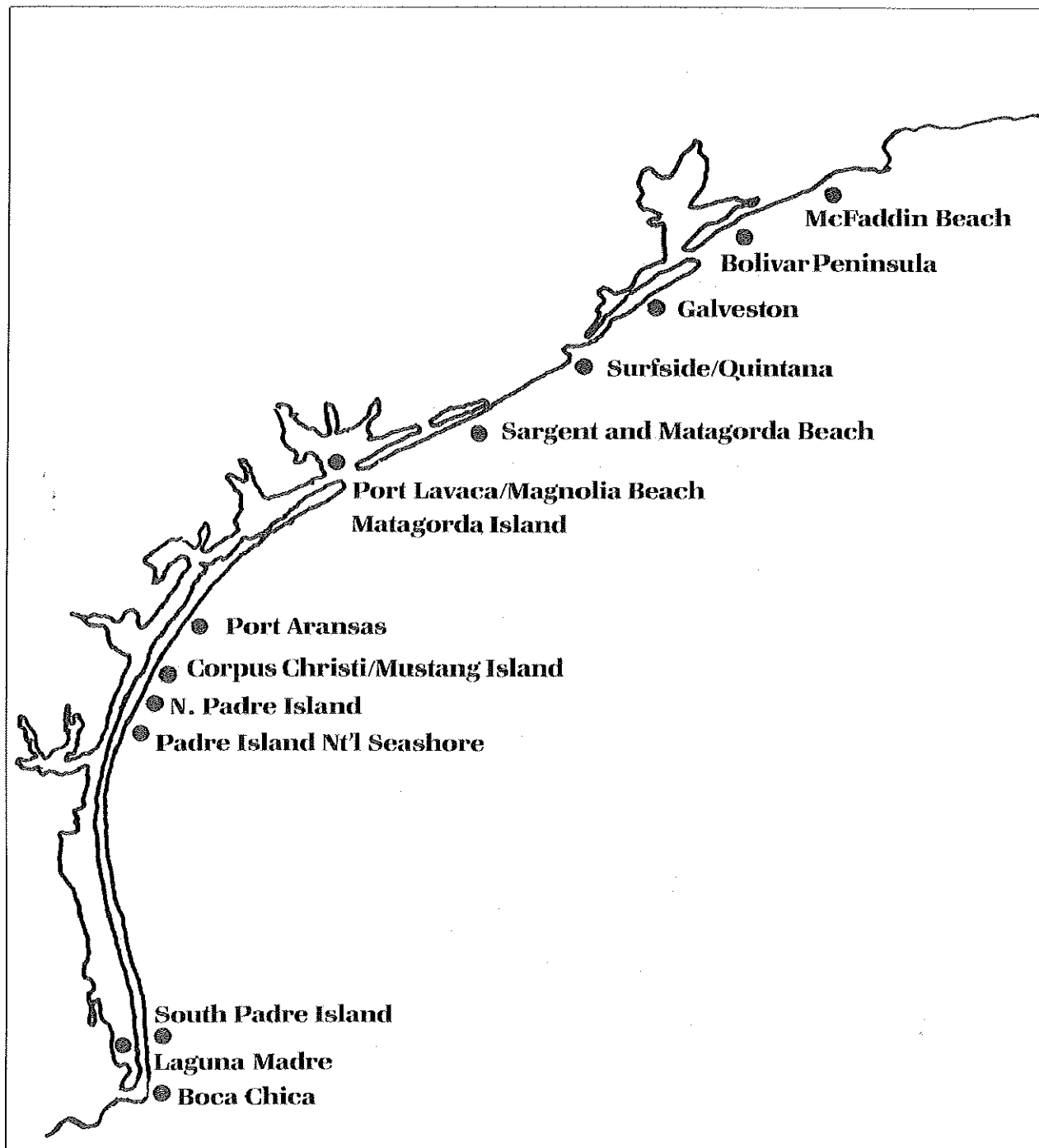


THE BRAZOSPORT FACTS

Charles Moss, Brazoria County Marine Agent and "zone captain" for local beach cleanups.

Committee did not meet in 1987, the members continued throughout the year to be supportive and helpful. The thirty-five member committee, established in the summer of 1986, represents people from the oil, shipping, fishing, and plastic industries, the environmental community, the U.S. Coast Guard, and other state and federal agencies. The committee reviewed portions of this report, and their comments and many of their corrections and ideas have been included.

Major funding for CEE's Texas Coastal Cleanup campaign was provided by individuals, corporations, businesses, and foundations. A list of donors is provided in Appendix 1.



CLEANUP ACTIVITIES ON SEPTEMBER 19, 1987

As in 1986, the cleanup activities at each location had their own local flavor. On Bolivar Peninsula, for example, some volunteers arrived at the cleanup site by ferry. Sargent Beach offered a prize for the most light sticks and foreign debris collected and Matagorda Island's cleanup was recorded on film by a Texas Parks and Wildlife Department crew.

Many state and local officials participated in the cleanup, which also helped to attract the media to the beach. Senator Buster Brown was at the Brazoria-Surfside site. Senator Gene Green participated in the Galveston area. In Corpus Christi, Land Commissioner Garry Mauro joined local volunteers. The staff from Senator Ken Armbrister's office joined in efforts at the Bay City-Sargent Beach site, while Senator Armbrister joined volunteers on Matagorda Island.

Volunteers arrived at sign-in areas at 9:00 a.m., where they were given CEE data cards; pencils provided by the Office Company, CEE and Tenneco; garbage bags donated by Mobil Oil Company; "safety first" cards; and directions to their beach assignments. South Padre Island had many more volunteers than expected, and the Gulf Coast Coalition for Public Health quickly provided more trash bags.

Beaches were marked by numbers or colored flags for easy identification. Adopt-A-Beach groups worked on their adopted mile, alongside other volunteers.



Beach Buddies working on Matagorda Island with the help of Texas Parks and Wildlife staff.

GLEN MILLS

Following the cleanup, garbage bags were placed behind the tide line, and data cards were returned to the sign-in area or left with the zone captains.

Zone captains were responsible for knowing the number of miles cleaned and for estimating the total pounds or tons collected. Tons collected were calculated by multiplying the number of bags of debris by the number of pounds per bag. (An average estimate of 20 to 30 pounds per bag was used.) Some zone captains calculated tonnage based on the number of truckloads of debris collected at their zone.

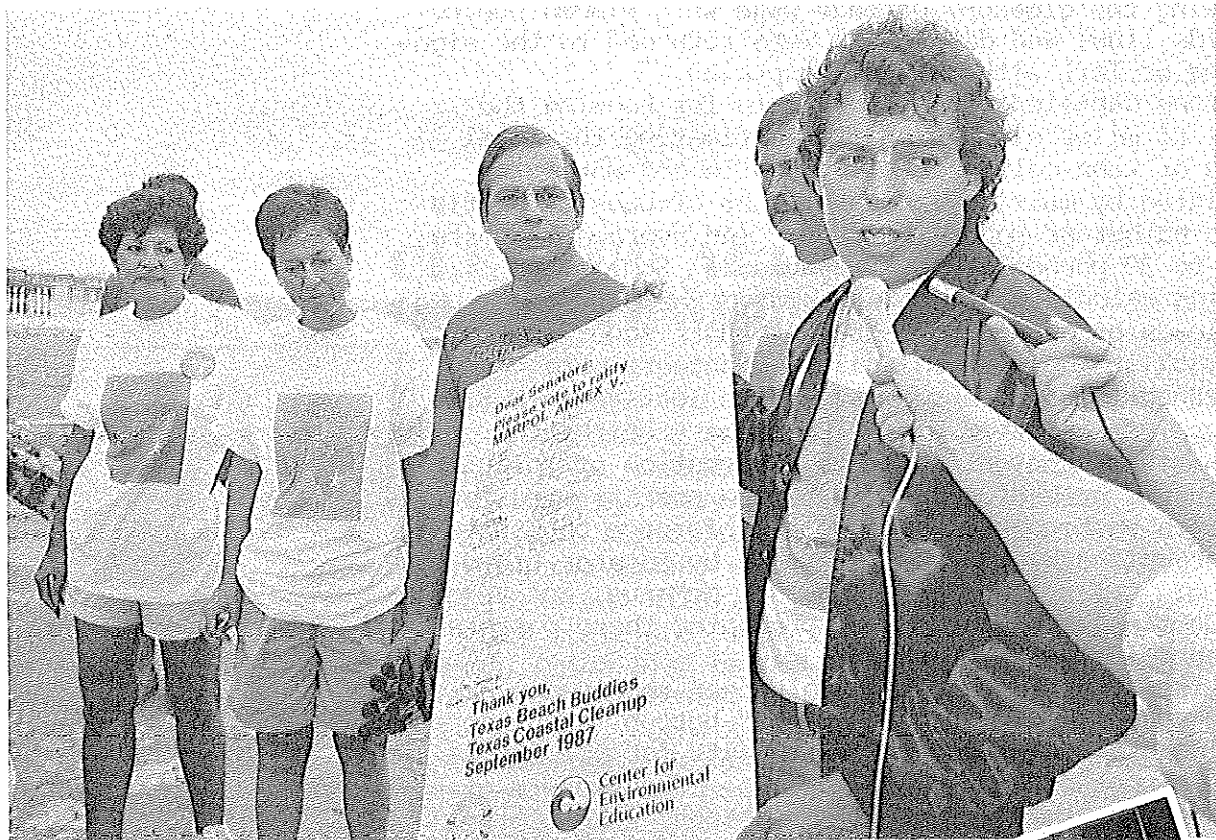
Back at the sign-in areas, volunteers were encouraged to sign large poster-size letters to U.S. Senators, asking them to ratify Annex V of the the International Convention on the Prevention of Pollution from Ships, or MARPOL Treaty. These posters were later used at a Washington, D.C. press conference on Capitol Hill organized by CEE and sponsored by Senator Lloyd Bentsen. CEE's President, Roger E. McManus, and Texas Land Commissioner Garry Mauro presented these posters to the Senate.

After the cleanup, each volunteer received a bright orange and blue "I'm a Beach Buddy" button. Many zone captains had arranged for refreshments for volunteers and held post-cleanup beach parties. The winners of the Beach Litter Blues song writing contest, Dick Neely and Mike Cross, sang their prizewinning song at a party on North Padre Island.

By the end of the three-hour cleanup, most volunteers were hot, tired, and very proud of their work. The beaches looked cleaner. The 1987 Texas Coastal Cleanup was a day to feel good. A day to enjoy being part of a group, a day to enjoy the beauty of the Texas coast, a day to make a difference in the way the marine environment looks, and a day to send a message to the rest of the country that Texans care about the beauty and well being of their beaches.

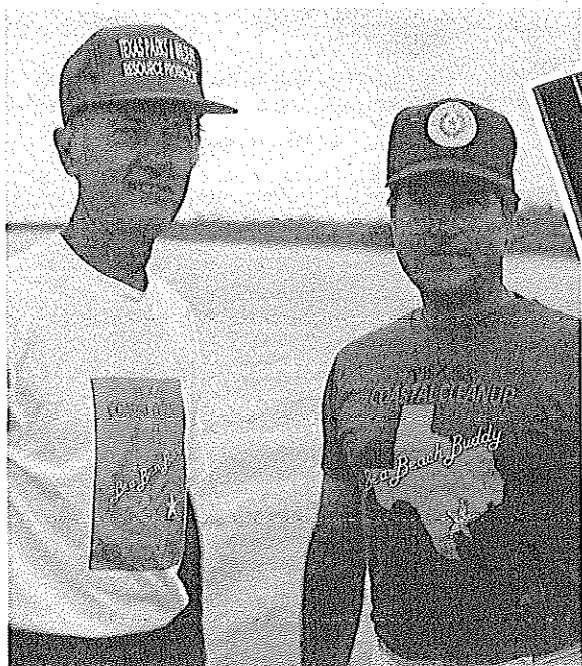


CEE President Roger E. McManus and Texas Land Commissioner Garry Mauro present U.S. Senator Lloyd Bentsen petitions from 1987 Beach Buddies urging the U.S. Senate to ratify Annex V of the Marpol Treaty.



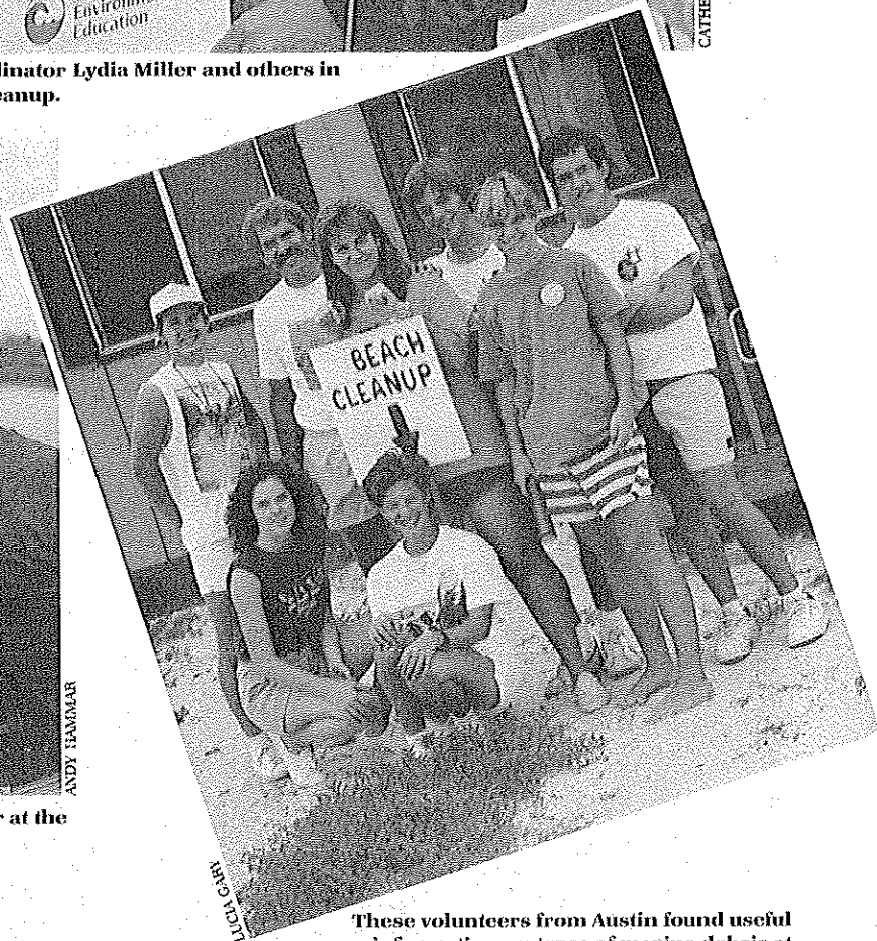
CATHERINE WEISS

Land Commissioner Garry Mauro with area coordinator Lydia Miller and others in Galveston during the September Texas Coastal Cleanup.



ANDY HANMAR

Leland Roberts and State Senator Ken Armbrister at the Matagorda Island cleanup, September 1987.



LYNN GRIFF

These volunteers from Austin found useful information on types of marine debris at the visitor's center at Padre Island National Seashore.

Mike Cross, one of the winners of the 1987 Beach Litter Blues Song Writing Contest at a beach party in Corpus Christi.



JERRY WINKLER

More than 300 Beach Buddies volunteers traveled by boat to the cleanup on Matagorda Island.

GLENN MILLS



SUE BARNETT

Students from Austin area high schools travelled four hours by bus to the cleanup in Port Aransas.

RESULTS



ANDY HAMMER

Volunteers work with buddies to collect data on marine debris during the cleanup on Matagorda Island.

More than 7,000 volunteers participated in CEE's Texas Coastal Cleanup on September 19, at seventeen coastal sites extending from the Louisiana border to Mexico. Volunteers filled more than 17,020 trash bags with an estimated 309 tons of debris. They covered a distance of 157 miles. Information on the number of volunteers, number of bags, weight of trash collected, and number of miles cleaned at each zone is provided in Exhibit 1.

CEE data cards were distributed to volunteers on the morning of the cleanup so that they could record important information on the types and sources of debris that were most prevalent (Exhibit 2). CEE did not expect 100 percent return of data cards for many reasons. For instance, some people chose not to use the cards so that they could dedicate more time to collecting trash. In other cases, more than two individuals shared a single data card. Therefore, the return rate of 1,580 data cards was considered good. It should be noted that since not all the data cards were returned, it was not possible to determine the total number of debris items collected. Analyses were carried out only on the information obtained from the data cards that were returned.

Each debris item was recorded under the major headings of plastic, styrofoam, glass, metal, paper, and wood. A total of 382,878 pieces of debris were recorded (Exhibit 3). The total number of plastic items



The Korean American Association from Austin drove to Galveston to help during the 1987 Texas Coastal Cleanup.

PAN KIM

(including styrofoam) collected in 1987 surpassed all other categories, totalling 66 percent of all debris items (Exhibit 4). Metal and glass items accounted for 11 and 13 percent of the total, respectively. Degradable items of paper and wood were significantly less abundant, constituting 7 percent and 3 percent respectively of all items collected.

The composition of materials collected during CEE's 1987 cleanup are nearly identical to CEE's 1986 Texas Coastal Cleanup, when plastics (including styrofoam) debris items accounted for 67 percent of all debris collected. Similar percentages were found both years for the categories of metal, glass, paper, and wood. As in 1986, the predominance of plastic can be attributed not only to its increasing usage in society, but also to its physical characteristics: it is lightweight and

Exhibit 1

General beach cleanup results reported from each zone for
CEE'S September 1987 Texas Coastal Cleanup.

ZONE	TOTAL NUMBER VOLUNTEERS	NUMBER BAGS FILLED	NO. TONS	NUMBER MILES CLEANED	NUMBER DATA CARDS RETURNED
BEAUMONT-MCFADDEN BEACH	286	728	4.5	13.5	79
BOLIVAR PENINSULA	400	170	40.0	11.0	85
GALVESTON	1200	1934	120.0	32.0	299
BRAZORIA-SURFSIDE	375	1248	26.3	20.0	67
BAY CITY- SARGENT BEACH	394	531	6.7	6.5	27
MATAGORDA ISLAND	371	1244	15.5	4.0	125
PORT ARANSAS	163	313	2.0	5.0	66
ARANSAS BAY (ROCKPORT)	66	26	*	2.5	0
CORPUS CHRISTI	1500	3398	28.0	29.0	379
PADRE ISLAND NATIONAL SEASHORE	477	1114	13.3	13.6	125
SOUTH PADRE	950	3759	40.0	10.0	240
BOCA CHICA	950	925	11.0	7.0	83
LAGUNA MADRE	26	100	2.0	3.0	5
TOTAL TEXAS	7158	17020	309.3	157.1	1580

* Information on the amount of debris collected at this site was not available.

Exhibit 2

ITEMS COLLECTED

You may find it helpful to work with a buddy as you clean the beach, one of you picking up trash and the other taking notes. An easy way to keep track of the items you find is by making tick marks like this:

bags |||| | Total
18

cups |||| | Total
22

PLASTIC	Total number of items
bags	
6-pack holders	
bottles:	
green	
soda	
other	
cups, utensils	
caps, lids	
strapping bands	
large sheeting	
fishing net	
buckets	
"write protection"	
rings	
hardhats	
vegetable sacks	
milk jugs	
egg cartons	
toys	
fishing line	
gloves	
rope	
light sticks	
diapers	
disposable lighters	
syringes	
plastic tampon applicators	
other (specify)	

GLASS	Total number of items
bottles	
light bulbs	
fluorescent light tubes	
pieces	
other (specify)	

STYROFOAM	Total number of items
cups	
buoys	
pieces	
other (specify)	

METAL	Total number of items
wire	
beverage cans	
bottle caps	
pull tabs	
other cans	
large containers	
drums: rusty new	
pieces	
other (specify)	

PAPER	Total number of items
bags	
cups	
cartons	
newspaper	
pieces	
other (specify)	

WOOD (do not include driftwood, twigs, etc.)	Total number of items
pallets	
crates	
pieces	
other (specify)	

RUBBER	Total number of items
tires	

Exhibit 2

BEACH CLEANUP DATA CARD

Directions

1. Complete the information below.
2. Open card to record items collected during cleanup.
3. After the cleanup answer the questions on the back of this card and return to area coordinator or CEE in Austin.

Name _____ Affiliation _____

Address _____ Zip _____ Phone _____

Occupation _____ M _____ F _____ Age: _____

Today's Date: Month _____ Day _____ Year _____ Name of your area coordinator _____

Location of beach cleaned _____ Nearest city _____

How did you hear about the cleanup? _____

Do you belong to the Adopt-a-Beach Program (1-800-85BEACH)? _____

SAFETY TIPS

1. Do not go near any large drums.
2. Be careful with sharp objects.
3. Wear gloves.
4. Stay out of the dune areas.
5. Watch out for snakes.
6. Don't lift anything too heavy.

WE WANT YOU TO BE SAFE

COMPLETE THIS PORTION AFTER CLEANUP

Estimated miles of beach cleaned _____ Number of bags filled _____

We are particularly interested in identifying the SOURCES of marine debris. If possible, please list all items that have labels or company names.

EXAMPLE: CLARASOL (green plastic Bottle) _____

OBSERVATIONS OF STRANDED AND/OR ENTANGLED ANIMALS (Please describe type of animal and type of entangling debris. Be as specific as you can.) _____

What was the most peculiar item you collected? _____

Comments _____

PLEASE RETURN THIS CARD TO YOUR AREA COORDINATOR OR MAIL IT TO:



Center for Environmental Education
1201 West 24th Street
Austin, TX 78705

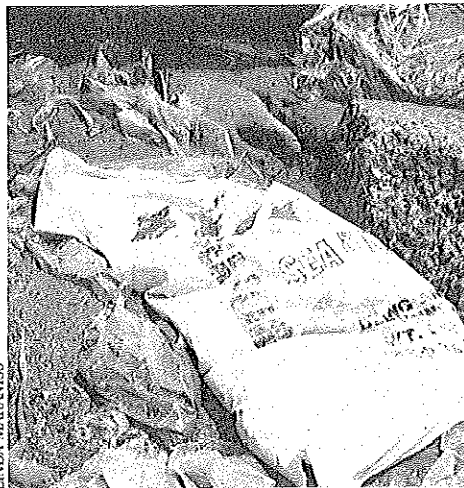
Exhibit 3

SEPTEMBER TEXAS COASTAL CLEANUP 1987

	BEACH	BEAUMONT	BOLIVAR	GALVESTON	MATAGORDA	FORT	CORPUS	BROWZORIA	BAY	PINE	SOUTH	LAGUNA	BOCA	TEXAS	PERCENT
	ISLAND	ARANSAS	CHRISTI						CITY		PADRE	MADRE	CHICA		
ELASTICS															
BAGS	749	3267	5186	891	1187	8266	1049	669	3646	4846	110	1907	31773	14.9%	
CAPS/LIDS	1055	2065	5581	1860	1997	8243	2120	307	3154	1496	145	517	28540	13.3%	
MISCELLANEOUS PIECES	348	1404	6479	762	2083	5605	724	240	1603	1859	50	462	21619	10.1%	
ROPE	944	1149	4103	1201	1212	5382	956	219	1993	1380	96	243	18878	8.8%	
OTHER															
BOTTLES-OTHER	1581	1558	1782	1843	441	2887	829	368	3039	1593	76	787	16784	7.8%	
BEER RINGS	711	1624	3642	301	392	3259	923	370	1087	1598	138	1586	15631	7.3%	
CUPS/UTENSILS	524	1140	2655	953	508	2692	699	320	950	1470	80	495	12486	5.8%	
MILK JUGS	626	1272	1051	805	93	1143	452	276	852	647	30	213	7460	3.5%	
GREEN															
BOTTLES-GREEN	92	402	503	642	123	1129	178	156	1610	1924	16	395	7170	3.4%	
BOTTLES-SODA	395	644	579	566	100	1233	277	128	798	1058	16	547	6341	3.0%	
STRAP BANDS	243	312	1108	266	351	1239	401	111	479	319	22	82	4933	2.3%	
LARGE SHEETING	152	541	752	163	101	1259	218	163	971	320	15	162	4817	2.3%	
WHITE															
FISH LINES	211	393	1093	162	133	1082	293	44	376	283	1	154	4225	2.0%	
LIGHT STICKS	268	213	818	287	208	1221	242	118	337	328	0	139	4179	2.0%	
GLOVES	439	450	477	318	150	973	194	178	518	319	37	74	4127	1.9%	
KG CARTONS	286	411	429	453	89	679	205	90	375	263	9	128	3417	1.6%	
TOYS															
TOYS	68	141	513	245	274	759	160	29	341	219	15	56	2820	1.3%	
STRAWS	3	69	1033	65	127	875	178	3	181	97	0	8	2639	1.2%	
LIGHTERS	145	226	542	153	75	596	238	52	195	152	32	23	2429	1.1%	
WRITE RINGS	19	190	570	170	108	636	92	98	213	206	3	32	2337	1.1%	
VEGETABLE															
VEGETABLE SACKS	59	192	285	111	60	565	89	26	301	255	6	74	2023	0.9%	
DIAPERS	30	124	150	50	47	282	131	38	93	557	0	412	1914	0.9%	
SHOES/SANDALS	32	110	218	282	62	400	80	36	245	179	0	106	1750	0.8%	
FISH NETS	60	98	447	98	101	445	85	15	167	114	7	82	1719	0.8%	
BUCKETS															
BUCKETS	112	247	266	247	50	209	99	61	232	108	8	69	1708	0.8%	
TAMPON APPLICATIONS	59	85	148	75	45	204	67	22	78	194	5	58	1040	0.5%	
SYRINGES	22	48	101	106	35	360	31	21	142	46	2	16	930	0.4%	
HARDWARE	10	15	26	41	0	15	5	2	26	64	5	16	225	0.1%	
TOTAL ELASTICS	9243	18390	40537	13116	10152	51638	11015	4160	24002	21894	924	8843	213914	100.0%	
GLASS															
PIECES OF GLASS	874	2705	7105	398	387	4443	963	394	703	2285	475	482	21214	49.9%	
BOTTLES	921	1671	1517	3471	205	2227	1072	433	1470	3183	136	1596	17902	42.1%	
LIGHT BULBS	352	176	210	825	27	232	118	61	238	64	7	17	2327	5.5%	
FLUORESCENT TUBES	125	44	156	223	61	211	57	25	136	39	0	11	1088	2.6%	
TOTAL GLASS	2272	4596	8988	4917	680	7113	2210	913	2547	5571	618	2106	42531	100.0%	
STYROFOAM															
MISCELLANEOUS PIECES	1315	2392	5120	1721	503	4169	1429	313	2154	2291	21	1181	22609	58.5%	
CUPS	1166	2234	2912	964	194	2481	956	397	798	1448	215	1233	14998	38.8%	
BUOYS	119	79	133	267	14	146	40	14	85	92	2	57	1048	2.7%	
TOTAL STYROFOAM	2600	4705	8165	2952	711	6796	2425	724	3037	3831	238	2471	38655	100.0%	

Exhibit 3

	BEACH	BEALMONT	BOLIVAR	CALVESTON	MATACORDA ISLAND	PORT ARANSAS	CORPUS CHRISTI	BRAZORIA	BAY CITY	PINE	SOUTH FLORE	LACUNA MADRE	BOCA CHICA	TEXAS	PERCENT
METAL															
BEVERAGE CANS	710	3446	2791	588	506	4089	1575	743	2037	3131	250	714	20580	40.9%	
FULL TINS	1772	441	1150	88	408	2791	1012	109	243	786	0	125	8925	17.7%	
BOTTLE CANS	400	594	1051	334	296	2502	821	192	400	1268	34	381	8273	16.4%	
OTHER CANS	297	549	489	383	62	656	325	193	399	719	163	234	4469	8.9%	
MISCELLANEOUS PIECES	247	420	871	110	208	659	266	59	128	533	6	151	3658	7.3%	
WIRE	86	241	317	85	119	717	245	82	228	485	63	139	2807	5.6%	
LARGE CONTAINERS	147	144	74	136	44	148	33	35	98	176	2	68	1105	2.2%	
DRUMS-RUSTED	24	34	35	51	2	26	5	6	24	52	0	9	268	0.5%	
DRUMS-NEW	11	30	38	21	3	53	10	0	3	56	0	0	225	0.4%	
TOTAL METAL	3694	5899	6816	1796	1648	11641	4292	1419	3560	7206	518	1821	50310	100.0%	
PAPER															
MISCELLANEOUS PIECES	208	697	2384	172	485	2813	1381	249	381	2438	1	1083	12292	46.0%	
CUPS	166	468	814	154	66	1050	422	166	238	718	20	229	4511	16.9%	
BAGS	130	464	550	93	50	846	267	142	152	1087	5	642	4428	16.6%	
CARTONS	190	573	607	103	94	571	409	148	213	824	1	340	4073	15.2%	
NEWSPAPER	41	272	184	15	39	186	63	68	58	299	49	141	1415	5.3%	
TOTAL PAPER	735	2474	4539	537	734	5466	2542	773	1042	5366	76	2435	26719	100.0%	
WOOD															
MISCELLANEOUS PIECES	303	460	2696	386	211	1697	564	118	679	1484	210	498	9306	91.2%	
PALLETS	129	20	109	54	5	55	26	11	44	131	1	20	605	5.9%	
CRATES	44	19	45	41	3	32	13	8	30	51	0	6	292	2.9%	
TOTAL WOOD	476	499	2850	481	219	1784	603	137	753	1666	211	524	10203	100.0%	
RUBBER															
TIRES	40	57	132	12	10	96	36	33	23	89	8	10	546		
TOTAL ITEMS	19060	36620	72027	23811	14154	84534	23123	8159	34964	45623	2593	18210	382878		
TOTAL RECORDS TALLIED	79	85	299	125	66	379	67	27	125	240	5	83	1580		



Number one item recorded during cleanup was plastic bags.



Plastic milk or water jugs and soda bottles found September 1987 on the Texas Coast.

buoyant, enabling it to be brought ashore by currents. And since most plastics are manufactured to be durable and not degradable, they may persist in the marine environment for longer periods of time as compared to other materials.

The most common debris items recorded were plastic bags, which numbered 31,773. Plastic bottles ranked second in abundance, accounting for 30,295 litter items. Of these, approximately 21 percent were soda bottles, 24 percent were green bottles which are generally containers for substances such as bleach, and the remaining 55 percent were categorized as "other."

The category of plastic caps and lids ranked third, being a broad category allowing for wide classification of everything from small medicine bottle caps to large bucket lids.

Styrofoam pieces and plastic pieces ranked fourth and fifth in abundance with 22,609 and 21,619 items recorded respectively. Glass pieces ranked sixth, with 21,214 pieces reported.

Metal beverage cans ranked seventh in abundance with 20,580 reported. Rope was the eighth most common debris item collected (18,979), followed by glass

Exhibit 4

COMPOSITION OF DEBRIS

Each debris item collected was recorded on a data card under the major categories given below. The amount of debris collected under each category was then calculated as a percentage of all debris combined. Results from CEE's 1986 September cleanup are provided in parentheses.

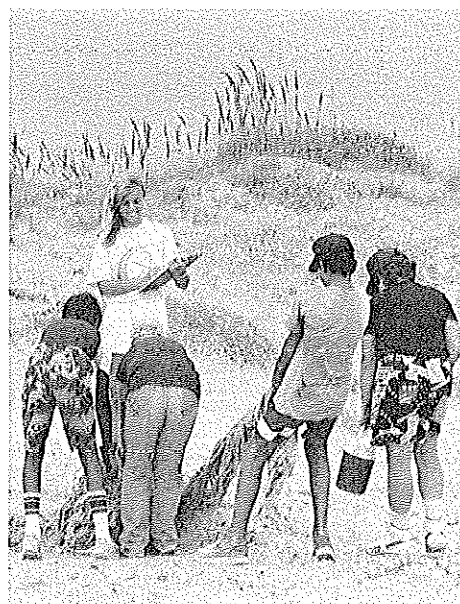
	PERCENT					
	PLASTIC	STYROFOAM	GLASS	METAL	PAPER	WOOD
BEAUMONT	48.6 (36)	13.7 (10)	11.9 (35)	19.4 (14)	3.9 (2)	2.5 (2)
BOLIVAR	50.3 (56)	12.9 (15)	12.6 (10)	16.1 (11)	6.8 (5)	1.4 (3)
GALVESTON	56.4 (58)	11.4 (14)	12.5 (9)	9.5 (10)	6.3 (6)	4.0 (2)
BRAZORIA	47.7 (54)	10.5 (13)	9.6 (9)	18.6 (14)	11.0 (8)	2.6 (2)
BAY CITY	51.2 (48)	8.9 (10)	11.2 (10)	17.5 (25)	9.5 (6)	1.7 (1)
MATAGORDA	55.1 (55)	12.4 (13)	20.7 (20)	7.5 (8)	2.3 (1)	2.0 (2)
P. ARANSAS	71.8 (65)	5.0 (10)	4.8 (6)	11.7 (12)	5.2 (4)	1.5 (2)
C. CHRISTI	61.2 (62)	8.0 (8)	8.4 (9)	13.8 (14)	6.5 (6)	2.1 (2)
P. I. N. S.	68.7 (64)	8.7 (8)	7.3 (15)	10.2 (8)	3.0 (2)	2.2 (3)
S. PADRE	48.1 (45)	8.4 (9)	12.2 (17)	15.8 (15)	11.8 (10)	3.7 (4)
BOCA CHICA	48.6 (53)	13.6 (9)	11.6 (13)	10.0 (13)	13.4 (10)	2.9 (2)
LAGUNA MADRE	35.7 *	9.2 *	23.9 *	20.0 *	2.9 *	8.2 *
TOTAL TEXAS	55.9 (56)	10.1 (11)	11.1 (12)	13.2 (13)	7.0 (6)	2.7 (2)

* data not available for 1986.

bottles (17,092) and plastic six-pack rings used for carrying beverages (15,631).

It is apparent that the categories of plastic soda bottles, six-pack rings, glass bottles, and beverage cans constituted a substantial portion of the debris collected. Detachable metal pull-tab rings from beverage cans were also noted to be abundant. Overall, items in this category, which will be termed "bottles and associated goods," made up 20.3 percent of all litter items collected (Exhibit 5). On a regional basis, the areas of Beaumont, Brazoria, Bay City, South Padre, and Boca Chica had the highest percentages of these goods as compared to all other items collected.

Based on the results of the 1986 cleanup, 12 items of debris were added to the 1987 data card: rope, plastic pieces, plastic drinking straws, gloves, shoes, plastic-lined diapers, plastic lighters, monofilament fishing line, plastic light sticks used for fishing, syringes, tires, and plastic tampon applicators. Most of these items were added because volunteers found them to be particularly prevalent on Texas beaches. Plastic tampon applicators were added because this debris item is prevalent in other areas of the United States, principally in the northeastern coastal states. Because many of these new items listed on the 1987 data card, particularly rope, were found to be among the most common items collected in 1987, this demonstrates that it is important for volunteers to record items that are not specifically listed on the data card. Data cards should be amended as necessary to ensure that important information is being obtained by beach cleanup volunteers.



CATHERINE WEISS

Volunteers collect not only marine debris but important data on what kinds of trash they find on the beach.

Exhibit 5

BEVERAGE ASSOCIATED GOODS

Six debris items fall into a category termed "bottles and associated goods." The amount of these items as a percentage of all debris reported from each zone and statewide is given below. Results from CEE's 1986 September cleanup are provided in parentheses.

	PERCENT						
	PL. SODA BOTTLES	BEVERAGE CANS	GLASS BOTTLES	6-PACK HOLDERS	BOTTLE CAPS	PULL TABS	TOTAL
BEAUMONT	2.1 (2.7)	3.7 (6.4)	4.8 (26.1)	3.7 (5.5)	2.1 (0.0)	9.3 (0.0)	25.8 (40.7)
BOLIVAR	1.8 (3.8)	9.4 (7.1)	4.6 (4.7)	4.4 (5.3)	1.6 (0.1)	1.2 (0.4)	23.0 (21.4)
GALVESTON	0.8 (1.9)	3.9 (5.8)	2.1 (4.9)	5.1 (7.2)	1.5 (0.2)	1.6 (0.9)	14.9 (20.9)
BRAZORIA	1.2 (1.9)	6.8 (7.9)	4.6 (4.8)	4.0 (6.0)	3.6 (0.1)	4.4 (0.6)	24.6 (21.3)
BAY CITY	1.6 (5.2)	9.1 (12.2)	5.3 (7.6)	4.5 (4.9)	2.4 (0.0)	1.3 (0.0)	24.2 (29.9)
MATAGORDA	2.4 (4.7)	2.5 (3.7)	14.6 (16.2)	1.3 (1.8)	1.4 (0.0)	0.4 (0.0)	22.5 (26.4)
P. ARANSAS	0.7 (1.7)	3.6 (5.8)	1.5 (2.8)	2.8 (9.0)	2.1 (0.2)	2.9 (1.1)	13.5 (20.6)
C. CHRISTI	1.5 (2.4)	4.8 (6.9)	2.6 (4.1)	3.9 (9.0)	3.0 (0.4)	3.3 (1.9)	19.1 (24.7)
P.I.N.S.	2.3 (1.3)	5.8 (4.6)	4.2 (10.1)	3.1 (4.2)	1.1 (0.1)	0.7 (0.1)	17.3 (20.4)
S. PADRE	2.3 (2.6)	6.9 (8.7)	7.0 (11.7)	3.5 (4.2)	2.8 (0.1)	1.7 (0.0)	24.1 (27.3)
BOCA CHICA	3.0 (3.8)	3.9 (5.6)	8.8 (10.1)	8.7 (5.7)	2.1 (1.9)	0.7 (0.0)	27.2 (27.1)
LAGUNA MADRE	0.6 *	9.6 *	5.2 *	5.3 *	1.3 *	0.0 *	22.1 *
TOTAL TEXAS	1.7 (2.7)	5.4 (7.3)	4.7 (6.9)	4.1 (6.0)	2.2 (0.2)	2.3 (0.6)	20.3 (23.7)

* data not available for 1986.

SOURCES OF DEBRIS

While certain types of debris items can be traced to specific sources, others are likely generated by several different and unspecifiable sources. The most common types of debris found included bags, containers, and other items used for "domestic" purposes. The predominance of plastic domestic items was clearly evident with plastic packaging being most prevalent. Unfortunately, it is not possible to trace many of these domestic items to a single source. Domestic wastes could be generated by land-based sources in Texas and other Gulf coast states. Even wastes generated on land far up the Mississippi River could be carried to Texas by river and Gulf currents.

The term "domestic" is not meant to imply that these items are coming only from land. Many of these items are also generated by offshore sources. The worldwide rate of disposal of garbage from ocean sources in the early 1970s was estimated by the National Academy of Sciences at 14 billion pounds per year. The world's merchant shipping fleet discards at least 4,800,000 metal, 300,000 glass, and 450,000 plastic containers at



Marine debris, including rope, strapping band and bucket found at Padre Island National Seashore.

CATHERINE WEISS



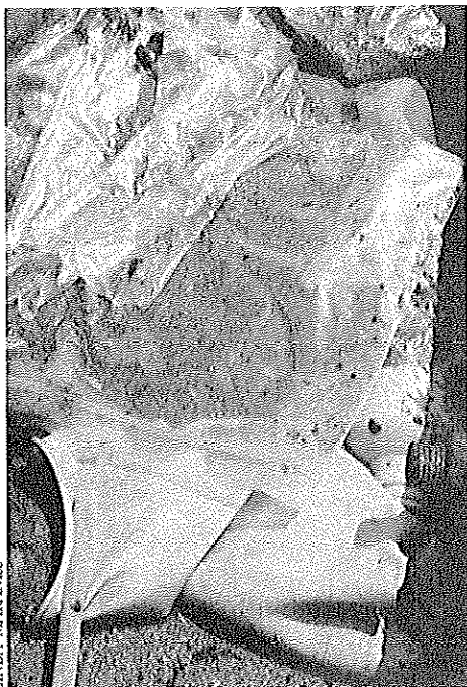
Foreign bottles and cans collected by volunteers at Sargent Beach.

sea every day. And recreational boaters are estimated to generate one pound of trash per person each day. Even U.S. naval ships, which routinely dispose of trash at sea, are estimated to generate more than three pounds of garbage per man each day--and some crews number 5,000 men. It is difficult to determine just what percentage comes from offshore versus land-based sources. However, the fact that many items of debris found on the Texas coastline have labels in foreign languages, including French, Spanish, Japanese, and Arabic, while others bear the insignias of petroleum companies, indicates that debris on the Texas coastline is not merely generated by careless beach goers or other land-based sources.

In order to help identify source of debris, volunteers were asked to record items that had labels or company names. More than 200 foreign label items were recorded. Countries of origin included Arabia, Argentina, China, Denmark, England, France, Germany, Italy, Jamaica, Japan, Singapore, Sweden, Thailand, Venezuela, Vietnam, and many other countries. Many of these items can be attributed to dumping by foreign merchant ships.

Several items listed on the data card served as indicators of debris generated by a particular offshore source. For example, items such as hardhats and fishing nets were chosen on the basis of their known association with offshore petroleum and fishing activities conducted in the Gulf.

With U.S. ratification of Annex V of the MARPOL Treaty, regulations are now in place to control offshore sources of debris beginning on December 31, 1988. However, these regulations do not address the problem of plastic debris generated by land-based sources. In some cases plastic debris generated by land-based sources is easily traced.



Plastic bags and a rubber glove, September 1987

A few of the better known land-based sources of plastic include sewage systems and landfills located along coastal waterways. Also included in this group are plastic manufacturing and processing plants, dock and marina structures, and littering by the general population.

In some areas of the country, sewer systems discharge plastic tampon applicators, diapers, and other plastic items directly into marine areas. Sewage sludge dumped into the ocean is also a source of plastics. This is especially true in coastal waters off New York and New Jersey where during sewage treatment approximately five percent of the plastics escape screening and are dumped along with treated sewage sludge. In the late 1970s, an estimated 1,000 plastic tampon applicators were dumped with sewage sludge in the New York Bight every day. Present amounts are thought to be considerably higher. They are so prevalent in some areas of the country that people have jokingly named them "beach whistles" and "New Jersey sea shells." Agencies in California have also reported sewage-associated wastes on southern coastal beaches and attribute much of this problem to inadequate sewer systems in Mexico.

Therefore, plastic tampon applicators and diapers could be used to indicate sewage-associated wastes. However, a large portion of the diapers found on Texas beaches are also left behind by beach goers with young children.

Another item, plastic syringes, was used to indicate whether medical wastes were a problem in Texas, since they have been a major problem in other areas of the United States, principally in the New York-New Jersey area during the summer of 1987. Although the cause for this incident has still not been identified, it is suspected that medical wastes were illegally dumped by a barge transporting trash to a coastal landfill. In the Gulf of Mexico, medical wastes may come from either land-based sources such as landfills or beach goers, or from ships in the Gulf.

In addition, although it was not possible to identify a particular indicator item for debris generated by landfills or entrainment from rivers, a specific incident described later in this section suggests that these sources also contribute to the debris problem in Texas.

The indicator items are described below under the categories of offshore sources, including cargo, galley-type, operational and fishing wastes, and land-based sources, including sewage-associated wastes and landfills. Medical type wastes and debris brought to the Gulf from inland sources via rivers are also described. The amount of ocean type sources of debris collected at each zone calculated as a percentage of all debris is given in Exhibit 6. A comparison of 1987 data with data from 1986 is also provided.

Exhibit 6

SOURCES OF DEBRIS

Several debris items were used as indicators of trash generated by offshore sources. These were grouped under four categories. The amount of these items calculated as a percentage of all items collected in each area is given below (see note below). Results from CEE's 1986 September cleanup are provided in parentheses.

	PERCENT			
	CARGO WASTES	GALLEY WASTES	OPERATIONAL GOODS	FISHING GEAR
BEAUMONT	1.7 (0.2)	5.1 (3.0)	3.9 (5.6)	10.7 (0.3)
BOLIVAR	1.6 (1.0)	5.1 (7.9)	2.0 (6.6)	6.5 (3.0)
GALVESTON	1.3 (8.8)	2.5 (6.1)	2.9 (7.5)	9.8 (2.2)
BRAZORIA	1.1 (3.9)	3.2 (5.5)	2.9 (6.6)	7.8 (1.7)
BAY CITY	2.3 (0.0)	4.8 (5.0)	3.6 (7.0)	7.2 (0.3)
MATAGORDA	1.1 (0.7)	5.8 (8.6)	6.4 (10.1)	9.8 (3.3)
P. ARANSAS	0.8 (4.9)	1.7 (3.1)	3.9 (8.1)	12.8 (2.8)
C. CHRISTI	1.6 (6.3)	2.8 (2.9)	2.8 (8.4)	10.9 (2.0)
P. I. N. S.	4.4 (5.2)	4.4 (5.8)	1.8 (10.4)	9.9 (3.4)
S. PADRE	1.1 (1.3)	2.6 (3.2)	1.5 (7.8)	5.5 (1.2)
BOCA CHICA	1.0 (0.8)	2.1 (5.7)	0.9 (6.8)	4.1 (1.0)
LAGUNA MADRE	0.6 *	1.8 *	1.4 *	5.5 *
TOTAL TEXAS	2.8 (3.7)	3.4 (5.2)	2.9 (7.6)	8.9 (2.1)

* data not available from 1986.

Note: Cargo Wastes: plastic sheeting, wooden pallets, wooden crates

Galley Wastes: plastic egg cartons, plastic milk jugs,
plastic vegetable sacks

Operational: plastic write-enable rings, hardhats, light
bulbs, plastic strapping bands, fluorescent light
tubes

Fishing Gear: nets, buoys, fishing line, light sticks, gloves, rope

Ocean Sources Of Debris

Cargo Associated Wastes

Indicator items of trash that are associated with cargo shipping activities, primarily maritime and petroleum industry operations, and that are found on Texas beaches, include large pieces of plastic sheeting, wooden pallets, and crates. Rope, which was included in the 1986 analysis of cargo wastes, was reassigned to the category of fishing associated waste based on recommendations from the steering committee.

Comparison of cargo-associated waste in all zones indicated that this group of debris was found most frequently at Padre Island National Seashore and the Bay

City area cleanups. At both of these zones large pieces of sheeting were most abundant.

Galley-Type Wastes

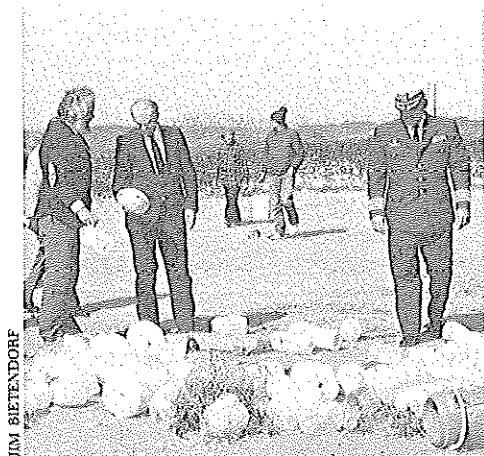
Egg cartons, milk jugs, and plastic vegetable sacks were chosen to represent items that are most likely generated by offshore sources with galleys. Although these items are also commonly used on shore, it is more likely that when found on the coastline in such large quantities they were not generated by beach users but rather by ships, commercial fishing vessels, recreational boaters, and offshore petroleum rigs and platforms.

Plastic milk jugs were a major item of debris. A total of 7,460 milk jugs were recorded. While some may argue that milk jugs could be left behind on beaches, more than 800 milk jugs were reported on just four miles of beach cleaned on isolated Matagorda Island which can only be reached by boat. It is difficult to debate the conclusion this item is generated predominantly from offshore sources. In fact, in comparison to other zones, Matagorda had the highest concentration of galley wastes for both the 1986 and 1987 CEE beach cleanups. Bolivar Peninsula also had high numbers of galley waste items for both years. But, unlike Matagorda, Bolivar Peninsula is readily accessible to the public and some people have been using the beach in this area to dispose of household trash. Beaumont, Bay City, and Padre Island National Seashore also reported high concentrations of galley type wastes.

Operational Wastes

Other forms of debris occurring on the Texas coastline are those that are associated with offshore operations in the Gulf conducted primarily by maritime and petroleum industry operations. Data cards listed five such items: 9-track "write-enable" rings which are used during seismic recording and other computer activities, hardhats, light bulbs, and fluorescent light tubes, and plastic strapping bands. Plastic strapping bands are used to bind boxes and other cargo and have come to replace the formerly used steel straps because they are more convenient and cheaper. Drums, which were also used as a indicator for this source in the 1986 report, were omitted from this category this year because the numbers are unreliable, as volunteers may record the same drum several times.

The most abundant operational type trash found statewide were plastic strapping bands, followed by write-enable rings and light bulbs. The more than 1,000 light bulbs and fluorescent light tubes reported from the four miles of beach on Matagorda Island attests to the fact that these items are coming from offshore. Matagorda Island, Beaumont, and Port Aransas had the largest percentage of operational goods as compared to



U.T. Oceanographer Tony Amos shows U.S. Senator Phil Gramm beach debris on St. Jo Island with Captain Anthony Alejandro from the U.S. Coast Guard at Port Aransas.

other zones. Light bulbs were the most abundant type of operational waste recorded at Matagorda and Beaumont, whereas plastic strapping was the most abundant item at Port Aransas.

Fishing Gear

Fishing operations, both commercial and recreational, are a source of debris in the form of domestic wastes and fishing gear. Although it is not possible to specifically identify which domestic type wastes are discarded by crews of commercial fishing vessels, fishing gear which is either accidentally lost or intentionally discarded is specifically identifiable to this source. Fishing nets, buoys, monofilament fishing line, light sticks, gloves and rope were designated to represent debris items generated by fishing activities in the Gulf. In 1986, the steering committee observed that thin latex gloves are used by Gulf shrimpers during the process of removing the heads of shrimp. Heavier rubber gloves are used in offshore operations, particularly during the handling of chemicals. However, since it was not possible to determine the types of gloves (thin latex vs. heavy rubber) from information provided by volunteers, all gloves were categorized as fishing wastes. Cyalume light sticks are chemical lights attached to a fishing line above the bait to attract fish. Light sticks have become standard gear in the swordfish, tuna, and other fisheries of the Gulf. A portion of the plastic milk jugs and plastic vegetable sacks found on the Texas coastline may also be attributable to this source; fishermen use plastic jugs as buoys for traps, and they use vegetable sacks for storing frozen shrimp and fish. But since there was no way to determine whether milk jugs or vegetable sacks were used for these purposes, these items were considered to be galley-type wastes.

The greatest concentration of fishing related debris was reported in Port Aransas, followed by Corpus Christi, Beaumont, Matagorda Island, and Padre Island National Seashore. The most common debris in this category was rope, followed by monofilament fishing line. However, counts of rope and fishing line do not provide a clear picture of the actual amount of these materials present. For this reason several groups carried out special rope surveys during the statewide cleanup including individuals with the National Marine Fisheries Service, Pan American University, the Beta Beta Beta Honor Society from Lamar University, and Corpus Christi State University. One professor from Corpus Christi State University, who conducted an independent rope survey on Padre Island National Seashore, reported that the 13 pieces of rope found on 1 kilometer (.62 miles) of beach measured approximately 70 feet in total length.



LINDA MARANISS

Mobil Oil Company donated 100,000 trash bags to the Texas Adopt-a-Beach program. More than 17,000 bags were filled during the September Texas Coastal Cleanup.



Medical Waste found on Matagorda Island during the 1987 Texas Coastal Cleanup.

Medical Wastes

Only one item of debris was used to indicate whether medical type wastes were prevalent on the Texas coastline--plastic syringes. During the cleanup 930 syringes were recorded. This debris type was primarily attributed to offshore sources because Matagorda Island had the highest concentration of syringes compared to other zones. However, both Corpus Christi and Padre Island National Seashore also reported high numbers of syringes relative to other areas.

In addition to syringes, many data cards listed other medical type wastes, including: plastic test tube kits with pills and oil samples, plastic bags marked cocaine and acid, and a 5 cc syringe nylon bag from Thailand, all found at the Beaumont zone; beakers and prescription medicine bottles on Boliver Peninsula; and surgical tubing and a blood transfusion bag on Matagorda Island.

Land-Based Sources of Debris

Sewage-Associated Wastes

Plastic tampon applicators and diapers were used to identify debris generated by this source, although a portion of these items may also be directly discarded by beach goers or boaters. The greatest concentration of sewage-associated wastes was found in Boca Chica, followed by South Padre, and Brazoria. The tendency for these items to be more prevalent on southern Texas beaches could be attributed to either beach goers or to inadequate sewer systems, perhaps in areas of Mexico. In all three zones, diapers were more prevalent than plastic tampon applicators and since they are less likely to remain intact after passing through a sewage system, beach goers may be a more likely source of these items.

Landfills

Land-based solid waste disposal sites are another source of marine debris. Although trash is no longer legally dumped at sea in the United States, in some areas garbage is emptied onto barges and then transported to landfills located along coastal waterways. An example is Fresh Kills landfill on Staten Island, New York, which receives 700 tons of trash a day. In this area, lightweight litter such as plastic is frequently blown off the barges and into the water. Escapement into surrounding waters also occurs directly from the landfill.

Private landfills and dumpers also contribute to the debris problem in Texas. To take advantage of lower labor costs, many U.S. companies have established manufacturing or assembly plants just across the border in areas of Mexico. In 1987, such a plant that was

dumping its trash on the banks of the Rio Grande River was discovered to be responsible for hundreds of plastic bags found at the National Audubon Society's Sabal Palm Sanctuary, near Brownsville.

For several years wardens at the sanctuary had noticed plastic bags clinging to the trees along the banks of the river. "Several times during the year we pump water from the river into our reservoir to attract water fowl. We'd get plastic in our pumps and it was clogging our pipes," said sanctuary manager Jesse Grantham.

The number of foreign-owned assembly plants along the Mexican border has increased in part because of the plunge of the peso's value. The number of plants in Ciudad Juarez, a city across the Rio Grande from El Paso, has more than doubled since 1982. Countries that have border assembly plants include the United States, Japan, Germany, England and others.

As previously noted, in order to help identify source of debris, volunteers were asked to record items that had labels or company names. While more than 200 items were recorded with foreign labels, 160 of these observations, or 76 percent, noted labels from Mexico. This is a problem that has not yet been addressed in Texas--how much debris found in Texas originates from inadequate land-based solid waste disposal practices carried out across the border in Mexico?

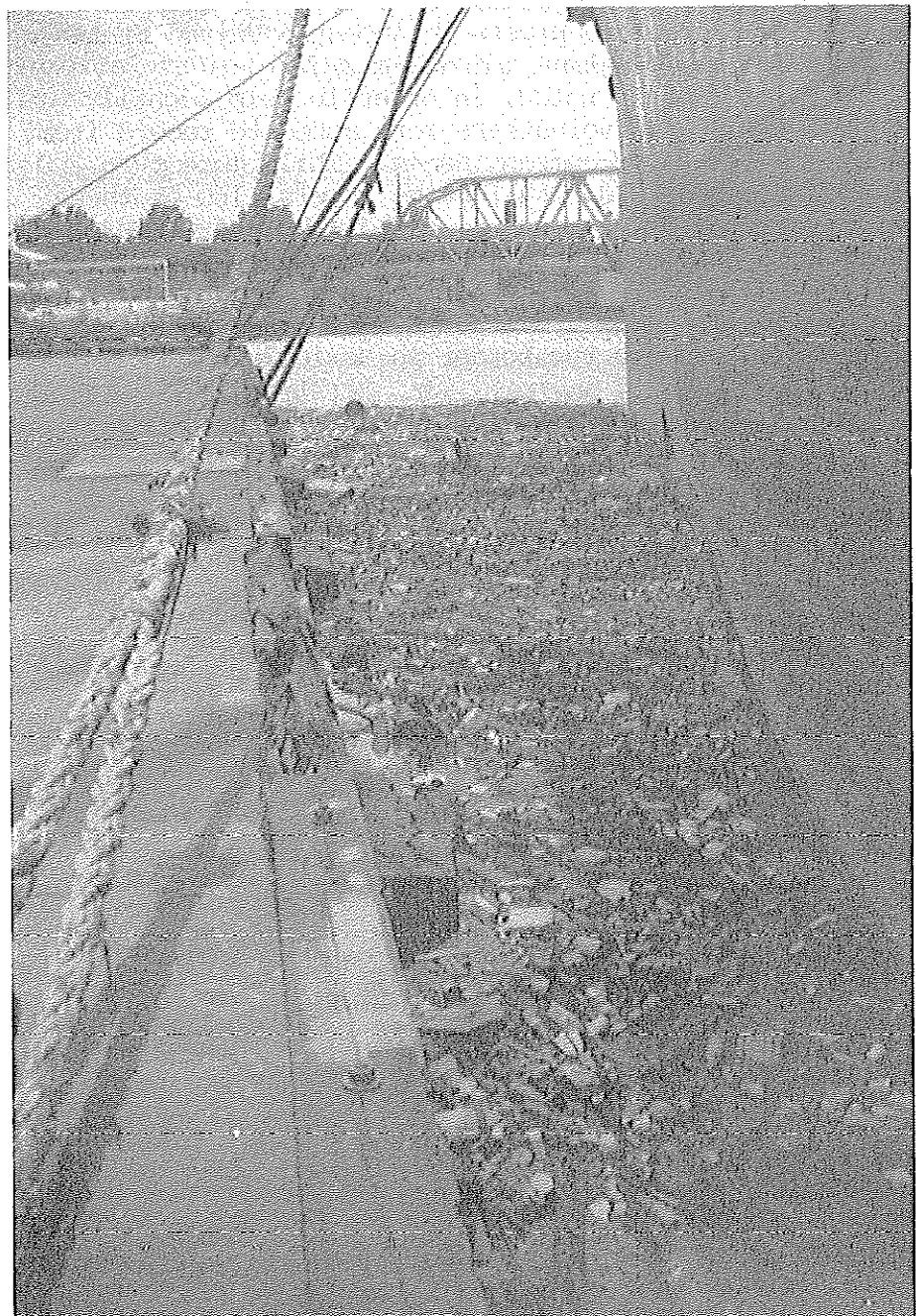


Thousands of plastic bags from an assembly plant line the Mexican side of the Rio Grande River.

PATTY REINHERT

Debris Transported by Inland Waterways

Another source of debris not previously addressed are rivers that transport debris from inland sources to the Gulf. It is not known what percentage of the debris found in the Gulf of Mexico comes from inland sources via rivers such as the Mississippi, Rio Grande, and other rivers. However, it is most probably a major source. In June 1987, Steering Committee member Captain Clarence Sheppard observed a large amount of plastic trash and other debris trapped between a dock and a steamship berthed at the Port of Houston. The debris, which appeared after a heavy rainfall, had been washed down the Buffalo Bayou. Had this trash not been trapped, it would have floated into the Gulf of Mexico.



Trash washed down rivers after heavy spring 1987 rains became trapped at the Houston Ship Channel between a ship and the dock.

CAPTAIN CLARENCE SHEPPARD

DISTRIBUTION OF DEBRIS

The data obtained from each of the seventeen zones revealed some interesting findings. For one, plastic items (including styrofoam) dominated in every area, ranging from 45 percent of the total reported at Laguna Madre to a high of 77 percent at Padre Island National Seashore. In contrast, Laguna Madre, which is located on the bay side of South Padre Island, reported the largest percentage of glass items with 23 percent, the majority of which were pieces. Laguna Madre also had the highest concentration of metal with 20 percent, the majority of which were beverage cans. Findings from each zone are described below.

Beaumont-McFadden Beach

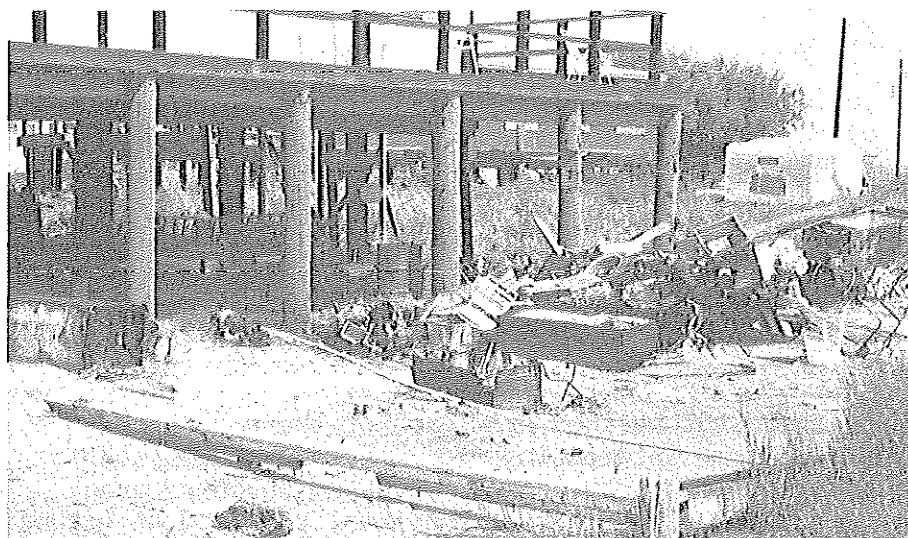
At the Beaumont zone, 286 volunteers participated in the cleanup, more than four times the number of volunteers in 1986. They collected 4.5 tons over 13.5 miles of beach. From the 77 data cards returned, the most abundant item reported were plastic bottles which numbered 2,068. Metal pull tabs were the second most common debris item collected, accounting for 1,772 of the total. Other prevalent debris types reported at this zone included miscellaneous pieces of styrofoam, styrofoam cups, and glass bottles. Also in abundance at this zone were pieces of glass. Twenty-six percent of the debris collected at Beaumont was beverage-associated litter, which was much less than the 40 percent reported in 1986. (Beaumont had the highest percentage of beverage associated goods in 1986).

Bolivar Peninsula

Bolivar Peninsula reported a total of 40 tons of debris collected by 400 volunteers over 11 miles. Apparently the problem of debris on Bolivar Peninsula has not improved. Compared to 1986, nearly the same amount of trash was collected by an equal number of volunteers but on half the distance of beach. The majority of items reported were plastic bags and bottles. Bolivar had the second highest percentage of galley-type wastes compared to other zones.

In 1986 it was noted that sections of the beach in this area were being used to dump household trash. This still appears to be a problem since in 1987,

Household trash dumped on Bolivar Peninsula.



televisions, toilets, mattresses, and car mufflers were removed from the beach.

Galveston

The results from Galveston's cleanup also indicate that the debris problem has not improved since last year. Galveston reported that 120 tons of debris were collected by 1,200 volunteers along 32 miles--three times more volunteers and 12 times the amount of trash collected on the same distance of beach in 1986. Volunteers included ARCO Civic Action Program and Adopt-A-Beach groups from Mobil and Tenneco, Houston Light and Power, Southern Union Gas, and Del Papa Distributing Company. The most abundant debris items collected were pieces of glass, followed by pieces of plastic, caps and lids, and plastic bags. Recreational fishermen appear to be a particular source of debris in this area because volunteers found more monofilament fishing line in Galveston than in other zones.

Brazoria-Surfside

The 375 volunteers, including Adopt-A-Beach groups from Dow Chemical and Boeing, joined others at Brazoria County's zone to collect more than 26 tons of debris on 20 miles of beach, surpassing their reported 9 tons on 32 miles in 1986. Plastic caps and lids and plastic bottles were most abundant at this zone. Metal beverage cans were also numerous. Consequently, Brazoria had one of the highest concentrations of beverage associated goods with 24.56 percent.

Bay City-Sargent Beach-Matagorda Beach

The Bay City cleanup held at Sargent Beach and Matagorda Beach collected 6.7 tons of debris by 394 volunteers over 6.5 miles. As in 1986, metal beverage cans were once again the most prevalent debris item reported from this area. Bay City also had the second



Marine debris included green bleach bottles from Mexico and eight pounds of aluminum cans from the cleanup at Sargent Beach.

highest concentration of light sticks and galley type wastes compared to other zones.

Matagorda Island

Once again, the results from Matagorda Island were used for comparison to other zones because it is not readily accessible to the public and only reachable by boat. This cleanup involved transporting 371 volunteers (a significant increase from the 35 volunteers in 1986) to and from Matagorda Island, as well as using several boats to haul back to port the 15.5 tons of trash they collected on 4 miles of beach. More than 150 staff members of Texas Parks and Wildlife Department provided invaluable assistance in coordinating this cleanup.

The most common debris items collected were glass bottles, followed by plastic bottles, plastic caps and lids, and pieces of styrofoam. Matagorda Island had the highest percentage of glass bottles compared to other zones. It also had the highest percentages of offshore generated galley and operational type wastes, due primarily to large numbers of plastic milk jugs and light bulbs. In addition, the highest percentage of syringes were reported at this zone.

Port Aransas

At Port Aransas 163 volunteers collected two tons of debris on five miles of beach. Compared to 1986, twice the amount of debris was collected on half as much beach. Plastic accounted for nearly 72 percent of all items collected, with pieces, caps and lids, and rope being most numerous.

Compared to other zones, Port Aransas had the highest concentration of fishing gear debris, more than 12 percent, with rope being most common. The percentage of light sticks relative to all other debris items collected at this site was also higher than at any other site.

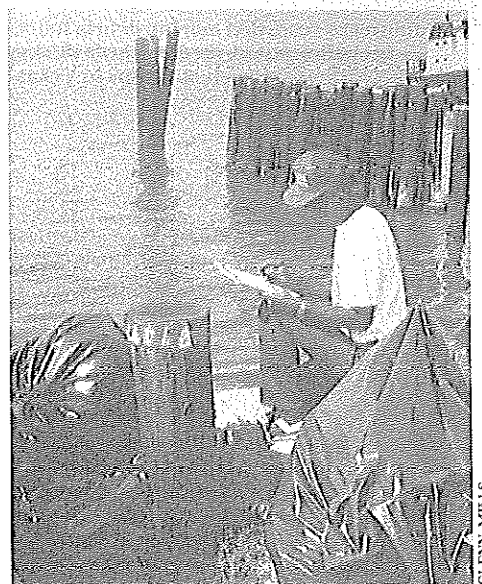
Aransas Bay

Aransas Bay was a new site for the cleanup where 66 volunteers helped to clean 2.5 miles of beach. Unfortunately, no data cards were returned from this site.

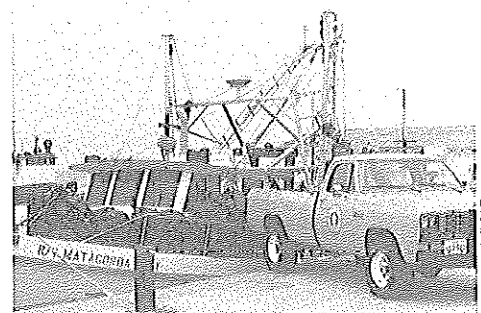
Corpus Christi

In 1987, the Corpus Christi zone included areas of Mustang Island and North Padre Island, to accommodate the 1,500 volunteers who collected 28 tons of debris on 29 miles of beach. The most abundant items collected were plastic bags, plastic caps, lids, and miscellaneous pieces of plastic.

Corpus Christi also reported numerous pieces of



Leland Roberts from Texas Parks and Wildlife Department computing totals after the Matagorda Island Cleanup. More than 1,200 bags of debris were filled.



Fifteen tons of trash from the 4 mile cleanup on Matagorda Island was brought back by boat with the help of Texas Parks and Wildlife staffers and other volunteers.

Volunteers recorded marine debris items, including wood, on data cards during beach cleanups in Texas.



LINDA MARANISS

fishing line and light sticks. Hence, the percentage of fishing gear wastes at this site was the second highest in the state.

Padre Island National Seashore

At Padre Island National Seashore 447 volunteers collected 13.3 tons of debris on 13.6 miles of beach. Volunteers from all over the country helped at this cleanup, including members from Keep America Beautiful and the Society of the Plastics Industry, both located in Washington, D.C.

The highest percentage of plastic (including styrofoam) was recorded at this zone. The most abundant items collected were plastic bottles, of which 29 percent were green, nearly 15 percent were soda bottles, and 56 percent other. Plastic bags, caps, lids, and metal beverage cans were also prevalent.

Compared to other zones, Padre Island had the highest concentration of cargo-associated wastes due primarily to the 971 large pieces of plastic sheeting reported. Nearly 10 percent of all debris collected at this zone was fishing gear.

South Padre

Volunteers at South Padre numbered 950. They collected 40 tons of debris along 10 miles of coastline. Plastic and styrofoam accounted for 56 percent of all debris items collected. Compared with 1986 results, the percentage of metal, paper, and wood found at South Padre has remained essentially the same, while plastics (including styrofoam) has increased slightly, and glass has declined by nearly 5 percent. The most abundant debris items collected were plastic bags. Plastic bottles, glass bottles, and metal beverage cans were also prevalent. Beverage associated goods accounted for 24 percent of all litter items collected.

For the second year, plastic diapers were reported to be more prevalent in this area than any other. In addition, the amount of plastic tampon applicators



BOB WHISTLER

Thirteen tons of trash was removed from thirteen miles of Padre Island National Seashore during the September 1987 Texas Coastal Cleanup.

relative to other debris reported at this zone was higher than at any other area.

Boca Chica

This year, Boca Chica had 950 volunteers, compared with 50 in 1986, thanks to the Adopt-A-Beach groups from the Brownsville schools. They also covered more beach and collected more debris--7 miles and 11 tons to be exact. Boca Chica had the highest percentage of paper items and the highest percentage of beverage-associated goods, with 27 percent of all litter items being beverage associated.

The most common items reported were plastic bags and glass bottles. Plastic six-pack rings were also common, accounting for 8.7 percent of all debris reported.

Sewage-associated wastes generated either by inadequate sewage treatment systems or by beach goers and boaters were most commonly found at this site compared to other zones. In fact, more diapers were found at this site than cargo-associated and operational wastes combined.

Laguna Madre

For the first time, a cleanup was organized on the "finger area" of Laguna Madre. Among the 26 volunteers that participated were members of the Laguna Madre Yacht Club. They hauled away five trailers and several pickup trucks full of two tons of debris. The most prevalent debris items were pieces of glass, metal beverage cans, styrofoam cups and pieces of wood. Volunteers reported that the major sources of trash seemed to be the shrimp boat docks located on the bay side of South Padre Island near Port Isabel, and from discarded construction materials.

Compared to other zones, Laguna Madre had the highest percentages of glass, metal, and wood.



Plastic bags including ice, salt and small bags filled with bait were found with rubber gloves on Bolivar Peninsula in September 1987.

DRUMS



Many 55 gallon drums arrive on Texas beaches unmarked, making identification of both contents and source difficult.

CEE's 1986 report addressed the problem of 30 and 55-gallon drums that come ashore on the Texas coastline. In 1986, Padre Island National Seashore reported 110 drums on its beaches alone. Of these, 64 percent still contained substances, some of which are hazardous to both humans and wildlife. An additional complication of this problem is that by the time many of these drums reach the shoreline they have lost their labels and therefore the contents of the drum are unknown. The cost for removing just one drum is more than \$1,000.

The Texas Coastal Cleanup provided a unique opportunity for volunteers to assess the problem of drums washing ashore on the Texas coast. Although volunteers were specifically cautioned not to go near any drums encountered during cleanup activities, they were asked to record the number of drums. Volunteers recorded 493 drums--268 rusty and 225 new.

However, in 1986 it was noted that different volunteers were recording the same drum, resulting in a higher number of drums reported than were actually present on the beach. In South Padre, young children were so conscientious about recording drums that they counted the drums used as trash receptacles. Yet, it is important for volunteers to know that these drums are a problem and could be dangerous on the Texas coastline and therefore drums are included on the data card.

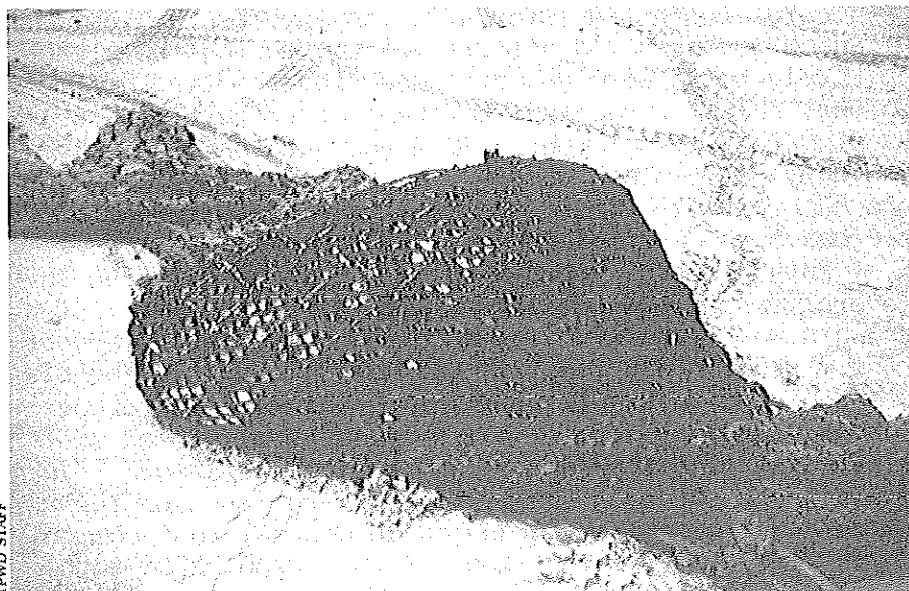
The U.S. Coast Guard and Padre Island National Seashore staff reported that a total of 120 drums were found on Padre Island National Seashore in 1987--10 more than 1986. Seventy-two of these drums contained a liquid substance but many were not labeled as to what kind of substance. Therefore, although educational efforts have been initiated by the petroleum industry to address the marine debris problem, and there has been an overall decrease in activity of offshore petroleum operations in recent years, the problem of drums has not been adequately addressed. According to the Minerals Management Service, after an inspection of 3,500 rigs and platforms, 111 marking citations were issued. Staff at Padre Island National Seashore and the Minerals Management Service should meet to discuss the label marking system used on 55-gallon drums. It should also be determined whether drums found at Padre Island National Seashore that are not marked could be coming from sources other than the petroleum industry.

ENTANGLEMENT

Although debris poses an aesthetic problem in the marine environment, its effects on marine wildlife are a greater threat. Frequent reports of the mortality of marine mammals, sea turtles, seabirds, and fish attributed to debris, and plastics in particular, have become of increasing concern among scientists, conservationists, fishermen, and others worldwide.

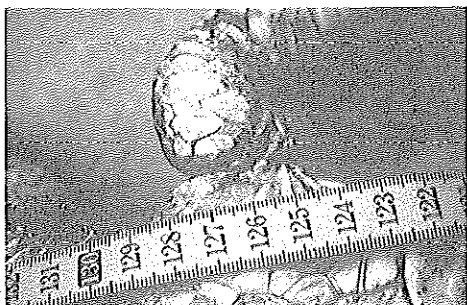
Problems arise when these animals encounter marine debris. Entanglement in debris such as fishing line, fishing nets, plastic strapping bands, or rope often leads to starvation, strangulation and death. Sea turtles and marine mammals often mistake floating plastic bags and sheeting for jellyfish or other prey and die from ingesting them. At least 50 of the world's 280 species of seabirds are known to ingest plastic debris items, including everything from small plastic pellets to cigarette lighters and toys.

Marine wildlife in Texas also unfortunately falls victim to marine debris. According to report by Pamela Plotkin with the National Marine Fisheries Service in Galveston, and Anthony Amos of the University of Texas, during the past two years 60 sea turtles were found on beaches between Mustang and North Padre Island entangled in debris or were found to have ingested marine debris. These animals were reported to the Sea Turtle Stranding and Salvage Network.



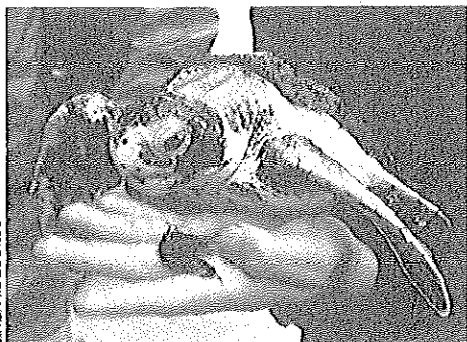
Loggerhead sea turtle entangled in shrimp trawl found on Matagorda Island April 1987.

TONY AMOS



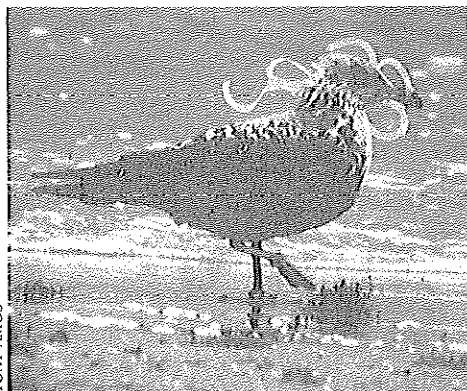
Hawksbill sea turtle entangled in plastic onion sack.

LINDA MARANISS



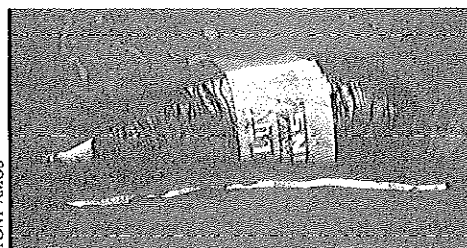
Kemp's Ridley sea turtle found at Padre Island National Seashore June 1987 with tar and plastic in its mouth.

TONY AMOS



Herring Gull entangled in 6-pack holder near Port Aransas.

TONY AMOS



Redfish entangled in onion sack found on a Texas beach.

Twenty-five of these turtles were entangled, including Kemp's ridley, loggerhead, green, and leatherback turtles, all of which are threatened with extinction. In 28 percent of these cases, entanglement was believed to be the cause of death. The remaining turtles were found entangled but alive, all but one of which were rehabilitated and released. The most common item found to cause entanglement was fishing line, followed by trawl fishing nets, vegetable sacks, other types of nets, and rope.

Thirty-five turtles were found with debris in either their mouth, throat, stomach, or intestines. Plastics were the most common types of debris ingested with bags being most prevalent. Other plastic items ingested, in order of frequency, were pieces of hard plastic, styrofoam, fishing line, plastic pellets, plastic strapping, and pieces of balloons. Non-plastic items found included pieces of aluminum foil, cardboard, and a pull tab from a beverage can. Unfortunately, the most common items found to entangle sea turtles—namely fishing line, nets, vegetable sacks, and rope—were among the most prevalent items of debris found during the cleanup. Moreover, the types of debris ingested by turtles, primarily plastic bags, plastic pieces, and styrofoam pieces, were also very abundant on the Texas coastline.

But sea turtles are not the only marine animals known to mistakenly ingest debris. In 1984, an infant pygmy sperm whale found near Galveston apparently died after it had swallowed plastic debris, including a large garbage bag, a bread wrapper, and a corn chip bag. In March 1988, a two-year-old female minke whale stranded on Matagorda Peninsula was reported to have died due to plastic sheeting in her digestive tract.

The Texas Coastal Cleanup has helped to increase public awareness of the effects of debris on marine wildlife. It also provided a unique opportunity to conduct a statewide survey of stranded marine animals. Data cards requested information on any observations of stranded or entangled animals sighted during the cleanup. Volunteers were asked to describe the type of animal, and if entangled, the type of trash that was causing the entanglement. From the data cards received, one dolphin, two sea turtles, more than twenty birds, and numerous fish and crabs were reported stranded on the beach.

Entanglement appeared to be the cause of death in several cases. On Bolivar Peninsula, the skeleton of a dolphin was found with its tail entangled in a piece of rope. Nine entangled birds were reported including six great blue herons entrapped in fishing line in Corpus Christi, and a young seagull with its beak closed shut by fishing line at Padre Island National Seashore. In addition, several of the crabs and fish found on the beaches were reported entangled in debris, most commonly rope, nets, and fishing line. Even a dead snake found

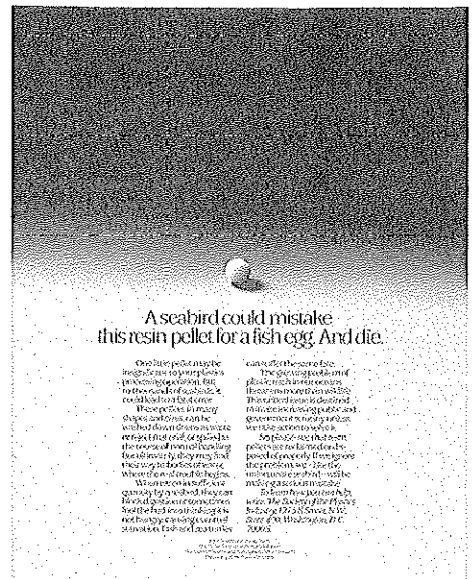
in Corpus Christi reportedly had a piece of rope in its mouth.

While representatives from the Society of the Plastics Industry were at the cleanup on Padre Island National Seashore, CEE staff took this opportunity to demonstrate the presence of plastic resin pellets at this zone. Plastic resin pellets, about the size of a match head, are the raw form of plastic after it has been manufactured from petrochemicals and before it is melted down and molded into plastic objects. Over the past two decades researchers have found that marine wildlife, and seabirds in particular, are ingesting plastic resin pellets which may resemble planktonic organisms, fish eggs, or even the eyes of fish and squid found at the ocean's surface. Nearly all of the plastics ingested by seabirds float at the surface where these natural prey are found. Many plastic pellets are similar in size, shape, and color to fish eggs, small crabs, and other prey. Although the impacts of pellet ingestion are not known for sure, some researchers report that unlike real food, plastics cannot be digested, and the birds slowly starve to death.

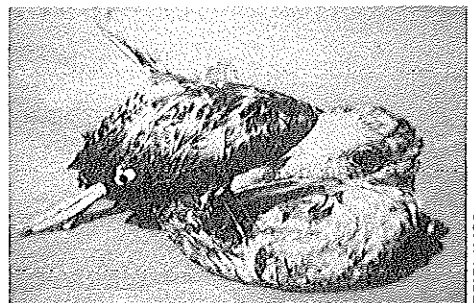
The ingestion of plastic pellets is now recognized as a problem facing seabirds worldwide. Certain species even collect these items and feed them to their young. But seabirds may not be the only marine animals feeding on pellets. There's evidence that some species of fish and several species of sea turtles also eat plastic resin pellets.

The means by which pellets enter marine systems is still unclear. In the 1970s it was believed that most pellets found in the marine environment had escaped from plastics manufacturing plants. Improved technology since then may have largely eliminated the escapement of pellets from resin plants in the United States, and more recent investigations suggest that pellets primarily enter marine areas during transportation and handling. Until this problem is carefully assessed, however, it is impossible to determine whether pellet escapement is still a problem for manufacturers. Many U.S. resin producers have already implemented new pellet reclamation procedures to prevent this problem. With the installation of collection weirs, precautions in handling, and thorough cleansing of freight cars, one of Dow Chemical Company's plants in Louisiana reclaims 500 pounds, or approximately 5 million pellets, each day that would otherwise escape into marine areas.

CEE is working with the Society of the Plastics Industry on an education program including the distribution of public service announcements for plastic industry trade journals and brochures to inform plastic manufacturers and processors of this problem and encourage proper care and handling of plastic resin pellets.



A seabird could mistake this resin pellet for a fish egg. And die.



Herring Gull entangled in monofilament fishing line on Mustang Island.

TONY AMOS

RESULTS OF THE APRIL 25, 1987 GREAT TEXAS TRASH-OFF

On April 25, 1987 3,556 volunteers participated in a statewide beach cleanup organized by Keep Texas Beautiful as part of the Texas General Land Office's Adopt-A-Beach program. They covered approximately 150 miles of beach and collected 139.12 tons of debris. Nine zones were established as cleanup sites extending from Beaumont to South Padre.

A total of 94,147 debris items were recorded on 435 data cards that were returned to CEE (Exhibit 7). Not surprisingly, the total number of plastic items (including styrofoam) once again surpassed all other types of materials, constituting 58 percent of all debris items recorded (Exhibit 8). Metal debris items accounted for 17 percent of the total. The amount of glass was nearly identical to CEE's September cleanup, accounting for 12 percent of the total. Eleven percent was paper and two percent was wood.

The most common items found were plastic bags constituting 10 percent of all debris items collected. The second most common items recorded were metal beverage cans accounting for 9.5 percent of all debris. Miscellaneous styrofoam pieces ranked third, followed by plastic bottles, miscellaneous glass pieces, glass bottles, plastic caps, lids, styrofoam cups, rope, and pieces of paper.

The amount of debris associated with beverage goods formed nearly 24 percent of the total debris collected (see Exhibit 9). Beverage cans were especially numerous at the Beaumont and Bay City beach cleanup zones.

Sources of Debris

The same categories and indicator items previously described were used to determine the sources of debris found during the April cleanup. The results are given in Exhibit 10.

Cargo-Associated Wastes

Cargo-associated wastes, including large pieces of plastic sheeting, plastic strapping bands, wooden crates and pallets, were found most frequently at Padre Island National Seashore where these types of debris constituted nearly 11 percent of all debris items



Galley-type wastes found on a Texas beach

collected. Similarly, Corpus Christi and South Padre indicated relatively high percentages of this type of debris.

Galley-Type Wastes

Galley type wastes, including plastic milk jugs, egg cartons and vegetable sacks, were the most prevalent offshore items found, with the greatest percentages in Port Aransas, followed by Bolivar Peninsula and Bay City. Plastic milk jugs were the most numerous item in this category.

Operational Wastes

There were fewer operational type wastes than other categories. However, Port Aransas showed the greatest percentage of these items compared to other zones. Brazoria was also slightly higher than other zones.

Fishing Gear

Fishing gear was generally more prevalent in April at sites in the southern end of the state, from Corpus Christi to South Padre. The greatest concentration of fishing gear was found at Padre Island National Seashore and consisted principally of pieces of rope.

Medical Wastes

During the April cleanup 97 syringes were reported, being most prevalent at Galveston.

Land-Based Sources

Plastic tampon applicators and diapers, indicators of sewage-associated wastes, were found most frequently at the Beaumont, Brazoria, and South Padre zones.

Exhibit 7

GREAT TEXAS TRASH-OFF APRIL 1987

	BEAUMONT	BOLIVAR	GALVESTON	BRAZORIA	BAY CITY	PT ARANSAS	C. CHRISTI	P. I. N. S.	SOUTH PADRE	TEXAS
PLASTICS										
BAGS	71	485	2700	955	550	44	2434	747	1339	9415
SIX-PACK HOLDERS	102	365	1076	542	83	8	499	213	307	3195
BOTTLES-GREEN	84	85	411	93	89	2	133	63	177	1137
BOTTLES-SODA	135	209	359	208	138	6	336	91	205	1687
BOTTLES-OTHER	85	296	479	299	232	6	491	483	603	2974
CUPS, UTENSILS	164	271	809	413	95	5	453	139	202	2551
CAPS, LIDS	63	391	2250	513	120	5	694	234	526	4796
STRAPPING BANDS	0	55	283	180	31	7	159	103	80	898
LARGE SHEETING	10	37	292	136	85	2	513	287	250	1612
FISHING NET	0	9	106	30	23	2	208	104	60	542
BUCKETS	0	18	116	60	21	1	55	25	42	338
WHITE PROTECT RINGS	0	10	356	193	6	0	52	44	24	685
HARDHATS	0	16	9	1	1	0	7	3	10	47
VEG. SACKS	0	73	313	144	21	1	116	42	45	755
MILK JUGS	15	280	383	274	195	10	318	215	246	1936
EGG CARTONS	28	54	118	196	72	3	191	68	183	913
TOYS	1	7	105	56	14	1	60	20	60	324
FISHING LINE	0	73	286	120	38	0	275	190	58	1040
GLOVES	1	25	49	38	68	2	111	36	180	510
ROPE	16	427	1110	696	241	8	789	462	502	4251
LIGHT STICKS	0	8	321	68	10	0	54	27	50	538
DIAPERS	31	39	97	158	4	1	43	17	70	460
LIGHTERS	12	16	227	58	14	0	28	12	39	406
SYRINGES	0	3	72	5	1	0	12	0	4	97
PLASTIC TAMP. APPLIC.	2	3	122	46	1	0	20	2	16	212
SHOES	0	0	39	30	30	1	45	23	89	257
SINAWS	0	0	231	75	0	0	64	6	12	388
MISC. PIECES	0	0	537	143	86	28	233	248	503	1778
TOTAL PLASTIC	820	3255	13346	5730	2269	143	8393	3904	5882	43742
TIRES	1	1	25	31	20	0	14	2	44	138
TOTAL RUBBER	1	1	25	31	20	0	14	2	44	138
GLASS										
BOTTLES	59	754	1286	1079	278	8	589	378	864	5295
LIGHT BULBS	4	9	42	62	24	1	49	18	25	234
FLUORESCENT LIGHT TUBES	0	0	28	27	2	0	5	5	22	89
MISC. PIECES	0	237	2744	1091	139	10	401	250	621	5493
TOTAL GLASS	63	1000	4100	2259	443	19	1044	651	1532	11111
STYROFOAM										
CUPS	137	452	1370	729	161	4	798	251	483	4385
BUOYS	2	3	74	86	11	0	41	25	31	273
MISC. PIECES	7	897	2143	940	149	19	1291	475	557	6478
TOTAL STYROFOAM	146	1352	3587	1755	321	23	2130	751	1071	11136

Exhibit 7

BEALMONT BOLIVAR GALVESTON BRAZORIA BAY CITY PT ARANSAS C. CHRISTI P. I. N. S. SOUTH PADRE TEXAS

METAL										
WIRE	7	14	156	47	68	0	380	60	66	798
BEVERAGE CANS	370	639	1995	1481	1498	13	1348	534	1130	9008
BOTTLE CAPS	83	161	603	186	50	5	297	189	202	1776
PULL TABS	35	80	856	134	35	6	259	78	84	1567
OTHER CANS	4	290	245	222	117	4	302	96	212	1492
LARGE CONTAINERS	8	60	60	23	33	2	34	16	65	301
RUSTY DRUMS	0	40	31	14	9	0	25	2	26	147
NEW DRUMS	0	0	22	1	10	0	13	0	10	56
MISC. PIECES	1	32	183	160	72	1	139	42	50	680
TOTAL METAL	508	1316	4151	2268	1892	31	2797	1017	1845	15825
PAPER										
PAPER BAGS	121	212	927	1010	98	1	281	74	235	2959
CUPS	48	41	803	157	60	0	197	54	163	1523
CARTONS	28	43	342	175	84	1	217	46	130	1066
NEWSPAPER	4	30	291	134	23	0	105	15	62	664
MISC. PIECES	8	299	1378	779	202	1	796	230	296	3989
TOTAL PAPER	209	625	3741	2255	467	3	1596	419	886	10201
WOOD										
PALLETS	1	0	11	2	1	0	3	1	45	64
CRATES	0	0	7	1	1	0	6	1	37	53
MISC. PIECES	0	45	891	280	88	0	272	101	338	2015
TOTAL WOOD	1	45	909	283	90	0	281	103	420	2132
TOTAL ITEMS	1747	7593	29834	14550	5482	219	16241	6845	11636	94147
TOTAL RECORDS TALLIED	5	12	113	31	29	2	99	40	64	395
% OF DEBRIS CATEGORIES										
ELASTIC	47	43	45	39	41	65	52	57	51	46
GLASS	4	13	14	16	8	9	6	10	13	12
STYROFOAM	8	18	12	12	6	11	13	11	9	12
METAL	29	17	14	16	35	14	17	15	16	17
PAPER	12	8	13	15	9	1	10	6	8	11
WOOD	0	1	3	2	2	0	2	2	4	2

Exhibit 8

Composition of Debris in April 1987

Each debris item collected was recorded on a data card under the major categories below. The amount of debris collected under each category was then calculated as a percentage of all debris combined.

	PERCENT					
	PLASTIC	STYROFOAM	GLASS	METAL	PAPER	WOOD
BEAUMONT	47	8	4	29	12	0
BOLIVAR	43	18	13	17	8	1
GALVESTON	45	12	14	14	13	3
BRAZORIA	39	12	16	16	15	2
BAY CITY	41	6	8	35	9	2
P. ARANSAS	65	11	9	14	1	1
C. CHRISTI	52	13	6	17	10	2
P.I.N.S.	57	11	10	15	6	2
S. PADRE	45	9	37	16	8	4
TOTAL	46	12	12	17	11	2

Exhibit 9

Beverage Associated Goods April 1987

Six debris items fall into a category termed "bottles and associated goods." The amount of these items as a percentage of all debris reported from each zone and statewide is given below.

	PERCENT						TOTAL
	SIX-PACK HOLDERS	PL. SODA BOTTLES	BOTTLE CAPS	GLASS BOTTLES	BEVERAGE CANS	PULL TABS	
BEAUMONT	5.8	7.7	4.8	3.4	21.2	2.0	44.9
BOLIVAR	4.8	2.8	2.1	9.9	8.4	1.1	21.9
GALVESTON	3.6	1.2	2.0	4.3	6.7	2.9	20.7
BRAZORIA	3.7	1.4	1.3	7.4	10.2	0.9	24.9
BAY CITY	1.5	2.5	0.9	5.1	27.3	0.6	37.9
P. ARANSAS	3.7	2.7	2.3	3.7	5.9	2.7	21.0
C. CHRISTI	3.1	2.1	1.8	3.6	8.3	1.6	20.5
P.I.N.S.	3.1	1.3	2.8	5.5	7.8	1.1	21.6
S. PADRE	2.6	1.8	1.7	7.4	9.7	0.7	23.9
TOTAL	3.4	1.8	1.9	5.6	9.6	1.7	23.9

Exhibit 10

Sources of Debris, April 1987

Several debris items were used as indicators of trash generated by offshore sources. These were grouped under four categories. The amount of these items calculated as a percentage of all items collected in each area is given below (see note below).

	PERCENT			
	CARGO	GALLEY	OPERATIONAL	FISHING
BEAUMONT	1.5	2.5	0.2	0.2
BOLIVAR	6.1	5.4	1.7	1.6
GALVESTON	4.8	2.7	2.6	2.8
BRAZORIA	5.7	4.2	3.3	2.4
BAY CITY	6.0	5.3	1.5	2.7
P. ARANSAS	4.6	6.4	3.7	1.8
C. CHRISTI	8.1	3.8	1.9	4.2
P.I.N.S.	11.0	4.7	2.6	5.6
S. PADRE	7.2	4.1	1.7	3.3
TOTAL	6.4	3.8	2.3	3.1

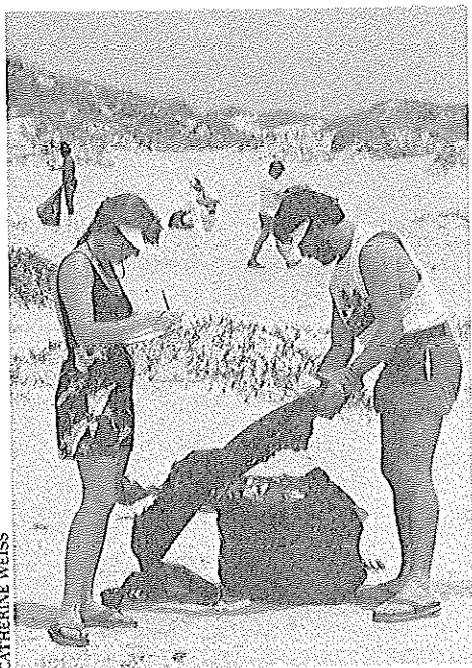
Note: Cargo Wastes: plastic sheeting, wooden pallets, wooden crates

Galley Wastes: plastic egg cartons, plastic milk jugs, plastic vegetable sacks

Operational: plastic write-enable rings, hardhats, light tubes, plastic strapping bands, fluorescent light tubes.

Fishing Gear: nets, buoys, fishing lines, light sticks, gloves, rope

OPTIONAL CLEANUPS 1987



Volunteers in Texas, using CEE data cards, have collected the most detailed information on marine debris of any coastal state in the nation.

In addition to participating in CEE's September beach cleanup and Keep Texas Beautiful's April cleanup, participants in the Adopt-A-Beach Program are encouraged to conduct one additional cleanup. Those participating in this third cleanup are asked to use CEE data cards to record debris items. In 1987, data was collected from optional cleanups held on July 11 in Sargent Beach, on August 5 in Galveston, on June 13 in Corpus Christi, and on November 7 at South Padre. The results from these cleanups are given in Exhibit 11.

Some interesting findings from the four optional cleanups: in Galveston, approximately 59 percent of the 2,984 debris items reported were plastic (including styrofoam). The most common debris item collected was pieces of plastic which accounted for more than 16 percent of all debris items, followed by pieces of glass. One month later, at the September cleanup, miscellaneous pieces of plastic and pieces of glass were again the most abundant debris items reported on this beach. At Sargent Beach, metal beverage cans were the most common debris item collected during the optional cleanup in July, as well as in April and September. Pieces of glass and glass bottles were also prevalent.

In Corpus Christi, the optional cleanup in June found plastic caps and lids to be most common, followed by pieces of paper and bottle caps. At this time 62 percent of the debris collected was plastic, including styrofoam. More than 20 percent of the debris was associated with beverage goods including metal beverage cans, glass bottles, plastic soda bottles, metal pull tabs, and bottle caps.

South Padre's optional cleanup conducted in November may indicate the success of a new policy that has been adopted on beaches in this area. In April, glass debris constituted 37 percent of all debris found on the beach. However, in November this amount dropped to less than 11 percent. A major factor for this decrease could be attributed to the anti-litter program adopted by the Cameron County Parks and Recreation Department. After determining that beach visitors are a major source of the debris problem on South Padre Island, in April 1987 the Commissioners' Court banned the use of glass on the beach. Beach visitors with glass could receive a ticket by the park police and be fined \$10.00 or appear in Commissioners' Court. The

park patrol officers talk to people about not leaving trash at the beach. However, more than 37 percent of the debris collected at South Padre was beverage-associated goods with metal pull tabs and bottle caps constituting more than half of this amount.

Exhibit 11

RESULTS OF 1987 ADOPT-A-BEACH OPTIONAL CLEANUPS

Debris Type

Number of Debris Items

PLASTIC

	Sargent Beach	Galveston	Corpus Christi	South Padre
bags	99	242	77	57
bottles:				
green	40	11	5	33
soda	52	13	37	58
other	69	71	5	35
buckets	12	5	1	4
caps, lids	94	171	221	208
cups, utensils	80	72	49	211
diapers	9	3	0	8
disposable lighters	31	6	15	16
egg cartons	36	9	6	6
fishing line	51	8	38	44
fishing net	13	11	8	5
gloves	42	13	9	2
hardhats	1	0	0	1
light sticks	44	11	22	7
milk jugs	75	4	17	30
pieces	49	495	6	0
rope	73	91	86	13
sheeting, lrg.	32	10	30	6
6-pack holders	72	93	31	75
shoes	11	0	0	0
strapping bands	43	20	43	6
straws	0	41	0	0
syringes	1	1	15	3
tampon applicators	6	3	16	2
toys	10	15	0	4
"write protection"				
rings	7	26	3	2
vegetable sacks	13	14	9	1
Total Plastic	1065	1459	749	837

GLASS

bottles	171	83	35	76
fluorescent light tubes	11	1	11	0
light bulbs	29	4	6	4
pieces	207	323	32	136
Total Glass	410	411	84	216

STYROFOAM

buoys	19	1	0	18
cups	87	90	57	84
pieces	84	199	83	124
Total Styrofoam	190	290	140	226

cont. next page

Exhibit 11 (cont.)

	Sargent Beach	Galveston	Corpus Christi	South Padre
<u>METAL</u>				
beverage cans	274	71	70	82
bottle caps	50	67	112	197
large containers	15	0	0	11
drums-new	1	11	0	0
drums-rusty	1	11	1	1
other cans	58	13	10	17
pieces	22	33	4	0
pull tabs	32	207	7	264
wire	20	13	13	2
Total Metal	473	426	217	574

PAPER

bags	48	20	6	30
cartons	45	34	3	25
cups	35	13	18	33
newspaper	4	5	0	10
pieces	75	290	200	14
Total Paper	207	362	227	112

WOOD

crates	5	1	4	3
pallets	5	3	2	3
pieces	16	83	0	32
Total Wood	26	87	6	38

RUBBER

tires	6	10	6	1
-------	---	----	---	---

<u>TOTAL</u>	2377	3045	1429	2004
---------------------	-------------	-------------	-------------	-------------

RESULTS OF THE APRIL 23, 1988 GREAT TEXAS TRASH-OFF

On April 23, 1988, 4,522 volunteers participated in a second statewide beach cleanup organized by Keep Texas Beautiful as part of the Texas General Land Office's Adopt-A-Beach program. They covered approximately 158 miles of beach and collected 159.3 tons of debris. Eleven zones were established at cleanup sites extending from Beaumont to Boca Chica.

Data cards used during this cleanup had been revised from the 1987 cards (Exhibit 12). Changes included: moving gloves from the category of plastic to rubber; moving egg cartons from the category of plastic to styrofoam; and adding the new categories of plastic sports fishing floats and lures, rubber balloons, styrofoam fast-food containers and meat trays, metal crab or fish traps, cardboard, and wooden crab traps. In addition, a miscellaneous or "other" category was added under styrofoam, glass, metal, paper, and wood so that volunteers could indicate whether debris items were truly pieces as opposed to whole objects. Also, a new category for cloth and rags was added. The categories of straws and other metal cans were purposely removed from the data card, while plastic buckets and syringes were unintentionally omitted.

A total of 152,041 debris items were recorded on 813 data cards that were returned to CEE (Exhibit 13). Once again, the total number of plastic items (including styrofoam) was higher than all other types of materials, constituting 63 percent of all debris items recorded (Exhibit 14). Metal debris items accounted for approximately nine percent of the total. The amount of glass was nearly identical to CEE's September 1986 and 1987 cleanups, and the April 1987 cleanup accounting for 11 percent of the total. Ten percent was paper and three percent was wood. Cloth and rags, which are more likely to degrade on beaches, accounted for only 1.5 percent of the debris collected.

The most common items found in April 1988 were pieces of styrofoam which constituted more than 12 percent of all debris items recorded. The second most common item recorded were plastic bags accounting for nearly seven percent of all debris. Miscellaneous glass pieces ranked third, followed by plastic caps and lids, plastic bottles, rope, styrofoam cups, glass bottles, plastic six-pack rings, and plastic cups.

The amount of debris associated with beverage goods

Exhibit 12

BEACH CLEANUP DATA CARD

Thank you for completing this data card. Answer the questions below and return to your area coordinator or to the address at the bottom of this card. This information will be very useful in getting debris stopped at the sources.

Name _____ Affiliation _____
Address _____ Occupation _____ Phone () _____
City _____ State _____ Zip _____ M _____ F _____ Age: _____
Today's Date: Month _____ Day _____ Year _____ Name of Coordinator _____
Location of beach cleaned _____ Nearest city _____
How did you hear about the cleanup? _____

SAFETY TIPS

1. Do not go near any large drums.
2. Be careful with sharp objects.
3. Wear gloves.
4. Stay out of the dune areas.
5. Watch out for snakes.
6. Don't lift anything too heavy.

WE WANT YOU TO BE SAFE

COMPLETE THIS PORTION AFTER CLEANUP

Number of people working together on this data card _____ Estimated distance of beach cleaned _____ Number of bags filled _____

We are particularly interested in identifying the SOURCES of marine debris. If possible, please list all items that have labels or company names.

EXAMPLE: *plastic bottle "Clarisol"*

OBSERVATIONS OF STRANDED AND/OR ENTANGLED ANIMALS (Please describe type of animal and type of entangling debris. Be as specific as you can.) _____

What was the most peculiar item you collected? _____

Comments _____

PLEASE RETURN THIS CARD TO YOUR AREA COORDINATOR OR MAIL IT TO:



Center for Environmental Education
1725 DeSales Street, NW
Washington, DC 20036

A Membership Organization

© Copyright 1988, Center for Environmental Education, Inc.

Exhibit 12

ITEMS COLLECTED

You may find it helpful to work with a buddy as you clean the beach, one of you picking up trash and the other taking notes. An easy way to keep track of the items you find is by making tick marks. The box is for total items; see sample below.

bags ||||| ||||| ||| Total
13

cups ||||| ||||| ||||| ||||| || Total
22

	Total number of items
PLASTIC	
bags	
bottles:	
green	
soda	
other	
caps, lids	
cups, spoons, forks, straws	
diapers	
disposable lighters	
fishing line	
fishing net	
floats & lures	
hardhats	
light sticks	
milk jugs	
rope	
sheeting, large	
6-pack holders	
strapping bands	
tampon applicators	
toys	
vegetable sacks	
"write protection"	
rings	
other (specify)	

GLASS	
bottles	
fluorescent light tubes	
light bulbs	
pieces	
other (specify)	

RUBBER	
balloons	
gloves	
tires	
other (specify)	

	Total number of items
STYROFOAM® (or other plastic foam)	
buoys	
cups	
egg cartons	
fast-food containers	
meat trays	
pieces	
other (specify)	

METAL	
beverage cans	
bottle caps	
containers	
crab/fish traps	
55 gallon drums	
rusty	
new	
pieces	
pull tabs	
wire	
other (specify)	

PAPER	
bags	
cardboard	
cartons	
cups	
newspaper	
pieces	
other (specify)	

WOOD (leave driftwood on the beach)	
crab or lobster traps	
crates	
pallets	
pieces	
other (specify)	

CLOTH/RAGS	
pieces	

Exhibit 13

Debris Reported on Data Cards for Keep Texas Beautiful's
April 1988 Great Texas Trash Off.

DEBRIS	BEAUMONT	BOLIVAR	GADSDEN	BRAZORIA	BAY CITY	ROCKFORD	PORT ARANSAS	CORPUS CHRISTI	P.I.N.S.	SOUTH FAYETTE	BOCA CHICA	TEXAS TOTAL
ELASTIC	:	:	:	:	:	:	:	:	:	:	:	:
BAGS	:	84	844	3289	1169	323	28	59	2408	292	331	10302
BOTTLES-GREEN	:	5	51	281	85	133	7	12	535	101	148	1765
BOTTLES-SODA	:	6	132	385	157	67	16	10	472	86	232	1928
BOTTLES-OTHER	:	6	43	835	612	279	45	32	1494	121	168	4537
CAPS/LEDS	:	26	173	3107	900	164	19	135	2745	263	391	8532
CUPS	:	46	258	1743	644	90	7	114	1288	102	270	5037
DIAPERS	:	0	65	57	59	26	0	2	78	19	93	545
DISPOSABLE LIGHTERS	:	3	35	369	84	35	5	4	193	20	53	799
FISHING LINE	:	1	100	551	374	46	9	9	411	63	34	1650
FISHING NET	:	0	35	204	44	18	6	2	66	23	6	451
FLOATS/LURES	:	0	25	52	36	7	0	4	116	7	10	289
HAND-RAIS	:	2	0	23	3	2	0	0	36	4	1	85
LIGHT STICKS	:	0	0	497	49	10	4	9	812	85	204	1767
MILK JUCS	:	34	128	407	741	302	16	6	912	84	140	3114
ROPE	:	26	183	3270	877	148	22	89	1708	228	110	7066
SHEETING	:	8	195	344	108	42	3	61	639	105	52	1634
6-PACK HOLDERS	:	60	269	2212	518	132	8	38	1351	74	266	5236
STRAPPING BANDS	:	12	49	544	146	34	6	18	456	59	68	1441
TAMPON APPLICATORS	:	1	21	74	31	14	0	10	80	11	21	275
TOYS	:	11	29	203	159	26	10	12	129	21	11	706
VEGGIE SACKS	:	12	24	157	37	29	3	17	175	40	28	558
WRITE PROT." RINGS	:	0	3	291	55	17	0	9	249	88	12	754
OTHER	:	0	35	3402	587	86	21	162	1664	210	58	6706
TOTAL ELASTIC	:	343	2697	22157	7555	2030	235	814	18017	2106	2707	65177
GLASS	:	:	:	:	:	:	:	:	:	:	:	:
BOTTLES	:	15	144	1306	584	238	53	37	1150	164	652	5272
FLUORESCENT LT. TUBE	:	0	2	41	12	8	10	0	145	8	20	274
LIGHT BULBS	:	1	12	52	65	15	19	1	200	37	44	517
PIECES	:	25	373	5732	408	219	5	547	869	191	155	9276
OTHER	:	0	0	97	1069	1	0	88	91	6	20	1404
TOTAL GLASS	:	41	531	7228	2138	481	87	673	2455	406	891	16743
RUBBER	:	:	:	:	:	:	:	:	:	:	:	:
BALLONS	:	15	3	346	154	9	0	15	171	2	22	801
GLOVES	:	21	183	135	129	71	7	5	263	28	61	973
TIRES	:	0	5	56	16	17	2	0	19	11	9	168
OTHER	:	0	5	157	58	32	0	12	480	22	14	865
TOTAL RUBBER	:	36	196	694	357	129	9	32	933	63	106	2807

Exhibit 13

	BEAUMONT	BOLIVAR	GALVESTON	BRAZORIA	FRY CITY	ROCKPORT	PORT ARANSAS	CORPUS CHRISTI	P.I.N.S.	SOUTH PADRE	BOCA CHICA	TEXAS TOTAL	
STYROFOAM	:	:	:	:	:	:	:	:	:	:	:	:	
BUOYS	:	0	11	108	34	10	2	1	94	8	15	62	345
CUPS	:	120	253	1817	1364	198	35	73	1936	147	283	598	6824
EGG CARTONS	:	72	12	214	158	30	21	11	565	60	137	367	1647
FAST FOOD	:	46	99	234	218	34	0	6	411	46	85	170	1349
MEAT TRAYS	:	2	17	110	118	9	0	22	356	25	66	152	877
PIECES	:	24	154	5712	2154	202	25	286	8063	789	593	1194	19196
OTHER	:	0	13	135	28	4	0	0	345	120	4	90	739
TOTALS	:	264	420	1330	4074	407	03	399	11770	1145	1183	2633	30977
METAL	:	:	:	:	:	:	:	:	:	:	:	:	:
BEVERAGE CANS	:	330	307	1196	936	235	14	51	1109	124	381	322	5005
BOTTLE CAPS	:	10	92	767	326	45	0	334	667	50	146	237	2674
CONTAINERS	:	7	58	224	150	94	29	3	284	20	83	204	1165
CRAB/FISH TRAPS	:	0	0	12	10	3	0	1	9	11	0	10	56
RUSTY 55 GAL. DRUMS	:	0	1	104	2	2	5	0	14	8	2	50	188
NEW 55 GAL. DRUMS	:	0	0	64	1	0	1	0	4	3	0	9	82
PIECES	:	18	85	465	118	45	4	32	141	48	8	97	1061
PULL TABS	:	0	58	736	209	23	0	265	365	25	236	66	1983
WIRE	:	2	44	235	81	18	4	26	131	62	17	63	683
OTHER	:	0	11	104	56	21	2	46	166	18	6	108	538
TOTAL METAL	:	367	656	3907	1898	486	59	758	2890	369	879	1166	13435
PAPER	:	:	:	:	:	:	:	:	:	:	:	:	:
BAGS	:	107	109	415	243	33	1	14	258	77	122	454	1833
CARDBOARD	:	38	134	283	184	53	0	2	189	24	61	196	1164
CARTONS	:	0	25	319	180	34	7	16	241	32	58	173	1085
CUPS	:	0	92	437	613	85	27	22	302	45	157	230	2010
NEWSPAPER	:	0	19	133	67	2	5	3	104	35	24	93	485
PIECES	:	28	137	2979	577	37	8	72	1178	159	354	594	6123
OTHER	:	0	0	704	59	5	0	767	1035	79	282	113	3044
TOTAL PAPER	:	173	516	5270	1923	249	48	896	3307	451	1058	1853	15744
WOOD	:	:	:	:	:	:	:	:	:	:	:	:	:
CRAB TRAPS	:	0	1	22	0	1	0	0	17	2	0	7	50
CRATES	:	0	4	87	3	2	3	0	24	6	2	28	159
PALLETS	:	0	2	65	4	8	1	0	19	9	12	34	154
PIECES	:	21	103	2001	284	41	5	49	705	126	138	620	4093
OTHER	:	0	15	139	37	3	0	28	93	11	0	77	403
TOTAL WOOD	:	21	125	2314	328	55	9	77	858	154	152	766	4859
CLOTH/RAGS	:	15	226	368	390	91	0	18	683	41	116	343	2299
TOTAL ITEMS	:	1260	5506	50268	18671	4008	530	3667	40913	4785	7092	15341	152041
TOTAL RECORDS TALLIED	:	5	10	273	45	20	5	16	229	32	25	153	813

was 14.5 percent of the total debris collected, a lower value compared to previous cleanups (Exhibit 15). Glass bottles and plastic six-pack rings were the most numerous items in this category. Rockport had the greatest number of glass bottles where they accounted for ten percent of all debris recorded. Glass bottles were also comparatively numerous at South Padre where they accounted for more than nine percent of all debris.

Exhibit 14

COMPOSITION OF DEBRIS--APRIL 1988

Each debris item collected was recorded on a data card under the major categories given below. The amount of debris collected under each category was then calculated as a percentage of all debris combined.

PERCENT										
BATCH	PLASTIC	GLASS	RUBBER	STYROFOAM	METAL	PAPER	WOOD	RICE	BATCH/TEXAS	BATCH
BENJAMIN	27.22	3.25	2.86	28.95	29.13	13.73	1.67	1.19	0.83	BENJAMIN
BOLIVAR	48.98	9.64	3.56	18.15	11.91	9.37	2.27	4.18	3.62	BOLIVAR
GALESTON	44.08	14.38	1.38	16.57	7.77	18.48	4.68	0.73	33.06	GALESTON
INVERGORDA	48.46	11.45	1.91	21.82	18.17	18.33	1.76	2.13	12.28	INVERGORDA
KEY CITY	58.65	12.00	3.22	12.15	12.13	6.21	1.37	2.27	2.64	KEY CITY
ROCKPORT	44.34	16.42	1.78	15.66	11.13	9.06	1.78	0.88	0.35	ROCKPORT
P. ARNESES	22.20	18.35	0.87	18.88	28.67	24.43	2.10	0.49	2.41	P. ARNESES
C. CHRISTI	44.04	6.88	2.28	28.77	7.06	8.88	2.18	1.67	26.91	C. CHRISTI
P.I.N.S.	44.01	8.48	1.32	24.97	7.71	9.43	3.22	0.86	3.15	P.I.N.S.
S. PADRE	38.17	12.56	1.49	16.68	12.39	14.92	2.14	1.64	4.66	S. PADRE
BOCA CHICA	42.47	11.81	1.64	17.16	7.68	12.08	4.99	2.24	18.09	BOCA CHICA
% TOTAL TEXAS	42.87	11.01	1.85	20.37	8.84	18.36	3.28	1.51	188.00	% TOTAL TEXAS

NOTE:

In the April, 1988 data,
Gloves were moved from PLASTIC to RUBBER
Egg Cartons moved from PLASTIC to STYROFOAM
Syringes was omitted from the data card.

Sources Of Debris

The same categories and indicator items previously described in this report were used to determine the sources of debris found during the April cleanup with two exceptions: based on previous data collected it was determined that metal and wood crab or fish traps, and plastic floats and lures should be added to the new data card. These were not only items found to be common in other parts of the country, but they could also serve as two additional indicator items for fishing associated wastes. The results of all indicator items are given in Exhibit 16.

Cargo-Associated Wastes

Cargo-associated wastes, including large pieces of plastic sheeting, wooden crates, and pallets, were the least numerous category of debris found in April 1988. These items were found most frequently at Bolivar and Padre Island National Seashore.

Galley-Type Wastes

Galley type wastes, including plastic milk jugs, egg cartons, and vegetable sacks, were reported to be

most prevalent in Beaumont and Bay City. Plastic milk jugs were the most numerous item in this category.

Operational Wastes

Operational type wastes were reported to be comparably more abundant at Rockport as compared to all other sites due primarily to the abundance of light bulbs and fluorescent light tubes. Padre Island National Seashore had the second highest percentage of these items.

Fishing Gear

Fishing gear was the most prevalent type of indicator item found statewide accounting for more than eight percent of the debris recorded. The greatest concentration of fishing gear was found in Galveston due primarily to the abundance of rope. In fact, rope accounted for approximately 6.5 percent of all debris collected in Galveston. It is of interest to note that both metal and wood fish and crab traps, which were not listed on previous versions of the data card, are found on Texas beaches; a total of 56 metal and 50 wooden traps were recorded. In addition, 289 floats and lures, most likely lost or discarded by recreational fishermen, were also found.

Land Based Sources

Plastic tampon applicators and diapers, indicators of sewage-associated wastes, were found most frequently in Bolivar, Bay City, South Padre, and Boca Chica.

Exhibit 15

BEACH	PERCENT BOTTLES AND ASSOCIATED GOODS							% BEACH	% TEXAS
	PLASTIC BOTTLES	REV. CANS	GLASS BOTTLES	6-PACK HOLDERS	BOTTLE CAPS	ROLL TINS	TOTAL ITEMS		
BEAUMONT	1.35	26.19	1.19	4.76	0.79	0.00	432	34.29	0.28
BOLIVAR	4.10	5.58	2.62	4.89	1.67	1.05	1096	19.91	0.72
GALVESTON	2.83	2.38	2.60	4.40	1.53	1.46	7638	15.19	5.02
BRAZORIA	4.57	5.01	3.13	2.77	1.75	1.12	3427	18.35	2.25
BAY CITY	11.95	5.86	5.94	3.29	1.12	0.57	1152	28.74	0.76
ROCKPORT	12.83	2.64	10.00	1.51	0.00	0.00	143	26.98	0.09
P. ARANSAS	1.47	1.39	1.01	1.04	9.11	7.23	779	21.24	0.51
C. CHRISTI	6.11	2.71	2.81	3.30	1.63	0.89	7143	17.46	4.70
P.I.N.S.	6.44	2.59	3.43	1.55	1.04	0.52	745	15.57	0.49
S. PADRE	7.73	5.37	9.19	3.75	2.06	3.33	2229	31.43	1.47
BOCA CHICA	11.43	2.10	6.06	2.01	1.54	0.43	3616	23.57	2.38
ITEM TOTAL	8230	5005	5272	5236	2674	1983	20400		18.68
ITEM TOTAL/TEXAS	5.41	3.29	3.47	3.44	1.76	1.30	18.68		

Exhibit 16

SOURCES OF DEBRIS--April 1988

Several debris items were used as indicators of trash generated by offshore sources. These were grouped under four categories. The amount of these items calculated as a percentage of all items collected in each area is given below (see note below).

PERCENT								
BEACH	CARGO WASTES	GALLEY WASTES	OPERATIONAL FISHING WASTES	FISHING GEAR	ITEM COUNT	% BEACH	% TEX WASTE	BEACH
BEAUMONT	0.63	9.37	1.19	3.81	189	15.00	0.12	BEAUMONT
BOLIVAR	3.65	2.98	1.28	9.32	944	17.14	0.62	BOLIVAR
GALVESTON	0.99	1.55	1.89	9.55	7824	13.97	4.62	GALVESTON
BAZORIA	0.62	5.01	1.51	8.12	2849	15.26	1.87	BAZORIA
BAY CITY	1.38	9.01	1.90	7.66	796	19.86	0.52	BAY CITY
ROCKPORT	1.32	7.55	6.60	9.43	132	24.91	0.09	ROCKPORT
P. ARKANSAS	1.66	0.93	0.76	3.16	239	6.52	0.16	P. ARKANSAS
C. CHRISTI	1.67	4.04	2.65	8.26	6880	16.62	4.47	C. CHRISTI
P.I.N.S.	2.51	3.85	4.10	9.36	948	19.81	0.62	P.I.N.S.
S. PADRE	0.93	4.38	2.04	6.06	946	13.34	0.62	S. PADRE
BOCA CHICA	0.91	4.87	1.25	4.89	1828	11.92	1.28	BOCA CHICA
TOTAL ITEM COUNTS	1947	5319	3971	12358	22695			TOTAL ITEM COUNTS
TOTAL % TEXAS	1.28	3.50	2.02	8.13			14.93	TOTAL % TEXAS

CARGO:

Plastic sheeting, wooden pallets, wooden crates

GALLEY:

Egg cartons, milk jugs, vegetable sacks

OPERATIONAL:

"Write" rings, hard hats, light bulbs, fluoro tubes, strapping bands

FISHING:

Nets, rope, line, buoys, floats, light sticks, gloves, fish traps, crab traps

COMPARISON OF TEXAS DEBRIS FROM SEPTEMBER 1986 TO APRIL 1988

Since CEE's first statewide beach cleanup in September 1986, three additional statewide cleanups have taken place on the Texas coastline: April 1987, September 1987, and April 1988. During these four events, which amounted to 12 hours of work, approximately 733 tons of debris were removed from the Texas coastline (Exhibit 17).

Although it will require several years of data collection to determine if any changes have occurred in the types of debris found on the Texas coastline, some interesting trends are appearing in the types and amounts of debris collected. For one, the majority of debris found on Texas beaches is plastic; plastic debris items have ranged from 58 percent of all debris recorded in April 1987 to 67 percent in September 1986 (Exhibit 17). It will be of particular interest to note whether the amount of plastics decreases after Annex V comes into effect. In addition, the amount of metal, glass, paper, and wood debris items have shown similar patterns of abundance throughout the four cleanups. The amount of debris found on Texas beaches associated with canned and bottled beverages has ranged between 14 percent in April 1988 to 24 percent in September 1986 and April 1987. It will be of equal interest to note what effect Annex V will have on the abundance of these items on Texas beaches.

The most common debris items found on Texas beaches have been plastic bags, of which more than 67,000 have been recorded during the four cleanups (Exhibit 18). Similarly, more than 63,000 plastic bottles, 58,000 miscellaneous pieces of styrofoam, nearly 55,000 plastic caps and lids, and 47,000 metal beverage cans were reported over the past four cleanups. Clearly, the prevalence of these items reflects their abundance in society. For example, according to the Society of the Plastics Industry, in 1986 nearly 1 billion pounds of plastic trash bags and 21 billion plastic bottles were manufactured in the United States. However, data compiled for the four cleanups also shows an abundance of somewhat unusual debris items such as the 17,818 milk jugs, 6,640 rubber gloves, 4,639 light bulbs and 484 hardhats.

Exhibit 17

Comparison of Cleanup Data by Categories
September 1986 through April 1988

	SEPTEMBER 1986	APRIL 1987	SEPTEMBER 1987	APRIL 1988
NUMBER OF VOLUNTEERS	2,772	3,556	7,158	4,522
NUMBER OF CARDS ANALYZED	749	435	1,580	813
TONS COLLECTED	125.5	139.25	309.3	159.27
MILES CLEANED	122.5	150	157.1	158
PERCENT OF DEBRIS				
plastic	56.0%	46.0%	55.9%	42.9%
glass	12.0%	12.0%	11.1%	11.0%
styrofoam	11.0%	12.0%	10.1%	20.4%
metal	13.0%	17.0%	13.2%	8.9%
paper	6.0%	11.0%	7.0%	10.4%
wood	2.0%	2.0%	2.7%	3.2%
PERCENT OF OFFSHORE DEBRIS*				
cargo wastes	2.4%	1.8%	1.5%	1.3%
galley wastes	5.2%	3.8%	4.0%	3.5%
operational wastes	3.2%	2.1%	3.0%	2.0%
fishing gear	5.5%	7.6%	8.9%	8.1%
beverage goods	23.1%	N/A	N/A	14.5%

*using selected indicator items

Exhibit 18

Comparison of Cleanup Data by Item
September 1986 through April 1988

ITEMS COLLECTED	SEPTEMBER 1986	APRIL 1987	SEPTEMBER 1987	APRIL 1988	TOTAL
PLASTIC BAGS	15,579	9,415	31,773	10,302	66,954
SIX-PACK HOLDERS	10,358	3,195	15,631	5,236	34,420
PLASTIC BOTTLES	18,144	7,212	30,295	8,230	63,881
HARD HATS	127	47	225	85	484
WATER/MILK JUGS	5,308	1,936	7,460	3,114	17,818
ROPE	6,367	4,251	18,878	7,066	36,562
FISHING LINE	315	1,040	4,225	1,650	7,230
FISHING NET	1,435	542	1,719	451	4,147
VEGETABLE SACKS	1,111	755	2,023	558	4,447
RUBBER GLOVES	1,030	510	4,127	973	6,640
STYROFOAM CUPS	8,751	4,385	14,998	6,824	34,958
LIGHT BULBS	1,561	234	2,327	517	4,639
GLASS BOTTLES	11,837	5,295	17,902	5,272	40,306
PULL TABS	1,106	1,567	8,925	1,983	13,581
BEVERAGE CANS	12,491	9,008	20,580	5,005	47,084

OTHER STATEWIDE CLEANUPS

In fall of 1987, 19 states including Texas held beach cleanups during a period designated as COASTWEEKS. In total, more than 26,500 volunteers covered over 1,900 miles of U.S. coastline and collected more than 700 tons of trash (Exhibit 20). Texas had the largest cleanup, attracting more volunteers and covering more coastline than any other state in the country. Unfortunately, the amount of debris collected in Texas was notably higher than any other state.

In some states, data was collected on the types of debris found. Three states in particular, Mississippi, Louisiana, and North Carolina, followed the Texas example by using CEE data cards, or a similar version. CEE's field office in Florida also used data cards during a beach cleanup in the Florida Keys.

Standardized data collection helps to assess the regional variation in coastal debris. Moreover, solutions developed in one part of the country to address the debris problem may not be applicable in other areas and therefore information on local debris problems are important for decision makers. Therefore, CEE has established a National Beach Cleanup Data Base for all statewide beach cleanups conducted during COASTWEEKS '88 (September 17-October 10). CEE will be furnishing all cleanup groups with data cards. The results from all cleanups will then be compiled and analyzed in a nationwide report written by CEE.

Following is a description of data collected during the 1987 Mississippi, Louisiana, and North Carolina beach cleanups. Data obtained from 1987 statewide cleanups in Florida, Maine, Massachusetts, and Oregon are provided in Appendix 5.

Louisiana

On September 19, 1987 Louisiana held its first "September Sweep of the Beach" statewide beach cleanup organized by the Louisiana Nature and Science Center and the Louisiana Clean Team. The cleanup extended along 16 sites from Cameron to the Chandeleur Islands. A total of 3,300 volunteers cleaned 85 miles of beach collecting 200 tons of debris. A total of 90,999 debris items were recorded on the data cards that were similar to the card developed by CEE (Exhibit 19, 21). As in Texas, plastic debris (including styrofoam) items constituted the

majority of debris at 64 percent (Exhibit 22). Other categories of debris were also relatively similar to Texas.

The most common debris item collected were styrofoam cups, which accounted for nearly 10 percent of all debris reported. The second most common items reported were plastic bottles, followed by plastic caps and lids, plastic bags, and plastic milk jugs. The amount of beverage associated goods, 21 percent, was very close to that of all four Texas cleanups (Exhibit 23).

In terms of sources, fishing gear was the most frequently found type of debris relative to cargo, galley wastes, and operational goods, accounting for nearly seven percent of all debris recorded (Exhibit 24). In Louisiana, volunteers were asked to record blue salt bags as a separate debris item since these are thought to be generated by fishermen to treat shrimp on boats. A total of 160 salt bags were recorded. Galley type wastes were the second most prevalent type of debris accounting for nearly six percent, followed by operational type wastes and cargo associated goods. In terms of operational wastes, volunteers were asked to record pipe thread protectors which are used by petroleum industry operations to protect pipe fittings.

Mississippi

On October 10, 1987 a beach cleanup was conducted on and organized by staff at Gulf Islands National Seashore, islands that are inaccessible to the public except by boat. Three islands were designated for cleaning: Horn, Ship, and Davis Islands. A total of 100 volunteers cleaned six miles of beach collecting 3.5 tons of debris. A total of 3,655 debris items were recorded on CEE data cards (Exhibit 25). As in Texas, plastic debris (including styrofoam) items constituted the majority of debris, at 52 percent (Exhibit 22). The abundance of other debris categories were also similar to that of all four Texas cleanups and Louisiana.

The most common debris item collected was metal beverage cans, which accounted for 17.9 percent of all debris reported. The second most common items reported were plastic bottles, followed by plastic bags, glass bottles, and plastic caps and lids.

Beverage associated goods were more abundant in Mississippi as compared to all other cleanups, constituting approximately 34 percent of all debris items collected (Exhibit 22). On Ship Island, this type of debris accounted for more than 41 percent of the debris.

In terms of sources, operational goods were the most frequently found type of debris relative to cargo, galley type wastes, and fishing gear, with light bulbs being most prevalent (Exhibit 23). Horn Island reported the greatest frequency of operational wastes. Horn Island also reported the largest quantity of fishing

gear relative to the other cleanup sites. Galley type wastes were most prevalent on Ship Island and cargo type wastes were essentially equal at all three sites.

North Carolina

On September 20, 1987 approximately 1,000 volunteers participated in North Carolina's first "Beach Sweep '87" organized by the University of North Carolina Sea Grant, the North Carolina Division of Parks and Recreation, the North Carolina Division of Coastal Management, and the Office of Marine Affairs. Approximately 150 miles of beaches were cleaned between Corolla to Calabash from which approximately 10 tons of debris were removed.

Statewide, a total of 87,531 debris items were recorded on data cards (Exhibit 26-27), of which more than 59 percent was plastic, including styrofoam (Exhibit 22). Metal debris accounted for more than 15 percent of the total, followed by paper (12 percent), glass (nine percent), wood (three percent), rubber (one percent) and other (one percent which included shoes, cloth and rags). Paper was more prevalent in North Carolina compared to both Texas and Mississippi.

The most common debris items reported in North Carolina were pieces of styrofoam which accounted for more than 11 percent of all debris items collected. Metal beverage cans were second in abundance, followed by plastic bottles, plastic bags, styrofoam cups, glass bottles, pieces of paper, miscellaneous pieces of plastic, plastic caps, lids, cups, and utensils. Based on the prevalence of these debris items it appears as if beach goers are a major source of debris in North Carolina. Beverage associated goods accounted for 24 percent of all debris items collected which was very similar to values for all other cleanups (Exhibit 23).

Using the same indicator items used in Texas to identify offshore sources of wastes, it appears that fewer debris items in North Carolina can be attributed to cargo, operational, and galley type wastes (Exhibit 24). However, since 465 milk jugs and 307 vegetable sacks were reported, it is evident that at least some of this debris is coming from ocean sources. The most prevalent type of offshore waste found in North Carolina was fishing gear. But more than a third of the 2,293 debris items traced to fishing activities were most probably generated by recreational fishermen in the form of fishing line and sports fishing floats and lures. In addition, 183 plastic tampon applicators, 137 plastic diapers, and 82 syringes were reported.

ITEMS COLLECTED

bags ~~III~~ ~~III~~ ~~III~~ FII TOTAL ☐ 18

TOTAL
NUMBER
OF ITEMS

TOTAL
NUMBER
OF ITEMS

bags _____
blue salt bags _____
caps, lids _____
6-pack holders _____
bottles: _____
 pop _____
 cleaners _____
 food _____
rope _____
cups, utensils _____
milk, water jugs _____
large sheeting _____
strapping bands _____
vegetable sacks _____
straws _____
"write protection" rings _____
gloves _____
toys _____
buckets _____
diapers _____
lighters _____
hardhats _____
tobacco "cans" _____
pipe thread protectors _____
baskets/crates _____
filters _____
other (specify) _____

tires _____
other (specify) _____

bottles/jars: _____
 pop _____
 beer _____
 wine coolers _____
 food _____
 light bulbs _____
 fluorescent light tubes _____
 pieces _____
 other (specify) _____

cups _____
 food trays _____
 egg cartons _____
 packing _____
 pieces _____

cans: _____

pop _____

beer _____

food/juice _____

aerosol cans _____

bottle caps _____

pull tabs _____

other cans _____

large containers _____

drums: rusty _____ new _____

wire _____

pieces _____

other (specify) _____

net fragments _____
fishing line _____
buoys _____
net floats _____
light sticks _____
crab traps _____
other (specify) _____

bags _____
cups _____
cartons _____
newspaper _____
pieces _____
other (specify) _____

pallets _____
crates _____
pieces _____
other (specify) _____



Exhibit 19

BEACH CLEANUP DATA CARD

DIRECTIONS

1. Complete the information below.
2. Open card to record items collected during cleanup.
3. After cleanup, answer the questions on the back of this card and return it to your Beach Captain or mail it to LGS at the address above.

Name _____ Affiliation _____
Address _____ Zip _____ Phone _____
Occupation _____ H. _____ F. _____ Age _____
Today's Date: Month _____ Day _____ Year _____ Name of your Beach Captain _____
Location of beach cleaned _____ Nearest City _____
How did you hear about the cleanup? _____

SAFETY TIPS

1. Do not go near any large drums; report their location to your beach captain.
2. Wear shoes and gloves.
3. Do not handle any marine mammals or sea turtles; report their location to your beach captain.
4. Stay out of dune areas.
5. Be careful with sharp objects.
6. Do not pick up dead fish.
7. Do not pick up trash that may be harmful.
8. Do not lift anything too heavy.

COMPLETE THIS PORTION AFTER CLEANUP

Estimated miles of beach cleaned _____ Number of bags filled _____
We are particularly interested in identifying the SOURCES of marine debris. If possible, please list all items that have labels or company names. Indicate country of origin of foreign items.

EXAMPLE: Clarasol (green plastic bottle) _____

OBSERVATIONS OF STRANDED AND/OR ENTANGLED MARINE MAMMALS OR SEA TURTLES. Please describe type of animal and type of entangling debris. Be as specific as you can. DO NOT HANDLE!

What was the most peculiar item you collected? _____
Comments _____

PLEASE RETURN THIS CARD TO YOUR BEACH CAPTAIN OR MAIL IT TO:

Louisiana Geological Survey
P. O. Box G, University Station
Louisiana State University
Baton Rouge, LA 70893

Exhibit 20

COASTWEEK 1987 Beach Cleanup Results by State

STATE	Volunteers Participating	Miles Cleaned	Tons of Debris Collected	Pounds Per Mile
Alabama	127	3	*	*
California	4,000	1,000	75.0	150
Connecticut	15	1	0.1	200
Delaware	700	50	1.5	60
Florida	1,232	50	4.0	160
Georgia	20	5	0.5	200
Hawaii	2,726	*	36.8	*
Louisiana	3,300	85	200.0	4,705
Maine	350	31	3.0	193
Massachusetts	391	39.5	1.9	96
Mississippi	100	5	3.5	1,400
New Hampshire	112	3	2.0	1,333
New Jersey	1,250	100	40.0	800
New York	80	2	1.5	1,500
North Carolina	1,000	150	10.0	133
Oregon	2,600	120	17.0	283
Rhode Island	450	40	*	*
Texas	7,132	154	306.5	3,981
Washington	1,000	100	6.0	120
TOTAL	26,585	1,938.5	708.8	731

* Data not available

Source: Center for Environmental Education 1987a.

Exhibit 21

1987 LOUISIANA CLEANUP

Debris Type Number of Debris Items

PLASTIC

bottles-cleaners	2522
bottles-soda	2007
bottles-food	1514
bottles-misc.	103
caps, lids	5043
bags	4608
milk, water jugs	3685
rope	3063
other	2674
cups, utensils	2048
6-pack holders	1725
pieces	1686
fishing line	698
tobacco "cans"	684
strapping bands	625
sheeting, lrg.	573
light sticks	550
disposable lighters	499
straws	443
nets	392
buckets	352
blue salt bags	312
net floats	302
toys	271
filters	225
diapers	221
buoys	211
vegetable sacks	209
"write protection" rings	180
pipe thread protectors	160
baskets/crates	151
hardhats	58

Total Plastic 37794

STYROFOAM

cups	8994
pieces	6887
food trays	2830
egg cartons	1331
packing	792

Total Styrofoam 20834

METAL

cans :	8120
soda	2867
beer	3384
food/juice	663
aerosol	1206
bottle caps	903
other cans	712
other	668
pieces	571
pull tabs	339
wire	334
large containers	189
drums-rusty	115
drums-new	7

Total Metal 11958

GLASS

bottles/jars:	7166
soda	3212
beer	1870
wine coolers	576
food	1376
misc	132

pieces	1715
light bulbs	1153
fluorescent light tubes	358
other	349

Total Glass 10741

PAPER

pieces	1384
other	941
cartons	860
cups	758
b a g s	6 2 4
newspaper	169

Total Paper 4736

WOOD

pieces	1797
other	204
pallets	71
crates	69

Total Wood 2141

RUBBER

gloves	684
other	644
tires	169

Total Rubber 1497

FISHING GEAR

other	374
crab traps	28

Total Fishing Gear 402

CLOTHING

shoes/sandals	355
rags	196
other	114
socks	22
underwear	17
shirts	15
caps	14

Total Clothing 733

OTHER 163

TOTAL 90999

Exhibit 22

COMPOSITION OF DEBRIS--TEXAS COMPARED WITH OTHER STATES

Percent composition of debris items based on number of items recorded from September 1986 to April 1988 Texas beach cleanups, and the Louisiana, Mississippi, and North Carolina 1987 beach cleanups. (Styrofoam debris items have been included under plastic.)

	PERCENT					
	PLASTIC	METAL	GLASS	PAPER	WOOD	RUBBER
LA	64	13	12	5	2	2
MS	52	23	17	5	1	2
NC	59	15	9	12	3	1
TX (Sept 86)	67	13	12	6	2	*
TX (April 87)	58	17	12	11	2	1
TX (Sept 87)	65	13	11	7	3	1
TX (April 88)	63	9	11	10	3	2

Exhibit 23

BEVERAGE ASSOCIATED GOODS--TEXAS COMPARED WITH OTHER STATES

Six debris items fall into a category termed "bottles and associated goods." The amount of these items as a percentage of all debris recorded from September 1986 to April 1988 Texas beach cleanups, and the Louisiana, Mississippi, and North Carolina 1987 beach cleanups.

TOTAL NUMBER OF ITEMS								
	PL. SODA BOTTLES	BEVERAGE CANS	GLASS BOTTLES	6-PACK HOLDERS	BOTTLE CAPS	PULL TABS	TOTAL	PERCENT
LA	2007	6914	7166	1725	903	339	19054	21
MS	134	655	415	57	0	0	1261	34
NC	3024	9283	5677	881	1607	275	20747	24
TX (Sept 86)	4663	12491	11837	10358	296	1106	40751	24
TX (April 87)	1687	9008	5295	3195	1776	1567	22528	24
TX (Sept 87)	6341	20580	17902	15631	8273	8925	77625	20
TX (April 88)	1928	5005	5272	5236	2674	1983	22098	14

Exhibit 24

SOURCES OF DEBRIS--TEXAS COMPARED WITH OTHER STATES

Several debris items were used as indicators of trash generated by offshore sources. These were grouped under four categories. The amount of these items calculated as a percentage of all items collected during the September 1986 to April 1988 Texas beach cleanups, and the Louisiana, Mississippi, and North Carolina 1987 beach cleanups is given below (see note below).

	PERCENT			
	CARGO WASTES	GALLEY WASTES	OPERATIONAL GOODS	FISHING GEAR
LA	0.8	5.7	2.8	6.6
MS	1.2	3.1	3.6	3.3
NC	0.5	1.1	0.6	1.7
TX (Sept 86)	2.4	5.2	3.2	5.8
TX (April 87)	1.8	3.8	2.1	3.1
TX (Sept 87)	1.5	4.0	3.0	8.9
TX (April 88)	1.3	3.5	2.0	8.1

Note (where applicable):

Cargo Wastes: plastic sheeting, wooden pallets, wooden crates

Galley Wastes: plastic egg cartons, plastic milk jugs,
plastic vegetable sacks

Operational: plastic write-enable rings, hardhats,
plastic strapping bands, light bulbs, (plastic
pipe thread protectors--Louisiana only)

Fishing Gear: nets, buoys, fishing line, light sticks, gloves,
rope, floats and lures, metal traps, wood traps

Exhibit 25

Results from 1987 MISSISSIPPI CLEANUP

Debris Type	Number of Debris Items			
	Horn Island	Ship Island	Davis Beach	Total
<u>PLASTIC</u>				
bags	198	98	142	438
bottles-green	23	18	3	44
bottles-soda	87	47	0	134
bottles-other	195	102	15	312
caps, lids	28	138	12	178
misc. pieces	73	0	33	106
cups, utensils	36	53	11	100
milk jugs	39	42	2	83
6-pack holders	28	29	0	57
rope	25	1	11	37
disposable lighters	23	0	2	25
strapping bands	2	13	2	17
sheeting, lrg.	5	7	1	13
shoes	9	0	2	11
buckets	6	3	1	10
fishing net	3	0	5	8
toys	0	4	0	4
vegetable sacks	0	4	0	4
syringes	0	1	1	2
hardhats	0	0	1	1
diapers	0	0	0	0
fishing line	0	0	0	0
light sticks	0	0	0	0
tampon applicators	0	0	0	0
straws	0	0	0	0
"write protection" rings	0	0	0	0
Total Plastic	780	560	244	1584
<u>STYROFOAM</u>				
pieces	43	104	30	177
cups	15	75	2	92
egg cartons	9	18	0	27
buoys	8	1	0	9
Total Styrofoam	75	198	32	305

Exhibit 25

<u>METAL</u>	Horn Island	Ship Island	Davis Beach	Total
beverage cans	134	484	37	655
other cans	71	42	6	119
large containers	1	17	0	18
wire	0	18	0	18
pieces	3	12	1	16
drums-rusty	0	5	1	6
bottle caps	0	0	0	0
drums-new	0	0	0	0
pull tabs	0	0	0	0
Total Metal	209	578	45	832

GLASS

bottles	201	174	40	415
pieces	0	96	22	118
light bulbs	54	30	1	85
fluorescent light tubes	9	0	0	9
Total Glass	264	300	63	627

PAPER

pieces	29	71	30	130
cartons	17	20	0	37
cups	2	0	16	18
newspaper	0	3	0	3
bags	0	0	0	0
Total Paper	48	94	46	188

WOOD

pieces	20	13	9	42
crates	4	4	2	10
pallets	1	1	0	2
Total Wood	25	18	11	54

RUBBER

gloves	29	33	3	65
tires	5	0	9	14
Total Rubber	34	33	12	79

<u>TOTAL</u>	1430	1781	444	3669
--------------	------	------	-----	------

Exhibit 26

ITEMS COLLECTED

You may find it helpful to work with a buddy as you clean the beach, one of you picking up trash and the other filling out this card. An easy way to keep track of the items you find is by making tick marks like those shown in the example below.

Total bags <u> </u> <u> </u> <u> </u> <u> </u> <u>18</u>	Total cups <u> </u> <u> </u> <u> </u> <u> </u> <u>11</u> <u>22</u>
---	---

	Total
PLASTIC	
bags _____	_____
bottles _____	_____
soda _____	_____
other _____	_____
buckets _____	_____
caps, lids _____	_____
cups, utensils _____	_____
diapers _____	_____
disposable lighters _____	_____
egg cartons _____	_____
fishing line _____	_____
fishing net _____	_____
large sheeting _____	_____
light sticks _____	_____
milk jugs _____	_____
plastic tampon applicators _____	_____
rope _____	_____
shot gun shells _____	_____
six-pack holders _____	_____
sportfishing floats and lures _____	_____
strapping bands _____	_____
syringes _____	_____
toys _____	_____
vegetable sacks _____	_____
other (specify) _____	_____

GLASS

bottles _____	_____
light bulbs _____	_____
pieces _____	_____
other (specify) _____	_____

RUBBER

gloves _____	_____
tires _____	_____
other (specify) _____	_____

STYROFOAM

buoys _____	_____
cups _____	_____
fast food containers _____	_____
pieces _____	_____
other (specify) _____	_____

PAPER

bags _____	_____
cardboard boxes _____	_____
cartons _____	_____
cups _____	_____
newspaper _____	_____
pieces _____	_____
other (specify) _____	_____

WOOD (do not include driftwood, twigs, etc.)

crates _____	_____
pallets _____	_____
pieces _____	_____
other (specify) _____	_____

METAL

beverage cans _____	_____
bottle caps _____	_____
crab pots _____	_____
drums, large containers _____	_____
other cans _____	_____
pull tabs _____	_____
pieces _____	_____
wire _____	_____
other (specify) _____	_____

Exhibit 26

NORTH CAROLINA BEACH SWEEP DATA CARD

DIRECTIONS

1. Complete the information below.
2. Open the card to record the items collected during the cleanup.
3. After the cleanup, answer the questions on the back of this card and return it to your zone captain or the Division of Parks and Recreation-NRCD in Raleigh.

Name _____ Affiliation _____
Address _____ Zip _____ Phone _____
Occupation _____ M _____ F _____ Age _____
Today's date _____ Name of your zone captain _____
Location of beach cleaned _____ Nearest city _____
How did you hear about the cleanup? _____

SAFETY TIPS

1. Do not go near any large drums.
2. Be careful with sharp objects.
3. Wear gloves.
4. Stay out of the dune areas.
5. Don't lift heavy objects.

WE WANT YOU TO BE SAFE

Cards provided by the North Carolina Marine Science Council

Three thousand copies of this public document were printed at a cost of \$130.00 or \$.04 per copy.

COMPLETE THIS PORTION AFTER CLEANUP

Estimated miles of beach cleaned _____ Number of bags filled _____

We are particularly interested in identifying the sources of marine debris, so please list on the lines below the items that had labels or company names on them.

Example: CLARASOL (green plastic bottle)

Did you observe any stranded and/or entangled animals? If so, please describe the type of animal and the entangling debris. Be as specific as you can.

What was the most peculiar item you collected? _____

Comments _____

PLEASE RETURN THIS CARD TO YOUR ZONE CAPTAIN OR MAIL IT, BY SEPTEMBER 26, TO:

Mike Dunn
Division of Parks and Recreation
N.C. Department of Natural Resources and Community Development
12007 Bayleaf Church Road
Raleigh, North Carolina 27614

Exhibit 27

1987 NORTH CAROLINA CLEANUP

Debris Type

Number of Debris Items

PLASTIC

bottles-misc.	4188
bottles-soda	3024
bottles-other	997
bags	8051
other	4533
caps, lids	3307
cups, utensils	2783
rope	958
6-pack holders	881
toys	655
fishing line	577
disposable lighters	485
milk jugs	465
strapping bands	440
sheeting, lrg.	346
vegetable sacks	307
sportsfishing floats and lures	193
light sticks	187
tampon applicators	183
shot gun shells	163
buckets	142
diapers	137
fishing net	108
syringes	82
Total Plastic	33192

STYROFOAM

pieces	9969
cups	6906
fast food containers	818
other	737
egg cartons	183
buoys	167
Total Styrofoam	18780

METAL

beverage cans	9283
bottle caps	1609
pieces	787
other cans	644
other	536
pull tabs	275
wire	257
large containers	43
crab pots	6
Total Metal	13440

GLASS

bottles	5677
pieces	1271
other	714
light bulbs	309
Total Glass	7971

PAPER

pieces	5062
other	1629
cups	1163
bags	948
cartons	618
cardboard boxes	443
newspaper	227
Total Paper	10090

WOOD

pieces	2076
other	193
crates	66
pallets	37
Total Wood	2372

RUBBER

other	591
tires	99
gloves	97
Total Rubber	787

OTHER

Cloth/rags	475
Shoes	221
Other	195
Total Other	891

TOTAL

87523

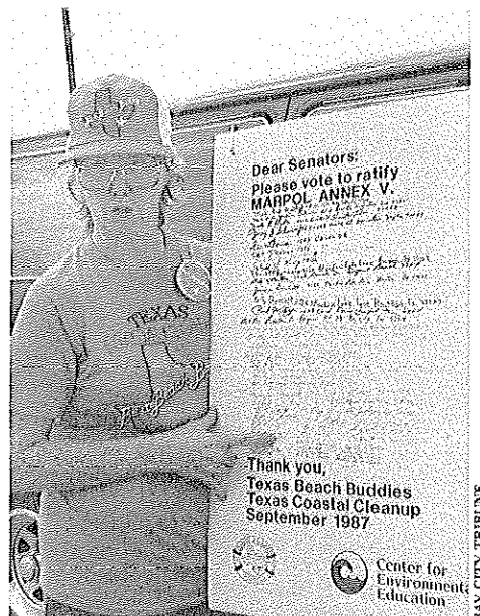
CONCLUSIONS

In the fall of 1987 several coastal states, including Texas, held beach cleanups in an effort to increase public awareness about the problems marine debris poses, including the threats to marine animals. The problem of ocean dumping clearly extends beyond the shores of Texas and the Gulf of Mexico. However, the amount of debris collected in Gulf Coast states, specifically Texas, appears to be much greater than other areas of the country. The reasons for this large concentration of debris is due in part to the tremendous amount of offshore shipping and fishing activity, and Gulf current patterns, which tend to concentrate debris on the Texas coastline.

One of the most obvious findings is that more than half of the debris found on the Texas coastline during the past four statewide cleanups has been plastic (including styrofoam). This was also found to be true during beach cleanups in the Gulf Coast states of Louisiana and Mississippi, as well as in North Carolina.

Fortunately, Annex V of the MARPOL Treaty prohibits the disposal into the sea of all plastics, including but not limited to synthetic ropes, synthetic fishing nets, and plastic garbage bags. It further regulates disposal of garbage by limiting it to 25 miles for floatable dunnage, lining, and packing materials, and 12 nautical miles for food wastes and all other garbage. However, under Annex V all offshore platforms and their associated vessels are also prohibited from dumping any type of garbage, except food waste, at sea. "Garbage" is defined as "all kinds of victual, domestic and operational waste excluding fresh fish and parts thereof, generated during the normal operation of the ship and liable to be disposed of continuously or periodically. . . ." Exceptions are made for accidents and if human safety is threatened.

The prohibitions apply to all ships, and to fixed or floating platforms engaged in mineral exploration and exploitation and associated offshore processing. The Annex also specifies that governments party to the Convention "undertake to ensure the provision of facilities at ports and terminals for the reception of garbage, without causing undue delay to ships, and according to the needs of the ships using them." However, thousands of pieces of glass, metal, and wood found on the Texas coastline also come from offshore



Beach Buddies in Texas sent a clear message to members of the U.S. Senate that marine debris is a serious problem. Mrs. Pat Radliff has served as a zone captain for the Sargent Beach cleanup for several years.

sources. In 1987, more than 3,400 glass light bulbs and fluorescent light tubes alone were reported from the September beach cleanup. More than 1,000 of these were found on isolated Matagorda Island. Once Annex V takes effect in December, regulations will allow for the disposal of glass and metal as long as it is dumped at distances at least 12 miles from shore.

Stricter controls would result if the Gulf of Mexico were designated a Special Area under Annex V. In a special area, ships are prohibited from dumping all garbage including paper products, rags, glass, metal, bottles, crockery, dunnage, lining, and packing materials. Ships could dispose of food wastes, but not less than 12 nautical miles from the nearest land.

The State of Texas has already begun the formal process necessary to have the Gulf of Mexico designated a "special area" under Regulation 5 of Annex V, and the United States has proposed the action to the International Maritime Organization (IMO), the body responsible for ocean pollution treaties. The IMO has expressed its interest in special area designation for the Gulf, and will take up the issue at its next meeting in London in September, 1988. However, a designation, because it is a process of amending an international treaty, would take several years before it went into effect.

In the meantime, the focus of citizen action must also turn to land-based sources of marine debris. Beach goers, practices at landfills, plastics manufacturing and processing plants, and the technological limitations of our wastewater treatment systems all contribute to the waterborne litter that eventually makes its way to marine and coastal areas.

The Texas beach cleanup and other events in 1987 have produced helpful information on the problem of land-based sources of debris, which are not regulated by Annex V. Some debris found in Texas, especially on southern beaches, may be originating from inadequate sewage and wastewater disposal systems. Moreover, it appears as if a portion of the debris found in Texas may be coming from Mexican land-based sources, including sewer systems and landfills located along coastal waterways. In addition, the incident in which large amounts of debris were found flowing down the Rio Grande river showed that inland sources contribute to the debris problem also.

In terms of wildlife entanglement, it is unfortunate to note that the items of debris reported to entangle and to be ingested by marine wildlife are among the most common types of debris found on the Texas coastline including plastic bags, styrofoam, rope and fishing line. Even raw plastic resin pellets, which are known to be ingested by marine life, are found on Texas beaches. Plastic bags, rope, and fishing line are also items of debris responsible for the disablement of vessels and therefore pose a threat to human safety. It is not known what impact other types of debris such as

medical type wastes may also have on wildlife or humans.

The Center for Environmental Education believes that public education will continue to play a major role in altering the behavior of those who now litter on land and at sea. In the future CEE and others must continue to inform users of the marine environment of the problems caused by marine debris.

One way CEE plans to direct citizen and government attention to land based sources of debris is to hold a major conference on the environmental quality of the Gulf of Mexico. Slated for November 1988 in Galveston, the meeting will bring together scientists, agency decision makers, environmental activists, municipal officials, and interested citizens to talk about the variety of pollution that makes its way into the Gulf—from litter to improperly treated wastes to toxic runoff. The conference is being sponsored by CEE, the Environmental Protection Agency, the National Oceanic and Atmospheric Administration, the Minerals Management Service, and the Moody Foundation.

The positive actions and new programs resulting from the Texas beach cleanups have demonstrated that grassroots citizen action leads to widescale government action—from towns and counties all the way to the U.S. Congress. CEE hopes that increasing public awareness of the other sources of debris and pollution in the Gulf will lead to new efforts to stop land-based sources of beach debris and other types of marine pollutants.



Volunteers with the Texas Marine Mammal Stranding Network tried to save the life of this two year old minke whale, who died with plastic sheeting in her stomach.

RECOMMENDATIONS

When plans for the first statewide Texas Coastal Cleanup campaign evolved in 1986, people who have worked on Texas coastal issues for years joined with newly concerned citizens in an effort to solve the beach debris crisis. News reports, informal discussions, and formal hearings brought the facts and problems out in the open, and offered creative suggestions for long-term solutions. As a result of the first Texas cleanup, 29 recommendations were offered in CEE's 1986 Texas Coastal Cleanup Report with the hope that permanent solutions to the beach debris problem would result from the cooperative efforts and abilities of all parties involved. Since that time, much progress has been made in Texas and nationwide. The following information updates the progress that has been made on the 1986 recommendations. In addition, there are several new recommendations. Recommendations are presented under two major categories: Governmental Issues and Industry Issues. Within each of these categories recommendations are classified under subheadings that highlight both necessary governmental actions and groups that must become involved in this issue to bring about its solution.

Governmental Issues

National

TOPIC: Ocean-going vessels regularly dispose of solid wastes at sea, including plastics and dunnage. Annex V of the MARPOL Treaty contains regulations specifically prohibiting the disposal of wastes from ships. However, Annex V has not been ratified by the United States and is not in force internationally.

1986 RECOMMENDATION: Annex V of the MARPOL Treaty should be ratified by the United States. This Annex, if in force, would prohibit the discharge of solid waste from ships at sea.

UPDATE: On December 31, 1987 the United States ratified Annex V. U.S. ratification brought the necessary tonnage to 50 percent of the aggregate world's shipping tonnage, thereby bringing Annex V into force internationally on December 31, 1988. Since plastics

account for more than half of all debris items found on the Texas coastline, effective enforcement of, and compliance with, this law will be a major step toward reducing debris. However, much of the non-plastic debris items found in Texas, such as glass and metal containers as well as items such as light bulbs, wooden crates and pallets, are most probably generated by offshore sources. Annex V does not prohibit the disposal of these items but rather regulates the distance from shore at which these items can be discarded (see Table 1). This, however, does not prevent these materials from floating ashore and it is not known what negative impacts may occur from debris that sinks. Special area designation for the Gulf of Mexico under Annex V would prohibit disposal of all garbage except food waste. The efforts of the U.S. delegation to the IMO to amend Annex V so that the Gulf of Mexico is designated as a special area should be actively supported. Also efforts to include the Wider Caribbean in a special area designation should be encouraged.

TOPIC: The United States Department of Agriculture regulations that require foreign garbage to be steam sterilized or incinerated are believed to encourage ships to dispose of their wastes before arriving or after leaving ports due to high costs and general lack of land-based disposal facilities.

1986 RECOMMENDATION: The USDA should review its regulations applying to foreign garbage and work with industry and port authorities to develop cost-effective technology that would encourage vessels to use the port facilities for treating and disposing of wastes.

UPDATE: In an effort to establish an adequate program for handling USDA regulated wastes, the Port of Corpus Christi has initiated a new program for handling ship wastes. Working in cooperation with a local representative of the Animal and Plant Health Inspection Service (APHIS) of the USDA, the port is establishing a disposal facility which utilizes a steam sterilization technique. The port has announced that this facility will be in place before Annex v becomes effective in December 1988. Other ports in the Gulf of Mexico should follow the lead of the Port of Corpus Christi.

TOPIC: The United States Navy is specifically exempt from the MARPOL dumping prohibitions.

1986 RECOMMENDATION: The U.S. Navy should be encouraged to review provisioning practices to minimize the amount of non-degradable trash generated at sea. The Navy should also take the lead in research and development of onboard waste management technology and make its

findings available to government, industry, and others. In addition, before homeporting in the Gulf, the Navy should have a comprehensive solid waste disposal plan.

UPDATE: Although naval vessels are exempt from MARPOL regulations, the U.S. legislation that implements Annex V in U.S. waters, the Marine Plastic Pollution Research and Control Act of 1987, specifically requires the U.S. Navy to be in compliance with Annex V by 1994.

In October 1987, the U.S. Navy convened an Ad Hoc Advisory Committee on Plastics. Composed of approximately 20 individuals, the Committee includes Congressional staff and several members of environmental groups including CEE and the Texas Environmental Coalition. The Committee spent several months analyzing naval procedures and practices to pinpoint measures that can be taken to minimize plastic wastes. In some cases, eliminating plastics before they go aboard vessels and substituting paper and metal for plastics will help minimize plastic wastes. In other cases, new equipment will be necessary to compact trash for storage onboard until it can be disposed of at shore. On June 28, 1988 the Committee released a final document that outlines recommended options and components of a comprehensive plan the Navy can consider in addressing plastics at sea.

TOPIC: While vessels are in U.S. ports they may be boarded to determine whether there has been a violation of the MARPOL Treaty. Annex V of the MARPOL Treaty would be enforced by the Coast Guard.

1986 RECOMMENDATION: When Annex V is ratified and comes into force, the U.S. Coast Guard should conduct regular investigations of vessels to determine whether a violation of the Annex has been committed. To this end, a "presentation" requirement, which would require all vessels to show evidence of having disposed of their trash in port, or a fine imposed on those known to litter at sea, should be part of the implementing regulations of Annex V.

UPDATE: U.S. ratification of Annex V was deposited with the IMO on December 31, 1987 and will take effect internationally on December 31, 1988. The Marine Plastic Pollution Control Act of 1987 implements the provisions of Annex V in the United States. In order to create incentives to comply with the law, strengthening measures were incorporated into this Act. For one, the law requires certain vessels to display placards to notify crew and passengers of the requirements of Annex V. It also requires some vessels to keep a log book on garbage disposal. (A similar log is required for oil disposal under regulation 20 of Annex I of the MARPOL Protocol). Each time vessel garbage is offloaded at port, or handled onboard by incineration or some other



"Stow It, Don't Throw It" was the message at the Texas International Fishing Tournament in the summer of 1987 and 1988.

means, an entry in the log is required.

In addition, certain sizes of U.S. vessels must develop and use a shipboard waste management plan to be approved by the Coast Guard. The plan would specify how a ship plans to comply with the provisions of Annex V. In addition, while Annex V applies only to ships of countries which are signatory to the MARPOL Protocol, the law gives the Coast Guard additional authority to prosecute any vessel operator who dumps plastics within 200 miles of the U.S. coast.

TOPIC: Under the Refuse Act of 1899 (33 USC 407) the U.S. Coast Guard enforces provisions that prohibit the disposal of any refuse matter, including garbage such as plastics, from any source into the navigable waters of the United States, including the territorial seas which extend out from the coast to three miles.

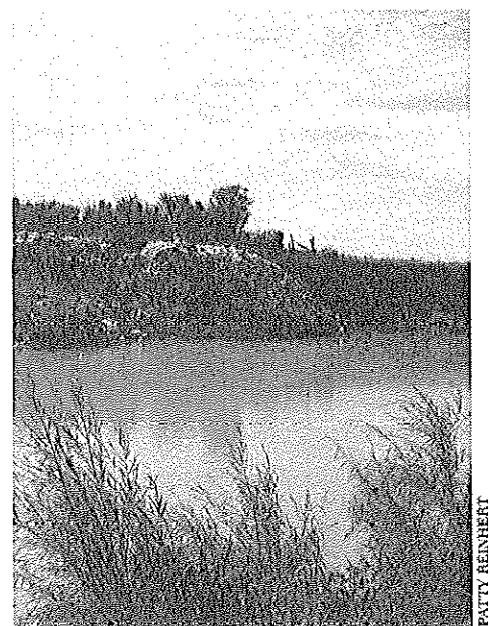
1986 RECOMMENDATION: Even though prosecution under terms of the Refuse Act is not common, it would be advantageous to enforce the Act against repeat violators. The Coast Guard should be encouraged to prosecute under the Act.

UPDATE: The budget for the U.S. Coast Guard was cut by \$100 million in 1988. Therefore, under present funding constraints it is difficult to expect the Coast Guard to carry out additional activities. For this reason education and local enforcement should be emphasized. The Coast Guard Auxiliary, in particular, should include information on the problems caused by marine debris during National Safe Boating Week which is sponsored by the Coast Guard each spring, and in boating safety classes. CEE's educational materials on marine debris, including the "Stow it--Don't throw it" bumper sticker for boat trailers, were used in June 1988 by the Coast Guard Auxiliary in Texas and several other states.

NEW TOPIC: The maquiladora assembly industry, or twin plant, concept along the Mexican border began in 1965. More than 1,000 U.S. plants are now operating in Mexico. Due to lax environmental laws in Mexico, many of these plants may improperly dispose of their trash.

RECOMMENDATION: The U.S. and Mexican governments should improve regulations that address the maquiladora policies of waste disposal and encourage industry cooperation. A study should be conducted to assess waste management policies of all U.S. companies operating along the Mexican border. Stricter controls and careful monitoring should be implemented to address these sources of debris.

NEW TOPIC: The collection of standardized data over



Plastic bags from an assembly plant in Mexico form a mountain of trash along the banks of the Rio Grande River.

PATTY REINHART

time is essential for understanding specific debris problems in different parts of the country, and for evaluating the effectiveness of specific measures implemented to reduce debris. For instance, effective December 31, 1988, the disposal of plastic trash from all ships in U.S. waters will be prohibited. Over the next few years, government agencies and others will look to annual beach cleanup data as a means to measure the effectiveness of this new law.

RECOMMENDATION: In 1988, CEE will establish a National Beach Cleanup Data Base so that standardized information can be obtained nationwide during COASTWEEKS '88 (September 17-October 10). CEE will furnish all cleanup groups with standardized data cards and beach cleanup guides to marine debris, serve as the repository for data collection in cleanups around the nation, and publish and distribute to cleanup organizers and others a summary of data analyses. All groups that will be conducting beach cleanups are encouraged to contact CEE to become part of the National Beach Cleanup Data Base.

State of Texas

TOPIC: Texas has several state agencies with some jurisdiction regarding coastal issues. Both the dispersion and overlap of authority leads to less effective management of coastal problems.

1986 RECOMMENDATION: The 1987 Texas Legislature should restore the Texas Coastal and Marine Council or similar advisory committee, or designate an existing agency to take the lead on the coastal debris problem.

UPDATE: The Texas Parks and Wildlife Department is developing policies and procedures that encourage litter abatement by using existing Department programs. Examples include requiring trash receptacles at Department sponsored boat ramps, including new educational messages about marine debris with boating registration materials, and publishing articles on this problem in the Texas Parks and Wildlife magazine.

The Texas General Land Office, besides creating the highly successful Adopt-A-Beach program, has worked with Congress to encourage ratification of Annex V and with the U.S. Coast Guard, USDA, and the Navy to continue efforts to eliminate marine debris. Through the General Land Office's permitting and leasing process, waste management policies have been implemented for all coastal oil and gas leasing and seismic operation permits. Penalties for dumping violations may include cancellation of leases or revocation of operating units.

The General Land Office staff are also working with coastal legislators to draft coastwide beach litter laws that prohibit glass containers, pull-tabs on cans, and non-degradable plastic six-pack rings from Texas beaches. Work continues for the 1989 legislative session.

TOPIC: The Gulf of Mexico is an unique oceanographic area due to its semi-enclosed geographic characteristics and circulation patterns that direct surface currents toward the Texas coastline.

1986 RECOMMENDATION: The Texas General Office should prepare a proposal for designation of the Gulf as a "special area" under MARPOL, so that it will be exempt from all garbage dumping. The proposal should be presented to the U.S. Coast Guard, the agency representing the United States at the International Maritime Organization.

UPDATE: The Texas General Land Office commissioned the Center for Environmental Education to prepare a report to determine the feasibility of designating the Gulf of Mexico as a special area under MARPOL Annex V. This document was submitted for consideration by the U.S. delegation to the International Maritime Organization (IMO). The delegation then recommended designating the Gulf as a special area at the December 1987 IMO meeting, and this proposal comes up for consideration in September 1988.

The Port of Corpus Christi enthusiastically endorsed the designation of the Gulf as a special area at a special meeting on October 26, 1987 called by the National Committee for Prevention of Marine Pollution. Texas Land Commissioner Garry Mauro has also initiated discussions with other countries bordering the Gulf of Mexico and the Caribbean to enlist their support for special area designation for both the Gulf of Mexico and the Wider Caribbean Region.

TOPIC: Ports in Texas do not have the incineration or steam sterilization facilities necessary to handle foreign garbage as required by the U.S. Department of Agriculture.

1986 RECOMMENDATION: The Texas General Land Office should conduct a feasibility study of providing disposal facilities at Texas ports. Texas state agencies and port authorities should develop and implement solid waste disposal programs that meet the USDA's standards for handling foreign garbage and that would serve as models for other state ports. Penalties should be imposed upon vessels that do not use these facilities.

UPDATE: There is currently an ongoing cooperative effort initiated by the Port of Corpus Christi to establish an effective facility for handling USDA regulated garbage where an average of 1,000 ocean-going vessels call each year. The majority of these vessels (80 percent) are bulk liquid petroleum carriers which have less dunnage and other cargo than other types of vessels and fewer crew members per ship. Although the port provides reception facilities for the disposal of

all items identified as pollutants under Annex V, there are no reception facilities available for USDA regulated wastes.

The Port of Corpus Christi has initiated a plan to develop such facilities in cooperation with representatives from the U.S. Department of Agriculture, Browning and Ferris Industries, a local refinery, the Texas Water Commission (quality control), and the Texas Air Control Board (air quality). The latter agencies are involved in granting appropriate permits where needed.

The shipping channel for this port is located between Padre and St. Joseph Islands, which is also an area that receives major concentrations of debris from the Gulf due to the convergence of north and south longshore currents along a ten-mile stretch of north Padre Island. Therefore, the availability of reception facilities at this port are essential to encourage proper disposal practices.

TOPIC: The U.S. Coast Guard is responsible for the removal of 30 and 55-gallon drums from the Texas coastline. If drums are not in a high user area, the drums are left in place. Many of these drums are unlabeled and contain hazardous chemicals.

1986 RECOMMENDATION: The drum removal program by the Coast Guard at Padre Island National Seashore is an example of good coordination between agencies. The removal program should be enhanced so that drums found in other areas of the state are removed as rapidly as possible.

UPDATE: The number of drums found on Padre Island National Seashore increased from 103 in 1986 to 120 in 1987 and many of the drums washing ashore are not labeled. All companies that handle drums should be required to permanently mark drums as to their origin and contents.

TOPIC: Over 45 tons of debris were collected from Bolivar Peninsula during the Texas Coastal Cleanup. Some people reportedly use the beach as a dump site because they do not have regular streetside trash pickup. Some visitors have been observed to take the ferry, owned and operated by the Texas Highway Department, to Bolivar to dispose of household garbage.

1986 RECOMMENDATION: Galveston County should make a special effort to provide garbage pickup to the residents of Bolivar Peninsula. Public awareness efforts through the county and especially at rental agencies on the Peninsula should inform all residents, renters, and visitors that the beach is not the proper place to bring household trash. The Texas Highway Department should post educational information

concerning marine debris problems on the ferry that goes to Bolivar Peninsula.

UPDATE: Nearly the same amount of debris, 40 tons, was collected on Bolivar Peninsula as compared to last year but on half the distance of beach cleaned.

Unfortunately, parts of Bolivar Peninsula are still being used as a local dumpsite. However, on December 29, 1986 an order was passed by the Galveston County Commissioners' Court granting permission to the Bolivar Peninsula Audubon Society to construct a fence to stop people from driving and dumping on one portion of Bolivar Peninsula. The area, known as Bolivar Flats, is among the most significant areas in the country for the endangered piping plover and other species of migratory birds. A proposal has been set forth to declare Bolivar Flats as a Galveston County Bird Sanctuary. The state of Texas should declare Bolivar Flats as a Bird Sanctuary. In addition, Galveston County has designated a sheriff who is responsible for patrolling beaches in Galveston and on Bolivar Peninsula for dumping violators. Residents should be encouraged to report any violators they see dumping trash on the beach. It may be warranted to establish a police "hot-line" number for such reports.

TOPIC: During the 1986 69th legislative session, Texas instituted several laws pertaining to litter.

1986 RECOMMENDATION: The effectiveness of present litter laws should be evaluated to determine if existing laws can be modified or if further legislation is necessary.

UPDATE: The Texas Parks and Wildlife Department now issues citations to litterers. 224 litter citations were issued in 1986, and 249 citations were issued in 1987. In addition, Brazoria County writes letters to litterers stating that the county is aware of what the litterer did and warning him or her not to do it again.

However, there is still a need to evaluate present litter laws and their enforcement. In addition, of those laws enforced, an evaluation should be carried out on the judicial actions taken (e.g. fines, sentences, community service, etc). In most cases, courts give minimum fines, if any, for litterers. Therefore, there is a need to increase awareness within the judicial branch to the importance of litter laws and the consequences of littering on state economies, public health, and wildlife.

The anti-litter program established by Cameron County Parks and Recreation at South Padre beaches should be used as a model for other areas. A five-point plan has been adopted to prevent litter on beaches. The plan incorporates public education, in the form of public service announcements, bilingual posters,

and verbal reminders from park employees, as well as vehicle checks to prevent glass containers from being brought to the parks and encouraging local merchants not to sell glass containers.

According to the Cameron County Parks and Recreation Director, Ken Conway, direct contact with the public has helped create behavioral changes. Fewer people are bringing glass to the beach and the volume of litter on target days has decreased. In addition, the new program has helped to cut costs of the county's cleanup activity. According to Mr. Conway, "Our beaches look better and that's why people come here, they want to see a clean beach."

TOPIC: Approximately 23 percent of the litter collected during the 1986 Texas Coastal Cleanup was related to beverage containers, including plastic soda bottles, metal beverage cans, glass bottles and six-pack holders. Several volunteers also commented on the prevalence of detachable metal pull-tab rings from beverage cans. Discarded plastic six-pack rings are known to kill seabirds and fish, and injure sea turtles and other animals that become entangled.

In January 1987, House Bill 210 was announced introducing deposit legislation on beverage containers for Texas. The bill also called for all six-pack rings to be degradable and for a ban on detachable pull tabs.

1986 RECOMMENDATION: House Bill 210 calling for container deposit legislation should be an important consideration for the Texas Legislature. Nine states that have laws regulating the disposal of beverage containers have found that nearly 90 percent of the containers are returned for recycling. The Texas Legislature should follow the lead of twelve other states in passing legislation mandating that six-pack rings be degradable.

UPDATE: Approximately 20 percent of the litter collected during the 1987 cleanup was beverage associated goods indicating that this type of debris is still a major component of litter on Texas beaches. In March 1987, the House Environmental Affairs Committee held hearings on House Bill 210. Although a Texas poll showed that 70 percent of Texans liked the idea of a beverage container deposit, banning pull tabs, and requiring photo-degradable plastic six-pack rings, the bill did not move. In other areas of the country, legislators are considering initiatives to encourage proper disposal and recycling of beverage associated goods as alternatives to deposit legislation. Such alternatives need to be carefully considered in effecting a state plan to reduce litter.

Several soft drink companies in the state have voluntarily started to use photodegradable plastic six-pack rings. Anheuser-Busch has adopted photodegradable

rings nationwide. The Texas soft drink association should do a survey of its members to see how many managers at bottling plants have made these changes. Beer bottlers should also be surveyed.

In any case, not all beverage-associated goods found on the Texas coastline are generated by Texans. Thus, laws passed in Texas will not completely eliminate this type of marine debris.

TOPIC: Texas is fortunate that efforts have been made to establish a Marine Mammal Stranding Network and a Sea Turtle Stranding and Salvage Network, which include many people who respond to incidents of marine animals washing up on the beach, assist in the rehabilitation of sick or injured animals and, when possible, perform examinations and tests to determine the cause of death and record important biological information. Network members include personnel from federal and state agencies in addition to numerous volunteers from private institutions, organizations, universities and the general public.

1986 RECOMMENDATION: Funding and other forms of support should be provided to the Marine Mammal and Sea Turtle Stranding and Salvage Networks so that they will become more effective. More volunteers willing to cooperate with these networks are needed as well as supplies and laboratory equipment. In addition, increased publicity for the networks is needed so that the public becomes aware of their existence and will know where to report animals found on the beach.

UPDATE: The networks are compiling useful information on strandings. For example, the findings of sea turtle entanglement and ingestion given in this report gathered by Pam Plotkin and Tony Amos were reported to the Sea Turtle Stranding and Salvage Network. The state coordinator for marine mammal strandings is Dr. Raymond Tarpley at Texas A&M University. The sea turtle stranding coordinator is Robert G. Whistler at Padre Island National Seashore. Funding, publicity, and equipment, however, are still problems, and need to be addressed.

TOPIC: Several individuals have expressed an interest or are already involved in studies pertaining to the marine debris problem in Texas. For example, Tony Amos, an oceanographer at the University of Texas Marine Science Institute has been studying marine debris on Mustang Island for nearly ten years. Amos has collected data and developed theories that would be useful internationally, nationally, and locally.

1986 RECOMMENDATION: Marine studies carried out by faculty, students, and others, especially at Texas

institutions, should be encouraged and supported. Funding provided to faculty, students, and private researchers would enable them to study marine debris distribution patterns, quantify debris generated by particular sources, and explore methods for handling shipboard wastes or other aspects of this problem that would provide valuable information towards finding solutions.

UPDATE: Texas A&M Sea Grant Program recently provided a grant to Tony Amos to hire a graduate student for six months to assist with his marine debris studies.



Don't mess with Texas beaches

TOPIC: The Texas General Land Office, under the direction of Garry Mauro, has started the first statewide Adopt-A-Beach program.

1986 RECOMMENDATION: The Adopt-A-Beach program should be a statewide effort involving people from many areas, and not just the coastal counties. Businesses and others should sustain this program with their financial support, and encourage participation in the program. Data collected by volunteers should be maintained to ensure current information about the types, amounts and sources of debris found on Texas beaches. The effectiveness of the program should be continuously evaluated by the Texas General Land Office and regular reports should be issued on the progress of the program.

UPDATE: The success of the Adopt-A-Beach program is demonstrated by the fact that less than a year after it was established, all accessible miles of Texas coastline were adopted. To date, more than 140 groups have adopted 172 miles of beach. Those that adopt a mile of beach agree to clean their beach three times per year, including once during the April cleanup with the Great Texas Beach Trash Off cosponsored by the Adopt-A-Beach program and Keep Texas Beautiful, and once during the Center for Environmental Education's Texas Coastal Cleanup in September. The Adopt-A-Beach program also sponsored a spring break cleanup for college students. The Adopt-A-Beach Task Force meets several times during the year.

Data collection from beach cleanups continues to be a valuable and important part of this effort.

TOPIC: Continued education and public awareness will bring a positive regard for the marine environment.

1986 RECOMMENDATION: The Texas Education Agency should include in the science curriculum a study of plastic in the marine environment, the dangers it can present to marine life, and other topics relating to the protection of the Texas coastline. Teachers should encourage their students to participate in community beach cleanups and

instill pride in students about the beauty of the Gulf of Mexico and the fragile coastal environment. Other agencies, industries, civic groups, volunteer groups and others should encourage and foster educational programs directed at the general public.

UPDATE: Students across Texas participated in the Texas Coastal Cleanup in September, and in other Texas beach cleanups during the year. Since school curricula are determined by the Texas Education Agency and by local school districts, these groups should also be educated as to the importance of increasing awareness about the marine debris problem. The Aquatic Resources Education Council also should be encouraged to include marine debris education in its curricula. In 1987, Texas A&M Sea Grant produced an educational video entitled "Trashed Out Texas Beaches." Teachers who bring their students to the Saturday beach cleanup events should receive professional in-service credit.

TOPIC: In recent years, Texas has been ranked among the top five states in terms of the number of recreational boats in the state. According to the U.S. Coast Guard, in 1984 there were nearly 600,000 recreational boats registered in Texas (in 1986 this number grew to 600,500). Recreational boaters have been identified as the source of nearly one pound of trash per person each day. Texas Parks and Wildlife is responsible for mailing boat registrations to boat owners in the state.

1986 RECOMMENDATION: Texas Parks and Wildlife should enclose with the registration mailings educational materials in the form of brochures or other written materials on plastic in the marine environment, its effects on wildlife and coastal aesthetics, as well as on boat propulsion and cooling systems. In addition, the Texas Parks and Wildlife Information and Education Division could participate by writing articles on the marine debris problem and be responsible for distributing these to publications across the state. A concerted educational campaign would help ensure that boaters return their trash to land-based disposal facilities.

UPDATE: The Texas Parks and Wildlife Department is developing a program to help reduce litter along Texas beaches. In the spring of 1988, the department began to include a "Stow it--Don't throw it" message logo developed by CEE on boater registration envelopes.

The Texas General Land Office will soon require under Chapter 33 of the Natural Resources Code that any marina on state land must have solid waste disposal facilities for boaters.

In addition, the Texas A&M University Sea Grant Program provided funding in 1987 to produce two "Stow it--Don't throw it" banners to be used at sports fishing

tournaments in Texas. Working with Sea Grant Agents and tournament directors, CEE used the first banner at the 49th Texas International Fishing Tournament at South Padre Island in July, 1987. A billfish caught at the tournament had a plastic ring from a baby bottle cap on its bill and a red snapper was also caught entangled in a plastic six-pack ring. In 1988, CEE worked with the ten recreational fishing tournament directors, and will be distributing information on marine debris to sports fishermen throughout the summer.

The availability of waste facilities at marinas in Texas is becoming more urgent as the growth in recreational boating increases, particularly in Galveston Bay, Port Arthur, Port Lavaca, the Coastal bend area, and Port Isabel/Brownsville.

The Texas Boating Trades Association and the Marina Association of Texas have taken a lead role in educating boaters. In 1987 these groups jointly funded a "Stow it--Don't throw it" bumper sticker developed by CEE. In the summer of 1988, these groups printed an additional 25,000 bumper stickers for recreational boaters and fishermen.



NEW TOPIC: Results from the September 1987 beach cleanup revealed that 930 syringes were recorded on 158 miles of Texas beach.

RECOMMENDATION: The Texas Task Force on Waste Management Policy, established in the 70th legislative session, should address the ways infectious wastes, including needles and syringes, are managed by small offices such as doctor and dental offices, veterinary clinics and nursing homes, as opposed to large hospitals. The Texas Department of Health should assess how these small quantity generators handle infectious wastes to determine whether they could be a possible source of these items on Gulf coast beaches.

Industry Issues

General

TOPIC: Joint cooperation of industry groups with government agencies, environmental groups, and others will help foster effective solutions to the marine debris problems.

1986 RECOMMENDATION: Industry should be encouraged to support research relating to land and sea disposal technologies, the entanglement of marine wildlife, and other debris associated problems. In addition, industry support for the State's Adopt-A-Beach program, CEE's September 1987 Texas Coastal Cleanup campaign, or other efforts relating to education and public awareness should be encouraged.

UPDATE: Several industry groups provided funding, supplies, and services for CEE's 1986 and 1987 Texas Coastal Cleanup Campaign. In addition, many companies are supporting and participating in the Adopt-A-Beach Program. The Offshore Operators Committee provided funding for the printing of this report.

Plastics Industry

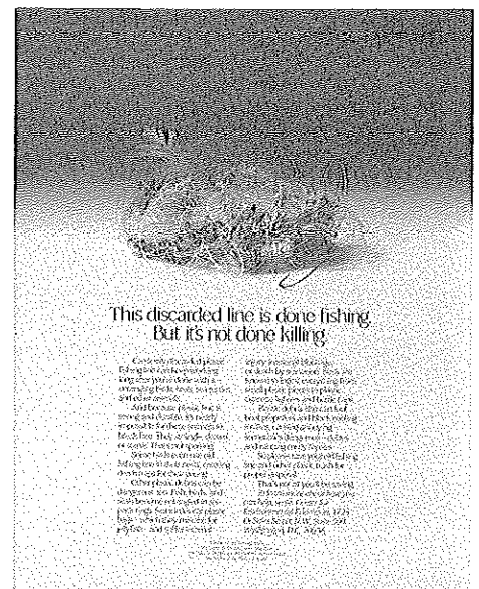
TOPIC: The most common types of debris items found during the 1986 and 1987 Texas Coastal Cleanups were plastics.

1986 RECOMMENDATION: The plastics industry should foster public awareness of the proper disposal of plastic products. Industry should also expand efforts to study the feasibility of developing degradable plastic products and recycling technologies.

UPDATE: In 1986, the Society of the Plastics Industry (SPI), the major trade organization of the U.S. plastics industry, launched a joint campaign with the Center for Environmental Education and the National Oceanic and Atmospheric Administration to curtail the disposal of plastics in marine areas. Phase I of the campaign involved the development of public service advertisements which are now being featured in trade journals of three major industry groups: the plastics, commercial fishing, and merchant shipping industries. Brochures have also been developed for each of these groups. Phase II of the campaign involved the development of similar ads and brochures for recreational boaters and sports fishermen as well as the production of a "Citizen's Guide to Marine Debris," and other projects.

In addition, in June 1986 SPI sponsored a major symposium on degradable plastics to determine what technology currently exists and the feasibility of extending the use of degradable plastic technology to other applications. SPI also distributes educational information on plastics recycling, including an annual directory to U.S. companies that are engaged in some aspect of plastics recycling.

Several members of SPI, including Dow Chemical U.S.A., have also provided assistance to CEE with cleanup efforts and in other projects to help mitigate the marine debris problem. Following the April 1988 cleanup, the Society of the Plastics Industry conducted a plastics recycling demonstration project near Corpus Christi in Texas. Volunteers at this site were asked to collect certain items of plastic beach debris for recycling including plastic milk jugs, bleach and other cleansing agent bottles, and six-pack rings.



TOPIC: Plastic pellets, the raw form of plastic after it has been manufactured from petroleum products and

before it is molded into plastic consumer goods, are often lost during production or shipping and often end up in the marine environment. Seabirds are known to ingest these pellets mistaking them for food, which leads to starvation and death. The discharge of pellets is regulated by the Clean Water Act.

1986 RECOMMENDATION: DOW Chemical's Louisiana Division produced a short video in September 1986 on waste reduction regarding plastic pellet reclamation. This video should be made available to all companies that are involved in the manufacture, shipping, and handling of plastic pellets.

UPDATE: The Society of the Plastics Industry, as described above, is educating U.S. companies of the problems caused by plastic pellet escapement, including the ads described above and an education package composed of posters, stickers, and other information to be used at individual plants and companies that handle plastic pellets.

Oil and Gas Industry

TOPIC: Operational wastes, such as write-enable rings and hardhats, were common debris items found during the Texas Coastal Cleanup. These items are undoubtedly generated by offshore activities associated with the oil and gas industry.

1986 RECOMMENDATION: As suggested by the Minerals Management Service, "all operators on the OCS should develop training aids and conduct periodic training and awareness sessions targeted at all offshore workers, contractors and subcontractors, especially boat operators, seismic and geophysical crews, drilling and production crews, derrick barge crews, and pipeline barge crews." In 1987, the National Marine Fisheries Service contracted the Kearney/Centaur Division of A.T. Kearney in Washington D.C. and CEE to develop educational materials for offshore oil and gas employees. These materials should be used in training programs.

UPDATE: The Offshore Operators Committee (OOC) has produced and begun distribution of a video for offshore workers concerning the problems caused by plastics in the marine environment entitled "All Washed Up." To date, 160 copies of the video have been purchased by 45 member companies and viewed by approximately 10,500 employees. In addition, some petroleum companies have adopted new procedures that require all contractors to sign agreements that all wastes generated offshore will be disposed of properly shoreside. The Minerals Management Service issued a letter in 1987 to all leasees in the Gulf concerning the importance of litter control. Moreover, Conoco has instituted a ban on the use of styrofoam cups at offshore platforms.

TOPIC: Hundreds of 55-gallon drums wash ashore on Texas beaches each year, many of which are unlabeled so that the source and contents of the drum are unknown. It costs taxpayers more than \$1,000 to have each drum safely tested and removed. More than half of the drums removed from Padre Island National Seashore have been found to contain hazardous chemicals.

RECOMMENDATION: As required under paragraph 5 of OCS Order No. 1, the oil and gas industry must use permanent marking systems for all drums. Such an inventory system could be used to identify lost drums and their contents.

UPDATE: This recommendation still needs to be fully addressed because the number of drums washing ashore increased in 1987 and many are not labeled. According to the Minerals Management Service, after an inspection of 3,500 rigs and platforms, 111 marking citations were issued. Staff at Padre Island National Seashore and the Minerals Management Service should meet to discuss the label marking system used on 55 gallon drums. It should also be determined whether drums found at Padre Island National Seashore that are not marked could be coming from sources other than the petroleum industry.

Maritime Industry

TOPIC: Merchant shippers have traditionally thrown shipboard wastes and dunnage (packing materials used to secure cargo) into the sea. This practice must be stopped, and would be required by law if Annex V of MARPOL is ratified.

1986 RECOMMENDATION: In preparation for the ratification of Annex V of the MARPOL Treaty, merchant shippers should cooperate in the development of waste disposal systems by determining the volume of ship wastes generated and the type of shipboard disposal system that would be effective. An education and information program about marine debris should be given to employees. In many cases educational materials should be developed in several different languages in order to provide this information to crews of foreign ships.

UPDATE: In March 1987, Lykes Brothers Steamship Company, based in New Orleans with offices in Houston and a member of CEE's Texas Coastal Cleanup Steering Committee, announced that it ordered officers on its 33 cargo ships to comply with the provisions of MARPOL Annex V even though it will not take effect until December 1988.

TOPIC: Other industry groups, such as the petroleum and plastics industries, have created educational materials for employees concerning marine debris and prevention.



1986 RECOMMENDATION: The maritime industry should follow the lead of other industries in developing educational and awareness materials for employees. CEE is currently developing educational materials for merchant shippers that could be incorporated into such programs.

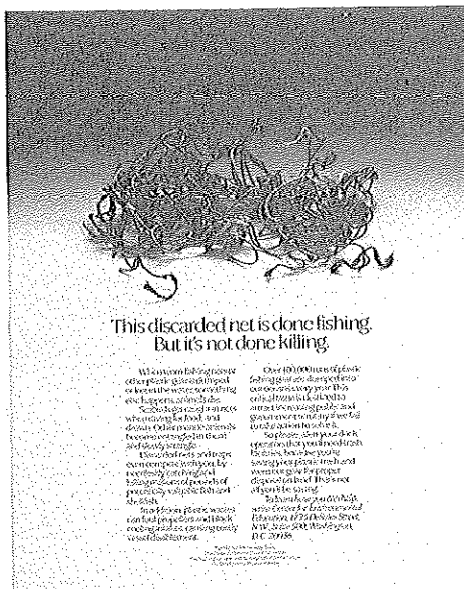
UPDATE: Several trade journals of the merchant shipping industry, including Marine Engineering Log and Sea Technology have featured the advertisement developed by CEE in cooperation with SPI and NOAA. As a result, many mariners are requesting information on what they can do to help prevent the problems caused by plastics in the ocean. Ports in Texas that have their own publications, such as the Port of Corpus Christi, Galveston, and Houston, as well as other Gulf ports, should also inform their readers of the marine debris problem.

Commercial and Recreational Fishing Industries

TOPIC: Items such as fishing nets, buoys, gloves, light sticks, and fishing line collected during the Texas Coastal Cleanup were indicative of having been generated by the fishing industry. In addition, although the sources of galley wastes such as milk jugs and egg cartons collected during the cleanup are not readily identifiable, it has been suggested that some portion of these items is generated by the crews of fishing vessels.

1986 RECOMMENDATION: Owners and managers of the commercial fishing industry should create company policies that prohibit the discharge of shipboard wastes into the Gulf. The National Marine Fisheries Service has contracted CEE to develop educational materials for commercial fishermen on the marine debris problem. These materials could be obtained by commercial fishing industry representatives and distributed to fishermen. Sea Grant Marine Advisory agents should also use their role as educators and use these and other educational materials to inform fishermen of the marine debris problem. Fishermen should also begin efforts to minimize the amounts of non-degradable supplies taken onboard.

UPDATE: Several trade journals of the commercial fishing industry, including National Fishermen, have featured the ad developed by CEE for commercial fishermen. As a result, many fishermen are becoming increasingly aware of the problems caused by plastics in the marine environment. In addition, the Texas Shrimp Association (TSA) has adopted a set of guidelines to reduce their contribution to the problem and the topic of dealing with marine debris was discussed at the TSA 38th Annual Convention on March 24-26, 1988 in San



Antonio. CEE has also produced an educational slide show program for Gulf fishermen which is currently being used by Sea Grant agents in all Gulf coast states.

Funds are now being sought to establish pilot port projects in Texas to encourage fishermen to return shipboard trash to shore. In 1988, a committee was formed to oversee this effort including the Texas Shrimp Association, CEE, the Texas General Land Office, the National Marine Fisheries Service, and the Texas A&M Sea Grant Program.

TOPIC: There are close to 100 sportfishing tournaments in Texas every year. Recreational fishermen are a source of litter such as beverage cans, six-pack rings, monofilament fishing line and other debris.

1986 RECOMMENDATION: Recreational fishing tournaments should encourage participants to dispose of wastes properly. Steve Qualia of Fish Trackers Incorporated of Corpus Christi, and a member of CEE's steering committee, suggested that fishermen in Texas tournaments be awarded extra points or some other incentive for bringing their trash back to shore. This would serve both as a means of encouraging fishermen to help solve the debris problem and as an educational vehicle.

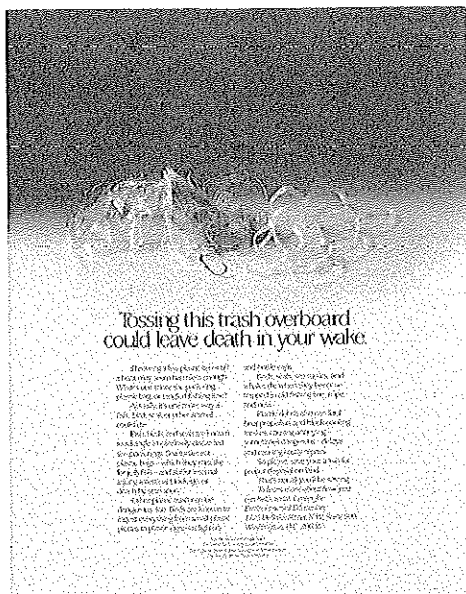
UPDATE: In 1987 and 1988 the Marina Association of Texas and the Texas Boating Trades Association and CEE produced "Stow it---Don't throw it" bumper stickers for boat trailers. In addition, two banners with the same slogan produced by Sea Grant and CEE have circulated to more than 10 fishing tournaments held during the summers of 1987 and 1988.

TOPIC: Gill nets, trawl nets, and other types of fishing gear are made of synthetic material that does not degrade when lost in the marine environment. Once lost and discarded, nets, traps, and other types of fishing gear will continue to catch fish and other marine wildlife. "Ghost fishing" by such gear can lead to the reduction of fishery resources as well as to the deaths of marine mammals, sea turtles, and seabirds that become accidentally entangled.

1986 RECOMMENDATION: Fishermen should be encouraged to return damaged nets to shore and should be prohibited from discarding damaged gear at sea as are foreign fishermen operating within U.S. waters. The establishment of a bounty system that would reward persons who return damaged or discarded gear would create an incentive. In addition, crab traps used in Texas must have brass name tags for identification. Similar marking systems should be developed and implemented for other types of fishing gear such as nets. Latches for traps should be made degradable to prevent "ghost fishing."



CEE's "Stow It, Don't Throw It" message appeared on a banner funded by Texas A&M Sea Grant. This banner is used at Texas recreational fishing tournaments.



UPDATE: Information is still needed on what type of incentives can be established that would encourage commercial fishermen to bring old gear back to port. In some areas of the country, there are groups that collect nylon fishing nets for recycling. In other areas, old fishing gear such as nets have been found to be useable for horticultural activities, ground erosion control, netting for sports equipment such as backstops and volleyball nets. In addition, restaurants and tourists sometimes collect old fishing gear for decoration.

In 1988, Sears and Roebuck Incorporated created another incentive for fishermen by offering trash compactors for boats at reduced costs. Both commercial fishing vessels, as well as large recreational boats should begin to install trash compactors. Under Annex V of MARPOL vessels will also be required to display notices onboard that offshore disposal of plastics is prohibited.

TOPIC: Many commercial docks and fish houses, as well as public marinas, do not have adequate trash facilities readily accessible to the fishing vessels and recreational boaters.

1986 RECOMMENDATION: Increased numbers of trash receptacles in conjunction with the development and distribution of educational materials such as posters, should be implemented by fishing company managers and public marina personnel.

UPDATE: The Texas General Land Office will soon require under Chapter 33 of the Natural Resources Code that any marina on state land must have solid waste disposal facilities for boaters.

Other Industry

TOPIC: Beverage-related debris constitutes a significant portion of the debris collected during beach clean-ups throughout the nation.

1986 RECOMMENDATION: Beverage companies should be encouraged to develop educational efforts directed at consumers, including information on the hazards posed by marine debris. Many companies in Texas have apparently independently eliminated the use of metal pull-tab rings and some have begun to use photodegradable plastic six-pack rings that will begin to break apart upon exposure to the sun. The example set by these companies should be followed by all.

UPDATE: The Texas Soft Drink Association initiated a program for their members to encourage the use of photodegradable six-pack rings. A statewide survey should be conducted by the Association to determine how many bottlers are using pull-tabs and degradable six-pack rings.

PROCLAMATIONS AND RECOGNITION

The response to CEE's second Texas Coastal Cleanup campaign was once again extremely positive throughout the planning and organizing of the cleanup and afterward. The public has become very concerned about the topic of debris in the marine environment and the effects it has on wildlife and the beauty of Texas beaches. People have been very generous with their praise and have commented that the event was a worthwhile project that should be repeated every year.

Letters of appreciation were received from many volunteers and state officials. Other forms of recognition included the following:

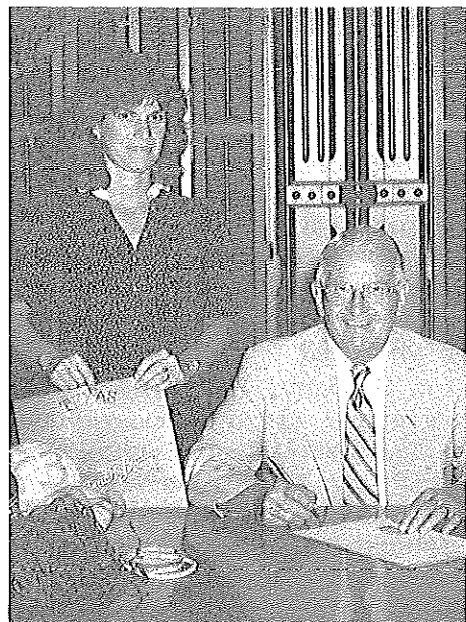
- o Proclamation from Texas Governor William P. Clements, designating September 19, 1987 Texas Coastal Cleanup Day and urging all Texans to participate.

- o Proclamation from the Texas Senate commending the Center for Environmental Education and the beach buddy volunteers and expressing their highest regard and appreciation.

- o Take Pride in America National Awards Program, Certificate of Merit, presented in Washington, D.C. July 21, 1987.

- o The Water Conservationist of the Year Award was presented to CEE in May 1988 by the Sportsmen's Clubs of Texas, the state affiliate of the National Wildlife Federation.

The interest in the debris problem generated by the Texas Coastal Cleanup also motivated the Department of Interior's Minerals Management Service to establish a "Take Pride Gulfwide" Padre Island Task Force in December 1987, composed of members of federal and state government agencies, industry groups, environmental organizations, and others who can play a role in solving the marine debris problem in the Gulf of Mexico.



Texas Governor Bill Clements signs a proclamation for the 1987 Texas Coastal Cleanup with Linda Maraniss, regional director for CEE's Gulf Coast States Office in Austin.



APPENDICES

Appendix 1.

Contributions to the 1986 Texas Coastal Cleanup

Foundation, Corporate, and Government Donors

ARCO Oil and Gas Company
Boating Trades Association of Texas
Ruth McLean Bowman Bowers Foundation
Harry S. and Isabel C. Cameron Foundation
Cities Service Oil and Gas Corporation
Dow Chemical
Exxon Company, U.S.A.
Harris and Eliza Kempner Fund
The LBJ Family Foundation
Lower Colorado River Authority
The Eugene McDermott Foundation
Offshore Operators Committee:
 Amoco Production Company
 Conoco, Inc.
 Cities Service Oil and Gas Corporation
 CNG Producing Company
 Chevron, U.S.A., Inc.
 Exxon Company, U.S.A.
 Marathon Oil Company
 Mobil Exploration and Producing, U.S.A., Inc.
 Shell Offshore, Inc.
 Standard Oil Production Company
 Sun Exploration and Production Company
 Tenneco Oil Exploration and Producing
 Texaco, Inc.
Rockwell Fund, Inc.
Shell Oil Company
The Society of the Plastics Industry
Sun Exploration and Production Company
Swift Independent Packing Company
Tandy
Texas Adopt a Beach Program
Texas Hotel and Motel Association
Trull Foundation
Waste Management, Inc.

Supplies and Services Donated for the 1987 Texas Coastal Cleanup

Abel Business Supplies	KSTE Radio---Corpus Christi
Allison Distribution	Kincer's
Alvin's Food Store	Kwik-Copy---Medical Parkway, Austin
Ambrosia Water---Houston	LBJ Catering
Better Beverages	Lone Star---Port Lavaca
Black and White Connection---Austin	Longhorn Trash Company
Blue Marlin Supermarket	Lower Colorado River Authority
Bobbie's Bait Stand	McDonald's Bay City
Browning Ferris Industries	Miller Lite Beer---Victoria
Brownsville Sanitary Services	MOBIL Oil Company
Budweiser---Victoria	Ken Moore
City of Brownsville Landfill	Oasis Water Company
Coastal Production Service	The Office Company---Austin
Coastal Safaries	Padre Island National Seashore
Coca Cola---Victoria	Pepsi Cola---Bay City
Coca Cola---Beaumont	David Pilbram
Coca Cola of the Southwest	Port Lavaca Chamber of Commerce
CONOCO	Quintana City Council
Coors---Victoria	Rainbow Bakery
Diamond Ice Company	Rotary Club of Corpus Christi
Dispose All	Safeway, Inc.
Dr Pepper	Safeway---Bay City
Dykes Plumbing	Sam's Beach Store
Elcompo Distributors	Seven-Eleven---Surfside
Evan's Oil Company	Sonora Offshore Services, Inc.
Express Inn	South Padre Island Visitor and
Galveston Park Board	Convention Bureau
Glenn's Bar B Que	Tenneco
Goldston Engineering	Texas Parks and Wildlife
Gulf Coast Coalition for Public Health	Texas Recycling
Holiday Inn---North Padre Island	Texas State Aquarium
HEB---Austin	Tracor
---Bay City	Utopia Water
---Port Lavaca	Zee Medical Services
---Victoria	

Beach Buddy Hotel Discounts

Airport Resort Inn, Galveston
Best Western Americana Motor Inn, Beaumont
Best Western Texas Rebel, Port Aransas
Best Western Sandy Shores, Corpus Christi
Beaumont Hilton
Brazosport Hilton Inn, Lake Jackson
The Commodore on the Beach, Galveston
Coral Cay Condominiums, Port Aransas
Chaparral Motel, Port Lavaca
Driftwood Motor Hotel, Port Arthur
Embassy Suites Hotel, Corpus Christi
Express Inn, Port Lavaca
Friendship Sea Shell Inn, Corpus Christi
The Galvestonian, Galveston
The Hershey, Corpus Christi
Holiday Inn Emerald Beach, Corpus Christi
Holiday Inn North Padre Island, Corpus Christi
International Inn, Corpus Christi
Marriott, Corpus Christi
Pleasure Island Hotel, Port Arthur
Quality Inn Bayfront, Corpus Christi
Ramada Inn Bayfront, Corpus Christi
Ramada Inn, Galveston
Rancho Viejo Resort and Country Club, Brownsville
Roadway Inn, Corpus Christi
San Luis Hotel, Galveston
The Sandpiper, Galveston
Shellfish Inn Motel, Port Lavaca
Sheraton Marina, Corpus Christi
Sheraton South Padre Island
Tarpon Inn, Port O'Connor, Tarpon
Victorain Condotel, Galveston
Villa Del Sol, Corpus Christi
Viking Inn, Port Lavaca

Special thanks go to Mr. Don Hansen, Executive Vice
President, Texas Hotel Motel Association.

Appendix 2.

Organizers of September 19, 1987 Texas Coastal Cleanup

Texas Coastal Cleanup Zone Captains

J.J. Jackson

KZZB Radio
Beaumont

Kim McAdams

Brazoria County Park Commission
Angleton

Russell Miget

Sea Grant Marine Advisory Service
Port Aransas

Lydia Miller

Clean Galveston
Galveston

Charles Moss

Sea Grant Marine Advisory Service
Port Aransas

Joe Surovik

Sea Grant Marine Advisory Service
Port Lavaca

Deana Sutherland

Texas State Aquarium
Corpus Christi

Bob Whistler

Padre Island National Seashore
Corpus Christi

Joe Ideker

Frontera Audubon Society
Boca Chica

Teresa Caldwell

Cameron County Parks Department
South Padre Island

Oscar L. Stowe

Gulf Coast Coalition for Public Health
South Padre Island

Sandra Schmoker

Bay City Parks and Recreation Department
Bay City

Pat Ratliff

Sargent Beach

Don Flint

North Padre Island

Ray Allen

Texas State Aquarium
Corpus Christi

Sibyl Bodamer

Sea-Arama Marineworld
Galveston

Maryann Young

Bolivar Peninsula

1987 Adopt A Beach County Coordinators

Carol Allen

Matagorda County

George Koenig

Galveston County

Leroy Belk

County Commissioner

Calhoun County

Kim McAdams

Brazoria County

Scott Bernard

Jefferson County

Ellen Trevino

Nueces County

Don Flint

Kleberg County

Steve Trevino

Aransas County

Don Hockaday

Cameron County

Bob Whistler

Padre Island National Seashore

General Land Office Adopt A Beach Staff

Commissioner Garry Mauro

Thomas Henderson

Angela Farias

Thea Selby

Eleanor Lee

Terri Polvado

Catherine Weiss, Staff Photographer

Kelly Houston, Staff Photographer

Center for Environmental Education

Gulf States Regional Office Staff

Linda Maraniss, Director

Sue Barnett, Program Assistant

Temporary Staff

Debra Hughes, Data Entry

Clark Mente, Data Entry

Mario Quijano, Data Analysis

Jerry Lile, Data Analysis

Jens Deichmann, Data Analysis

Lucia Gary, Data Analysis

Volunteers

Regine Chambard

Cindy Jennings

Andy Hammar

Andy Maraniss

Sarah Maraniss

Appendix 3.

CEE Texas Coastal Cleanup Steering Committee

Anthony Amos
University of Texas Marine Science Institute
Port Aransas, TX 78373

Carole Allen
HEART
3902 Gladebrook Court
Houston, TX 77068

Sue Barnett
Program Assistant
CEE Gulf Coast States Regional Office
1201 West 24th Street
Austin, TX 78705

Charles Branton
9300 Elm Grove Circle
Austin, TX 78736

Belinda Breaux
ARCO Oil and Gas Company
P.O. Box 1345
Houston, TX 77251

Colonel Floyd Busch
Port of Corpus Christi
P.O. Box 1541
Corpus Christi, TX 78403

Charles Caillouet
National Marine Fisheries Service
4700 Avenue U
Galveston, TX 77550

Jennifer Bjork
U.S. National Park Service
Padre Island National Seashore
9405 South Padre Island Drive
Corpus Christi, TX 78418

Thomas Bright
Director
Texas A&M Sea Grant College Program
Texas A&M University
College Station, TX

Chris Combs
Sea Grant Program
Texas A & M University
College Station, TX 77843

Sally Davenport
Coastal Policy Division
Texas General Land Office
Stephen F. Austin Bldg.
1700 N. Congress Avenue
Austin, TX 77843

Steve Melander-Dayton
CEE Board of Directors
206 Camino del Norte
Santa Fe, New Mexico 87501

Jens Deichmann
Camp, Dresser & McKee
Austin, TX 78759

Angela Farias
Program Director
Adopt-A-Beach
Texas General Land Office
Stephen F. Austin Bldg.
1700 N. Congress Avenue
Austin, TX 77843

Merriwood Ferguson
Gulf Coast Coalition for Public Health
95 Poinciana
Brownsville, TX 78521

Norm Freeman
Dow Chemical, USA
APB Freeport, TX 77541

Pat Hallisey
Galveston Ct. Beach and Parks Department
613 19th Street
Galveston, TX 77550

Allan Hayes
Exxon Company, USA
P.O. Box 2528
Corpus Christi, TX 78403

Jesse Hibbetts
Dow Chemical, USA
APB Freeport, TX 77541

N.R. Johnson
TCBT
P.O. Box 4746
Corpus Christi, TX 78469

John Kachmar
Exxon Company, USA
P.O. Box 2528
Corpus Christi, TX 78403

Commander Brian Kelly
Eighth Coast Guard District
Hale Boggs Federal Building
500 Camp Street
New Orleans, LA 70130

Bill Lukens
U.S. National Park Service
Padre Island National Seashore
9405 South Padre Island Drive
Corpus Christi, TX 78418

Linda Maraniss
Director, CEE Gulf States Regional Office
State Coordinator, Texas Coastal
Cleanup Campaign
1201 West 24th Street
Austin, TX 78705

Kim McAdams
Brazoria County Parks Commission
Route 2
Armory Building
Angleton, TX 77515

Roger E. McManus
President, CEE
1725 DeSales Street, N.W.
Washington, D.C. 20036

Charles Moss
Marine Extension Agent
Sea Grant Advisory Service
Route 2, 1800 C.R. 171
Angleton, TX 77515

Kathy O'Hara
Entanglement Biologist, CEE
12 Cantamar Court
Hampton, VA 23664

Steve Qualia
Fish Trackers, Inc.
P.O. Box 4746
Corpus Christi, TX 78469

Villere Reggio
Recreation Planner
U.S. Department of the Interior
Minerals Management Service
1201 Wholesalem Parkway
New Orleans, LA 70123

Brian Shannon
ARCO Oil and Gas Company
P.O. Box 1345
Houston, TX 77251

Clarence Shepherd
Lykes Steamship
8866 Gulf Freeway
Houston, TX 77017

David Steed
Professionals in Seafood
Concerned Enterprises (PISCES)
107 RM 620 South, No. 8-F
Austin, TX 78734

Alan Sowards
Oil Information Committee
400 West 15th Street
Austin, TX 78701

Ted Thorjussen
West Gulf Maritime Association
1717 East Loop
Houston, TX 77029

Murray Walton
National Audubon Society
Southwest Regional Office
2525 Wallingwood, Suite 1505
Austin, TX 78746

Bob Whistler
U.S. National Park Service
Padre Island National Seashore
9405 South Padre Island Drive
Corpus Christi, TX 78418

Appendix 4.

CEE'S Marine Debris Education and Awareness Materials

The following educational materials on the marine debris problem are available from the Center for Environmental Education (CEE). For further information on these and other materials contact CEE's national office in Washington, D.C.

COMMERCIAL FISHING

Marine Debris and Commercial Fishermen Slide Show--10-minute slide show details marine debris problem and how it relates to commercial fishermen. With accompanying written script and audio cassette narrative. \$30.00.

Marine Debris PSA and Brochure--public service advertisement and 8-panel brochure on the marine debris problem as it relates to commercial fishermen and suggestions on ways fishermen can help to reduce this problem.

MERCHANT SHIPPING

Marine Debris PSA and Brochure--public service advertisement and 8-panel brochure on the marine debris problem as it relates to mariners and suggestions on ways to help reduce this problem.

PLASTICS INDUSTRY

Marine Debris PSA and Brochure--public service advertisement and 8-panel brochure on the problems caused by plastic resin pellets in the marine environment and suggestions on ways to help reduce this problem.

PETROLEUM INDUSTRY

"Plastics are a Different Kind of Trash" education program--designed for offshore oil and gas industry workers in the Gulf of Mexico. Consists of a 6 minute slide video and four briefing sheets (produced by Kearney/Centaur Division of A.T. Kearney, Inc., Washington D.C.).

RECREATIONAL FISHING

Marine Debris PSA and Brochure--public service advertisement and 8-panel brochure on the problems caused by plastic fishing line and other debris in the marine environment and suggestions on ways to help reduce this problem.

"Stow it--Don't throw it" banner--available on loan to recreational fishing tournaments and other events to encourage proper disposal of plastics.

"Stow it--Don't throw it" bumper stickers for boat trailers (limited supply).

RECREATIONAL BOATING

Marine Debris PSA and Brochure---public service advertisement and 8-panel brochure on the problems caused by plastic debris in the marine environment and suggestions on ways to help reduce this problem.

GENERAL

"Marine Debris and Entanglement Slide Show"---10-minute slide show program with accompanying script. \$25.00.

"Plastics in the Ocean: More Than a Litter Problem"---report on a study funded by the EPA on the plastic debris problem in the marine and Great Lakes environments of the U.S. Discusses types of plastic debris, their sources, their impacts on wildlife and coastal economies, and laws and treaties pertaining to ocean debris. \$8.95.

"1986 Texas Coastal Cleanup Report"---details the 1986 CEE Coastal Cleanup, discusses the findings and recommendations for solving the problems caused by debris. \$4.00.

"Entanglement Network Newsletter"---current information on legislative developments, research, and other activities pertaining to the problems of marine debris and entanglement.

"Citizen's Guide to Marine Debris"---informative guide on the marine debris issue for concerned citizens with suggested activities on how to help.

Appendix 5

Results of Cleanups in Florida, Maine, Massachusetts, and Oregon

THE 1987 FLORIDA KEY WEST BEACH CLEANUP

(Source: Lee Hallman, CEE Florida Field

Representative, P.O. Box 6256, Key West, FL 33041.)

Debris Type	Number of Debris Items
-------------	------------------------

PLASTIC

caps, lids	8334
6-pack holders	4999
bottles	1200
bags	323
cups, utensils	128
milk jugs	87
light sticks	40
vegetable sacks	36
sheeting, lrg.	17
strapping bands	12
fishing net	9
buckets	9
crates	3
"write protection" rings	1
hardhats	1

Total Plastic	15199
---------------	-------

STYROFOAM

buoys	257
foam slabs	3
egg cartons	3
pieces	0
cups	0

Total Styrofoam	263
-----------------	-----

METAL

pull tabs	19992
beverage cans	178
large containers	6
aluminum siding	4
gutter	3
drums--new	3
drums--rusty	3
fuel tanks	2
bedsprings	2
bedframe	2
television	2

channel marker	2
airplane part	1
hubcap	1
refrigerator	1
bicycles	1
wire	0

Total Metal	20203
-------------	-------

GLASS

pieces	lots
bottles	224
light bulbs	13

Total Glass	237
-------------	-----

PAPER

cartons	6
newspaper	0
pieces	0

Total Paper	6
-------------	---

WOOD

pieces	40
pallets	6
bamboo	3
crates	0

Total Wood	49
------------	----

CLOTH

blankets	2
carpet	2
mattress	2

Total Cloth	6
-------------	---

TOTAL	35963
-------	-------

RESULTS OF THE 1987 MASSACHUSETTS BEACH CLEANUP

(Source: Thomas E. Bigford, Massachusetts Beach Cleanup Coordinator, National Marine Fisheries Service, Management Division, Habitat Conservation Branch, 2 State Fish Pier, Gloucester, MA 01930-3097.)

Percentage of debris
by number of pieces
(based on random sample)

PLASTIC

styrofoam	19.5
plastic containers (bottles, jugs, etc.)	16.9
plastic rope or strapping	13.2
plastic bags and sheeting	12.6
other plastic pieces	10.4
plastic eating utensils (cups, utensils, straws)	9.4
6-pack yokes	2.4
Total Plastic	84.4

FISHING GEAR

commercial fishing pots, traps, netting, buoys, etc.	9.3
recreational fishing gear	2.1
Total Fishing	11.4

GLASS

glass	4.2
TOTAL GLASS	4.2

Ocean Drift 57.5 %
Beach Use 42.5 %

THE 1985-1987 MAINE CLEANUP

(Source: Katrina Van Dusen, Maine Coastweek '87
Coordinator, State Planning Office, 184 State Street,
State House Station 38, Augusta, ME 04333.)

	1985	1986	1987
volunteers:	368	495	793
miles cleaned:	29.6	69.5	80.7
pounds:	1560	5983	7118

1987
Number of
Pieces

PLASTIC

bags and sheeting	2606
containers	
(bottles, jugs, etc.)	2263
6-pack yokes	280
life jackets	70
shotgun shells	30
tampon applicators	25
diapers	7
lighters	6
sleds	5
toys	5
hardhats	2
syringes	1
Total Plastic	5300

STYROFOAM

other	4624
fastfood containers	3
Total Styrofoam	4627

METAL

metal, cans	1835
aerosol cans	5
other	11
Total Metal	1851

GLASS

glass bottles	5315
---------------	------

Maine (cont.)

PAPER

magazines	40
-----------	----

RUBBER

rubber gloves, boots	504
tires	17
balloons	3
toys	3

Total Rubber	527
--------------	-----

OTHER

household items	1186
fishing gear	700
house shingles	14
1000's of cigarette filters	

TOTAL	19560
--------------	--------------

THE 1987 OREGON COASTAL CLEANUP

(Source: Judie Neilson, Oregon Department of Fish and Wildlife, P.O. Box 59, Portland, OR 97207.)

Debris Type	Number of Debris Items
-------------	------------------------

PLASTIC

pieces	12536
caps, lids	5880
rope	2725
other	1454
strapping bands	1340
beverage containers	1304
vegetable sacks	1251
jugs	840
6-pack holders	797
floats and buoys	438
fishing net	385
Total Plastic	28950

STYROFOAM

egg cartons	248
other	9982
Total Styrofoam	10230

METAL

beverage cans	1329
---------------	------

GLASS

beverage containers	1930
---------------------	------

PAPER

pieces	5105
cardboard	1520
Total Paper	6625

MISCELLANEOUS

pieces	9306
galley wastes	45

<u>TOTAL</u>	58415
--------------	-------

ENVIRONMENTAL QUALITY IN THE GULF OF MEXICO

WHAT:

A regional symposium to address environmental conservation, natural resource management, and economic issues affecting the marine environment of the Gulf of Mexico and its coastal states.

WHEN:

November 16, 17, 18, 1988

WHERE:

The San Luis Hotel, Galveston, Texas. Located along the Galveston beachfront on the Gulf, the conference location is minutes away from the city's many attractions.

WHO:

Participants will include scientists, representatives from federal, state and municipal governments, industry leaders, conservationists and interested citizens.

WHY:

This three-day symposium will provide a forum for exchanging information and ideas essential to developing a balance between the economic and recreational demands placed on the Gulf of Mexico, and preserving its environmental quality.

TOPICS:

Speeches, panel discussions and audience participation will provide an opportunity to learn about the Gulf Initiative, marine debris, MARPOL Annex V, Special Area Designation for the Gulf, land and water based sources of pollution in the Gulf, habitat loss, resource management, the Galveston Bay Estuary, and the private, state and federal programs designed to address these issues.

DISPLAYS:

In addition to poster sessions on such topics as the Clean Water Act, Gulf Coast parks and refuges, beach clean-ups and non-point source pollution, participating organizations will have the opportunity to display information about their programs and to present educational materials, videos, and slide programs.

For more information and a registration brochure, please write or call Linda Maraniss, Regional Director, Center for Environmental Education, Gulf Coast States Regional Office, 1201 West 24th St., Austin, Texas, (512) 477-6424.

Co-sponsored by the Center for Environmental Education, the Environmental Protection Agency, the Minerals Management Service, the National Oceanic and Atmospheric Administration, and the Moody Foundation of Galveston, Texas.

1987 BEACH LITTER BLUES SONG WRITING CONTEST

...AND THE WINNERS ARE... MIKE CROSS AND DICKY NEELY

I WENT DOWN TO THE BEACH, THERE WAS A PARTY GOIN' ON THERE
MUSIC AND LAUGHTER WERE DRIFTIN THROUGH THE AIR
THERE WERE PEOPLE DRINKIN' AND EATIN' BARBECUE
DOIN' ALL THOSE THINGS THAT PARTY PEOPLE LIKE TO DO.
THE NEXT DAY IT WAS OVER AND THE SUN CAME SHININ' THROUGH.
WHAT I SAW THAT MORNIN' BROKE MY HEART IN TWO.

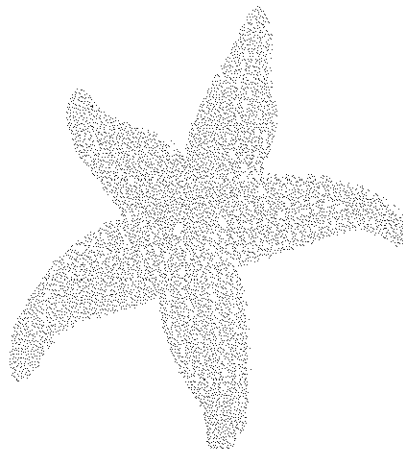
THERE WAS TRASH AND LITTER, LAYIN' EVERYWHERE.
PLEASE DON'T TRASH THOSE TEXAS BEACHES, SHOW EVERYBODY THAT YOU
CARE.

LAST WEEK I WENT FISHIN' AFTER A LONG WEEK OF TOIL
I GOT OUT OF MY PICK-UP TRUCK AND STEPPED DOWN IN SOME OIL
THERE WAS OIL ON THE BEACHES AND IN THE WATER TOO
JUST TO SEE THOSE DIRTY BEACHES ONLY MAKES ME BLUE.

THERE WAS TRASH AND LITTER, LAYIN' EVERYWHERE
PLEASE DON'T TRASH THOSE TEXAS BEACHES, SHOW EVERYBODY THAT YOU
CARE.

THEY SAY DON'T MESS WITH TEXAS AND THAT'S ALRIGHT WITH ME,
BUT WE'VE GOT TO STOP THIS GARBAGE FROM ROLLIN' OFF THE SEA.

ALL THIS TRASH AND LITTER, LAYIN' EVERYWHERE.
PLEASE DON'T TRASH THOSE TEXAS BEACHES, SHOW EVERYBODY THAT YOU
CARE.



Be a Beach Buddy



Center for Environmental Education

National Office
1725 De Sales St. N.W.
Washington, DC 20036
(202) 429-5609

Gulf Coast States Regional Office
1201 W. 24th St.
Austin, TX 78705
(512) 477-6424