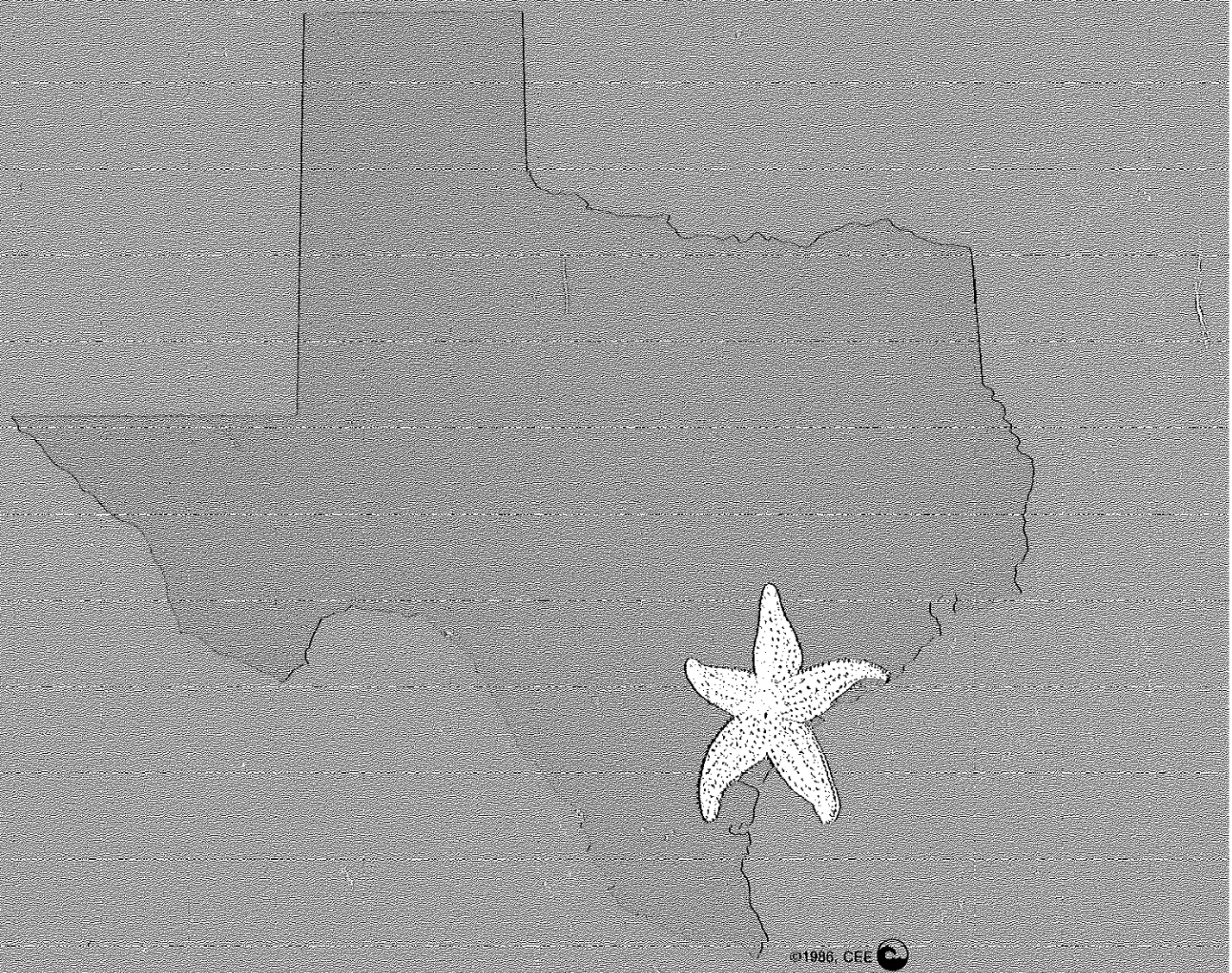
1986 Texas Coastal Cleanup

Report



Prepared by
Center for Environmental Education

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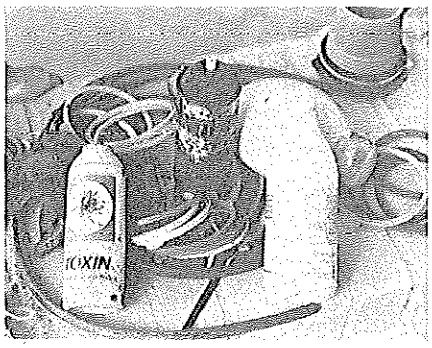
CEE would like to thank the members of the Texas Coastal Cleanup Steering Committee for their comments on the draft report; however the information and recommendations in the report are the sole responsibility of CEE.

Litter-strewn beach of Padre Island National Seashore. Photo courtesy of Padre Island National Seashore.

EXECUTIVE SUMMARY

The Center for Environmental Education (CEE), a conservation organization dedicated to protecting marine wildlife and their habitats, organized a Texas Coastal Cleanup campaign in 1986. As part of this campaign, a Texas beach cleanup was conducted on September 20, 1986 during national Coastweek. Two important goals of the cleanup 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. The statewide event was coordinated from CEE's regional office in Austin, Texas.

Organizational features of the cleanup included the distribution of brochures, posters and other printed materials to encourage participation, and locating zone captains to help organize cleanup activities at twelve coastal sites. The media, coastal businesses and local organizations assisted in publicizing the event and attracting volunteers. CEE organized a steering committee comprised of representatives from local, state and federal governments, the U.S. Coast Guard, petroleum companies, the maritime, commercial fishing, and plastics industries, and environmental organizations. The committee was formed to provide insight into the sources and prevention of ocean litter.



Write-enable rings (shown here among a collection of foreign cans) were chosen as "indicator items" of debris generated by the oil and gas industry. Zone captains helped volunteers identify the small plastic rings. Photo: Linda Maraniss

On September 20, approximately 2,800 volunteers participated in CEE's Texas Coastal Cleanup at twelve sites extending from McFadden Beach near Beaumont to Boca Chica near South Padre. Volunteers filled nearly 7,900 trash bags with 124 tons of debris. They covered a distance of 122 miles.

Each debris item collected was recorded on a data card under the major headings of plastic, glass, styrofoam, metal, paper and wood. Data cards were returned by an estimated 54 percent of all volunteers. From these cards approximately 171,500 pieces of debris were reported. Plastics comprised 56 percent of all debris items by number, with bottles, bags, and plastic caps and lids being the most abundant. Metal beverage cans, glass bottles and 6-pack connector rings used for beverage cans were also among the most abundant items collected. Items that were categorized as "bottles and associated goods" accounted for 23 percent of all debris items.

Determination of the sources of the debris items was difficult in that a large portion of the trash collected included bags, containers and a multitude of other items used for domestic purposes. Domestic wastes such as these may be generated by land-based sources in Texas and other Gulf coast states. Many of these items are also generated offshore by the maritime and fishing industries as well as by recreational boaters. The fact that many items of debris found on the Texas coastline have foreign labels, while others bear the insignias of petroleum companies, indicates that much of the debris on the Texas coastline is generated by offshore sources.

Several items listed on the data card were used as indicators of debris generated by offshore sources. 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 and wooden pallets, were most frequently found in areas near large port cities which provides some clue to the source of these items. Milk jugs, egg cartons and plastic vegetable sacks were categorized as galley-type wastes and were found to encompass the greatest percentage of debris items collected on Matagorda Island. Since Matagorda is an island, virtually inaccessible to the general public, the abundance of these wastes at this zone demonstrates that these goods are generated offshore. Operational goods included computer 9-track write-enable rings used during seismic recording and other computer activities, hardhats, plastic strapping bands and light bulbs. These debris items were found to constitute the greatest proportion of debris on Matagorda Island and at Padre Island National Seashore. Fishing goods, including nets, buoys, fishing line and gloves that are commonly used on shrimp fishing vessels, were recorded most frequently at Matagorda Island, St. Joseph Island and Padre Island National Seashore.

Each year hundreds of 30 and 55-gallon drums come ashore on the Texas coastline--the frequency of drums washing ashore on Padre Island National Seashore is about one drum every two days. It costs $1,400 to remove each drum. During the cleanup, eight drums were reported by zone captains.

The entanglement of marine wildlife in debris is a serious problem and was a major focus of the cleanup. In Texas, both sea turtles and marine mammals have been reported entangled in, or having ingested a variety of debris items including plastic bags, bottles, and tar. During the cleanup volunteers found six dead animals including three turtles and one porpoise. Although no obvious signs of entanglement were reported for these four animals, two seagulls were found at Boliver Peninsula dead and entangled in fishing line.

The problem of marine debris is not unique to Texas as demonstrated by the results of beach cleanups conducted in other coastal states during Coastweek 1986. The concentration of debris in Texas, however, appears to be greater than in any other state. Existing domestic legislation and international treaties that address ocean disposal of wastes are inadequate. A major international authority that could address this problem on a worldwide basis is Annex V of the MARPOL Treaty. If the U.S. ratifies Annex V, as is presently being considered, other countries are likely to follow suit. CEE and others also believe that continued public education will play a major role in altering the behavior of those who now litter.

CEE has made several recommendations to help foster solutions to the marine debris problem. Governmental issues that should be addressed include implementation and enforcement of stricter regulations and improved waste disposal procedures, evaluation of existing state litter laws and introduction of new laws such as a bottle bill, support for research, and continued efforts to increase public awareness. The new Adopt-a-Beach program of the Texas General Land Office can be an effective means toward promoting education and research. In addition, the 1987 Texas legislature should designate an existing agency to take the sole lead on coastal debris problems. Industry issues that should be addressed by the plastics, oil and gas, maritime and fishing industries include the development of sound disposal practices, and educational efforts to inform employees of the hazards posed by marine debris. In addition, cooperation among industry, government, environmental groups and others in efforts relating to education and public awareness should be encouraged.

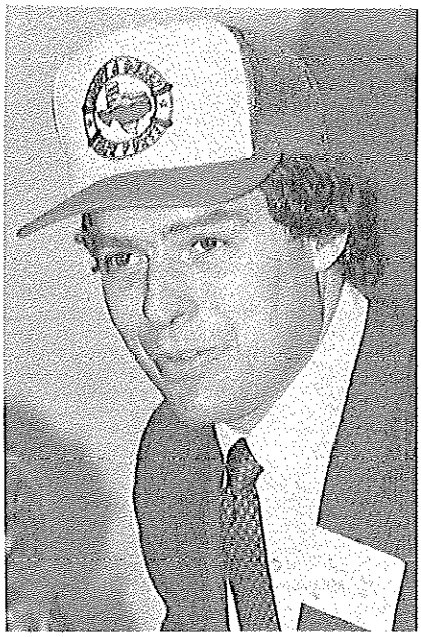
FOREWORD

It is both an honor and pleasure to introduce this report, and I would like to salute the Center for Environmental Education for initiating and organizing the first statewide beach cleanup in Texas. The tremendous success of the September 20, 1986 cleanup must be attributed largely to the Center's ability to promote public awareness and to call attention to the plight of our endangered marine wildlife and to the need to conserve our precious coastal and ocean resources.

September 20, 1986 will remain a memorable day for me. I joined thousands of Texans and responded to the Center's battle cry to "Be a Beach Buddy" for a few hours, and I helped collect litter that had washed up on Texas beaches.

It was this event that convinced me that Texas was dealing with a severe garbage problem rather than a litter problem. This report presents evidence that much of the garbage collected is a result of offshore dumping from ships, pleasure boats, oil and gas platforms and other sources.

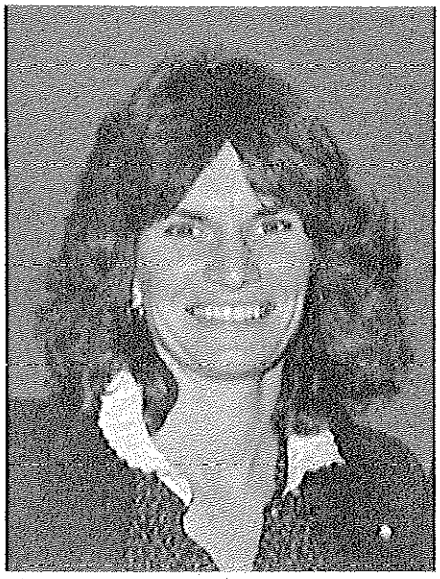
The Texas General Land Office has taken CEE's innovative action to heart by initiating a five-part "Don't Mess With Texas Beaches" campaign so that one day in the near future our beaches will again be playgrounds rather than dumping grounds.



Garry Mauro at the first meeting of the Adopt-a-Beach task force, December 1986. Photo: Kelly Houston

Garry Mauro
Texas Land Commissioner

ACKNOWLEDGEMENTS



Linda Maraniss. Photo: Chris Young

It is hard to say what motivated the teachers from Denton, Texas who drove a small yellow school bus full of seventh graders to Corpus Christi for the coastal cleanup. I saw that bus with the cheerful but tired students leaving for a long drive back home. I never had the opportunity to thank those kids or their teachers for their help that day. I've always wished I could have expressed my appreciation to them and the more than 3,000 special people who helped in many ways to make the cleanup a success. This just may be my chance!

Without the generous donation from Vaughan and Chi Chi Brown this project would never have been possible. Many corporations, foundations and individuals generously supplemented this initial support and CEE wishes to thank them all. The major donors are listed in this report, and we also thank those that wish to remain anonymous.

I would also like to acknowledge the energetic commitment of the fourteen volunteer zone captains, the 2,772 Beach Buddies, the local litter leaders, the Beach Buddy hotel managers, our steering committee members, the musicians who entered the Beach Litter Blues song writing contest, the reporters and editorial writers across the state, and the numerous public officials who were involved in the cleanup.

Special thanks to Garry Mauro and his staff at the Texas General Land Office for their interest in the beach debris problem and solutions, and to Jens Deichmann, who so kindly donated hours of his time tabulating the results of all the data cards.

If you have ever spent time at the coast--feeding the sea gulls, collecting shells, watching crabs hurry along the sand, observing a playful dolphin leap through the air, or if you have ever watched kids splash and run in the surf--you know that our Texas coast is a precious resource. I hope you'll "Be a Beach Buddy" on September 19, 1987. We need your help and you <u>will</u> make a difference!

Linda Maraniss

Linda Maraniss
Director, CEE Gulf States Regional Office
State Coordinator, Texas Coastal Cleanup

INTRODUCTION

For many years people have been concerned about the concentrations of litter along the Texas shoreline for a number of reasons. Beach debris is expensive--it depresses the coastal tourist industry and burdens coastal communities faced with the costs of routine beach clean-ups. According to the U.S. Minerals Management Service, it costs an average of $4,000 per mile per year to remove oil and gas industry trash from major shorefront recreational beaches. Aside from the aesthetic problems, beach debris poses a threat to public health and safety, and to wildlife. But the amounts of litter on Texas beaches are just an indicator of even greater amounts of litter offshore in the Gulf of Mexico. Out here, marine debris can foul propellors and cause vessel disablement, endangering human safety. In addition, debris kills thousands of marine mammals, sea turtles and seabirds every year that either become entangled in debris items such as rope, nets and monofilament fishing line, or ingest items like plastic bags and sheeting mistaking them for food.

The Center for Environmental Education (CEE), established in 1972, is a conservation organization dedicated to protecting marine wildlife and their habitats and conserving coastal and ocean resources. In 1986, CEE organized a Texas Coastal Cleanup campaign. An important goal of the campaign was to have a successful one-day beach cleanup attracting a large number of participants to clean the beaches and to heighten the public's awareness of the problem. It was equally important to gather data on the types and quantities of debris collected in order to obtain information necessary to developing long term solutions to the problems caused by debris in the marine environment. By informing the public about the problems and identifying the sources, CEE hoped that attitudes and behaviors toward the marine environment would be altered and new policies to reduce beach debris in Texas would be implemented. The Texas Coastal Cleanup campaign was coordinated from CEE's regional office in Austin, Texas.

Major funding for the Texas Coastal Cleanup campaign was provided by the Vaughan W. Brown Charitable Trust in May of 1986. Other contributions were subsequently received from individuals, corporations, businesses and foundations. A list of donors is provided in Appendix 1.

Accumulated debris in a Texas marina. Photo: Linda Maraniss

ORGANIZATION OF THE TEXAS COASTAL CLEANUP

September 20, the date of CEE's Texas Coastal Cleanup, was selected to coincide with the beginning of Coastweek 1986, a national event dedicated to the marine environment. Many features of CEE's cleanup were adapted from previous cleanups conducted in Oregon by Judie Neilson of the Oregon Department of Fish and Wildlife. Linda Maraniss, director of CEE's Gulf Coast States Regional Office in Austin, served as the state coordinator for the Texas Coastal Cleanup.

"Be a Beach Buddy" was the slogan that appeared on thousands of bright orange and blue posters and brochures. The brochure contained information on the litter problem on the Texas coastline and how citizens could become involved in the cleanup. Bilingual posters were distributed throughout the state as well as bumper stickers encouraging Texans to "Be a Beach Buddy" or "Sea un Amigo de la Playa."

Locating volunteers to serve as zone captains to help organize beach cleanup efforts was an important task to be completed in the early planning stages. Eventually, fourteen zone captains coordinated cleanup activities at twelve sites (see map for cleanup locations and Appendix 2 for listing of zone captains). Zone captains demonstrated their willingness to work diligently throughout the planning stages of the event and on to the day of the cleanup, working with the press, responding to requests for interested volunteers, and securing services from garbage haulers and free landfill sites for trash. Several zone captains arranged for free soft drinks, planned parties or had drawings for donated prizes after the cleanup. CEE supplied each zone captain with brochures, posters, bumper stickers, data cards, and items donated by corporations such as garbage bags and pencils.

The media were a tremendously helpful vehicle for publicizing the cleanup and creating interest in the beach debris problem. On Sunday, July 13, a front page story entitled, "Texas' Beach Trash Stirs Swell of Concern" appeared in the Houston Chronicle. Subsequently, media throughout the state become increasingly interested in the topic of beach debris and the Texas Coastal Cleanup. Coverage appeared in USA Today, 25 Texas newspapers, 14 state and national newsletters and two state magazines. Fourteen editorials appeared in major newspapers in the state. CEE staff members were interviewed

by radio, newspaper and television reporters statewide.

Radio station KSTE in Corpus Christi held a contest in September and the winner, Bill Oliver of Austin, sang his song at a beach party following the Corpus Christi beach cleanup.

To encourage statewide participation, CEE contacted hotels near the twelve cleanup zones, soliciting sponsors of "Beach Buddy Weekend" discounts. Discounted room rates enabled many people from Austin, San Antonio, Houston, College Station, and Dallas to participate in the cleanup.

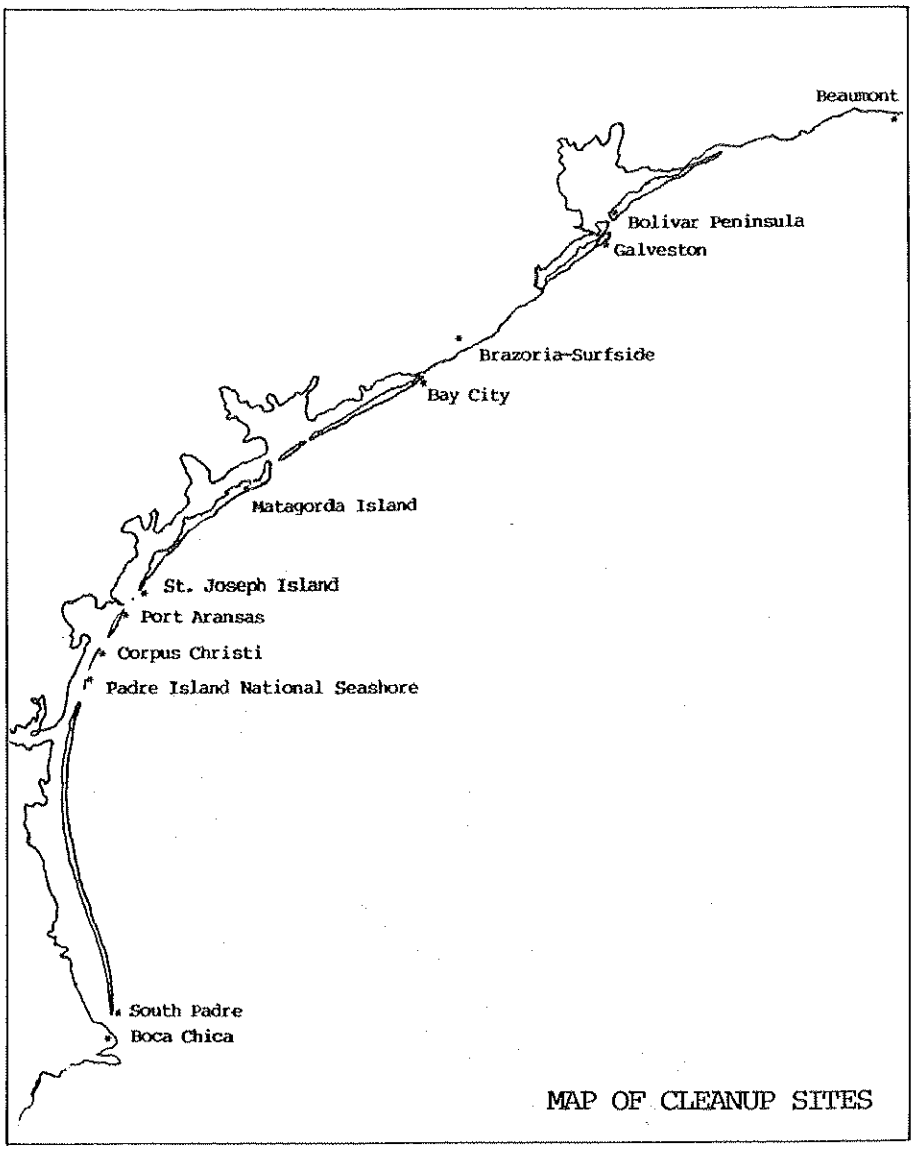
CEE's Texas Coastal Cleanup was guided in part by a Steering Committee which consisted of representatives from local, state and federal governments, the U.S. Coast Guard, major oil companies, the chemical, shipping and fishing industry and environmental organizations. A complete listing of Steering Committee members is provided in Appendix 3. The main purpose for this group was to exchange information and to assist CEE in developing a report recommending long lasting solutions to end ocean litter. The committee was not created to help plan the September cleanup, but rather formed to provide insight into the complexity of the issues relating to the sources and prevention of ocean litter.

The first meeting of the steering committee held on August 14 provided an opportunity to exchange information on the beach debris crisis nationally and in Texas. Kathy O'Hara, CEE's marine biologist, presented an overview of the marine debris problem in the United States, pointing out that Texas is an area of particular concern. Tony Amos, a University of Texas oceanographer, reported on his ten-year study of debris on seven miles of beach near Port Aransas, Texas. Linda Maraniss gave a progress report on plans for the cleanup. Villere Reggio, from the U.S. Minerals Management Service, discussed the national "Take Pride in America" campaign and

The first meeting of the Texas Coastal Cleanup Steering Committee was held on August 14. Photo: Chris Young

presented the Offshore Operators Committee's new educational video for employees of the oil industry, entitled, "All Washed Up." The afternoon session focused on the structure and content of the draft report.

The second meeting of the steering committee was held in Austin on November 20 to discuss the results of the cleanup and follow-up activities. Land Commissioner Garry Mauro spoke to the committee about new initiatives planned by the Land Office to reduce beach debris. During the afternoon session committee members presented reports and distributed materials related to their work and the debris problem. Final discussions led by Roger E. McManus, CEE's President, concerned future plans and recommendations to be included in the final coastal cleanup report.

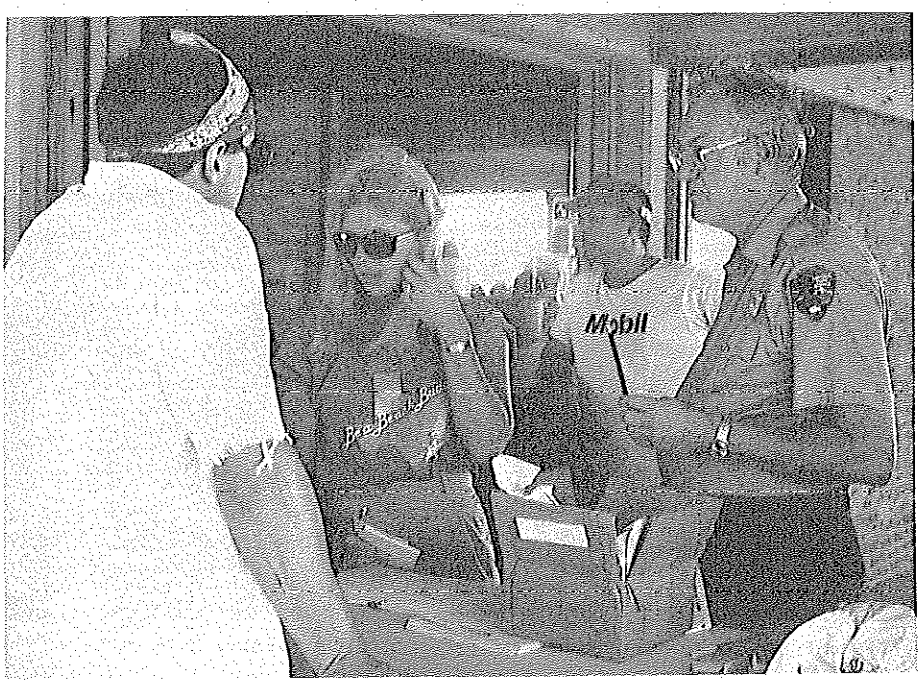


MAP OF CLEANUP SITES

CLEANUP ACTIVITIES ON SEPTEMBER 20

After weeks of planning, with thousands of details in place, September 20 dawned dark and rainy along much of the Texas coast, proving that Mother Nature has the last word. But, by 9:00 a.m. the weather had improved and the cleanup began as scheduled. In some areas the volunteer turnout may have been lower than had been expected due to morning weather conditions.

The organization of cleanup activities at each zone varied according to the plans made by the individual zone captains. In Corpus Christi, for example, the Holiday Inn on the beach offered a free conference room for early morning check-in and beach assignments. Volunteers filed in to the room to receive data cards, bags, pencils, safety rules and were assigned an area of beach to clean. Houston's zone captain collected volunteer names during the summer, and mailed beach assignments in early September. In Brazoria County, approximately 30 volunteer "Litter Leaders" helped to organize the cleanup. These volunteers attended a planning meeting in early September to discuss details for the cleanup. County water trucks supplied refreshments to thirsty and hot volunteers. Representatives from Mobil Oil were present at each zone with Mobil flags indicating meeting sites for volunteers.



CEE's Kathy O'Hara, Zone Captain Bob Whistler, and Mobil representative help volunteers sign in at the Padre Island National Seashore cleanup site. Photo: Linda Maraniss

After the Surfside cleanup, Brazoria County volunteers were treated to free food and refreshments donated by a local Seven Eleven store and a Beach Buddy T-shirt, provided by the Dow Chemical Company. Volunteers at Padre Island National Seashore followed well marked road signs through the park to a covered shelter on the beach where bags, pencils and data cards were distributed. The Park's staff worked well past the noon stopping time because many volunteers wanted to fill "just one more bag." And in the South Padre area, volunteers were so numerous that two separate locations were cleaned at South Padre Island and Boca Chica Beach.

Many state and local officials participated in the cleanup, which helped attract the media to the beach. In Corpus Christi, Land Commissioner Garry Mauro, State Senator Carlos Truan, Representative Ted Roberts and local officials worked at the Mustang Island site. Attorney General Jim Mattox and his staff from Austin helped to clean the sea wall in Galveston. State Senator Carl Parker worked at the Beaumont-McFadden beach cleanup.

Afterwards, most volunteers were hot, tired and very proud of their work. The beaches looked cleaner. Many volunteers said that their eyes had been opened to the problem of plastic debris. One zone captain said the experience changed her life and offered to help with follow up activities. Many others voiced their willingness to participate in future cleanups. Some even assumed that the beach cleanup was now an annual event as they turned in their data cards and received "I'm a Beach Buddy" bumper stickers, saying, "See you next year!"

Young volunteers at Padre Island National Seashore display their "I'm a Beach Buddy" bumper stickers. Photo: Tom O'Hara

RESULTS

Approximately 2,800 volunteers participated in CEE's Texas Coastal Cleanup on September 20, at twelve coastal sites extending from McFadden beach near Beaumont to Boca Chica beach near South Padre. Volunteers filled nearly 7,900 trash bags with an estimated 124 tons of debris. They covered a distance of 122 miles. Information on the number of volunteers, number of bags, weight of trash collected, and number of miles cleaned was obtained from each zone captain the Monday following the cleanup. This and other information obtained from zone captains is provided in Exhibit 1.

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). The organization and distribution of data cards were directed by each zone captain. 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

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Exhibit 1

General beach cleanup results reported from each zone for the 1986 Texas Coastal Cleanup.

ZONE	TOTAL NO. VOLUNTEERS	NO. BAGS FILLED	NO. POUNDS COLLECTED	NO. TONS	NO. MILES CLEANED	NO. DATA CARDS RETURNED	NO. DRUMS	STRANDED ANIMALS REPORTED
BEAUMONT-MCFADDEN BEACH	70	200	5,000	3	7	16	0	1 SEA TURTLE
BOLIVAR PENINSULA	400	2,900	90,000	45	22	113	0	2 BIRDS
GALVESTON	400	620	18,600	9	32	99	0	--
BRAZORIA-SURFSIDE	420	900	18,000	9	27	75	0	--
BAY CITY-SARGENT BEACH	172	500	30,000	15	6	23	0	1 SEA TURTLE
MATAGORDA ISLAND	35	126	2,520	1	1	15	3	--
ST. JOSEPH ISLAND	20	30	1,000	0.5	0.5	11	0	--
PORT ARANSAS	55	148	4,200	2	10	42	3	--
CORPUS CHRISTI	300	660	21,780	11	4	119	0	--
PADRE ISLAND NATIONAL SEASHORE	100	312	10,302	5	4	42	1	--
SOUTH PADRE	750	1,400	47,000	24	7	179	0	1 PORPOISE, 1 SEA TURTLE
BOCA CHICA	50	100	2,650	1	2	15	1	--
TOTAL TEXAS	2,772	7,896	251,052	125.5	122.5	749	8	6

Exhibit 2

TEXAS COASTAL CLEANUP

Dear Beach Buddy,

Thank you for joining in CEE's Texas Coastal Cleanup. This is only the beginning. We ask that you fill out this information card as you clean the beach today. CEE will use the information from this card to find out where the litter is coming from and hopefully stop the litter before it starts.

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 𝍸 //
6-pack holders ///

Please return this card to your Zone Captain at the end of the Cleanup.

REMEMBER

1. **Do not go near any large drums.**
2. **Be careful with sharp objects.**
3. **Wear gloves.**

WE WANT YOU TO BE SAFE

QUESTIONNAIRE

PLASTIC — 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 _____
other (specify) _____
_____

GLASS — Number of items

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

STYROFOAM

cups _____
buoys _____
pieces _____
other (specify) _____
_____

METAL

wire _____
beverage cans _____
other cans _____
large containers _____
drums: rusty _____ new _____
pieces _____
other (specify) _____
_____

Over

Exhibit 2

PAPER

cartons _____

newspaper _____

pieces _____

other (specify) _____

_____

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

pallets _____

crates _____

pieces _____

other (specify) _____

_____

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

EXAMPLE: hard hat, Smith Oil Co., TTK 111

_____

_____

_____

_____

LOCATION OF BEACH CLEANED _____ TYPE OF BEACH: ocean _____ bay _____

ESTIMATED MILES OF BEACH CLEANED _____ NUMBER OF DRUMS OBSERVED: 30 gallon _ 50 gallon _

NUMBER OF TRASH BAGS FILLED _____

DO NOT GO NEAR DRUMS!
THEY MAY CONTAIN TOXIC LIQUID.

ESTIMATED TOTAL POUNDS OF TRASH COLLECTED ____

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 DEBRIS ITEM YOU COLLECTED? _____

OTHER OBSERVATIONS _____

_____

_____

COMMENTS _____

_____

_____

HOW DID YOU HEAR ABOUT THE CLEANUP? _____

Name _____ Affiliation _____

Address _____ Zip _____ Phone _____

Occupation _____ M _____ F _____ Age: _____

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

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

Exhibit 3

	BEAUMONT	BOLIVAR	GALVESTON	BRAZORIA	BAY CITY
PLASTICS					
BAGS	109	3869	921	1355	661
SIX-PACK HOLDERS	163	1747	1548	1244	463
BOTTLES-GREEN	45	478	400	384	105
BOTTLES-SODA	81	1266	408	395	489
BOTTLES-OTHER	53	1169	859	1229	722
CUPS, UTENSILS	151	1068	985	642	494
CAPS, LIDS	271	2528	1815	1656	478
STRAPPING BANDS	37	345	376	264	141
LARGE SHEETING	33	707	350	300	353
FISHING NET	2	399	195	130	21
BUCKETS	4	196	159	107	21
WRITE PROTECT RINGS	17	147	171	123	35
HARDHATS	0	13	27	9	0
VEG. SACKS	9	201	111	74	35
MILK JUGS	53	1662	855	636	265
EGG CARTONS	27	757	348	440	169
TOYS	5	129	113	95	42
FISHING LINE	0	34	60	56	0
DIAPERS	0	72	5	34	0
GLOVES	0	333	161	110	0
ROPE	7	324	1910	809	0
SHOES/SANDALS	3	89	85	60	0
LIGHT STICKS	0	64	4	14	0
STRAWS	0	179	285	401	0
SYRINGES	0	15	19	4	0
LIGHTERS	0	53	116	26	0
MISC. PIECES	0	775	265	719	32
TOTAL PLASTIC	1070	18619	12551	11316	4526
RUBBER					
TIRES	0	7	4	0	0
TOTAL RUBBER	0	7	4	0	0
GLASS					
BOTTLES	770	1552	1056	1008	711
LIGHT BULBS	23	324	239	230	14
MISC. PIECES	230	1522	744	679	184
FLOURESCENT BULB	0	3		0	0
TOTAL GLASS	1023	3401	2039	1917	909
STYROFOAM					
CUPS	198	2356	1476	1395	756
BUOYS	8	151	66	44	5
MISC. PIECES	92	2457	1551	1328	202
TOTAL STYROFOAM	298	4964	3093	2767	963
METAL					
WIRE	25	181	122	122	129
BEVERAGE CANS	190	2328	1263	1649	1149
LARGE CONTAINERS	137	501	306	484	911
OTHER CANS	3	159	56	55	37
RUSTY DRUMS	11	28	22	12	5
NEW DRUMS	0	4	2	0	2
MISC. PIECES	62	227	85	334	120
PULL TABS	0	140	188	134	0
BOTTLE CAPS	0	22	42	18	0
TOTAL METAL	428	3590	2086	2808	2353
PAPER					
CARTONS	15	498	363	352	299
NEWSPAPER	1	173	563	56	25
MISC. PIECES	51	881	432	968	244
BAGS	1	12	35	205	0
TOTAL PAPER	68	1564	1393	1581	568
WOOD					
PALLETS	0	76	21	15	5
CRATES	0	39	16	25	0
MISC. PIECES	65	721	434	357	74
TOTAL WOOD	65	836	471	397	79
TOTAL ITEMS	2952	32974	21633	20786	9398
TOTAL RECORDS TALLIED	16	113	99	75	23

Exhibit 3

MATAGORDA	ST.JOE	P.ARANSAS	C.CHRISTI	P.I.N.S.	S.PADRE	BOCA CHICA	TEXAS
50	202	1048	3490	1008	2523	343	15579
52	65	705	2559	567	1082	163	10358
79	18	96	370	232	786	130	3123
134	116	131	695	169	669	110	4663
404	195	286	967	1434	1319	149	8786
85	26	217	1115	326	813	120	6042
282	73	970	2534	1137	1007	141	12892
39	10	291	734	294	231	13	2775
30	36	91	931	508	411	11	3761
19	7	114	287	59	176	26	1435
55	29	38	69	127	98	17	920
18	4	63	220	82	140	10	1030
5	1	5	29	7	28	3	127
13	5	42	259	183	142	37	1111
156	98	115	463	408	510	87	5308
76	16	86	101	195	177	40	2432
21	7	56	244	88	174	12	986
0	3	39	11	74	38	0	315
0	1	1	20	0	211	54	398
10	49	38	94	217	18	0	1030
20	39	388	1800	696	350	24	6367
4	18	23	130	119	100	8	639
7	5	19	101	56	2	0	272
0	0	83	93	11	17	0	1069
2	0	5	19	6	2	0	72
2	3	51	37	34	14	1	337
0	81	146	443	620	613	41	3735
1563	1107	5147	17815	8657	11651	1540	95562
0	2	1	3	0	3	0	20
0	2	1	3	0	3	0	20
464	206	219	1165	1363	3033	290	11837
96	27	66	81	248	209	4	1561
26	33	224	1264	354	1284	87	6631
0	1	0	2	6	0	1	13
586	267	509	2512	1971	4526	382	20042
121	54	280	848	328	824	115	8751
59	8	8	75	47	66	4	541
198	90	489	1356	681	1418	126	9988
378	152	777	2279	1056	2308	245	19280
16	32	61	273	58	271	5	1295
106	338	458	1965	622	2261	162	12491
79	64	80	313	323	493	46	3737
10	8	14	26	21	102	33	524
7	6	4	7	8	71	11	192
0	0	2	4	2	7	0	23
7	14	258	653	81	541	52	2434
0	0	88	540	13	3	0	1106
0	0	14	105	7	32	56	296
225	462	979	3886	1135	3781	365	22098
15	16	91	384	92	695	78	2898
0	0	11	55	10	245	1	1140
21	19	204	1098	231	1517	170	5836
0	0	3	37	4	113	53	463
36	35	309	1574	337	2570	302	10337
6	3	16	9	11	123	13	298
8	0	3	5	8	28	1	133
57	103	128	470	339	947	31	3726
71	106	147	484	358	1098	45	4157
2859	2129	7868	28553	13514	25934	2879	171496
15	11	42	119	42	179	15	749

Volunteers at Matagorda Island were encouraged to work in pairs, with one person collecting debris and the other filling out the data card. Photo: Jill Perry

time to collecting trash. However, assuming that the 2,772 volunteers worked in pairs, then 1,386 data cards were expected. The return rate of 749 data cards or 54 percent was considered good. It should be noted that since all data cards were not returned to CEE, it was not possible to determine the total number of debris items collected during the Texas Coastal Cleanup. Analyses were carried out only on the information obtained from the data cards that were returned.

Each debris item collected was recorded on data cards under the major headings of plastic, glass, styrofoam, metal, paper and wood. A total of 171,479 pieces of debris were recorded (Exhibit 3). The total number of plastic items collected surpassed all other categories, comprising 56 percent of all debris items (Exhibit 4). 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 buoyant, enabling it to be brought ashore by currents. Since most plastics are manufactured to be durable and not degradable, they last much longer than any other material. In fact, the lifespan of a plastic 6-pack ring has been estimated to be 450 years. Glass, styrofoam, and metal items each comprised from 11 to 13 percent of the total. Degradable items of paper and wood were significantly less abundant, constituting 6 percent and 2 percent respectively of all items collected.

The most common debris items found were plastic bottles, which numbered 16,572. Of these, approximately

Exhibit 4

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

	PERCENT						
	PL. SODA BOTTLES	BEVERAGE CANS	GLASS BOTTLES	6-PACK HOLDERS	BOTTLE CAPS	PULL TABS	TOTAL
BEAUMONT	2.7	6.4	26.1	5.5	0.0	0.0	40.7
BOLIVAR	3.8	7.1	4.7	5.3	0.1	0.4	21.4
GALVESTON	1.9	5.8	4.9	7.2	0.2	0.9	20.9
BRAZORIA	1.9	7.9	4.8	6.0	0.1	0.6	21.3
BAY CITY	5.2	12.2	7.6	4.9	0.0	0.0	29.9
MATAGORDA	4.7	3.7	16.2	1.8	0.0	0.0	26.4
ST. JOE ISL.	5.4	15.9	9.7	3.1	0.0	0.0	34.1
P. ARANSAS	1.7	5.8	2.8	9.0	0.2	1.1	20.6
C. CHRISTI	2.4	6.9	4.1	9.0	0.4	1.9	24.7
P.I.N.S.	1.3	4.6	10.1	4.2	0.1	0.1	20.4
S. PADRE	2.6	8.7	11.7	4.2	0.1	0.0	27.3
BOCA CHICA	3.8	5.6	10.1	5.7	1.9	0.0	27.1
TOTAL TEXAS	2.7	7.3	6.9	6.0	0.2	0.6	23.1

28 percent were soda bottles, 19 percent were green bottles which are generally cleaning agent containers for substances such as bleach, and the remaining 53 percent were categorized as "other."

Plastic bags ranked second in abundance, numbering 15,579. This category encompasses a wide spectrum of items from small "baggies" to large trash bags. "Plastic caps and lids" ranked third and was a broad general category allowing for wide classification of everything from small medicine bottle caps to large bucket lids.

Metal beverage cans and glass bottles ranked fourth and fifth in abundance with 12,491 and 11,837 items recorded respectively. Along with these, plastic 6-pack connector rings used for beverage cans were ranked sixth, with 10,358 reported.

It is apparent that the categories of plastic soda bottles, 6-pack rings, glass bottles and beverage cans comprised a substantial portion of the debris collected. Detachable metal pull-tab rings from beverage cans were also noted to be abundant, although a specific category for these items was not included on the data card. Overall, items in this category, which will be termed "bottles and associated goods" comprised 23.1 percent of all litter items collected in the state (Exhibit 5). On a regional basis, the areas of Beaumont, Bay City, Matagorda Island, St. Joseph Island, South Padre and Boca Chica had the highest percentages of these goods as compared to all other items collected. The fact that Matagorda Island, an area not readily accessible to the general public and reached only by boat, had the second highest percentage of glass bottles indicates that many

Exhibit 5

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					
	PLASTIC	GLASS	STYROFOAM	METAL	PAPER	WOOD
BEAUMONT	36	35	10	14	2	2
BOLIVAR	56	10	15	11	5	3
GALVESTON	58	9	14	10	6	2
BRAZORIA	54	9	13	14	8	2
BAY CITY	48	10	10	25	6	1
MATAGORDA	55	20	13	8	1	2
ST. JOE ISL.	52	13	7	22	2	5
P. ARANSAS	65	6	10	12	4	2
C. CHRISTI	62	9	8	14	6	2
P.I.N.S.	64	15	8	8	2	3
S. PADRE	45	17	9	15	10	4
BOCA CHICA	53	13	9	13	10	2
TOTAL TEXAS	56	12	11	13	6	2

bottles are coming from offshore sources.

Data cards also provided volunteers with the opportunity to record items of debris that they frequently collected but did not fit into any category. While volunteers recorded everthing from bikini bottoms to refrigerators, 11 items were reported in notable quantities including rope, plastic pieces, plastic drinking straws, gloves, shoes, plastic-lined diapers, plastic lighters, monofilament fishing line, plastic light sticks used for fishing, syringes and tires (Exhibit 6). All these additional items were recorded with the greatest frequency in the northern and southern portions of the state, and recorded with lesser frequency from Bay City to Port Aransas. This could be attributed to the variability in detailed record keeping by the volunteers, although the reasons remain unclear.

Rope was the most abundant of the "frequently listed" items collected and appeared to be most concentrated in the areas of Galveston-Brazoria and Corpus Christi-Padre Island National Seashore. Plastic pieces were also distributed at the northern and southern ends of the state. Although only special kinds of plastics are degradable, some nondegradable plastics are prone to shattering or may become brittle when exposed to sunlight for long periods of time. Hence, the presence of large numbers of plastic pieces collected. Drinking straws were recorded in the greatest numbers in the area of Bolivar Peninsula through Brazoria.

The number of gloves was surprisingly high, especially at Padre Island National Seashore where they comprised 2 percent of the total number of all debris pieces collected.

Exhibit 6

Twelve items were recorded to be abundant but were not listed on data cards. The number of these items reported from each zone and statewide is given below.

	ROPE	PLASTIC PIECES	STRW	GLOVE	SHOE	DIAPERS	LIGHTR	FISHLINE	LITESTIX	SYRINGE	TIRE
BEA	7	0	0	0	3	0	0	0	0	0	0
BOL	324	775	179	333	89	72	53	34	64	15	7
GAL	1910	265	285	161	85	5	116	60	4	19	4
BRZ	809	719	401	110	60	34	26	56	14	4	0
BAY	0	32	0	0	0	0	0	0	0	0	0
MAT	20	0	0	10	4	0	2	0	7	2	0
STJ	39	81	0	49	18	1	3	3	5	0	2
P A	338	146	83	38	23	1	51	39	19	5	1
C C	1800	443	93	94	130	20	37	11	101	19	3
PIN	696	620	11	217	119	0	34	74	56	6	0
S P	350	613	17	18	100	211	14	38	2	2	3
B C	24	41	0	0	8	54	1	0	0	0	0
TTX	6367	3735	1069	1030	639	398	337	315	272	72	20

SOURCES OF DEBRIS

While certain types of debris items found during the cleanup 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 a multitude of other items used for domestic purposes. The predominance of plastic items was clearly evident with plastic packaging being most prevalent. Unfortunately, it is not possible to trace many of these domestic items such as plastic bags, plastic and glass bottles, and metal beverage cans, 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 Gulf currents.

Moreover, the term "domestic" is not meant to imply that these items are coming only from land because many of these items are also generated by offshore sources. The worldwide rate of disposal of garbage from ocean sources in the early 1970's 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 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 over 3 pounds of garbage per man each day--some crews may number 5,000 men. But 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.

There were several items that were listed on the data card that served as indicators of specific groups of debris generated by a particular offshore source. Indicator items such as hardhats, fishing nets, and others were chosen on the basis of their known association with particular activities conducted in the Gulf. Selection of these items was also determined by how familiar the public would be with them. In some cases, zone captains presented examples of certain items, such as write-enable protection rings and plastic strapping

Linda Maraniss displays beach debris from Japan, Russia, and Mexico. Photo: Larry Kolvoord, Austin American Statesman

bands, to volunteers before the cleanup to familiarize them with particular objects. The indicator items are described below under the categories of cargo, galley-type, operational and fishing wastes. The amount of these items collected at each zone calculated as a percentage of all debris is given in Exhibit 7.

Exhibit 7

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.

	PERCENT			
	CARGO WASTES	GALLEY WASTES	OPERATIONAL GOODS	FISHING GEAR
BEAUMONT	0.2	3.0	5.6	0.3
BOLIVAR	1.0	7.9	6.6	3.0
GALVESTON	8.8	6.1	7.5	2.2
BRAZORIA	3.9	5.5	6.6	1.7
BAY CITY	0.0	5.0	7.0	0.3
MATAGORDA	0.7	8.6	10.1	3.3
ST.JOE. ISL.	1.8	5.6	5.0	3.4
P. ARANSAS	4.9	3.1	8.1	2.8
C. CHRISTI	6.3	2.9	8.4	2.0
P.I.N.S.	5.2	5.8	10.4	3.4
S. PADRE	1.3	3.2	7.8	1.2
BOCA CHICA	0.8	5.7	6.8	1.0
TOTAL TEXAS	3.7	5.2	7.6	2.1

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

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

Operational: plastic write-enable rings, hardhats, light bulbs, drums, plastic strapping bands.

Fishing Gear: nets, buoys, fishing line, light sticks, and gloves.

Cargo Associated Wastes

Indicator items of trash that are associated with cargo shipping activities of primarily the maritime and petroleum industries, and that are found on Texas beaches, include large pieces of plastic sheeting, wooden pallets, crates and rope. Large sheets of plastic are used in cargo shipments to cover items during transportation. (One pound of this sheeting will cover 28 square feet of beach.)

Comparison of cargo associated waste in all zones indicated that this group of debris was found most frequently in Galveston, Port Aransas, Corpus Christi, and Padre Island National Seashore. At all of these zones, large pieces of sheeting were most abundant among

the debris items in this category. The fact that these areas are near large port cities may provide some clue to this pattern of distribution.

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 offshore sources such as merchant ships, commercial fishing vessels, recreational boaters and offshore oil and gas rigs and platforms.

Plastic milk jugs were a major item of debris. A total of 5,308 milk jugs were recorded. While some may argue that milk jugs could be left behind on beaches, when more than four milk jugs were reported on every data card returned from isolated Matagorda Island, it is difficult to debate the conclusion that this item is generated predominantly from offshore sources. In fact, in comparison to other zones, Matagorda had the highest concentration of galley wastes. Bolivar Peninsula also had high numbers of galley waste items, however, the reasons for this are complicated by the fact that residents have been using the beach in this area to dispose of household trash.

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, which included 9-track "write-enable" rings which are used during seismic recording and other computer activities, hardhats, light bulbs, drums 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 not only more convenient, they are cheaper.

The most abundant operational type trash found statewide were light bulbs, followed by write-enable rings. The 96 bulbs reported on Matagorda Island attests to the fact that these items are coming from offshore. Matagorda Island and Padre Island National Seashore had the largest percentage of operational goods as compared to other zones. Light bulbs were the leading item in terms of abundance at both sites.

Fishing Gear

Fishing operations, both commercial and recreational, are a source of debris in the form of domestic wastes and fishing gear. Although domestic wastes generated by fisheries may be incorporated in the galley

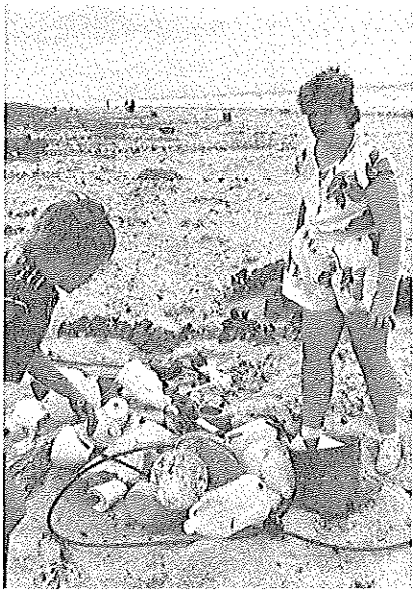
section above, fishing gear is specifically identifiable to this source. Fishing nets and buoys were designated to represent debris generated by fishing activities in the Gulf. There are many reasons why fishing gear may become lost accidentally. Gear failure caused by normal wear and tear may cause nets, lines, and buoys to separate from a fishing unit. If marker buoys are lost, submerged fishing gear such as traps may not be retrievable. Operational mistakes, such as setting traps too deep, may also cause accidental gear loss. Towed or dragged gear is highly susceptible to becoming snagged on the bottom structures, and in the Gulf submerged oil and gas structures present a problem to trawl fishermen. However, during gear mending procedures, or when gear becomes old and unusable, pieces of nets or other fishing gear are also discarded deliberately.

Three additional fishing associated items were recorded to be abundant and were incorporated in this analysis: fishing line, light sticks and gloves. Steering committee members familiar with offshore operations noted that thin latex gloves are used by Gulf shrimpers during the process of removing the heads of shrimp. Heavier rubber gloves are used by offshore crew members using chemicals. However, since it was not possible to determine the types of gloves (thin latex vs. heavy rubber) from information provided by volunteers, 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 jugs as buoys for traps. They use vegetable sacks for storing frozen shrimp and fish. But since there was no way to determine what milk jugs or vegetable sacks were used by fishermen for these purposes, these items were considered only under the section of galley-type wastes.

The greatest amount of fishing related debris was reported in the areas of Matagorda Island, St. Joseph Island, and Padre Island National Seashore. Matagorda had the highest numbers of fishing related debris primarily due to the presence of large numbers of buoys. Interestingly, Bolivar Peninsula had the greatest number of fishing nets and a large number of light sticks. Because the principal fishing areas for swordfish in the Gulf are found at the Mississippi Delta, the presence of light sticks in the northern portion of the state is not surprising. Corpus Christi and Padre Island National Seashore also had notable numbers of gloves and light sticks.

DISTRIBUTION OF DEBRIS

In view of the data obtained from each of the twelve zones, some interesting findings were uncovered. For one, plastic items dominated in every area, ranging from 36 percent of the total number of pieces of trash reported from Beaumont-McFadden Beach, to a high of 65 percent in Port Aransas. Bay City-Sargent Beach reported the largest percentage of metal items with 25 percent, the majority of which were beverage cans. Beaumont had the highest concentration of glass with 35 percent, the majority of which were bottles. It was not possible to make comparisons on the amount of debris collected at each zone since all data cards were not returned from each area. A brief description of each zone follows.



Pile of plastic debris collected at Matagorda Island. Photo: Jill Perry

Beaumont-McFadden Beach

At McFadden Beach, 70 Beaumont volunteers participated in the cleanup collecting 3 tons over 7 miles of beach. The most abundant item reported was glass bottles, followed by plastic caps and lids, and miscellaneous glass pieces. Also in abundance at this zone were plastic 6-pack holders which numbered 163 and constituted over 5 percent of all trash collected. Over 40 percent of all items collected in Beaumont were categorized as bottles and associated goods which was the highest percentage as compared to all other zones.

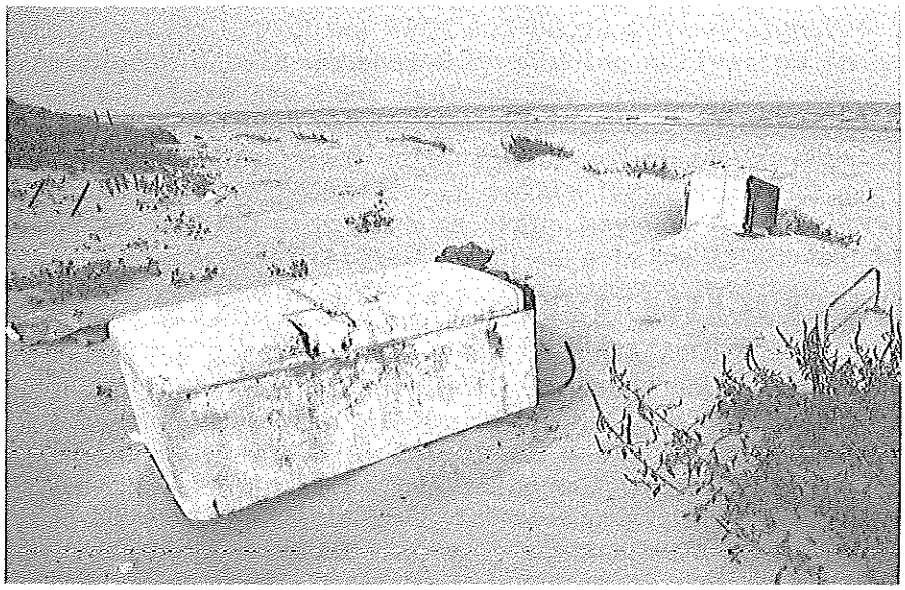
Bolivar Peninsula

Bolivar Peninsula reported a total of 45 tons of debris collected by 400 volunteers over 22 miles. The majority of items reported were plastic bags and bottles. This area is apparently being used as a trash dump and many heavy items, including refrigerators, were removed from the beach.

Galveston

Galveston reported that 9.3 tons of debris were collected by 400 volunteers along 32 miles. Most of the trash was comprised of plastic (58 percent) and styrofoam (10 percent). The most abundant items were pieces of rope, plastic caps and lids, and plastic bottles. Six-pack holders were also numerous at this zone. Due

Residents of Bolivar Peninsula often use the beach as a dumping site for household trash, such as this refrigerator. Photo courtesy of Conoco Oil.



to large numbers of rope pieces collected, Galveston had the highest percentage of cargo associated wastes as compared to any other zone.

Brazoria-Surfside

The 420 volunteers at Brazoria County's zone collected 9 tons of debris on 27 miles of beach. Over half of all items collected were plastic with bags, caps and lids being most abundant. Metal beverage cans were also numerous. The Friday night before the cleanup a group of volunteers cleaned 1 mile of beach within this zone. The next day during the cleanup the same area was re-cleaned and 167 pounds of trash was collected that had accumulated overnight.

Bay City-Sargent Beach

The Bay City cleanup held at Sargent Beach collected 15 tons of debris by 172 volunteers over 6 miles. Metal debris items were more dominant in this area as compared to any other zone due to a large number of beverage and other cans collected on the beach. No cargo, and very few fishing associated wastes were found at this site.

Matagorda Island

Matagorda Island was a prime area to use for comparison because it is not readily accessible to the public. Here, 35 volunteers were taken by boat to the island where they collected 1 ton of debris on 1 mile of beach. Numerous plastic bottles were reported in addition to glass bottles and plastic caps and lids. In comparison to other zones, Matagorda had consistently high percentages of operational, fishing and galley-type wastes.

St. Joseph Island

A group of 20 volunteers were taken to St. Joseph Island by boat where they collected 0.5 tons of debris on 1 mile of beach. Data obtained from this island also provide information on distant sources of debris since it is not readily accessible to the public. However, people do come to the island to fish. St. Joseph Island had one of the greatest percentages of fishing associated goods primarliy due to the number of gloves collected. The most abundant items collected at this site were metal beverage cans, plastic bottles, and glass bottles. In fact, 34 percent of all debris at this site was categorized as bottles and associated goods.

Port Aransas

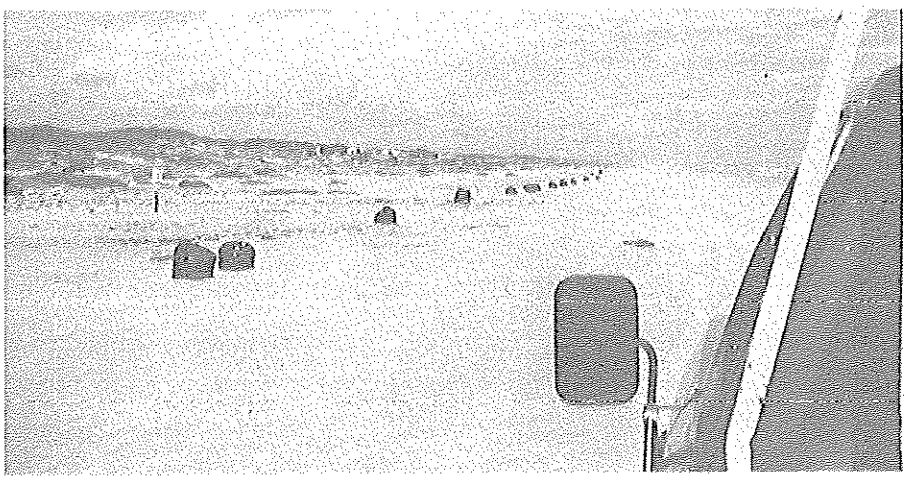
At Port Aransas 55 volunteers collected 2 tons of debris on 10 miles of beach. Plastic comprised 65 percent of all items collected with bags, caps, lids, and 6-pack holders being most numerous. In fact, 6-pack holders alone comprised 9 percent of all debris collected.

Corpus Christi

In Corpus Christi, 11 tons of debris was collected by 300 volunteers who covered 4 miles of beach. The most abundant items collected were plastic bags, 6-pack holders and plastic caps and lids. Corpus Christi also reported numerous rope pieces. Hence, the percentage of cargo associated goods at this site was comparatively high in relation to other areas.

Padre Island National Seashore

At Padre Island National Seashore approximately 100 volunteers collected 5 tons of debris on 4 miles of beach. Previous studies of debris at Padre Island have



Full trash bags along a stretch of cleaned beach at Padre Island National Seashore. Photo: Tom O'Hara

determined that the concentration of debris is higher in this area as compared to other parts of the Texas coastline due to Gulf circulation patterns. The most abundant items collected during the cleanup were plastic bottles, followed by glass bottles and plastic caps and lids. Over 10 percent of all debris items collected at this zone were associated with operational activities offshore such as write-enable protection rings and light bulbs.

South Padre

The number of volunteers at South Padre was greater than any other zone with 750 volunteers who collected 24 tons of debris over 7 miles. The most abundant debris items were glass bottles, plastic bottles, and plastic bags. One outstanding finding at this zone was the number of diapers that were reported.

Boca Chica

Boca Chica had 50 volunteers who collected 1 ton of debris on 2 miles of beach. The most common items reported were plastic bottles, plastic bags, and glass bottles. As was discovered at South Padre, a large number of diapers were reported at this zone.

In all, Texas beach buddies collected 124 tons of debris in three hours. This sample is from the cleanup near Corpus Christi. Photo: Linda Maraniss

DRUMS

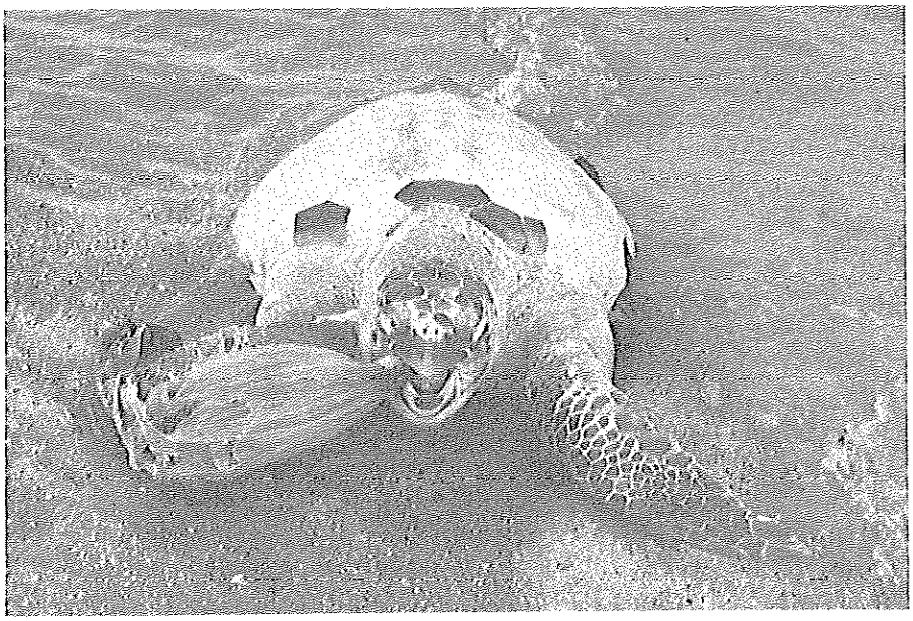
Removing a 55-gallon drum containing hazardous material. Photo courtesy US Coast Guard.

Each year hundreds of 30 and 55-gallon drums come ashore on the Texas coastline. In fact, the frequency of drums washing ashore can be estimated at about one every two days on Padre Island National Seashore. Over half of these drums contain substances 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. Due to the special procedures and precautions that must be taken in removing these drums from the beach, the cost for removal of just one drum is more than $1,000.

The Texas Coastal Cleanup provided a unique opportunity to assess the problem of drums washing ashore on the Texas coastline. Although volunteers were specifically cautioned not to go near any drums encountered during cleanup activities, they were asked to record the number of drums. In addition, volunteers recorded the condition of the drums they found under the headings of "new" versus "rusty" in order to determine how many drums may have been on the Texas coastline for some time.

A total of 215 drums were recorded during the cleanup. Of these, 193 drums were recorded to be rusty in appearance and 23 were new. There was a possibility that volunteers recorded the same drum several times in a single zone. At some zones, particularly in South Padre, young children were so conscientious about recording drums that they actually listed 55-gallon drums used as trash receptacles on the beach as debris items. Others reported concealed drums found in the dunes, and some volunteers recorded 5-gallon buckets and other metal containers under the category of drums. Therefore, to achieve some level of consistency, after the cleanup zone captains were asked to report the number of drums found in their area. From their information a total of eight 55-gallon drums were found during the cleanup, which is probably an underreporting. Port Aransas and Matagorda Island reported three drums each, and 1 each was found at Padre Island National Seashore and Boca Chica.

ENTANGLEMENT



Loggerhead sea turtle ingested a large plastic bag and died. Photo: Rex Heron

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 become entangled in debris items such as fishing nets, monofilament fishing line, plastic strapping bands and rope. Entanglement often leads to starvation, strangulation and death. Other animals, such as sea turtles and marine mammals, mistake floating plastic bags and sheeting for jellyfish or other prey and die from ingesting them. To date, of the 280 species of seabirds, 50 are known to ingest plastic debris items, including everything from small plastic pellets to cigarette lighters and toys.

Marine wildlife in Texas is equally affected by marine debris. Sea turtles have been found in Texas entangled in monofilament fishing line. In Port Aransas, two loggerhead sea turtles were reported stranded on the beach, one of which was found with a piece of a plastic onion sack around its neck. At Padre Island National Seashore where juvenile sea turtles that

have been raised in captivity are released into the wild, some wash back to beach in a matter of days, many having eaten tar balls that seal their mouths shut. Other turtles in Texas have been found to have ingested tar, plastic bags, pieces of plastic bottles, parts of beer cans and even a milk carton. Marine mammals are also threatened by debris. One example occurred on New Year's Day 1984, when an infant pygmy sperm whale stranded beside his dying mother on a Galveston beach. La Fitte, as the infant whale was named, survived for several days in a local aquarium while scientists attempted to rehabilitate him. But then suddenly he died and an autopsy revealed that while in the wild, La Fitte had swallowed numerous plastic bags including a large garbage bag, a bread wrapper, and a corn chip bag. Consequently, the young whale died because the plastic that had been mistaken for food caused him slowly to starve.

The Texas Coastal Cleanup not only helped to increase public awareness of the effects of debris on marine wildlife, but it provided a unique opportunity to conduct a statewide survey for stranded marine animals. Data cards requested information on any observations of stranded or entangled animals sighted during the clean-up. Volunteers were asked to describe the type of animals, and if entangled, the type of trash that was causing the entanglement. From the data cards received, six animals were found on the beach. Three were sea turtles, one each from Beaumont, Bay City and South Padre. Considering that three turtles were found within just three hours along only 120 miles of the 650-mile Texas coastline, this could represent thousands of turtles that die each year. A carcass of a porpoise was also found at South Padre. Although no obvious signs of entanglement were reported for the turtles and porpoise, at Bolivar Peninsula two seagulls were reported dead and entangled in fishing line.

CEE President Roger McManus and netting found on a Texas beach. Photo: Linda Maraniss

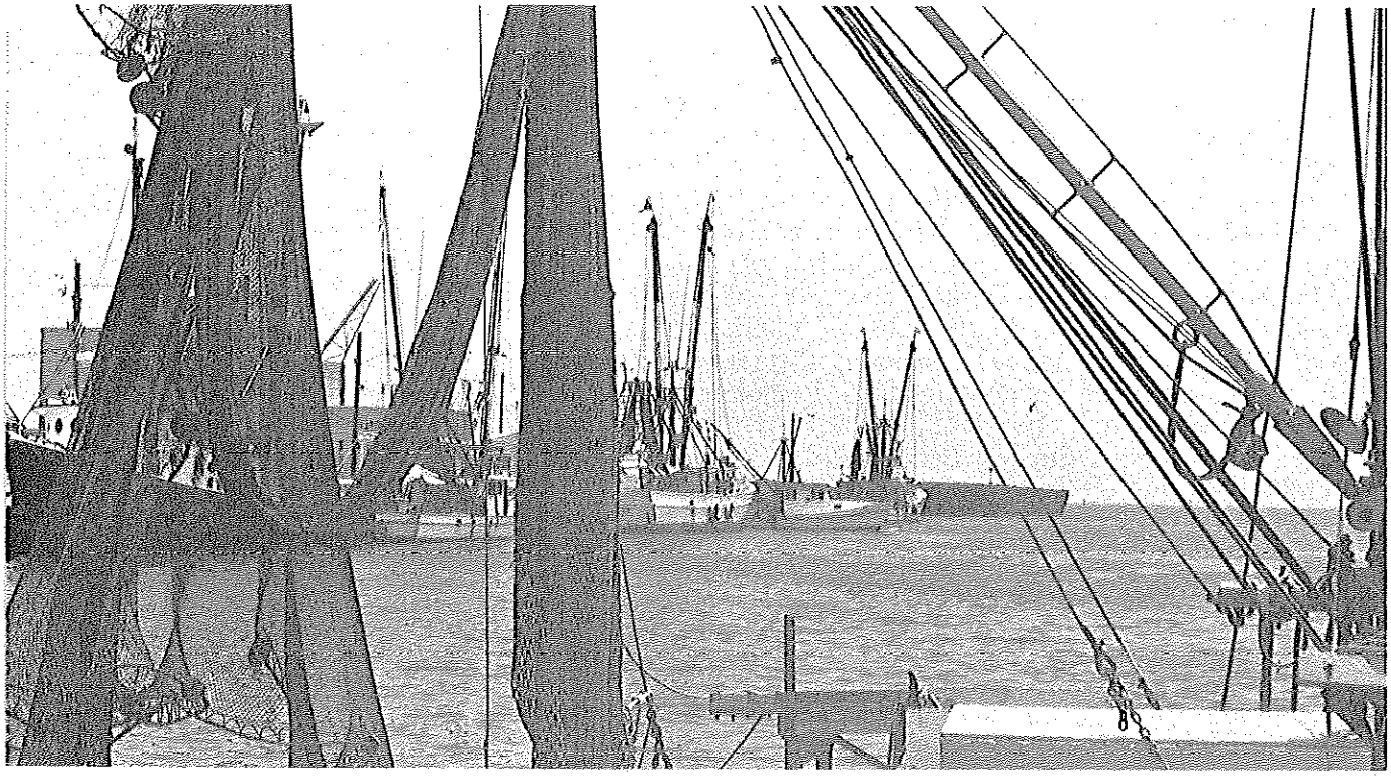
CONCLUSIONS

In the fall of 1986 several coastal states, including Texas, held beach cleanups in an effort to increase public awareness about the problems marine debris poses including the threat to marine animals which often die after ingesting or becoming entangled in plastic. The problem of ocean dumping clearly extends beyond the shores of Texas and the Gulf of Mexico, as evidenced by the hundreds of tons of garbage collected from the beaches of Hawaii, Oregon, California, and along the east coast in New Jersey, Massachusetts, New Hampshire and Maine. However, as compared to the amount of debris collected during other state cleanups, Texas has the greatest concentration of beach debris.

Although the proliferation of debris in the marine environment may indicate the contrary, there are laws pertaining to ocean dumping and disposal of wastes. U.S. domestic legislation governing ocean or inland dumping is typified by the Rivers and Harbors Act of 1899, the Act to Prevent Pollution from Ships, the Marine Protection Research and Sanctuaries Act or Ocean Dumping Act, and the Clean Water Act. All of these authorities in some way prohibit the disposal of wastes in the marine environment but enforcement is difficult, inadequate and costly. Moreover, the problem may lie in the fact that although present laws prohibit ocean disposal, there are no laws that specifically require proper disposal of garbage generated by ships. The U.S. Department of Agriculture requires that all trash brought to U.S. ports must be treated by sterilization or incineration to prevent the importation of foreign agricultural and domestic livestock pests but does not require ships to bring their trash to ports. In fact, the expense for ships that use port facilities is large, and port facilities are often inadequate. Therefore, some believe that the USDA regulations may discourage ships from bringing their trash to ports and therefore encourage waste disposal at sea.

There are also relevant international authorities including the London Dumping Convention, the MARPOL Treaty, the U.N. Regional Seas Program, the United Nations Law of the Sea and other agreements similar in pattern to these major conventions. Each of these authorities is aimed at controlling dumping in the oceans. The major authority is the MARPOL (Marine Pollution) Treaty or the Protocol of 1978 Relating to the

International Convention for the Prevention of Pollution from Ships. The Treaty consists of five categories, or Annexes, that state the provisions governing specific types of pollution. Annexes I-IV address the prevention of pollution from oil, hazardous chemicals, sewage and other potentially harmful substances. Annex V contains provisions specifically dealing with garbage from ships, including the intentional discard of fishing gear, packaging materials, dunnage and food wastes. A key feature of Annex V is its prohibition of "the disposal of all plastics, including but not limited to synthetic fishing nets, and garbage bags" from all ships at sea. Hence, it would appear as though major strides have been taken to address this international problem.



Shrimp net with shrimp boats in background. Photo: Linda Maraniss

However, Annex V is an Optional Annex under the MARPOL Treaty. In other words, each country has a choice to ratify this Annex. Also, under terms of the MARPOL Treaty, Annex V will come into effect only after it has been ratified by at least 15 countries whose combined merchant fleets constitute at least 50 percent of the gross tonnage of the world's merchant fleet. At present, 26 of the 38 countries that have signed the MARPOL Treaty have ratified Annex V, but the combined gross tonnage of these countries is only 44.5 percent of the world's merchant shipping fleet. The U.S. has not ratified Annex V but is planning to do so.

U.S. ratification of Annex V would contribute 4.58 percent to the gross tonnage still needed before Annex V can come into force internationally, and would provide incentive for other nations to ratify as well. Full

implementation of Annex V and stricter enforcement of existing domestic laws, in conjunction with the development of improved methods for handling shipboard wastes at sea and in port would be major steps toward solving the marine debris problem.

Another aspect of MARPOL that is of particular interest to Gulf coast states is its designation of "special areas." Regulation 5 of Annex V sets out procedures for disposal of garbage within these 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 documented to show that these areas are extremely susceptible to long-term build-up 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, more stringent regulations for disposal of ship garbage are prescribed for these areas. It has been suggested that the Gulf of Mexico is just such an area, and that designation under MARPOL could afford additional protection to the Gulf.

The Center for Environmental Education believes that continued public education will also 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 Gulf of Mexico about the problems caused by marine debris. The Offshore Operators Committee's award winning video, "All Washed Up", aimed at educating offshore employees in the Gulf is an excellent example of a useful educational tool. Wayne Kewley, an employee of Conoco and representing the Offshore Operators Committee at the Minerals Management Service's Seventh Annual Information Transfer Meeting in 1986 stated that, "The Minerals Management Service (MMS) knew that making more regulations wasn't the solution to the problem. The MMS also knew that increased enforcement of existing laws wasn't the solution to stopping our share of the litter. Their agency simply does not have the manpower necessary to oversee our operations closely enough to find the minority of our offshore workers who thoughtlessly litter...the MMS and representatives of the Offshore Operators Committee agreed that there was only one way to eliminate or drastically reduce our share of the litter, and that was to increase our emphasis on educating our employees about the litter problem."

David Steed, representing Professionals in Seafood Concerned Enterprises (PISCES) for inshore seafood producers, and a member of the Texas Coastal Cleanup steering committee, reports that "...the problem with coastal litter production from the fishing industry is one of attitude. Therefore, it is a social issue with environmental consequences. As with so many other social issues, the solution may be attained only through education. It is useful to present ads in periodicals frequently seen by persons in the (fishing) group."

Ted Thorjussen, President of the West Gulf Maritime Association and a member of the steering committee, also pointed toward the need for education of the maritime industry stating that "There will unquestionably have to be a major effort in educating the seafarers on the damage done to marine life and the environment by overboard discharge so that they will be encouraged to cooperate."

Educational efforts must also be directed at students of all ages in Texas schools. If we hope to instill the concept that marine debris is a threat to the Texas tourist economy, our wildlife and our fragile marine environment, we must inform young people now, so they will make responsible decisions and understand that the practice of dumping trash on land and at sea is not only harmful to the environment, but to wildlife and themselves.

One outstanding initiative that resulted from the interest generated by the Texas Coastal Cleanup is that the Texas General Land Office, under the direction of Garry Mauro, held the first Adopt-a-Beach task force meeting in December 1986 to outline plans for a new program in Texas directed at the debris problem. The purpose of this program is to encourage Texans to care for a section of beach which will not only protect the beauty of the coastline but will also help to continue public education efforts. In addition, plans are pending that would require all participants to maintain data on debris items collected during subsequent beach cleanups, which will serve as an ongoing database of the types of debris found on the Texas coastline. From this information, sources of the debris can be identified and confronted.

Enforcement of strict regulations aimed at sources of marine debris in conjunction with educational efforts will help to strengthen the new awareness that has been created in Texas about the need to preserve the state's marine environment and protect the wildlife it supports.

RECOMMENDATIONS

When plans for the 1986 Texas Coastal Cleanup campaign first evolved, 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 provided the facts and the problems, and offered creative solutions. The following recommendations have been formulated by CEE and are offered with the hope that permanent solutions to the beach debris crisis will result from the cooperative efforts and abilities of all parties involved. 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 become a part of the solution.

Government 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 U.S and is not in force internationally.

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.

TOPIC: The United States Department of Agriculture regulations that require foreign garbage to be steam sterilized or incinerated are belived 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.

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.

TOPIC: The United States Navy is specifically exempt from the MARPOL dumping prohibitions. According to Larry Koss, U.S. Navy Ship Environment Program Manager, "ship complements vary from 100 to 6,000 personnel and these personnel produce up to eight and one-half tons of garbage and trash per day." (Statement of Mr. Larry Koss, Navy Ship Environment Program Manager, Environmental Protection and Safety Occupational Health Division, Deputy Chief of Naval Operation for Logistics, before the Subcommittee on Oversight and Investigations of the House Merchant Marine and Fisheries Committee on Disposal of Trash at Sea, 29 October 1986, Corpus Christi, Texas). The routine procedure for disposing of shipboard wastes is to throw it over the side of the ship in plastic bags. "Navy regulations require that shipboard personnel attempt to package the trash so that it sinks when discharged overboard." Furthermore, the concentration of naval ships in the Gulf is expected to increase as the U.S. Navy plans to homeport ships at several coastal states in the Gulf of Mexico.

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 on-board 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.

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.

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.

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.

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.

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.

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.

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

RECOMMENDATION: The Texas General Land Office should prepare a proposal for designation of the Gulf as a "special area" under MARPOL, so that it will be exempt from dumping as are similar enclosed bodies of water, such as the Mediterranean Sea and the Persian Gulf. The proposal should be presented to the U.S. Coast Guard, the agency representing the United States at the International Maritime Organization.

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. According to Ted Thorjussen, President of the West Gulf Maritime Association, "...it is our belief that if it is made easy enough to dispose of plastics in port, it can, by and large, be accomplished."

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.

TOPIC: The U.S. Coast Guard is responsible for the removal of 30 and 55-gallon drums from the Texas coast-

line. If drums are not in a high user area, the drums are left. Many of these drums are unlabeled and contain hazardous chemicals.

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.

TOPIC: Over 45 tons of debris were collected from Bolivar Peninsula during the Texas Coastal Cleanup. Many people reportedly use the beach as a dump site because they do not have regular street side 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.

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.

TOPIC: During the last legislative session, Texas instituted several laws pertaining to litter.

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

TOPIC: Approximately 23 percent of the litter collected during the Texas Coastal Cleanup was related to beverage containers, including plastic soda bottles, metal beverage cans, glass bottles and 6-pack holders. Several volunteers also commented on the prevalence of detachable metal pull-tab rings from beverage cans. Discarded plastic 6-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 6-pack rings to be degradable and for a ban on detachable pull tabs.

RECOMMENDATION: House Bill 210 calling for container deposit legislation should be an important consideration for the Texas Legislature. Nine states that already 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 eleven other states in passing legislation mandating that 6-pack rings be degradable.

TOPIC: Texas is fortunate that efforts have been made to have a Marine Mammal and Sea Turtle Stranding and Salvage Network, which consists of volunteers who respond to incidents when marine animals wash 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.

RECOMMENDATION: Funding and other forms of support should be provided to the Marine Mammal and Sea Turtle Stranding and Salvage Network so that it 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 stranding network is needed for the public so that the public becomes aware of its existence and will know where to report animals found on the beach.

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.

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.

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

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.

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

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 Texas 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.

TOPIC: In recent years, Texas has been ranked among the top five states in terms of number of recreational boats. According to the U.S. Coast Guard, in 1984 there were nearly 600,000 recreational boats registered in Texas. 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.

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.

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.

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.

Plastics Industry

TOPIC: The most common types of debris items found during the Texas Coastal Cleanup were plastic bottles. Plastic bags ranked second and plastic caps and lids ranked third. In all, over 84,000 plastic items were recorded from data cards returned from volunteers.

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.

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.

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.

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.

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." The National Marine Fisheries Service has contracted CEE to develop educational materials for offshore oil and gas employees. These materials, which will be available in 1987, could be used in training programs.

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.

Maritime Industry

TOPIC: Merchant shippers have traditionally thrown shipboard wastes and dunnage (wood and wire 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.

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.

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

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.

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.

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.

TOPIC: There are close to 100 sportfishing tournaments in Texas every year. Recreational fishermen are a source of litter such as beverage cans, 6-pack rings, monofilament fishing line and other debris.

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.

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.

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 incentive for fishermen. In addition, crab traps used in Texas must have brass name tags for purposes of 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."

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.

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.

Other Industry

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

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. The example set by these companies should be followed by all.

PROCLAMATIONS AND RECOGNITION

The response to CEE's Texas Coastal Cleanup campaign was 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 beaty 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 each year.

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

Proclamation from Texas Governor Mark White at a ceremony July 17, 1986 at the Capitol Building,
Senate Proclamation from Texas State Senator Chet Brooks,
Resolution from Cameron County declaring September 20 Clean Beach Day,
Resolution and presentation ceremony at the Texas Senate, September 25,
Letter of best wishes from Texas Governor Mark White, September 26,
Letter of congratulations from Garry Mauro, Land Commissioner, Texas General Land Office
Letter of congratulations from Luther Jones, Mayor of Corpus Christi,
"Houston Post Salutes the Beach Buddies" in a special news feature,
Keep Texas Beautiful Certificate of Appreciation, presented at a KTB board meeting in Lake Jackson, October 24.

The interest in the debris problem generated by the Texas Coastal Cleanup instigated three additional major events in Texas that were directed at solving the problem. In August 1986, a press conference was held in Austin by Garry Mauro, Commissioner of the General Land Office to announce new regulations affecting offshore dumping in Texas waters from oil and gas exploration boats, rigs and platforms. The General Land Office also announced the state's first Adopt-a-Beach program. Later, on October 28, the U.S. House of Representatives Committee on Merchant Marine and Fisheries convened a hearing in Corpus Christi on the impact of ocean debris

on the Texas shoreline. U.S. Congressmen Kika de la Garza and Solomon Ortiz heard testimony from six panels, comprised of the Texas General Land Office, U.S. Coast Guard, Navy, U.S. Department of Agriculture, U.S. Minerals Management Service, port authorities, local governments, Keep Texas Beautiful, Offshore Operators Committee, American Institute of Merchant Shipping and CEE on the effects of plastics in the marine environment and the results of the beach cleanup.

Linda Maraniss shows Governor Mark White a sampling of debris that washes up on Texas beaches. Photo: Bill Malone

APPENDICES

Appendix 1.
Contributions to the 1986 Texas Coastal Cleanup

Corporate Grants

Amoco Production Co.

ARCO Oil & Gas Company

Exxon Company, U.S.A.

Kerr-McGee Corporation

Foundation Grants

Brown (Vaughan W.) Charitable Trust

Trull Foundation

Supplies & Services

Ambrosia Water, Houston

Back in a Flash, Austin

Black & White Connection, Austin

Browning and Ferris Industry

Cities Service

Coca Cola Bottling Co, Corpus Christi

Conoco, Inc.

Dow Chemical, U.S.A.

Driskell Hotel, Austin

Exxon Company, U.S.A.

Jack Brown Cleaners, Austin

Kwik Copy, Austin

McDonalds, Galveston

Mobil Oil Corporation

Ocean Pacific Sunwear, CA

Pepsi, Beaumont

Safeway

Seven Eleven, Corpus Christi

Seven Eleven, Surfside

Shell Oil Company

Stephen F. Austin Hotel, Austin

The Office Company

Tracor, Inc.

Waste Management Inc., Houston

Hotel Discounts

Best Western Texas Rebel, Port Aransas

Coral Cay Condominium, Port Aransas

Friendship Sea Shell Inn, Corpus Christi

Hersey Corpus Christi Hotel, Corpus Christi

Holiday Inn, Corpus Christi

Holiday Inn, Port Aransas

Holiday Inn, Port Lavaca

Ramada Inn, Galveston

The Victorian, Galveston

Villa Del Sol Condominium Hotel, Corpus Christi

CEE also wishes to express appreciation as well for the many gifts from individuals and foundations who wish to remain anonymous. In addition, thanks go to the many local merchants who provided prize incentives and assistance within their localities.

Appendix 2.
Texas Coastal Cleanup Zone Captains

Merriwood Ferguson
Gulf Coast Coalition for Public Health
Brownsville

J.J. Jackson
KZZB Radio
Beaumont

Jeff Koch
KGBT TV
Harlingen

Marianna Lisherness
Corpus Christi

Steve Lunsford
Galveston County Parks and Recreation
Galveston

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
National Park Service
Padre Island National Seashore

Maryann Young
KUHF Radio
Houston

Willie Younger
Sea Grant Marine Advisory Service
Bay City

Appendix 3.
Texas Coastal Cleanup Steering Committee

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BEACH LITTER BLUES
BY BILL OLIVER

A little bit of litter makes a lot of bad beach
It's bad on the eyesight and it can hurt your feet
Wastes our taxes and treats wildlife mean
Be a Beach Buddy and keep our beaches clean

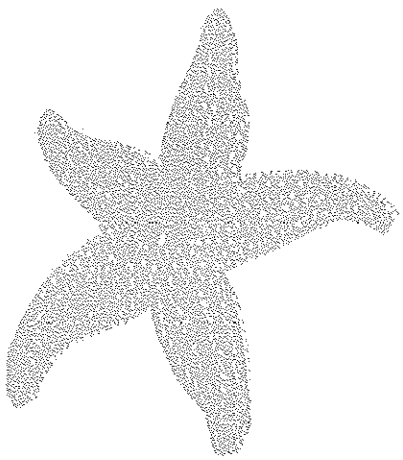
There's nothing as soothing as clean white sand
But just like time it's slipping through our hands
A few lonely litter bugs can ruin that scene
So be a Beach Buddy and keep the beaches clean

It's not just the surfers that come in with the surf
It's the offshore garbage that makes beach litter worse
And the local economy gets hit where it hurts
So be a Beach Buddy and keep the beaches clean

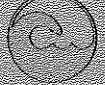
Plastic trash bags from boats and ships
From under the water look like jellyfish
To a hungry sea turtle about to meet its death
They're easy to bite but they're hard to digest

Think of the birds that make beaches their home
The fish eggs they eat are really styrofoam
Pop-top bottles and pop-top cans
Turning popular beaches into pop-top land

It's good for your feelings, it's good for your health
Go down to the beach, fill a bag for yourself
Clean up the beaches, then spread the news
Get everybody singing the beach buddy blues



Be a Beach Buddy®



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