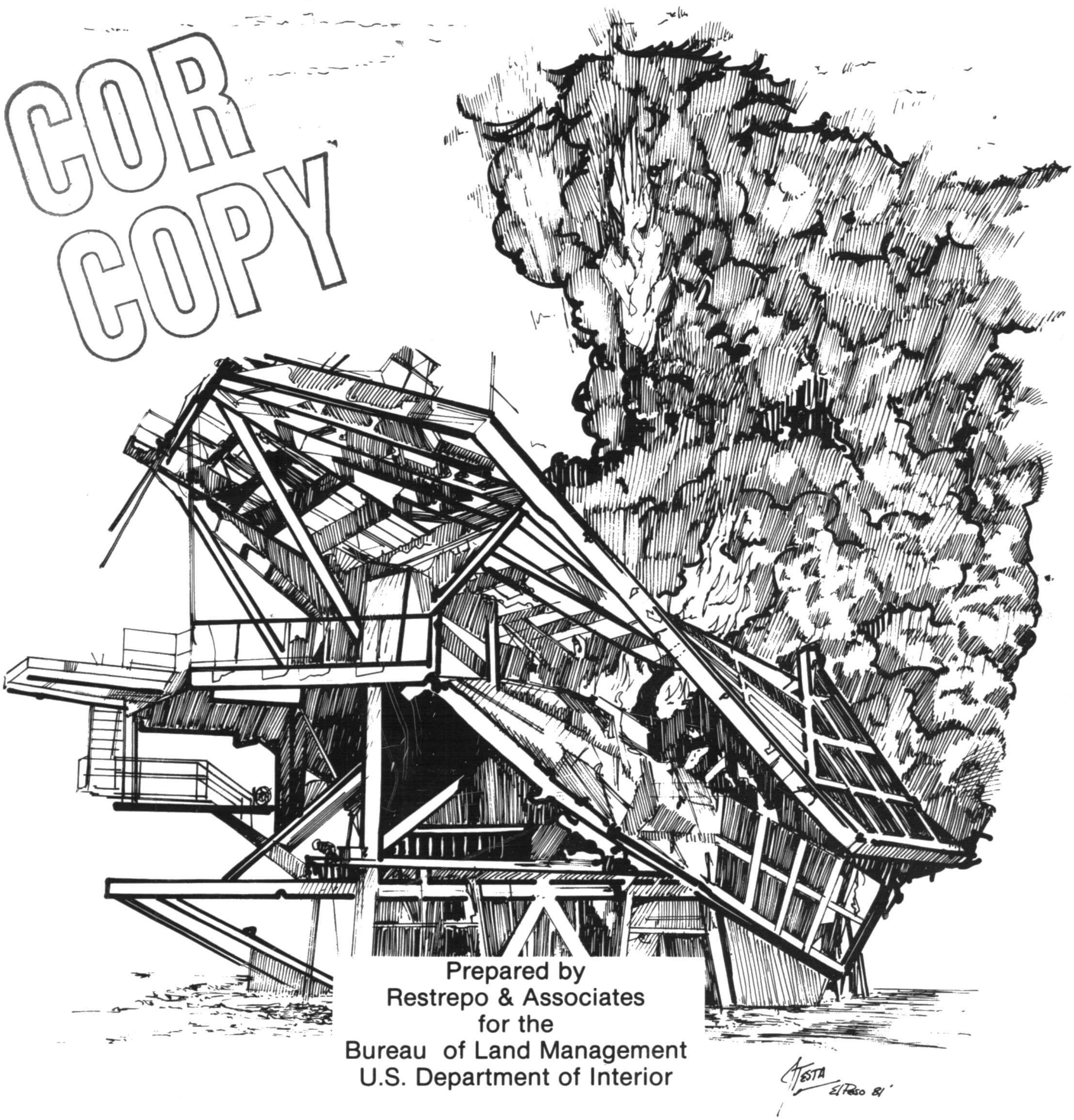
IXTOC I OIL SPILL ECONOMIC IMPACT STUDY



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IXTOC I OIL SPILL ECONOMIC IMPACT STUDY

by
Carlos E. Restrepo, Ph.D.
F. Charles Lamphear, Ph.D.
Clare A. Gunn, Ph.D.
Robert B. Ditton, Ph.D.
John P. Nichols, Ph.D.
Linda S. Restrepo, M.B.A.
Restrepo & Associates
P.O. Box 13165
El Paso, Texas 79912

Robert M. Avent, Ph.D.
Contracting Officer's Authorized Representative
Bureau of Land Management
New Orleans Outer Continental Shelf Office
500 Camp Street
New Orleans, Louisiana 70130

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ABSTRACT

The IXTOC I Oil Spill Economic Impact Study presents an economic assessment of the direct and indirect impacts of the IXTOC I oil spill and the BURMAH AGATE sinking on the Tourism, Recreation, and Commercial Fishing industries in 19 counties along the Texas coastline. The oil spill impact period was defined as the period from January 1979 to December 1981. The IXTOC I blowout occurred in June 1979 and was followed by the sinking of the BURMAH AGATE some six months later.

The analysis of the economic effects of the IXTOC I and BURMAH AGATE oil spills upon the study region was based on the following methods: 1) the establishment of a baseline of regional economic activity prior to the disturbance, and 2) the development, implementation, and interpretation of a density gradient model for measuring direct impacts, and an input-output model for measuring indirect impacts.

Due to contract specifications and budget restrictions, namely the specification of a nonsurvey approach, it was assumed that the economic impact assessment of the oil spills could be limited to 1) the current direct economic impacts on the tourism, recreation, and commercial fishing industries, and 2) the current indirect, "induced-by" economic effects on the supportive or related economic activities located in the study region. The results of surveys and interviews served as the foundation for estimating overall impact for the three major industrial sectors.

Data on Tourism losses due to the oil spills provided researchers sufficient evidence to quantify the direct economic impact of the IXTOC I oil spill on the most affected area of Subregion V, South Padre Island, from a low estimate of $3,979,000 to a high estimate of $4,444,000. There was no apparent negative impact upon tourism in any subregion of the Gulf coast as a result of the BURMAH AGATE sinking. This does not mean that there was no tourism business negatively affected; rather, when evaluated on a subregional basis, there was no negative impact. There were no indirect economic impacts that exceeded $1 million. Thus, it appears that the overall indirect economic impact due to the oil spills was quite limited in the Tourism sector.

Data on recreation losses due to the oil spills indicate that losses were not equally distributed within each subregion. Rather, they were absorbed by a small number of businesses close to the water's edge. The calculated losses, in terms of gross receipts, across the three major affected regions (II, IV, and V) indicate a total direct economic loss of $3,098,616 for the Standard Industrial Classification recreation sectors. None of the indirect economic impacts exceeded $1 million. These estimates, based upon the available data, support a

statement that there is no significant indirect economic impact in the study region that can be attributed to the oil spills.

Analysis of the data on Commercial Fishing losses does not indicate any significant direct economic effects from either oil spill on the commercial fishing industry that were measurable on either a regional or subregional level. Also the results do not indicate any measurable indirect economic effects on the industry from the oil spills.

An extensive survey of the media coverage of the oil spills, disclosed that the public's viewpoint of the Texas Coastal Region may have been altered by the relatively high density of information sources during August through October 1979. The public's subsequent behavior may have been changed from approach to avoidance of the coast. As a direct result, the tourism and recreation industries along the coastline <u>may</u> have suffered an economic loss.

Regular annual surveys of tourism and recreation activity along with an improved oil spill contingency planning system are major recommendations made by the study effort. These recommendations will improve the state of the art on social and economic impact measurements of any future oil spills along the Gulf coast.

CHAPTER I

INTRODUCTION

CHAPTER I. INTRODUCTION

On June 3, 1979, in the Bahia de Campeche (19° 20' N, 92° 25' W) Mexico, an exploratory oil well, the IXTOC I, blew out. As the result of this disaster and especially due to the progression of events that followed, the Bureau of Land Management contracted Restrepo & Associates of El Paso, Texas to conduct an economic assessment of the IXTOC I oil well blowout on the Texas coastal region--the area of the United States that received the brunt of the oil spilled by the Mexican oil well.

The IXTOC I, as of this date, is the world's largest and probably most expensive oil spill. Estimates of the amount of spilled oil range from 3 million barrels to 5 million barrels. The oil that was extruded by the IXTOC I was carried by Gulf currents into American waters on August 6, 1979. The U.S. was given two months to prepare for the oil slick and mounted a planned effort to protect the Texas coast against the effects of the IXTOC I accident. In addition to the oil from the IXTOC I, the Texas coast was affected by fresh, unweathered oil from the sinking of the oil tanker, BURMAH AGATE, on November 6, 1979. These events have multiple effects and consequences on local, state, federal and international economies. Several studies are currently being conducted to assess the impact of these multiple effects in a variety of disciplines; this study examines some of the (macro) economic effects that resulted from the oil that was spilled by the IXTOC I and the BURMAH AGATE.

OBJECTIVES

Economics is a discipline that deals with the production, distribution and consumption of wealth. Economic assessments generally attempt to translate the results of a physical action into a set of monetary values. The purpose of this report is to define and quantify the economic components and their relationships that were established as a result of the June third accident in the Bahia de Campeche.

The Objectives of this Investigation are:

1) To apply traditional economic methods to assess the physical events that occurred as the result of the IXTOC I oil well blowout and the sinking of the BURMAH AGATE and, if needed, to develop innovative methods to assign dollar values to the various services, products, and goods that were affected by the oil spills.

2) To implement the appropriate methods and measure the economic effects of the IXTOC I oil well blowout and the sinking of the BURMAH AGATE upon the tourism, recreation

and commercial fishing industries in the Texas coastal region.

3) To document and quantify the economic losses, if any, that can be attributed, directly or indirectly, to the IXTOC I oil well blowout and BURMAH AGATE sinking so that the appropriate form of compensation can be made to the affected parties.

4) To identify and compile the cost of clean-up procedures to the local, state, and federal governments.

CHRONOLOGY[1]

In the spring of 1977, Petroleos Mexicanos (PEMEX) contracted Performaciones Marinas del Golfo S.A. (PERMARGO) to conduct exploratory drilling in the Chac area of the Bahia de Campeche in the Gulf of Mexico. PERMARGO contracted SEDCO, Inc. of Dallas, Texas in August of 1977 to supply a semi-submersible oil drilling rig under a bareboat charter (equipment, rig and supplies). In a separate agreement, PERMARGO contracted SEDCO for the personnel to assist PERMARGO in the operation of the rig. The location of the rig was (19° 20' N, 92° 25' W).

On June 2, between midnight and 0300 LT, the IXTOC I lost its downward hydrostatic pressure as the drill bit entered either a cavern or a highly porous section of the geologic formation. Engineers did not detect any oil or gas and elected to observe the well. On June 3, at 0230 LT, the oil well began to emit drilling mud. The workers activated the cut-off devices on the ocean floor, but these devices failed to work properly and did not stop the rapid upsurge of pressure.

The surge of pressure bent the drill pipe, and as a result, the crews were unable to control the well by lowering or raising the deformed drill pipe. Oil and gas gushed from the drill pipe to a height of 30 metres above the platform floor. Within moments, the platform caught fire and the crew abandoned the rig. The fire destroyed the SEDCO rig, causing it to collapse. Eventually, the rig sank to the ocean floor and caused more damage to the drill pipe and the well casing.

Initial efforts to cap the well did not succeed. The Red Adair Co. of Houston, Texas did succeed in closing the well casing and extinguishing the fire, but the well ruptured below the casing and caused a second blowout. Because of the danger to the ships, the fire was relit. Observers noted that the

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[1]Adapted from the Oil Spill Intelligence Report, CSA Cahners Publishing Co., 1980.

volume of oil and gas was larger and that the fire was brighter than before the attempt.

In September, Brown and Root, Inc. of Houston, Texas constructed a large steel cone, called the Sombrero. The Sombrero would be placed over the IXTOC well and be connected to a separater/diverter to isolate the oil from the water. The first time the Sombrero was taken to the location, it was damaged by high seas and had to be taken back to Houston for repairs. After repairs, the Sombrero was taken back out and installed over the well. The Sombrero did not function properly when it was in place. This was attributed to (1) the turbulence around the well head--which carried the oil around the Sombrero and (2) the escape of some of the oil from cracks in the sea floor that were adjacent to the well's cracked casing.

During mid-June, PEMEX began drilling the IXTOC IA and the IXTOC IB. The IXTOC IB made contact with the IXTOC I in late November. PEMEX reduced the flow of the oil well by pumping steel balls and low density mud into the well. PEMEX was able to cap the well on March 25, 1980.

The U.S. response to the IXTOC I oil well blowout initially consisted of flights over the oil slick to gather information for slick trajectory models. The U.S. did not immediately prepare for the oil slick because the National Response Team was receiving reports from PEMEX that the capping and clean-up operations were proceeding quickly.

The Regional Response Team (Coastal Region VI) and National Oceanic and Atmospheric Administration met on July 13 and developed several plans of action: (1) To obtain samples of oil at the edge of the slick and gather wind and current data, (2) to conduct a vulnerability analysis of the Texas coast to determine the priorities of the environments and (3) to continue to monitor the oil slick movement. Several universities were preparing to conduct biological and geological analyses of the oil slick's impact on the Texas coastline.

In late July, the available information indicated that the slick would enter the U.S. waters in early August. Clean-up equipment was deployed along the areas that were deemed to be vulnerable, and more equipment was en route. The U.S. Coast Guard boomed the Brazos Santiago Pass and several other inlets to the ecologically sensitive Laguna Madre area. Oil skimmers were deployed in front of the Brazos Santiago Pass, Port Mansfield, Port Arthur, and Port O'Conner.

On August 6 and 7 tar balls began to wash ashore onto Padre Island hotel beaches. Clean-up crews scraped the oil from the beaches by using Vac-Alls, graders, and front-end loaders. The oiled sand was dumped into a pit on Padre Island.

While the surface oil was controlled, divers found submerged oil in concentrations of up to 3600 particles per cubic metre in depths of up to 12 metres. The Coast Guard deployed a heavy nylon net to trap submerged particles at the Port Mansfield cut.

The oil stopped washing up on to the Texas shoreline by mid-September. The seasonal change in the wind and off shore currents began to reverse the northward flow of oil. Overhead reconnaissance flights indicated that there were large clear areas of water accompanied with smaller, occasional sheens of oil. The Coast Guard reduced the clean-up operation, but retained contractors on the scene until the end of the hurricane season. In mid-September, Hurricane Fredrick removed up to 95% of the oil that had accumulated on the Texas beaches. In November, tar balls were again sighted in the Corpus Christi and Brazos Santiago Pass areas. The Coast Guard reported that there were no new slicks in the area and suggested that the tides may have uncovered the weathered IXTOC I oil in the subtidal zone.

There is a great deal of conjecture on the effectiveness of the oil clean-up effort. In order to assess the environmental and economic impact of the spilled oil, a cooperative state and federal program was developed to determine the extent of the damages. The damage assessment program was prepared by the NOAA and the U.S. Environmental Protection Agency--Region 6. The cooperating federal agencies were the Bureau of Land Management, the Fish and Wildlife Service, the National Park Service, and the U.S. Geologic Survey. The cooperating state agencies included: The Department of Water Resources, the Bureau of Economic Geology, the Parks and Wildlife Department, the General Land Office, Corpus Christi State University, Texas A & I University, Texas A & M University, and the University of Texas. The program proposed to monitor the movement of the spill, analyze the rate of uptake of hydrocarbons within various resources, and conduct damage assessment studies for various resources. The schedule of the budget is 4.2 million--first year with the remaining 5.6 million over the following two years.

SCOPE

This examination's extent is an economic investigation, through time, of the oil spill's impact on the Texas coastline. Nineteen counties along the Texas coastline were selected for the study and divided into five subregions: (See Figure 1)

I. Orange, Jefferson
II. Harris, Chambers, Galveston, Brazoria
III. Wharton, Matagorda, Jackson, Victoria, Calhoun

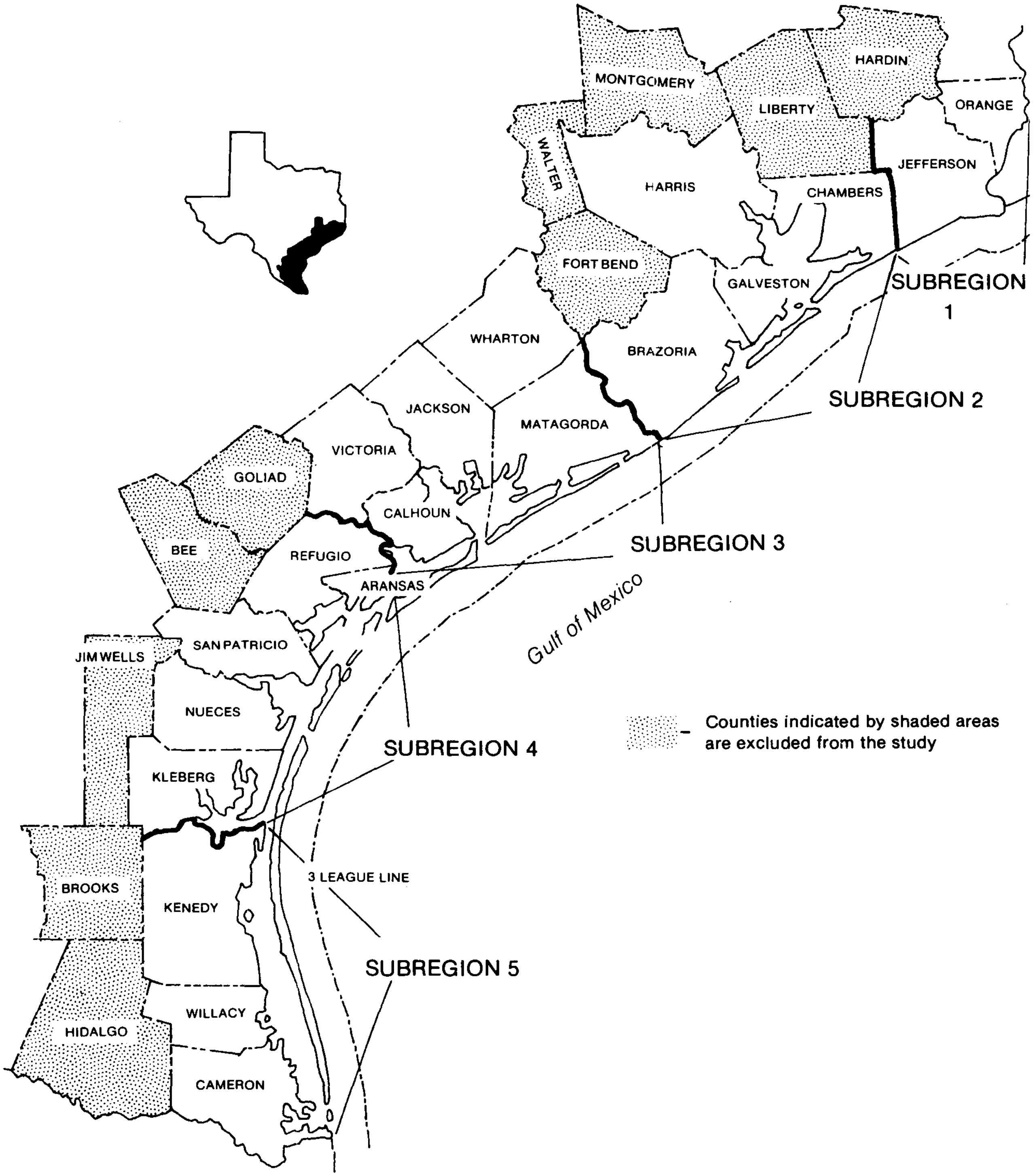


Figure 1

TEXAS COASTAL COUNTIES

IV. Refugio, Aransas, San Patricio, Nueces, Kleberg
V. Kenedy, Willacy, Cameron

The study period is defined as the time from 1979 through 1981. The Texas coastal industries that were selected for this study are: the tourism industry, the recreation industry, and the commercial fishing industry.

In addition, the study also presents two features: a manual that describes input-output economic models and provides instruction in the use of the input-output model that was designed for this study and a chapter that is devoted to an analysis of the media's impact on the tourism and recreation industries.

The limitations of the study are primarily due to the state of the art in assessing oil landing impacts on coastal areas. The sources of the data that were available were erratic and sometimes conflicting. In the case of the study on the commercial fishing industry, the limited data on the biological fluctuations on certain variables prevented the development of a truly descriptive mathematical model. The State Department of Employment could only furnish data for the previous two years prior to the oil spill, which prevented an assessment of the oil spill's impact on the employment levels in the region.

Chapter II describes the methods that were used to assess the effects of the oil slick on the Texas coastline. The two models developed for the study are the density gradient model and an input-output model. The density gradient model was developed to measure the current direct economic impacts of the oil spills on the tourism, recreation, and commercial fishing industries. Deficiencies in the data forced a shift from an "expenditures" approach to an "output" approach. Current indirect or induced by economic effects were assessed with an input-output model. Current indirect effects are defined as the effects in the industries that are dependent upon, or associated with, the primary direct effect industries.

To facilitate comprehension of regional economy input-output models, the report provides a manual for future research efforts. The regional input-output model consists of three tables: the transaction table, the direct requirements table, and the total requirements table. The transaction table is a system of accounts, and its most important feature is the classification of inter-industry transactions. The direct requirements table is calculated from part of the information that is contained in the transaction table and the total gross outlay figures for the producing sector's purchases. The total requirements table uses the direct requirements table to measure the regional impact due to some change in regional sales to final demand. The reliability of the model is based on the assumptions that are used to convert the transaction table into an analytic model. The assumptions are: 1) a proportional relationship exists between the input and the output, 2) the input coefficients are average relationships and 3) there is no substitution of production factors.

The manual applies this information to the oil impact assessment by explaining the methods that were used in the construction of the input-output models for the entire 19-county study region and also for each of the 5 subregions. Due to the constraints or the lack of consistent and complete data, the high cost of model construction, and the lack of existing models, the manual presents a modification of the 1972 Texas State Input-Output Model.

The model is regionalized by deflating the a_{ij} coefficients to reflect the increased imports at the substate level. The manual demonstrates this procedure and illustrates the updating procedures for an input-output coefficient.

Using the methods to regionalize the 1972 Texas input-output model, the manual designs 18 input-output models for the 19-county study area and the 5 subregions for the years 1979, 1980, and 1981. Output multipliers are used to demonstrate the effects of a decline in a sector, that is, the direct and indirect losses to the other producing sectors in the region.

The Tourism study (Chapter III) documents and quantifies the effects of the IXTOC I and BURMAH AGATE oil spills on the Texas coastline's tourist industry. The chapter describes the development of the tourism industry and the attractions that are responsible for drawing people to the region. The study defines "coastal tourism" as a linear geographic region at the water-land interface and further subdivides this region into the geographic location of the tourists. The study identifies four main nodes of tourist activity: Beaumont-Port Arthur, Houston and Galveston, Corpus Christi, and Harlingen-Brownsville in the 19-county region.

The chapter also presents the concept of tourism as a system of interrelated components. These components are: the people, the attractions, the transportation, the services and facilities, and a guidance function called information-direction.

The study develops its baseline by developing a statewide ratio of tourism activity to total business activity in the sectors of auto expense, food and lodging. The ratio was applied to estimate the amount of tourism in each county. A baseline was established by making these calculations for a series of years prior to the oil spills. The baseline was projected into 1979 through the use of a regression routine. The trend line was compared to the actual figures for 1979 to detect if there was a discrepancy that could conceivably be attributed to the oil spills.

Using this method, the only significant decline in any of the sectors for any of the 5 subregions was in the lodging sector of Subregion V (Cameron and Willacy). To identify the influence of price rise in this area, Cameron and Willacy counties were compared to a county that had incurred limited impact (Victoria county). The results indicate that, when price is held constant, the decline in business volume, especially in the lodging sector, in the counties of Cameron and Willacy was appreciable. Interviews with local business uncovered another negative (indirect) impact: the adverse publicity affected the entire Texas coastal tourism industry. This effect was not quantified in this investigation.

The conclusions reached by the tourism investigation disclosed that the apparent concentration of the impact was on South Padre Island area, and sufficient evidence was gathered to assume that decreases of an estimated 50 percent of the total tourist business season affected the South Padre Island area for the year.

Impact of the IXTOC I oil spill was estimated as a decrease of tourist activity in Subregion V that totaled from a low estimate of $3,979,000 to a high estimate of $4,444,000.

There was no apparent negative impact upon tourism in any subregion as a result of the BURMAH AGATE sinking. This does not mean that there was no tourism business negatively affected; rather, when evaluated on a subregional basis, there was no negative impact.

The quantity of indirect loss associated with the tourism industry was analyzed with the regionalized Texas Input-Output Model. Output multiplier coefficients were derived from the regionalized Input-Output Model for 65 Standard Industrial Classification sectors. The output multiplier coefficients were summed over the 65 sectors to produce three total output multipliers for the major sectors of automotive, food, and lodging. The total output multipliers were then multiplied by the direct economic impact estimates to yield the indirect induced-by economic impacts.

No indirect economic impact exceeded $1 million. Thus, it appears that the overall indirect economic impact, due to the oil spills, was quite limited.

Chapter IV deals with the effects of the oil spills on the Texas coastal region's recreation industry. This chapter defines the characteristics of the Texas coastal recreation industry and some of the issues that surround the use of the coast's multiple resources. By presenting a brief history of previous coastal recreation studies, the investigation illustrates the primitive state of the art in assessing economic impacts that are associated with oil spills.

The study establishes a baseline of economic activities by obtaining quarterly expenditure data from the Texas Comptroller's Office and then, using the Standard Industrial Classification codes, categorizes the expenditures of those businesses and services that fall into the domain of recreation. The study notes that an artificial separation has been made between tourism and recreation.

The quarterly sales data, from the 19-county study region for the period 1974-1978, were transformed on a county basis by expenditure category by year. The county data were then aggregated into subregional quarterly totals by expenditure category by year. The subregional quarterly totals were used to develop a trend line by a multiple regression routine. The trend was projected for the estimated sales in the recreation sector for the years 1979 and 1980. Interviews were conducted with the owners and managers of recreation designated businesses. The interviews indicated that an adjustment in the estimated percentages were needed to correct the original data. A procedure based on the ratio of all general retail sales between the county level and the major Gulf coast cities were used to discount reports of lost sales. The adjusted percentages were applied to the regression estimates to yield a dollar value for the losses that were attributed to the oil spills.

The results of these procedures yield an economic assessment of the oil spills from the IXTOC I and the BURMAH AGATE. The results indicate that the losses were not equally distributed within each subregion. Rather, they were absorbed by a small number of businesses close to the water's edge and in the recreation oriented subregions.

The calculated losses, in terms of gross receipts, across the three major affected regions (II, IV, and V) indicate a total direct economic loss of $3,098,616 for the Standard Industrial Classification recreation sectors. The majority of these losses were assumed to be attributed to the IXTOC I oil spill. This spill, as well as the associated statewide and national media coverage, occurred during the height of the summer tourist season. Oil from the BURMAH AGATE reached the area in early November, during the off-season, and did not have any significant economic impact in the area.

The indirect induced-by economic effects in the recreation industry were analyzed with the regionalized Texas Input-Output Model. Output multiplier coefficients were derived from the Input-Output Model and applied to the recreation sectors.

None of the indirect economic effects exceed $1 million. These estimates, based upon the available data, support a statement of no significant indirect economic impact in the study region that can be attributed to the oil spills.

Chapter V (Commercial Fishing) describes the industries' organization and structure by reviewing the geographic location of the fishing groups, the level of sales, and the number of fish processing plants. The study describes the important commercial species in the shellfish and finfish categories and provides information on the number of personnel employed by the commercial fishing industry and their earnings.

After describing the baseline activities of this region, the study analyzes the effects of the IXTOC I and BURMAH AGATE oil spills by comparing the ex-vessel value of previous years to the year in question. The ex-vessel value is the primary economic variable that was used to quantify the output of the harvesting level of the Texas commercial fishing industry. Although the study has its limitations, such as inherent variability in the biological and environmental factors and the lack of previous examinations of the relationships between the various environmental and economic variables, the main conclusion of the oil impact assessment is that the oil spills had a limited effect on the biological activity on the important commercial species as measured by the ex-vessel value.

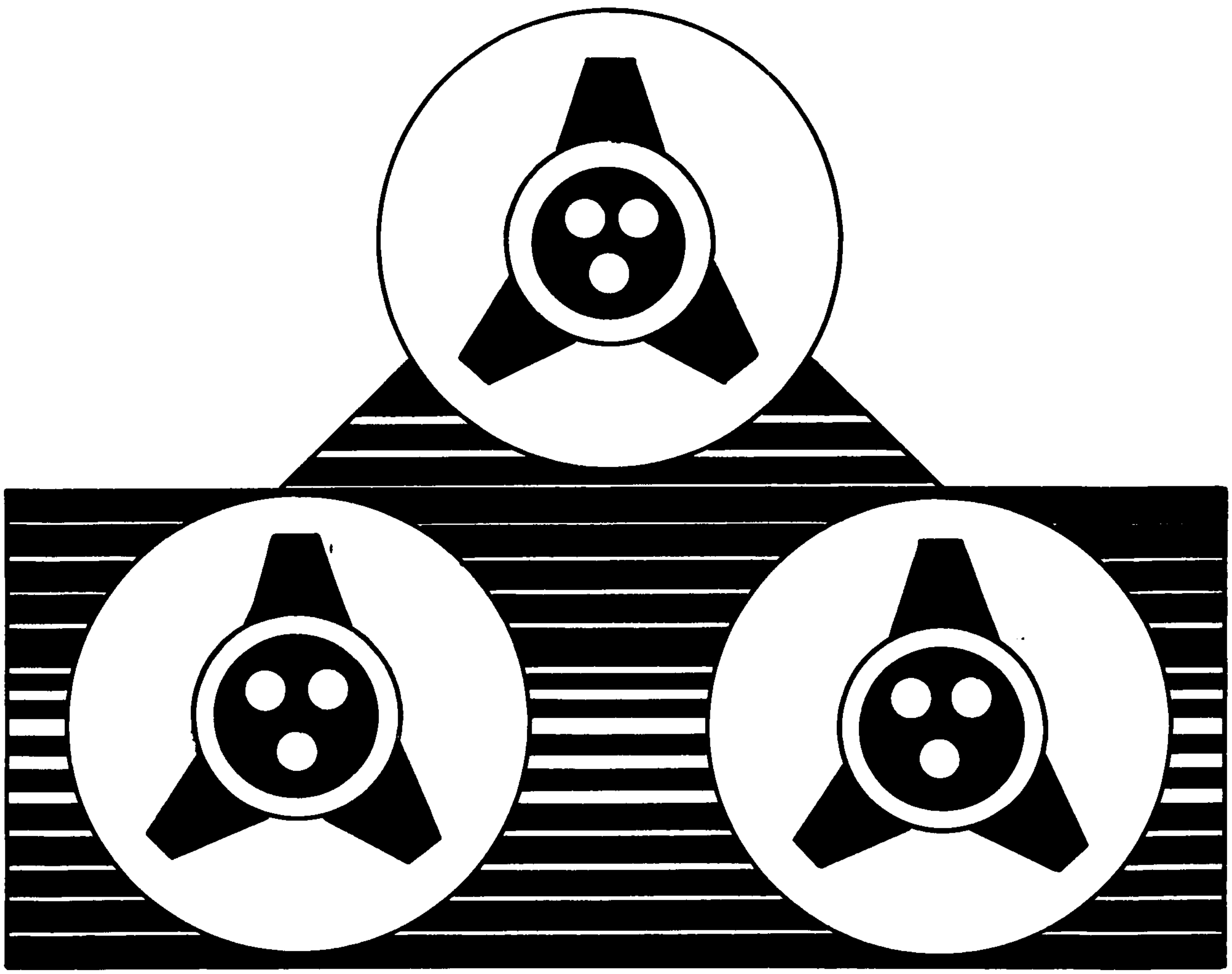
Chapter VI presents an analysis of the media and advertising coverage of the IXTOC I oil well blowout and the sinking of the BURMAH AGATE. The study collected 593 news reports from newspapers, journals, magazines, and television from around the country. The study classifies the content of the various news reports into seven categories: The BURMAH AGATE sinking, capping the IXTOC I oil well (and attempts), environmental effects of the oil slick, effects on the commercial fishing industry, effects on the tourism and recreation industry, legal and political issues, and general information. The media are separated into three classes (television, newspapers, journals and magazines) and analyzed by the category of the report presented. Graphs are provided to illustrate the distribution of the number of news reports and their content by category through time. Traffic counts, an indicator of tourist and other activity, were obtained from the Flour Bluff entrance to Padre Island. A graph was created that illustrates the decrease of the traffic count as the frequency of the news stories increase. Pearson product-moment correlation coefficients were calculated for the variables and indicate negative linear relationship among the variables. This may be interpreted to mean: as the number of media stories that are presented to the public rises, there is a concurrent decline in the traffic count. This does not establish a clear cause and effect relationship between the news media and the observed traffic counts, nor does it establish a relationship between the news media and the decline in expenditures that were documented in previous chapters.

COSTS

The IXTOC I oil spill is probably the world's most expensive oil spill. The estimated loss of oil exceeded 5 million barrels of oil worth approximately $365 million. Damage claim suits that are pending in U.S. Courts total in excess of $400 million. The SEDCO-135 semi-submersive drilling platform, a complete loss, was valued at $21 million. PEMEX has reportedly spent over $70 million in capping operations and $42 million in clean-up operations. The expense to the U.S. Government is still being compiled, and cost estimates exceed $8 million. The cost to the state of Texas, for the clean-up measure, has been compiled by the involved agencies and totals to $331,389. The Small Business Administration received 523 inquiries for economic recovery loans. They approved 238 business loans for a total of over $7 million.

The IXTOC I Oil Spill Economic Impact Study is intended to present a scientifically based analysis of the major direct and indirect effects of the oil spill on the commercial fishing, tourism, and recreation industries along the designated Texas Gulf coast counties. The study also provides, through the use of an input-output analytical model, the basis for future updating of industry data and the prediction of economic impacts of future oil spills on the three major industrial sectors analyzed.

CHAPTER II
METHODOLOGY OF IMPACT STUDY



CHAPTER II. METHODOLOGY OF IMPACT STUDY

IMPACT CONDITIONS

Common to any analytical procedure used to measure economic impact are 1) the delineation of the impact study region, 2) the determination of the study period, 3) the establishment of a baseline of reference, and 4) the specification and interpretation of the economic impacts that are to be measured. The following discussion is devoted to these four areas. Major assumptions used in the formulation of these conditions are highlighted. The chapter closes with a summary discussion of the analytical models developed for this study.

Study Period

Generally, the determination of the impact study period is based on two factors: 1) the duration period of the initial exogenous disturbance and 2) the period of economic reaction or impact from the initial exogenous disturbance. An example of an initial exogenous disturbance is an oil spill, where its associated disturbance period would be the expected duration of adverse ecological effects. Importantly, the period of economic impact can extend beyond the disturbance period simply because time is involved in the transmission of a disturbance across a socioeconomic landscape. For instance, it may take several years before a hotel business along a coast, once stained by an oil spill, returns to normal. The disturbance period and the associated economic reaction or economic impact period can overlap, however. Most important is the comparability of the defined impact study period with the actual disturbance and economic reaction periods.

The oil spill impact study period was defined as the period from 1979 through 1981. The IXTOC blowout occurred early in 1979, followed by the BURMAH AGATE sinking some six months later.

ASSUMPTION: The study period was from January, 1979 through December, 1981.

The selection of the 3-year study period was largely governed in this study by the limited resources available to conduct an economic impact assessment of the oil spills. Discussions in later chapters will indicate, however, that the 3-year study period was adequate to include all known and measurable economic effects within the study region due to the oil spills.

Impact Region

Generally, the magnitude of economic impact is directly related to the geographic size of the chosen region of study.

If the chosen area or region of study is quite small; for example, a multicounty area, it is quite likely that a significant amount of the economic impact will occur outside the area, resulting in an understatement of the total economic impact. As an illustration, consider a situation where snowfall this past winter at a popular ski area was inadequate for skiing, creating a 70 percent average vacancy rate for the lodges in the area. Imagine further that many items, such as food, fuel, lavatory notions, and the like are imported from suppliers and producers located outside the ski area. In this case, an area estimate of the economic impact would be largely limited to the decline in the occupancy rate for the lodging sector in the area. It would not include any economic effects on suppliers and producers located outside the ski area. Therefore, the total economic impact estimate would be understated.

The 19 Texas coastal counties were selected as the oil impact study area or region. These counties make up a varied mixture of economic activities, ranging from the King's Ranch in Kenedy County to a major urban complex in Harris County--the location of Houston, which currently is the fourth largest city in the U.S. Such economic diversity suggests that many of the counties have stronger economic ties with areas outside the study region than with their neighboring counties within the defined study region. The inclusion of additional counties or areas into the study region would undoubtedly increase the estimates of economic impact of the IXTOC blowout and the BURMAH AGATE sinking.

<u>ASSUMPTION</u>: The study region was chosen to be the 19 coastal counties of Texas. This region coincides with the environmental assessment region defined by the Bureau of Land Management.

The 19 coastal counties of Texas are indicated in the map for Figure 2. The 19-county study region was subdivided into five multicounty subregions in order to differentiate more clearly between the economic impact of the BURMAH AGATE sinking and the IXTOC I blowout. These subregions are also indicated in Figure 1. It should be noted that because of the subregional disaggregation and the corresponding relative increase in importation that such disaggregation creates, the size of the economic impacts will decline accordingly. It should also be noted that this geographic-size effect on the magnitude of the impact estimates does not render them invalid. It simply means that the impacted area of study has been reduced geographically to a subregion. Therefore, the impact estimates should be smaller.

An additional point needs to be noted with the measurement

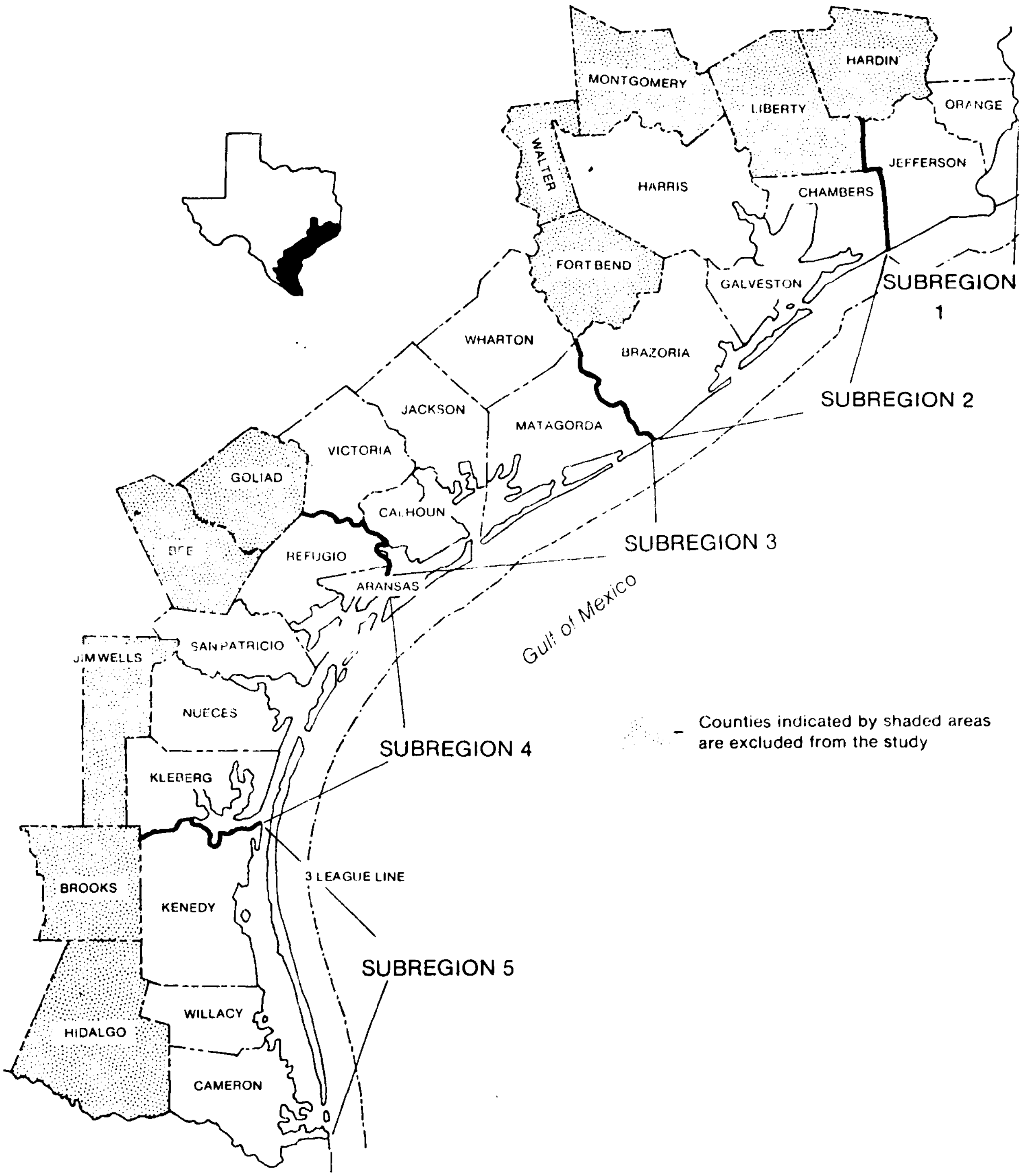


Figure 2
IXTOC I STUDY REGION

of economic impacts at the regional or area level. Regional level impact measurements conceal the varying degree of economic impact at the establishment level. For instance, a disturbance such as an oil spill can trigger both positive and negative economic effects across the study region. An oil spill can reduce sharply the occupancy rates of shoreline hotels. But, at the same time, hotels located adjacent to inland lakes within the same study region may pick up some or all the business lost by the hotels along the oil stained coast. Thus, one hotel's loss can mean another one's gain, and the economic impact, measured at the regional level, would be zero or insignificant.

ASSUMPTION: In accord with the contract requirements of the Bureau of Land Management economic impact estimates were measured at the area level rather than at the establishment level.

In order to provide some information of the possible severity of the effects of the oil spills at the establishment level, a number of onsite interviews were conducted with owners and managers of businesses located along the coast. Portions of these interviews are summarized in later chapters.

Baseline

Consistent with the notion of an initial exogenous disturbance is the establishment of a baseline economy for the study period. Simply put, a baseline economy represents the projection of recent past economic conditions across the study period for the region. Thus, for the study period, observed deviations of economic activity from the baseline can be assumed to be a result of the exogenous disturbance under study. Further, deviations for selected economic sectors can be regarded as "direct" economic impacts.

ASSUMPTION: Observed deviations of economic activity from the baseline, were a result of the exogenous disturbance under study. Further, deviations for selected economic sectors can be regarded as direct economic impacts.

More will be said about the concept of direct impacts later. A properly prepared economic baseline would include all phenomena affecting the study region's economy during the defined study period except the exogenous event under consideration; for example, the exogenous disturbance due to an oil spill.

Data limitations often preclude the development of a properly refined baseline as outlined above. Data problems are especially acute for substate economies. Major sections of later chapters will be devoted to the difficulty of developing a baseline for the study region. It will be noted in these later chapters that the deficiency of local economic data prevented the full use of the baseline concept. In short, the baseline concept served only as a background guide for assessing the economic impact of the oil spills. Figure 3 presents pictorially the baseline concept and the identification of economic deviations or economic impacts.

Definition and Interpretation

The definitional and interpretational scope of economic impact refers to the question: "How much of the 'total' economic impact has been included in the impact measure?" It should be noted at the outset that this question is focusing on definitional and interpretational issues of economic impact assessment apart from the issue of how the economic-geographic delineation affects the magnitude of impact estimates. This latter issue was discussed in an earlier section of this chapter.

First, in answer to the above question, is the distinction between current impacts and investment impacts. Current economic impact estimates consider only changes in current economic activity--given a fixed stock of economic capital. For example, the current impact of an oil spill on shoreline hotels would be the change in the current operating levels of the hotels, measured in terms of a change in occupancy rates or revenues. The important point is that the current impact figure would not include any long-term economic impacts, such as the effects of any relocation of hotels away from the coast, creating obvious long-term economic impacts on the coastal economy.

Second, in addition to the distinction between current impacts and investment impacts is the differentiation between direct impacts and indirect impacts. Indirect impacts are further divided into "induced-by" effects and "stemming-from" effects. This division applies to investment impacts as well as current impacts. Any reduction in the output of, say, commercial fishing as a result of an oil spill is an example of a current direct impact. But, a reduction in output means fewer inputs now required for the lower level of production. Moreover, fewer input requirements mean fewer purchases which, in turn, mean reduced sales for suppliers. And, reductions in suppliers' sales lead to lower outputs, and so on it goes. Notice that these suppliers of input requirements are affected indirectly by the oil spill; hence, the term, "current indirect impact." Impacts that are transmitted through economic linkages on the production or input side are referred to as "induced-by" effects; hence, the previous example is more

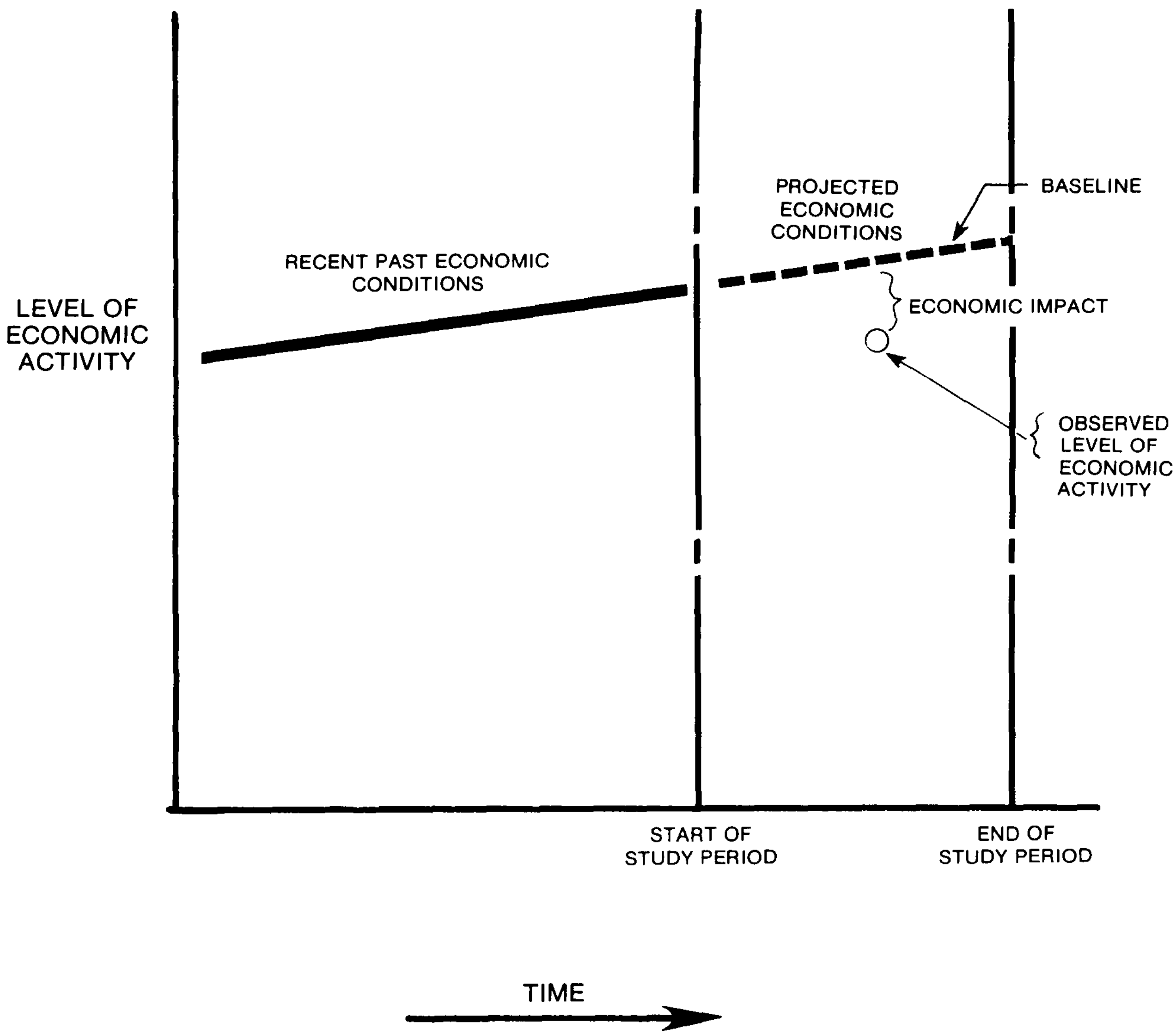


Figure 3

ECONOMIC BASELINE
(HYPOTHETICAL)

completely called a "current induced-by (indirect) impact." Current indirect impacts can also occur through so-called "forward" linkages. An example of a forward economic linkage associated with commercial fishing is the purchase of marine animals by meat processing plants. If a reduction in commercial fishing leads to a reduction in the output activities of meat processing plants in the study region, this impact is referred to as a "stemming-from" effect or, more completely, a "current stemming-from (indirect) impact." It is extremely difficult to identify stemming-from effects short of an extensive field survey of establishments doing business in the impact study area. A stemming-from effect would not occur in the previous example if meat processors in the area increased their purchases of imported marine animals to offset the local shortage in order to maintain their current levels of operation. Awareness of import substitution practices for impact assessment purposes would require plant level surveys.

The separation between "stemming-from" effects and "induced-by" effects is defined on the basis of the direction of the economic linkage from the industry or sector that has been directly impacted. Impacts associated with backward linkages are defined as "induced-by" effects and impacts associated with forward linkages are defined as "stemming-from" effects.

Just as there are forward and backward linkages associated with current impacts, so also there are forward and backward linkages associated with investment impacts, because of the analogous forward and backward linkages of investment activity. Economic impacts can be summarized in the following way:

Current Impacts	Investment Impacts
Direct	Direct
Indirect	Indirect
Induced-by	Induced-by
Stemming-from	Stemming-from

Due to contract specifications and budget restrictions, namely the specification of a nonsurvey approach, it was assumed that the economic impact assessment of the oil spills could be limited to 1) the current direct economic impacts on the tourism, recreation, and commercial fishing activities, and 2) the current indirect, "induced-by" economic effects on supportive or related economic activities located in the study region. Impact figures given in later chapters of this report must be interpreted in the context of this assumption.

<u>ASSUMPTION</u>: The economic impact assessment of the oil spills could be limited to 1) the current direct economic impacts on tourism recreation, and

commercial fishing activities, and 2) the current indirect, "induced-by" economic effects on supportive or related economic activities located in the study region.

Finally, as part of an answer to the question raised earlier, there is the consideration of an appropriate economic unit of impact measurement. The appropriate unit of measure depends largely on the expected duration of the impact period. If the disturbance is short-lived, and the economic recovery period is brief, businesses would not likely reduce employment as a result of the impact. Therefore, an employment measure for economic impact would be inappropriate in this case. The appropriate measure would be some volume indicator of current business activity, such as gross revenue or value of production. Impact periods of several years probably do involve employment effects as well as changes in gross business activity. In this case, estimates of employment effects would be appropriate. Because of the short-term nature of the economic effects of the IXTOC blowout and the BURMAH AGATE sinking, it was assumed that an appropriate economic impact measure would be gross revenues by economic sector. Thus, the impact estimates reported in later chapters are measures in terms of the value of sector or industry output.

<u>ASSUMPTION</u>: Because of the short-term nature of the economic effects of the IXTOC blowout and the BURMAH AGATE sinking, an appropriate economic impact measure would be gross revenues by economic sector.

In one of the previous assumptions, it was noted that current direct economic impacts are to be identified with the tourism, recreation, and commercial fishing groups or sectors. This reflects an assumption made by representatives of the Bureau of Land Management that the major economic activities in the study region affected most by the oil spills were tourism, recreation, and commercial fishing. This assumption was established prior to the start of the study investigation.

<u>ASSUMPTION</u>: The major economic activities in the study region affected most by the oil spills were tourism, recreation, and commercial fishing.

The extent of identifiable current direct economic impacts that occurred in these three sectors could then be used to determine the extent of current indirect, "induced-by" economic effects. Tourism expenditures and data on the number of tourists coming to the region were to be compiled (by quarter) for recent years. Information on total tourist dollars spent in the study region would provide the base for identifying the extent of any relationship between the oil spills and tourism activity during the study period. Similar kinds of data were to be compiled for recreation activity. The use of tourism and recreation expenditures (by types) is an "expenditures" approach to impact measurement. In contrast, an "output" approach was assumed to be the appropriate method for measuring the economic impact of commercial fishing. Output was to be measured in terms of landings and later converted to a dollar value. Times series data on output would be used to determine any relationship between the oil spills and commercial fishing activity. Commercial fishing was defined to consist of shrimp, finfish, and other saltwater shellfish.

ASSUMPTION: An expenditures approach would serve as the appropriate method for measuring the current direct economic impact for tourism and recreation activities.

ASSUMPTION: An output approach would serve as the appropriate method for measuring the economic impact for commercial fishing.

The problem of data availability for the coastal counties of Texas, especially the lack of time series data on the number of tourists and recreationists in the study region, precluded the use of an expenditures approach to measure the economic impact on tourism and recreation. In the end, an output approach was used. In brief, recreation and tourism were defined on the basis of major industry groups; for example, all eating and drinking establishments in the study area were considered a part of tourism. Defining tourism and recreation activity on the basis of industry groups was not desirable. It was necessary because of data limitations experienced during the investigation. As a result of data limitations, the expenditures approach assumption was abandoned for the output approach to measure the current direct economic impacts for recreation and tourism. More will be discussed about the output approach in the last section of this chapter and, also, in the later chapters on tourism and recreation.

IMPACT MODELS

Introduction

The assessment of current direct and current indirect economic impacts associated with the oil spills required the formulation of two separate analytical procedures that would yield estimates of current direct and current indirect economic impacts. These two separate procedures, however, contained certain common definitions, since the estimates of the current direct economic impact were used in the second procedure or model to estimate the current indirect economic impacts associated (indirectly) with the oil spills. For discussion purposes, the procedure for measuring direct impacts will be referred to as a direct impact density gradient model. The model used in this study to measure indirect economic impacts is referred to in the literature as an input-output model. The density gradient model will be discussed first.

Density Gradient Model

A relative density gradient was developed for each of the identified or named economic sectors most directly affected by the oil spills. For recreation, the economic sectors selected were: Other Retail Trade and Recreation Services. These sector names reflect an economic classification system called the Standard Industrial Classification (SIC) code. This code is analogous to the well-known 'zip' code system used by the U.S. Postal Service. For tourism, the selected (SIC) economic sectors were: Eating and Drinking Establishments, Automobile Service Stations, and Lodging Establishments. Commercial fishing was comprised of one sector, called Commercial Fisheries in the SIC code system. The sector composition of the three groups--recreation, tourism, and commercial fishing--is summarized below by SIC description:

Recreation
- Other Retail Trade
- Recreation Services

Tourism
- Eating and Drinking Establishments
- Automobile Service Stations
- Lodging Establishments

Commercial Fishing
- Commercial Fisheries

Direct economic impact density gradients were developed for each of the SIC sectors making up the combined group of recreation, tourism, and commercial fishing. It should be noted at the outset that an impact density gradient was not developed for Commercial Fisheries, as no direct impacts were discernible either from onsite interviews for this study or from the findings of related marine studies of the biological effects of the oil spills. Impact density gradients were developed for the other five SIC sectors, as measurable direct impacts were observable in several of the five subregions.

Basically, the direct impact density model consisted of converting qualitative assessments of the direct impact of the oil spills to quantitative impact estimates at the subregional level. The model is very simple, as indicated below in the hypothetical impact density gradient of Figure 4. Density refers to the relative degree of direct economic impact across the geography of a subregion. Theoretically, the relative density could range from 100 percent say, for shoreline establishments, to zero percent for inland establishments. A relative density of 100 percent means that the economic establishments at that geographic locale incurred a total loss of business activity due to the oil spills. In contrast, a relative density of zero percent means that the oil spills had no measurable economic impact on the business establishments.

Qualitative assessments of direct economic impacts were made on the basis of onsite interviews with owners and/or managers of restaurants, hotels, and the like. These onsite interviews provided the information to develop relative density gradients similar to the hypothetical one depicted in Figure 4. It is important to point out that these interviews were not part of any survey plan specified in the research contract. The contract specifications did not include the development of a survey plan to obtain primary information. In short, these interviews became necessary because of certain data deficiencies discovered in existing data sources. These interviews were limited almost entirely to the coastline.

On the basis of these limited interviews, the impact density gradients were assumed to consist of only two values--a relative density of zero for all establishments by sector, such as Lodging, not located adjacent to the shoreline. Nonzero relative density values would be confined to shoreline establishments. Remember that this assumption is based on limited interviews rather than on the results of an extensive survey. It is also based on professional judgment. Most important, the assumption seems realistic, given the evidence collected for this study.

ASSUMPTION: Establishments located away from the shoreline did not experience any direct economic impact. Any direct economic impact was confined to shoreline establishments, and this impact was equal to or greater than zero at the establishment level.

The relative density gradients, which represent qualitative assessments, were converted to estimates of lost revenues by sector at the subregional level, which is the quantitative estimate of the direct economic impact due to the oil spills. A more thorough discussion of this conversion is best handled in each of the chapters that are devoted to the areas of recreation, tourism, and commercial fishing.

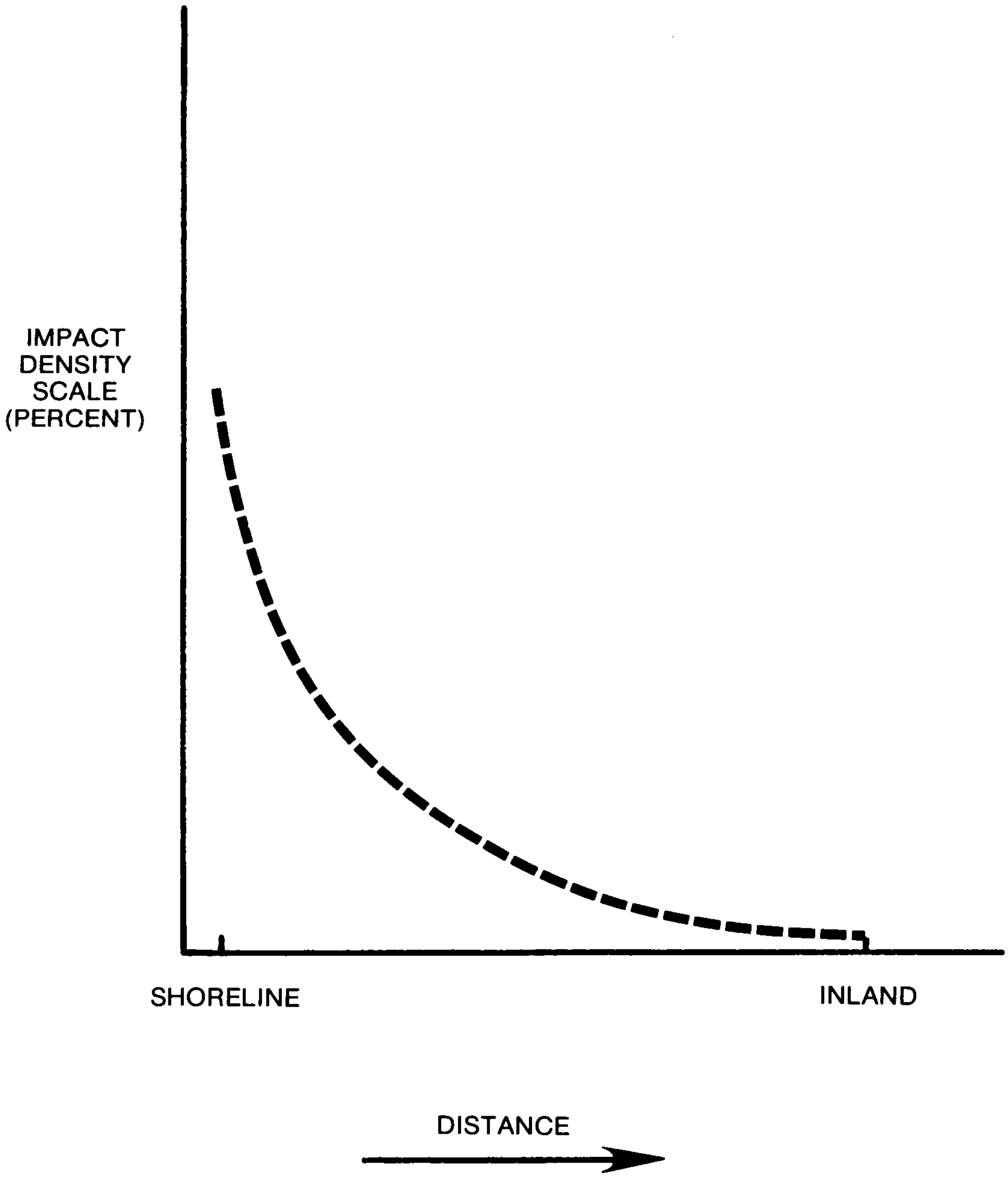


Figure 4

DIRECT IMPACT DENSITY GRADIENT
(HYPOTHETICAL)

In conclusion, the need to use relative density gradients was necessary because of serious data deficiencies. These deficiencies will be articulated in later chapters. The use of relative density gradients to estimate the direct economic impacts shifted the methodology from an "expenditures" approach to an "output" approach. The distinction between an expenditures approach versus an output approach will become more apparent in the following discussion of indirect economic impact estimates. Finally, the notion of a baseline, which was discussed in the earlier parts of this chapter, served only as a conceptual framework in the actual analysis of the direct economic impact of the oil spills. These methodological changes simply reflect deficiencies in existing data sources to conduct a study as complex as the one being reported here.

Input-Output Model

A regional input-output model framework was chosen as the appropriate method for measuring the current indirect "induced-by" economic effects associated with the oil spills. Input-output models are widely used to measure indirect economic impacts due to some initial exogenous disturbance on a region's economy. These models can yield meaningful results if the user has a fundamental understanding of the basic analytical characteristics (and, capabilities) of input-output analysis.

The basic feature of an input-output model is the identification and accounting of inter-industry transaction flows. Inter-industry transaction flows establish the linkages or interdependencies across industry groups or sectors. The mathematical formulation of these linkages permit one to trace the various economic paths from direct economic effects to indirect economic effects within the region's economy. Mathematical solutions yield various sector impact multipliers that are similar to (but, not identical with) the well-known Keynesian income multipliers. The two most common multipliers used in economic impact analysis are <u>final demand</u> multipliers and <u>sector output</u> multipliers. Final demand multipliers measure indirect economic effects associated with changes in final demand. A change in tourism expenditures is a change in final demand for tourism related activities. Multiplying appropriate final demand multipliers times the estimated change in tourism expenditures (by type) would be the "expenditures" approach for estimating economic impact. Output multipliers, on the other hand, measure indirect economic effects associated with changes in sector outputs. A decline in restaurant sales is a decline in the output of the Eating and Drinking Establishments sector. Multiplying the output multiplier for this sector times the estimated change in the sector's total output would be the "output" approach for estimating indirect economic impact. The output approach and sector output multipliers were used in this study to measure indirect economic impacts due to the oil spills.

While a full discussion of the analytical features and capabilities of input-output models for economic impact assessment purposes is beyond the scope of this chapter, it is important for interpreting impact figures given in later chapters to highlight one important analytical feature of input-output models. The inter-industry relationships (transactions) expressed in most regional input-output models reflect average relationships (transactions). This means that the models measure average changes (or, impacts) rather than marginal changes (or impacts). This important point can best be seen with the use of a simple hypothetical illustration. Suppose that the total gross receipts for the Lodging sector of an area economy in 1979 was $183.2 million. Suppose further that the Lodging sector purchased $1.8 million in lavatory notions from the wholesale trade sector. This means that on the average approximately one cent of lavatory notions was used for every dollar of gross output of the Lodging sector ($1.8 million/$183.2 million = 0.0098). Suppose now that the gross output of the Lodging sector increased by $10 million. If the average input relationship of 0.0098 is used, then the increased purchase of lavatory notions is estimated to be $98,000 ($10,000,000 x 0.0098). In this case, an average input relationship is being used to measure an expenditure effect associated with a marginal change in the gross output of the Lodging sector. Due to the difficult (if not impossible) task of developing marginal input relationships, the indirect economic impact estimates presented in later chapters are based on average input relationships.

ASSUMPTION: Average input relationships would be appropriate for measuring indirect economic impacts associated with the oil spills.

What has just been discussed is not unique to input-output analysis. Many elaborate econometric models are characterized by average relationships. The derivation of average relationships rather than marginal relationships reflects the current state of available statistical information and research budget limitations. Especially at the substate level, data inadequacies preclude the development of an analytical model built on marginal relationships.

The formulation of input-output models involves a variety of accounting principles and analytical assumptions. For a thorough understanding of input-output analysis and economic impact assessments, the reader is urged to read the Input-Output Model for Economic Analysis, Instructional Manual, prepared especially for oil impact assessment analysis for the coastal counties of Texas.

At the start of this study, input-output models did not exist for either the total 19-county study region or for any of the five subregions for the period 1979 through 1981. This made it necessary to construct 18 regional input-output models, including annual models for 1979, 1980, and 1981 for the total study region and similar annual models for each of the five subregions. Applying the following assumptions, the models were developed from the 1972 Texas Input-Output Model.[2]

ASSUMPTION: The Texas model could be modified to reflect economic relations within the study region.

ASSUMPTION: The 1972 inter-industry relationships of the Texas model could be adequately updated to reflect inter-industry relationships for the 1979, 1980, and 1981 periods.

Procedures used to "regionalize" and "update" the 1972 Texas model for the substate coastal area economies are thoroughly discussed in the Input-Output Model for Economic Analysis, Instructional Manual.

A listing of the sectors contained in the 18 regional input-output models developed for this study are given in Table 1. This table will be useful for interpreting the sector impact estimates given in later chapters.

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[2]The Texas Input-Output Model, 1972, Texas Department of Water Resources, LP-24, March, 1978.

Table 1

Sector Descriptions

Sector No.	Sector Title
1	Crop Production
2	Livestock & Livestock Products
3	Agricultural Supply, Ginning & Agri. Services
4	Primary Forestry
5	Commercial Fishing
6	Crude Pet. & Natural Gas
7	Natural Gas Liquids
8	Oil and Gas Services
9	Other Mining
10	Construction
11	Meat Products
12	Dairies
13	Grains
14	Bakeries and Foods
15	Beverages
16	Textiles
17	Wood and Furniture
18	Newspapers & Printing
19	Chemicals
20	Petroleum
21	Plastic, Leather, and Glass
22	Clay, Stone, and Cement
23	Metals
24	Machinery
25	Electrical Equipment
26	Transportation Equipment
27	Other Manufacturing
28	Railroad
29	Motor Vehicle
30	Water Transportation
31	Air and Other Transportation
32	Telephone
33	Radio and Television
34	Other Communication
35	Gas Services
36	Electric Services
37	Water and Sanitary Services
38	Wholesale Automotive
39	Groceries
40	Farms, Wholesale, Machine Products
41	Machinery Wholesale, Machine Products
42	General Wholesale
43	Retail Lumber Yards

Table 1 cont'd

Sector No.	Sector Title
44	Retail, Equipment Supply
45	Retail, Department Stores
46	Food Stores
47	Retail, Automotive and Apparel
48	Retail, Furniture
49	Eating and Drinking Establishments
50	Other Retail
51	Banking
52	Other Finance, Insurance, & Real Estate
53	Legal Services
54	Lodging
55	Personal Services
56	Advertising & Other Business Services
57	Recreational Services
58	Auto Service and Repairs
59	Doctors
60	Hospitals
61	Education
62	Colleges
63	Other Services
64	Outdoor Recreation
65	Households
66	Sector Totals

CHAPTER III

TOURISM

CHAPTER III. TOURISM

I. INTRODUCTION

This report includes the methods used and the results obtained by studying the tourist activity along the Texas Gulf coast and making an assessment of the possible impact of the oil spills caused by the sinking of the BURMAH AGATE and the blowout of IXTOC I Mexican oil well in the Bay of Campeche in 1979. Incidental to the main purpose of the oil spill impact, the study reveals the status of data collection and monitoring of tourism and the need for improvement in models and regular measures. The following report includes three main sections: (1) a description of coastal tourism in Texas, its relationship to recreation and the rationale used in the study of oil spill impact contained in this section; (2) a discussion of the several economic models available and the methods used in this study to establish a baseline of tourist activity; and (3) a description of the impact and its implications.

TEXAS COASTAL TOURISM

Texas coastal tourism in a modern context is relatively new, although it has old antecedents. A few remnants of a late nineteenth century resort era can be found today, such as the Luther Hotel in Palacios and the newly remodeled Galvez in Galveston. However, in those pre-air conditioned, turn-of-the-century-days, Texas was not generally caught up in tourist and resort development compared with that in upper New York or the Great Lakes region. In fact, Southerners dominated northern cool resort areas to escape the heat and disease then prevalent in the South. The South was the market; the North, the destination.

Texas and its Gulf coast encountered a gradual growth of tourism throughout the post-WWII years but did not experience a real breakthrough until the late 1960s. Several factors seemed to converge to bring Texas into the spotlight of tourist development in these later years. For one thing, the great economic expansion of the "sun-belt" and the media coverage of Texas as a boom industrial and business development area brought increasing masses of visitors. The great expansion of reservoirs in Texas, heretofore a region without inland water for recreation, together with new Gulf coast publicity, skyrocketed the state into the marketplace for water-based recreation and tourism. The completion of the prime Interstate routes to Texas in this period, for the first time, provided easy automobile access to Texas. And the establishment of the Texas Tourist Development Agency in 1973, providing for the mass out-of-state promotion for the first time, had a great effect on tourism expansion. This expansion began in the late 1960s and developed further through the 1970s. The number of out-of-state visitors to Texas rose from slightly over 11 million in 1963 to 23.2 million in 1977 (Texas Tourist Industry

Growth: 1978).

The Gulf coast, as a special region of Texas, has gradually risen in popularity, and in 1979, ranked fifth as a destination within the state, compared with the Hill Country, east, west, and north Texas (1979 Report: n.d., 3). In that year the coast attracted 3,750,900 short-term U.S. visitors (those staying less than 30 days) and 393,700 long-term visitors (over 30 days). In recent years certain segments of this coast, such as Corpus Christi and South Padre Island, have become much better known nationally as tourist destinations, especially for winter visitors.

So, in recent decades the market-destination relationship between the South and the North has generally reversed. Texas and the Gulf coast have now become more popular as destinations, and much of this is due to the nation's increased interest in the coast and its many amenities.

Coastal tourist amenities offer a special mix unlike other destinations. Coastal cities contain convention facilities, sports arenas, and museums, much like other cities, but the marine-land interface places them in a different context. The proximity of beaches, bays, rivers, and estuarine resources provide an array of attractions important to tourists. Coastal wildlife observation, photography, coastal fishing, shell collecting, surfing, and diving offer special appeals, but probably the greatest of all is that of coastal aesthetics. Viewing vast streches of open waters, feeling sea breezes, listening to the special waterfront sounds and marveling at sunsets on the water are part of the coastal tourism experience mosaic. Conservation and restoration of historic sites, buildings, and artifacts in recent years have added a significant new set of appeals. Coastal cities had an especially romantic past, just now being rediscovered, redeveloped, and interpreted, adding to the appeal to tourists. Especially important have been several historic redevelopments in Galveston: Ashton Villa, Bishop's Palace, and the Strand.

The term, "coastal tourism," implies a linear geographic region at the water-land interface with homogeneous characteristics paralleling the water's edge all along the coast, which is partly true. For example, the coast could be divided into a series of littoral zones, each having somewhat different capability for tourism, as illustrated in Figure 5 (Gunn: 1970, 13). Between the extremes of oceanic and terrestrial zones, the coast could be divided into four development zones for tourism. The "neritic" zone, defined as a near-shore marine zone spreading from the continental shelf to the beach, is the richest zone for fishing and often contains interesting bars and reefs. It is well suited to cruising and sailing and sometimes is used for travel to nearby islands. Visual contact is dominantly with the sea rather than

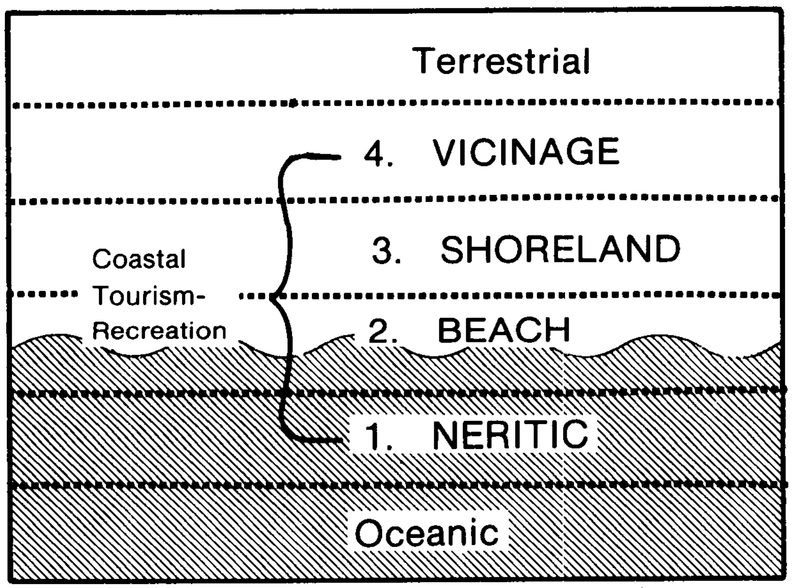


Figure 5

Zones of Coastal Tourism Development Potential the land. The "beach" zone reaches both into water and onto the land and, especially if wide and sandy, supports the most popular of water-based tourist activities: relaxing, building sand castles, shore water activities, and beach sports. Also very important in this zone are other activities such as watching and photographing people, the surf, shore birds, plant life, and the sunsets. The "shoreland" lies behind the beach and offers a base for camping, picnicking, and hiking, and some locations support hotels and other service businesses. Visual connection with the sea is important. Coastal backland labeled "vicinage," is frequently well suited to support coastal tourism and is also the locale for vacation homes. Visual linkage may or may not be important, but these zones can be delineated along most coasts and suggest a strong littoral consistency.

Experience with the development of tourism shows that a lineal pattern is countered by other factors, which vary from one subregion to another, and tend to create tourism nodes along the coast. For example, on the Texas Gulf coast, climatic and other physical differences are quite pronounced from Louisiana to Mexico. Near Louisiana, the rainfall averages 137 centimetres, growing season about 245 days (also more useful tourism days), and a mean annual temperature of 21° (Celsius). Adjacent to Mexico, however, the coast has annual rainfall of 66 centimetres, a 320-day growing season, and a mean annual temperature of 23° (Celsius). The difference is especially important to winter tourism development toward Mexico (Texas Coastal Maps: 1975, 1A and 1B). Areas of coastal flooding and hurricane washover are not uniform from one end of the Gulf coast to the other (Texas Coastal Maps: 1975, 4A and 4B). Soils are not uniform and are generally more sandy toward Mexico and clayey and loamy toward Louisiana (Texas Coastal Maps: 1975, 5A and 5B). Historical and archeological backgrounds also vary (Texas Coastal Maps: 1975, 8A and 8B).

Perhaps of even greater significance is the nodal clustering of tourist activity at or near cities, especially along the coast (Figure 6). Transportation termini--airports, bus terminals, train stations, harbors, car rental centers--are in or near cities, not in between. The Interstate highway system is designed to interconnect cities. Tourist service businesses often serve both local and travel markets and, therefore, are more successful in or near cities. Access to the coast from inland areas is generally directed toward cities.

If the above principles of coastal tourism are applied to the Texas Gulf coast, one can expect the greatest concentrations of tourist activity to occur at four main nodes: Beaumont-Port Arthur, Houston-Galveston, Corpus Christi area, and Brownsville-Harlingen. A less well-defined node occurs in the Victoria-Port Lavaca area. Using the total gross receipts

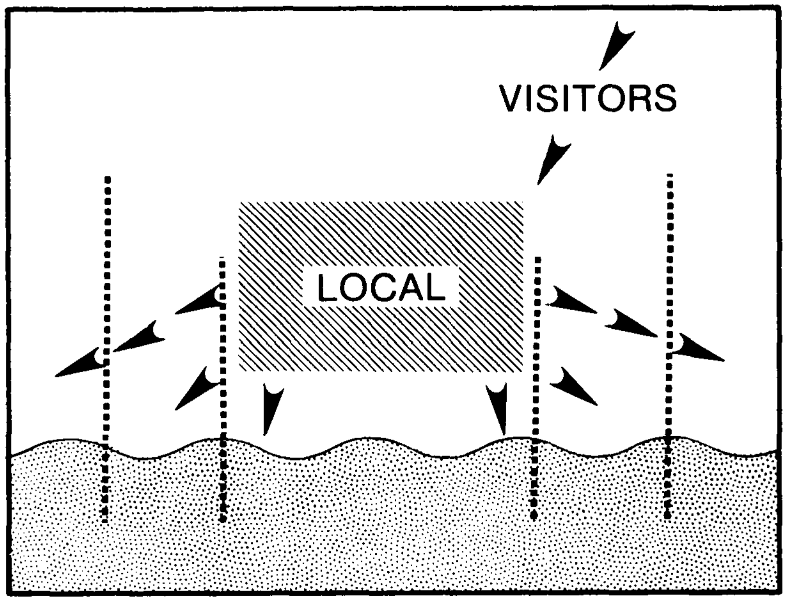


Figure 6

Tourism Concentration at Cities

attributable to tourism for the several subregions for 1979, the following are the results:

Subregion 1	- 78% occurs in Jefferson County (Beaumont-Port Arthur)
Subregion 2	- 97% occurs in Harris and Galveston Counties (Houston and Galveston)
Subregion 4	- 77% occurs in Nueces County (Corpus Christi)
Subregion 5	- 97% occurs in Cameron County (Harlingen, Brownsville).

The relative distribution of the three tourist business sectors - gasoline stations, food and beverage services, and hotels - are shown in Figures 7, 8, and 9, respectively.

The purpose of the above discussion is to emphasize that the location of tourist activity is not uniform along a coast, and therefore, any coastal catastrophe will have greatly varying impact depending on its location.

TOURISM'S DEFINITIONAL PROBLEMS

This report is directed to the possible impact on tourism along the Texas Gulf coast from the IXTOC I and BURMAH AGATE oil spills in 1979. Because of definitional confusion in the field of tourism, explanation of the study's scope is necessary. Today, official tourist agencies, tourist-oriented businesses, government regulators, and academicians use different definitions for tourism. For example, conventions are sometimes included in tourism and sometimes not. Resorts and group organization camps are often excluded. Few researchers use the same rules regarding the portion of business activity to attribute to tourism. Business-oriented reports on tourism often exclude the developed resources, such as beaches and parks, which make up much of the attractiveness for travel. Definitional problems are not so troublesome in general literature, but become important whenever statistical data are being prepared and compared. Great variations in data often are more the result of differences in definitions than in actual changes in quantities.

On the international level, a United Nations Conference in 1963 suggested that the overall group of visitors to a country should be divided into two groups:

(1) Tourists--visitors making at least a single overnight or a stay of more than 24 hours in the country visited and the purpose of whose journey can be classified under one of the following headings: recreation, holiday, health, study, religion, or sport;

(2) Excursionists--temporary visitors not making an

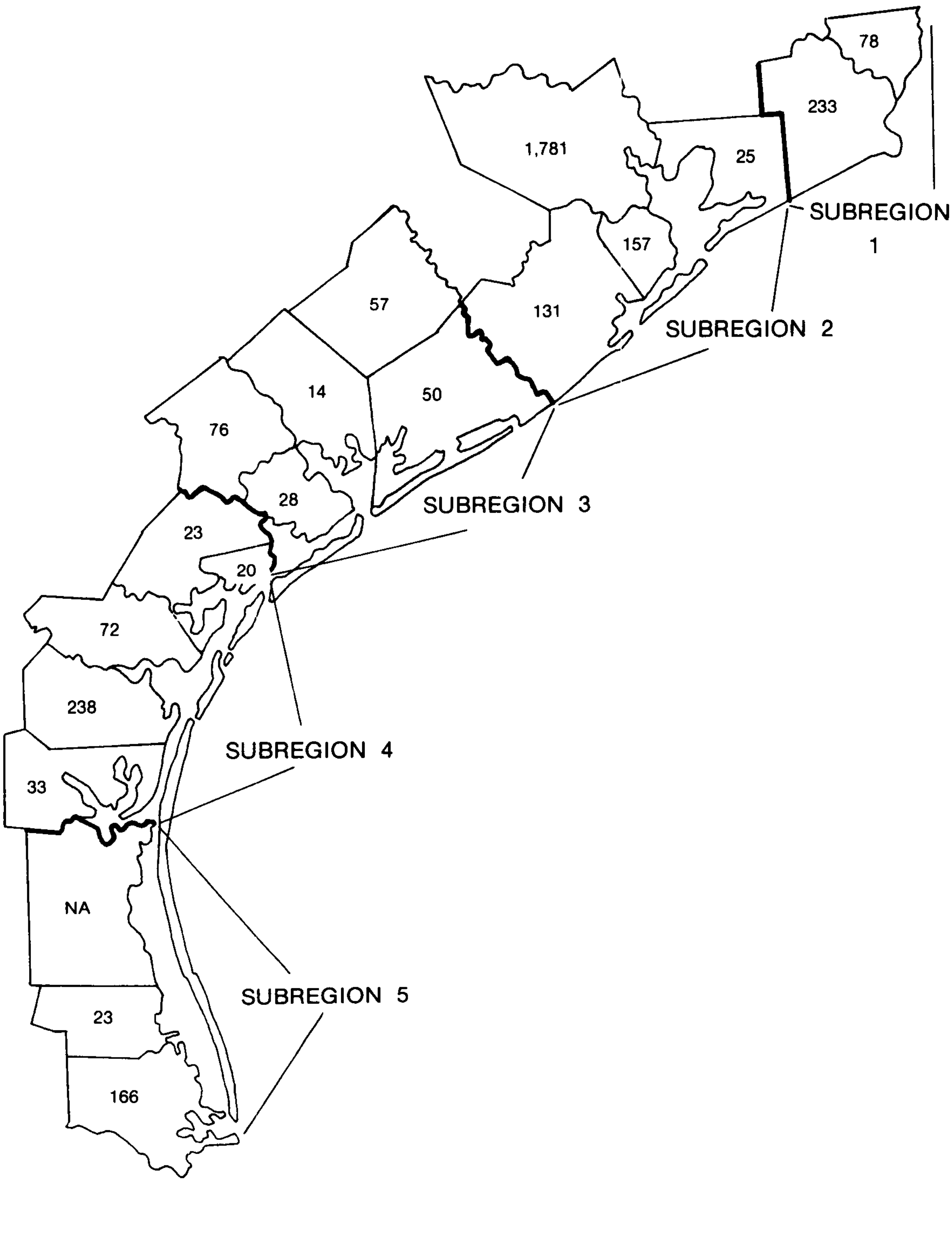


Figure 7

Distribution of Gasoline Service Stations, 1978

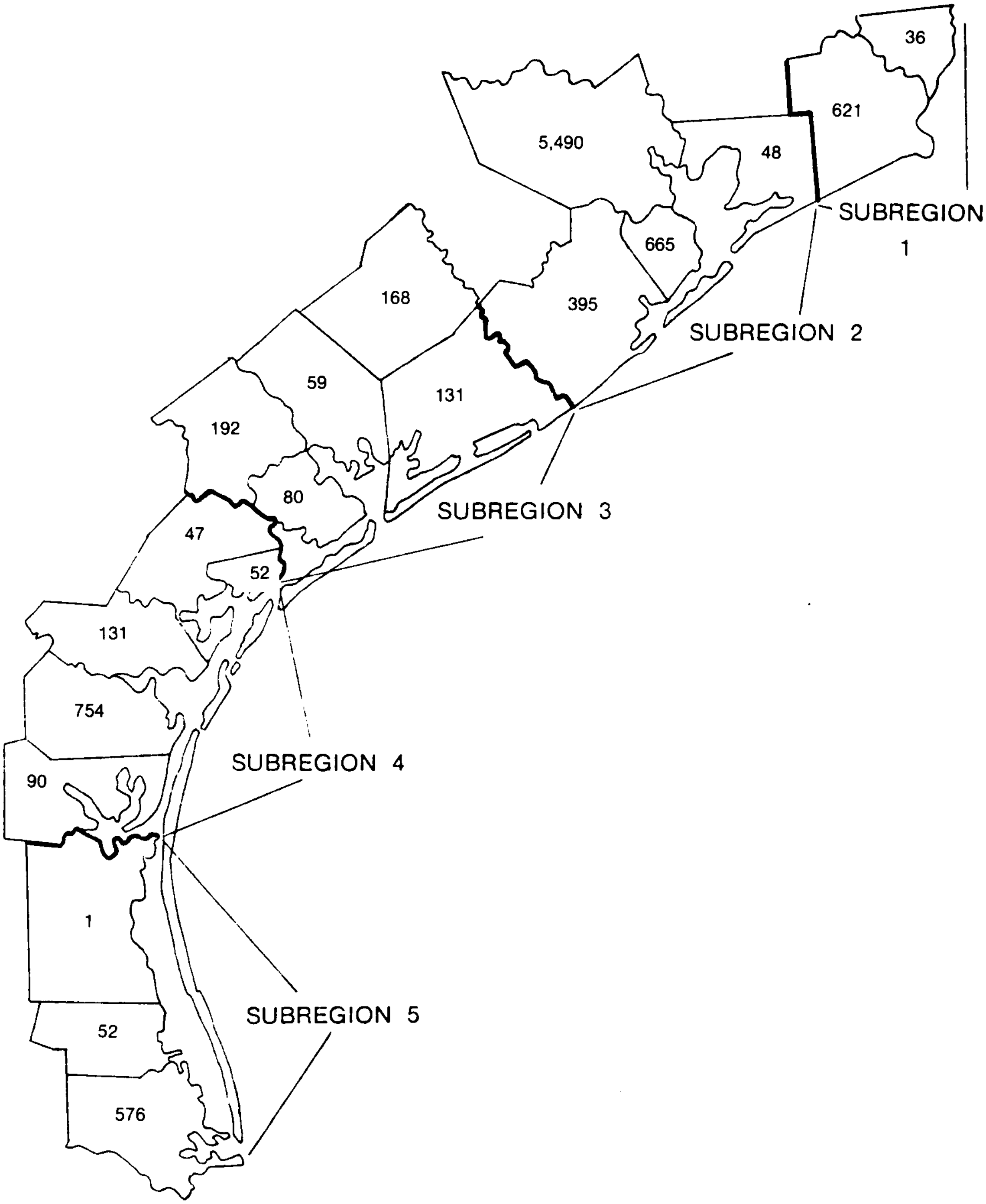


Figure 8

Distribution of Food and Beverage Services, 1978

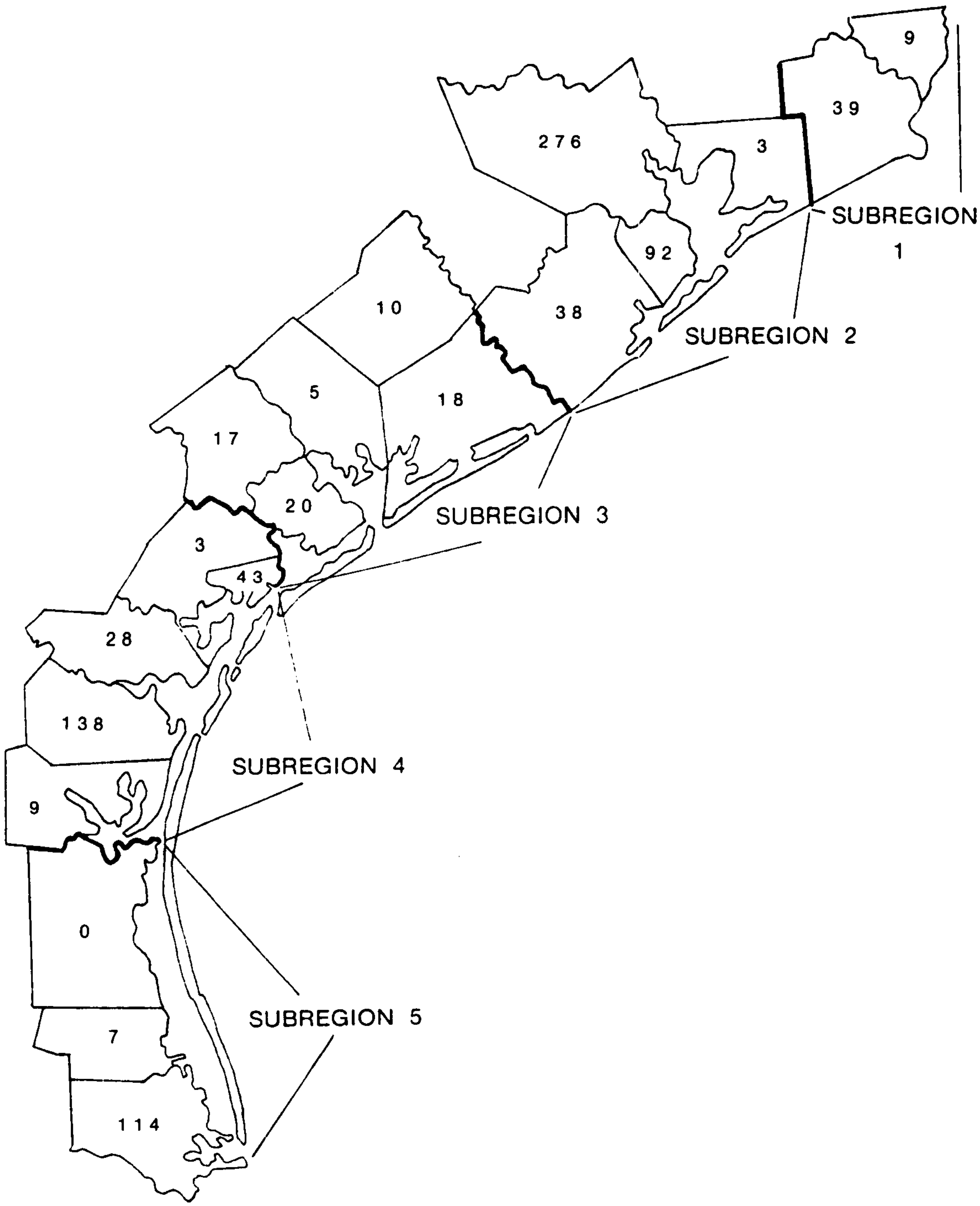


Figure 9

Distribution of Lodging Facilities, 1978 overnight stay in the country visited (or staying less than 24 hours) (Guidelines: n.d. 9).

These recommendations are, in general, used in many European countries; but in the United States, no two states use the same basis for calculating statistical data on tourism, unless a single contractor with a single model is performing the research. As a result, in 1973 the industry fostered the establishment of the U.S. Travel Data Center, a nonprofit tourist data collection and processing organization. In its formative stage the decision was made to avoid the issue of tourist definitions and to adopt the policy of including all travel, regardless of the purpose. Even so, because of the lack of base data, several segments of travel are either omitted or are under-reported. In general, the trip is used as the basic unit of measure, "defined as travel to a place 100 miles (160 kilometres) or more away from home and return, whether or not an overnight stay is involved" (1980 National Travel Survey: 1981, 2.)

For this oil spill study, the data prepared annually by the U.S. Travel Data Center showed potential, except that refinement at the county level in Texas had not been consistently prepared. The Texas Tourist Development Agency contracted the U.S. Travel Data Center to prepare data for the county level, but only for the years 1976 and 1979, which were identified as County Travel Economic Impact Models (CTEIM).

The Census Bureau, U.S. Department of Commerce, defines tourism as "any trip extending 100 miles (160 kilometres) or more from origin to destination." Specifically excluded are "(1) travel taken as part of an operating crew on a train, plane, or bus, truck or ship, (2) commuting to a place of work, (3) travel by students between home and school, and (4) travel by the Armed Forces while on active duty" (National Travel Survey: 1979, v-vi).

So the topic of tourism does not enjoy the standardization given other forms of economic development. Unless primary data can be obtained, tourism definitions and statistical description remain arbitrary on the part of the researcher.

A FUNCTIONAL APPROACH

Functionally, tourism can be conceived as a system of interrelated components (Gunn: 1972, 20), as illustrated in Figure 10. Each component, in turn, is made up of a great many separate elements, interacting both within and outside each component. A very important component, sought by promoters and marketers, is that of a body of <u>people</u>, able and interested in travel. Increasingly, research techniques, such as psychographics, are reaching into this body of travelers to determine characteristics important to forecasting, planning,

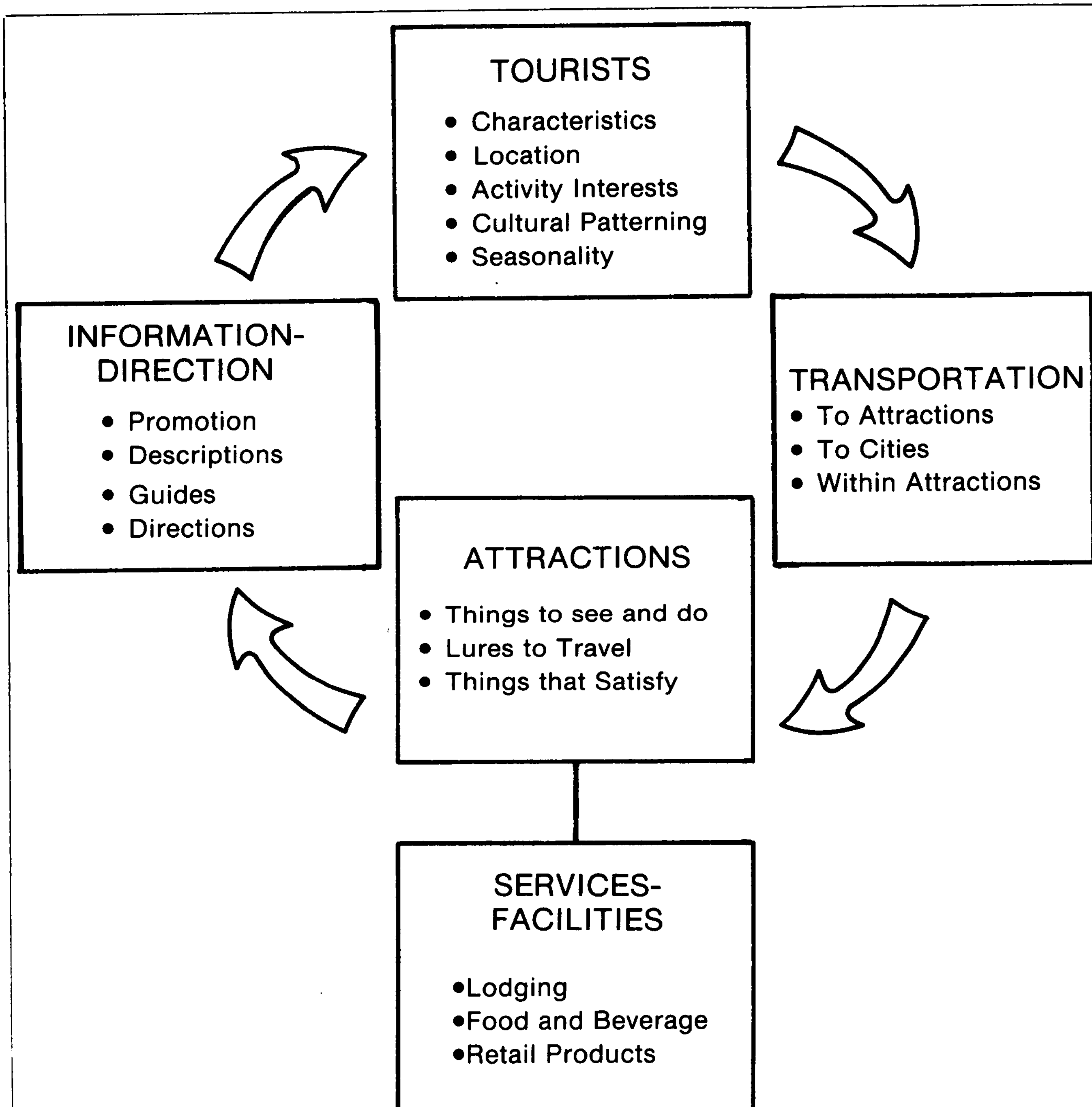


Figure 10

The Tourism Functional System

and marketing. A second component, intimately linked with people, is that of attractions--developed things to see and do. In the United States, attractions are dominated by natural and cultural resource areas, mostly developed by governments and nonprofit organizations. In recent years, man-made attractions, such as sports arenas and theme parks, have added materially to the bank of attractions. Of course, transportation, providing access for people, is another important component. The transportation mode, scheduling, cost, convenience, and reliability are important to visitors. The most popularly known component of tourism is that of the services and facilities. It is through this component that the greatest economic impact from tourism is felt on a local basis. Hotels, motels, food services, souvenir shops, gasoline service stations, and many other retail service outlets are heavily involved in tourist activity. A final component, very important in giving guidance and knowledge about travel and destinations could be called information-direction. Nearly all states spend millions of dollars annually in advertising and promotion. And in many other ways tourist communication occurs through movies, books, atlases, maps, signs, and mass media.

All components are always in an intimately related dynamic balance. A change in even one segment of a component can immediately affect all other components. Even though the greatest economic impact comes from services and facilities, they are greatly dependent upon all other components.

From this description of the tourism system, a great diversity and tremendous number of businesses and acreages of land are encompassed in the concept of tourism. And, although there is logical foundation for this functional concept, it is not consistently recorded in data systems. No state or federal agency is presently charged with the responsibility of regularly monitoring the many elements within each component, and only fragments of the system are inventoried or monitored in Texas.

TEXAS TOURISM DATA

For Texas tourism the only regularly collected time series data on visitors and expenditures are those of the State Department of Highways and Public Transportation (SDHPT), Travel and Information Division. Sporadic studies in greater detail have been prepared by others, but these utilized differing models of measurement and are not issued as a regular time series. The reporting by the SDHPT is on an annual basis and is prepared primarily from data collected from questionnaires voluntarily filled in by respondents who stop at the various entrance visitor centers at the borders of Texas. A sample SDHPT report is included in Appendix A. Data on bus and air travel are obtained from other sources. The annual reports break down the spending ratios (food, lodging, etc.)

only for automobile travelers. All data exclude domestic tourism--travel originating in Texas and destined for Texas areas. Therefore, the primary data used in this oil spill study are those of out-of-state automobile travelers to Texas because this is the only consistent annual data source in sufficient detail for the study.

TOURISM RELATED TO RECREATION

From the preceding discussion, it can be observed that tourism, when considered in its broad context, includes much of what professionally could be defined as within the field of recreation. Therefore, for purposes of this study, arbitrary distinctions were created to avoid overlap of data reporting. For example, the SDHPT annual reports break expenditures of tourists into five categories: auto expense, food, lodging, entertainment, and other. Total tourism, therefore, does contain large and important economic and social elements (entertainment and other) that can be defined as recreation. On the other hand, not all recreation requires travel.

In order to meet the terms of reference for this project, an <u>artificial</u> distinction was created between tourism and recreation. Figure 11 illustrates the manner in which tourism and recreation overlap: If one were reporting on tourism, comprehensively, areas "A" and "C" would be included. However, because of the study requirements, area "A," exclusive of "C," is included in the report on tourism. Areas "C" and "B" are included in the report on recreation. Throughout this study the reader must recognize the artificially defined distinction between tourism and recreation.

RATIONALE FOR ASSESSMENT

Basically, the rationale for assessment of possible oil spill impact on tourism consisted of establishing a baseline of activity and then justifying 1979 decreases as being caused by the oil spills.

The two catastrophies to be studied were of quite different origin. The freighter MIMOSA collided with the BURMAH AGATE about 72 kilometres from Galveston harbor, losing great quantities of oil into the Gulf. "The spill contaminated the entire coast of Galveston Island northeast of Corpus Christi." A blowout in the Mexican IXTOC I oil well in Campeche Bay produced an unprecedented amount of crude oil onto the surface of the Gulf of Mexico. The oil tar reached the Texas coast in August and then turned back with a change in wind direction (Environmental Quality: 1980, 20, 21). These two events were examined with regard to their possible impact upon tourist activity along the Texas Gulf coast.

The rationale for establishing baseline was that of

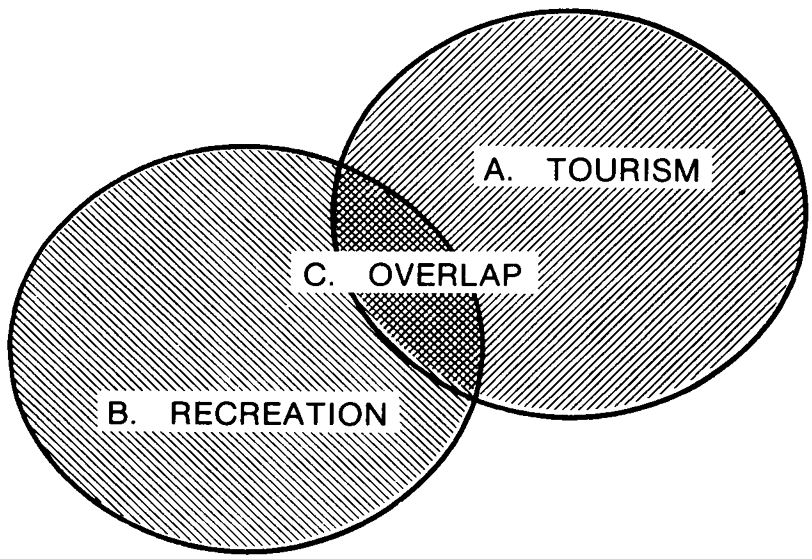


Figure 11

Relationship Between Tourism and Recreation identifying tourism economic activity in the three tourism business sectors--automotive, food, lodging--for all coastal counties of the study. Because such data are not regularly collected, calculated, and published, it was necessary to develop an approach for obtaining the data. Kahn's model (1976) adapted to the needs of the study, and consisted of developing a statewide ratio of tourist activity to total business activity in the three business sectors. Then, by applying this ratio to the total business activity of the three sectors in each county, the amount attributable to tourism could be estimated. A baseline could then be developed by making these calculations for a series of years, 1976-1979.

The second component of the rationale was to analyze the baseline data and add any other substantive information, such as interviews and surveys, that could provide support for possible impact assessment of the oil spills.

PROCEDURES

To implement the rationale described above, certain necessary procedures were adopted only after examination of several economic tourism models and approaches. From the earlier discussions regarding definitions, models, relationships to tourism data in Texas, any approach for this study would obviously require special assumptions and estimations. The following procedural steps were planned to conduct both baseline and impact assessment:

1. Obtain tourism expenditure data to determine statewide expenditures on automotive, food, and lodging for each year of baseline.

2. Tabulate total statewide gross receipts for each of the three sections of automotive, food, and lodging for each year of baseline.

3. Create a ratio between the tabulations above. For example, by dividing the tourist expenditures on automotive expenses for a year by the gross receipts for that same year in gasoline service stations, a proportion of total receipts attributable to tourism is obtained for each year of baseline.

4. Estimate the amount of activity due to tourism for each county by using the above ratios. For example, multiplying the ratio of food for 1976 times the gross receipts for food sales in restaurants and drinking places in Galveston county for 1976, produces an estimate of tourism activity in food in that county for that year. Because quarterly data are required, the ratio for the year is applied to quarterly data for each year for each county.

5. Aggregate calculations for each county within each

subregion to produce total tourism activity for each sector, for each quarter, and for each subregion of the Texas Gulf coast. This, in turn, represents the baseline and can be displayed in tables and graphs.

(The procedure also called for estimating baseline employment and income data, which was attempted but was unworkable due to refusal of the Texas Employment Commission to produce the base data. Other sources might have yielded some estimation, but upon investigation, they were not usable due to incompatibilities with the study characteristics or not available for the needed time series. This was an unfortunate but unavoidable omission from the procedure.)

6. Analyze the graphs and tables for possible irregularities that might provide clues to an impact (positive or negative) from the oil spills, recognizing the areas of the coast where the actual spills occurred.

7. Visit the region, interview managers of businesses and seek documents that would provide on-site data regarding impacts.

8. Calculate estimated impacts from the above data, if any, and the levels of business without impacts.

These procedures are not necessarily designed to produce exact data due to the nature of tourism, its measurement, and due to the special relationship of tourism to a catastrophe such as an oil spill. Importantly, tourism is very responsive to many externalities such as price rise and freedom of movement by the several transportation modes.

ASSUMPTIONS AND LIMITATIONS

In conducting this study, certain assumptions were made in order to reduce the variables and to compensate for deficiencies in data. Also, several limitations were imposed upon this study that dictated certain procedures and outcomes.

For example, the model of economic activity uses statewide ratios of gross sales to tourist expenditures, but these statewide ratios were assumed to be equally applicable to the individual coastal counties of the study. Data on auto tourists entering the state were assumed to be a sufficient indicator of tourism because in-state tourism activity is not measured in Texas. Because of "disclosure" omissions in data on lodging activity, the lodging receipts for hotel tax purposes were assumed to be acceptable for baseline.

The outcome reporting of the study is greatly limited because of the arbitrary separation of recreation from tourism, as required in the terms of reference. Usually, tourism is reported as encompassing retail sales of souvenirs, gifts, supplies, and expenditures on entertainment and recreation, but these are excluded from the tourism section and included in the recreation portion. At first, it was anticipated that oil spill impacts of 1979 could be observed from time series data since 1970. However, lodging data were available only after 1976, limiting the impact calculations to projections based on the years 1976 to 1978. Because lodging is nearly exclusively a travel-oriented business, as compared with restaurants and gasoline service stations, all lodging receipts were attributed to tourism.

Furthermore, the original data on lodging was greatly under-reported due to "disclosure," (small numbers of places were not reported). Another, more complete source was used. Since no separation of data revealed local use of lodging establishments, all receipts were used. This slight over-reporting does not create a serious problem as compared with the quality of all data used. Without the benefit of detailed annual survey information of tourism and without the collection and processing of needed tourism data at the state level, the data used in the study are assumed to represent the best current aproach to the problem.

These assumptions and limitations are important in evaluating the results of this study.

II. BASELINE ASSESSMENT

As described in the first section of this report, a major portion of the rationale is the establishment of baseline activity of tourism in the study region. This was accomplished by starting with an ideal generic appraisal of tourism activity and then reducing this to workable portions for which data were available.

THE BUSINESS SECTOR

The identification of the elements of the business sector involved in tourism, as might be implied from the introduction to this study, is somewhat complicated. Based upon general references and past experiences, Dr. Ditton and Dr. Gunn first prepared a comprehensive typology of all conceivable enterprises that could be included under headings of "recreation" and "tourism" as shown in Table 2. This list represents a generic ideal that reaches beyond the needs of the study but shows much of the overlap between fields conceived as tourism and recreation. Further refinement was necessary in reconciling these classifications with the system of business classification in the SIC codes.

Table 2. TYPOLOGY OF TOURISM AND COMMERCIAL RECREATION ESTABLISHMENTS

I. COMMERCIAL RECREATION

A. Businesses that provide direct recreational services to recreationists:

Amusement parks	Hotels, motels (some)
Beauty shops	Massage parlors
Billiards, pool	Night clubs
Bowling alleys	Racetracks, auto
Camps, group, organization	Racetracks, horse, dog
Camps, overnight, RV (some)	Restaurants, bars (some)
Carnivals, circuses	Skating rinks, ice
Casinos	Skating rinks, roller
Charter fishing, boat services	Sports arenas
Coin game arcades	Summer beach resorts
Convention facilities	Tennis clubs
Cruise ships	Theaters, live
Cultural, historic attractions	Theaters, movie, drive-in
Custom charter tours	Tour bus guides
Golf courses, country clubs	Winter sports resorts
Health, fitness clubs	

B. Businesses that sell or rent equipment or products or provide services directly to recreationists:

Airlines	Hunting equipment, sales
Airplane rental, sales	Jogging, health sales
Bicycle rental, sales	Liquor, beverage sales
Book stores	Marinas
Buslines	Musical instrument stores
Canoe Liveries	Off-road vehicle sales
CB, stereo, hi-fi shops	Party goods rental, sales
Coin, stamp stores	Photographic shops
Condo management firms	RV rentals, sales
Costume rental, sales	Skiing equipment, clothing
Drug stores	Tobacco store
Fishing equipment, bait sales	Travel agents
Food stores	Vacation home rentals
Gardening equipment, sales	Wilderness outifitters
Hobby, craftshops	

C. Businesses that train recreationists:

Art studios	Music studios
Craft studios	Photographic training
Flying lesson businesses	Sports training clubs

D. Businesses and manufacturers that provide services, products or equipment in support of recreation:

- Accounting firms
- Advertising agencies
- Attorneys
- Automobile, boat mfgs.
- Building suppliers, builders
- Business management firms
- Designers, planners
- Architects
- Drug manufacturers
- Food producers
- Food sales
- Insurance firms
- Mass media
- Mechanics (auto, aircraft, boat)
- Medical, ambulance
- Playground equipment mfgs.
- Recreational equipment
- Security personnel
- Sports equipment mfgs.
- Tax accountants
- Telephone, telex
- Travel, vacation apparel
- Wholesalers, distributors

II. TRAVEL AND TOURISM

A. Businesses that provide transportation:

- Boat rental
- Car rental
- Chartered bus
- Chartered plane
- Gas service stations
- Plane rental
- Rail
- Scheduled air
- Scheduled bus
- Ship
- Taxi
- Travel

B. Businesses that provide lodging:

- Cottages, apartments (for travel)
- Hostels
- Hotels, motels, inns
- RV campgrounds, overnight
- Sport & recreation camps
- Tourist rooms
- Boarding houses

C. Businesses that provide food, beverage:

- Coin food, beverage machines
- Grocery stores
- Liquor stores
- Restaurants
- Snack bars

D. Businesses that provide direct recreational services to travelers:

- Amusement parks, theme parks
- Beauty shops
- Billiards, pool
- Bowling alleys
- Camps, group, organization
- Camps, overnight RV (some)
- Carnivals, circuses
- Casinos
- Charter fishing boat service
- Coin game arcades
- Hotels, motels (some)
- Massage parlors
- Night clubs
- Racetracks, auto
- Racetracks, horse, dog
- Restaurants, bars (some)
- Skating rinks, ice
- Skating rinks, roller
- Sports arenas
- Summer beach resorts

D. Continued

- Convention facilities
- Cruise ships
- Cultural, historic attractions
- Custom charter, tours
- Golf courses, country clubs
- Health, fitness clubs
- Tennis clubs
- Theaters, live
- Theaters, movie, drive-in
- Tour bus guides
- Winter sports resorts

E. Businesses that sell or rent equipment or products or provide services directly to tourists:

- Airplane rentals, sales
- Bicycle rentals, sales
- Bookstores
- Canoe liveries
- CB, stereo, hi-fi shops
- Coin, stamp stores
- Condo management firms
- Drug stores
- Fishing equipment, bait
- Hobby, crafts shops
- Hunting equipment sales
- Jogging, health equipment
- Marinas
- Musical instrument stores
- Off-road vehicle rentals
- Party goods rental, sales
- Photographic
- RV rentals, sales
- Skiing equipment, clothes
- Sporting goods stores
- Tobacco stores
- Toy, games stores
- Vacation home sales
- Wilderness outfitters

F. Businesses and manufacturers that provide services, products, or equipment in support of tourism:

- Accounting firms
- Advertising agencies
- Attorneys
- Automobile, boat mfrs.
- Building supplies, builders
- Business management
- Designers, planners
- Architects
- Drug mfrs.
- Food producers
- Food sales
- Insurance firms
- Mass media
- Mechanics (auto, plane, boat)
- Medical, ambulance
- Recreational equipment
- Realtors
- Security personnel
- Sports equipment mfrs.
- Tax accountants
- Telephone, telex
- Travel, vacation apparel
- Wholesalers, distributors

MODELS

The literature on tourism economic models necessary for a baseline revealed a number of isolated approaches, each created for, and adapted to, specific needs. The following discussion is not meant to be exhaustive but represents the diversity of approaches used in recent years.

1. For Mexico, Boltvinik (1979, 57) expanded on five areas of economic characteristics of tourism: balance of trade, tourism component of the gross domestic product, multiplier effect on product, multiplier effect on employment and income, and multiplier effect on domestic economy. For the identification of establishments encompassed by tourism, the following 13 were used in input-output analysis:

meat and dairy products
fruit and vegetables
wheat and its products
alcoholic beverages
beer
nonalcoholic beverages
petroleum
commerce
hotels and restaurants
transportation
communications
amusement
medical service

The amounts attributable to tourism, domestic, or export, are not defined but come from time series data collected by a governmental office of statistics.

2. At the city level, three studies have particular interest because of their diversity. Babul, Lintz, and Somersan (1978) evaluated the tourism and recreation impact on three resort communities in northern Wisconsin: Minocqua, Woodruff, and Algoma. Direct impacts were measured by survey of hotels, vacation homes, campgrounds, resorts, and other locations. Multipliers were used to determine further impacts, including taxes paid to governments. The study results were based upon primary survey data.

Another northern study, but for a much larger city, was that done by Blank and Petkovich (1979) for the twin cities of Minneapolis and St. Paul. For this study of the 7-county metropolitan area, tourists were defined as all travelers coming to the area, whether or not a night's stay was involved. The reasons for travel were many, including visits to friends and relatives, work or business, personal business, recreation, sightseeing, entertainment, shopping, conferences, and merely "because that's where the road goes or the plane stops."

Contrary to most tourism studies at larger geographical scales, this study, based upon direct interviews with travelers in the study period, shows a very high percentage of expenditures (55 percent) on purchases of goods and services not directly related to travel: purchases in shops and departments stores; medical, legal, and other professional services; and purchases of furniture, automobiles, and consumer durables. Lodging, often a leader in expenditures by travelers, was actually only 9 percent.

Quite a different approach was used by Zlatkovich (1973) for the city of Austin. The study was based only on visitors spending one night in Austin, and the methods used were a mixture of data from three sources: sample of registration records at hotels and motels, hotel occupancy tax records, and survey of hotel guests through one year. The distribution of expenditures was as follows:

Food and Drink	31.43%
Lodging	27.80%
Transportation (public & private)	10.68%
Entertainment	9.68%
Other (including shopping)	20.41%

3. At the national level, two approaches are currently available. For each of the years 1963, 1967, 1972, and 1977, the U.S. Bureau of the Census prepared a National Travel Survey, including data on transportation mode, purpose of trip, incomes, origins, and destinations. While the earlier surveys were conducted by mail, the most recent survey (1977) was conducted by interviewing a sample of approximately 25,000 households across the United States. The interviews measured trips of 160 kilometres or more, one way. The tables for states and regions do not include expenditures, and the report does indicate that tapes containing data on costs of package tours, lodging, and transportation are available (National Travel Survey: 1979).

A model was created by the U. S. Travel Data Center in 1975 under contract to the Bureau of Land Management, U.S. Department of the Interior (TEIM: 1975, iii). Advance description appeared in 1974 (Frechtling: 1974, 9). The technique used by this model is intended to avoid respondent recall problems that accompany most expenditure surveys. Therefore, instead of respondents reporting on expenditures, a list of over 1,400 "per-unit-cost factors" derived from industry sources is used. For example, automobile costs per kilometre are obtained from an industry source and applied to the kilometres-per-trip data from the National Travel Survey. Throughout the study, data on tourist travel are taken from the Bureau of the Census National Travel Survey, and then the several per-unit cost factors are applied to determine total economic impact. These factors vary with trip purpose and from year to year. This model includes the following SIC codes:

45	air transportation
411	taxicab companies
55	(except 554) automobile dealers
554	gasoline service stations
443	intercity highway passenger transportation
44	(except 441) water transportation
	National Railway Passenger Corporation
701	hotels, motels, and tourist courts
703	trailer parks and campsites
152,1531	residential construction
78,79	motion picture, amusement, recreation service
53,59	general merchandise, misc. retail stores
58	eating and drinking places (TEIM: 1975, 4).

The model does not include foreign travelers or expenditures in preparation for trips.

4. Many state tourism agencies have created their own individual models, few of which are compatible. For political and continuity reasons, many prefer to use their own models rather than to accept the state data generated by the U. S. Travel Data Center.

A different approach, for example, was used by Doering (1976, 13) in relating tourism expenditures to population. Doering's study includes the per capita expenditures (PCT) produced by dividing the traveler expenditures by per capita personal income x 100 (TIF); and a tourism proportion factor (TPF) computed by dividing a state's traveler expenditures by gross state product and multiplying the result by 100. Doering concludes that per capita traveler expenditure is as good as a TIF or a TPF for measuring economic impact.

Sporadic studies, rather than time series, are often produced at the state level. Corsi and Harvey (1979, 7) and Belden Associates (Texas Tourism Today, 1979) report tourist opinions in response to gasoline increases in price in Wisconsin and Texas, respectively.

Following the Census Bureau's 1977 Census of Transportation, the TEIM of the U. S. Travel Data Center was revised substantially. Therefore, the reporting of state information (1977-78 Impact: 1980) reflects new formulas and availability of new primary data. "The individual state estimates [by USTDC] should not necessarily be viewed as substitutes for the work of the states with major research projects on the impact of travel and tourism" (1977-78 Impact: 1980, 1). For example, this study produced Texas travel in 1978 as follows:

Public transportation	$1,325,400,000	18.2%
Automobile transportation	1,697,800,000	23.5%
Lodging	1,071,200,000	14.7%
Food	1,956,100,000	26.9%
Entertainment & recreation	613,200,000	8.4%
Incidental purchases	601,700,000	8.3%
TOTAL	$7,265,400,000	100.0%

(1977-78 Impact: 1980,7,9)

For the same year, 1978, the estimates for Texas tourism produced by the State Department of Highways and Public Transportation were as follows for U. S. visitors, short term (less than 30 days):

Automobile Travel:

Food	$848,141,820	25.6%
Lodging	811,698,230	24.5%
Auto Expense	702,367,440	21.2%
Entertainment	308,114,020	9.3%
Other	642,732,470	19.4%
TOTAL	$3,313,054,000	100.0%

Air, Bus, Rail Travel: $1,020,316,000

TOTAL $4,333,370,000

(1978 Texas Visitor Industry: 1979,22).

Even though the two models do not measure exactly the same travelers, this comparison endorses the concern over basic tourism statistics that certainly plague the tourism researcher.

Another important model at the state level is that prepared by Kahn for Texas (Kahn: 1976). Although his emphasis is upon employment, the model is based upon expenditure data. His model begins with the data prepared by the State Department of Highways and Public Transportation of Texas and then develops ratios with total gross receipts in comparable SIC business categories in Texas. His study for 1974, however, had the advantage of including domestic travel for that year, the only year it was ever obtained by SDHPT.

5. Although not directly applicable in this report, other studies such as those on the multiplier effect were reviewed. These include papers and reports by Archer (1972 and 1977) and Harmston (1976).

RECEIPTS AND EXPENDITURES

The Texas Office of the Comptroller of Public Accounts furnished special computer printouts of tabulated gross receipts for key tourist businesses for each for the 19 coastal counties for years 1974-1979 (Gross Sales: 1981). While the majority of the listings were complete enough for use, the lodging categories were severely under-reported due to "disclosure," that is, not reported because the number of places was so small that it might disclose activity in an identifiable business. Therefore, another request was made; for hotel tax purposes, more complete data were available from the Miscellaneous Tax Division, Comptroller of Public Accounts (Hotel Gross Sales: 1981). These data were limited to the years 1976-79.

Because of erratic reporting of data for many minor SIC code categories, the final reporting would include only the following: SIC 554, gasoline service stations; and SIC 581, food and drinking places and lodging facilities. The equivalent of 701-703, hotels, motels, and lodging places, were reported in the hotel taxable figures mentioned above.

In Appendix B is a sample of the work sheets used for calculating tourism baseline data. The gross receipts for gas service stations, food and beverage places, and lodging places for each county, for each quarter, were posted on these work sheets.

Annual data on tourist expenditures were obtained from the SDHPT. These are statewide data, not broken down into the county level. Data on bus, air, and rail travel were collected, but could not be used because they are not broken down by category of expenditure. No data are provided on in-state tourism. As a result of these constraints, only the data on out-of-state automobile visitors to Texas could be used. Table 3 shows the tourist expenditures on food and automotive for 1970 through 1979. (Expenditures on lodgings were not calculated because they were taken directly from the hotel taxable receipts information at the county level.)

Based upon Kahn's model, a ratio between total state tourism expenditures and the gross receipts for automotive and food was developed. Because tourism expenditure data from SDHPT are kept only on an annual basis, a ratio for each year was prepared and applied quarterly. For example, for Harris county for 1974, the following shows the calculation of the ratio:

$$\frac{\text{1974 travel expenditures on automotive (total state)}}{\text{1974 gross receipts, gasoline service stations (total state)}} = \frac{502{,}030{,}420}{4{,}429{,}512{,}167} = .1135$$

Table 3.

TOTAL STATE TOURISM EXPENDITURES, 1970-1979

	Total	%	Automotive	%	Food
1970	$ 976,134,000	23	$ 224,510,820	27	$ 263,556,180
1971	1,305,367,000	22	287,180,720	25	326,341,750
1972	1,588,984,000	20	317,796,800	24	381,356,160
1973	1,500,665,000	22	330,146,300	26	390,172,900
1974	2,186,654,000	23	502,930,420	24	524,796,960
1975	2,851,489,000	22	627,327,580	26	741,387,140
1976	3,163,529,000	23	727,611,670	25	790,882,250
1977	3,520,017,000	21	739,203,570	26	915,204,420
1978	3,313,054,000	21	695,741,340	26	861,394,040
1979	3,563,261,000	29	1,033,345,600	25	890,814,020

(SDHPT: 1970-80).

Tables 4 and 5 illustrate the ratios prepared for automotive and food tourism for the years 1974-79.

TOURISM ATTRIBUTION

The ratios, obtained for each year for automotive and food sectors, were multiplied by the gross receipts in each of these sectors to produce the estimated amounts of activity attributable to tourism. Using the work sheets, this amount was calculated for all counties of the coast for each quarter and for the years 1976-79. The lodging activity was posted directly on the assumption that even though some hotel business is local (food, meetings), these amounts could not be isolated and do not affect the general relationships significantly. The time series was limited to the 1976-79 span because lodging data were unavailable before 1976.

The results of the above calculations were first determined for each county each quarter and for the years 1976-79. Then, by aggregating this information, totals for the subregions were obtained and are displayed in Tables 6-9 and Figures 12-16.

III. OIL SPILL IMPACT

In assessing possible impacts from the oil spills, the secondary data described above provided the foundation. The tourist activity for the separate subregions and for each business sector of tourism is displayed in Tables 6-9 and Figures 12-16. These were studied for clues to variations, especially those that might be attributable to the spills. In addition, some very enlightening interviews were obtained from managers of businesses along the Gulf coast. But, these pieces of information must be placed in proper perspective of tourist activity generally in the United States during these troublesome years.

TEXAS COAST TOURISM IN PERSPECTIVE IN 1979

Ever since the oil embargo of 1973-74, United States travel and tourism never fully stabilized again. In contrast to a rather steady increase in travel before, in all modes of transportation and in most all regions of the United States, the country entered a period of irregularity and uncertainty that is continuing today. At no time in previous history had travel been upset by so much nervousness and confusion. Among the events were the following:

In 1978, talk of air deregulation culminated in its reality, changing dramatically the posture of airline travel as compared with automobile. Several gas rationing contingency

Table 4.

TOURISM PROPORTION OF TOTAL AUTOMOTIVE BUSINESS ACTIVITY

Year	Automotive Expenditures*	Gross Receipts**	Ratio
1974	$ 502,930,420	$ 4,429,512,167	.1135
1975	627,327,580	4,991,858,869	.1256
1976	727,611,670	5,570,681,442	.1306
1977	739,203,570	5,761,838,868	.1283
1978	695,741,340	5,655,749,697	.1230
1979	1,033,345,600	7,252,763,227	.1425

*SDHPT

**Texas Comptroller of Public Accounts

Table 5.

TOURISM PROPORTION OF TOTAL FOOD AND BEVERAGE ACTIVITY

Year	Food Expenditures*	Gross Receipts**	Ratio
1974	$ 524,796,960	$ 2,254,677,980	.2328
1975	741,387,140	2,748,897,178	.2699
1976	790,882,250	3,312,439,429	.2388
1977	915,204,420	3,885,520,191	.2355
1978	861,394,040	4,526,208,809	.1903
1979	890,814,020	5,200,640,723	.1713

* **From Table 4**

**Texas Comptroller of Public Accounts

Table 6.

TOURISM EXPENDITURES, BY SUBREGION, 1976

(in dollars)

Sub-region	Quarter	Automotive	Food	Lodging	Total
1	1	$ 2,441,790	$ 4,454,721	$ 2,150,561	
	2	2,674,688	5,343,084	2,386,030	
	3	2,632,729	4,947,061	2,505,952	
	4	3,478,008	5,090,461	2,310,232	
		11,227,215	19,835,327	9,352,775	$ 40,415,317
2	1	88,922,572	44,666,949	27,377,862	
	2	77,579,397	47,529,452	33,606,233	
	3	78,403,025	48,997,868	33,570,056	
	4	76,033,111	48,015,578	29,208,923	
		320,938,105	189,209,847	123,763,074	633,911,026
3	1	1,205,439	2,229,902	1,109,837	
	2	1,414,136	2,449,272	1,147,992	
	3	1,502,422	2,532,683	1,434,428	
	4	1,441,000	2,345,068	1,162,693	
		5,562,997	9,556,925	4,854,880	19,974,802
4	1	3,446,142	4,940,570	3,542,965	
	2	4,368,753	5,581,845	5,255,713	
	3	4,439,393	5,771,611	6,853,785	
	4	4,045,673	5,298,391	3,293,507	
		16,299,961	21,582,417	18,945,970	56,828,348
5	1	993,474	2,552,998	4,039,806	
	2	1,003,791	2,448,794	3,876,506	
	3	921,775	2,436,944	4,766,719	
	4	1,197,733	2,344,112	2,045,228	
		4,116,773	9,782,848	14,728,259	28,627,880

Table 7.

TOURISM EXPENDITURES, BY SUBREGION,1977

(in dollars)

Sub-region	Quarter	Automotive	Food	Lodging	Total
1	1	$ 2,628,480	$ 5,033,172	$ 2,540,556	
	2	3,185,152	5,619,396	2,710,834	
	3	3,078,400	5,776,572	2,698,965	
	4	3,172,352	6,307,100	2,564,341	
		12,064,384	22,736,240	10,514,696	$ 45,315,320
2	1	76,635,392	48,290,556	34,805,944	
	2	90,511,104	56,741,952	38,687,808	
	3	66,253,568	56,246,588	40,227,862	
	4	73,377,920	58,350,056	34,853,390	
		306,777,984	219,629,152	148,575,004	674,982,140
3	1	1,268,352	2,360,472	1,233,268	
	2	1,494,144	2,649,336	1,423,421	
	3	1,618,176	2,813,592	1,446,367	
	4	1,644,032	2,651,124	1,409,780	
		6,024,704	10,474,524	5,512,836	22,012,064
4	1	3,868,672	5,483,460	3,816,778	
	2	4,409,088	6,262,260	5,799,132	
	3	5,278,976	6,538,616	7,285,278	
	4	4,893,568	6,214,084	3,816,148	
		18,450,304	24,498,420	20,717,336	63,666,060
5	1	969,728	2,743,264	4,039,678	
	2	946,432	2,566,264	3,869,954	
	3	1,510,528	2,673,408	5,193,259	
	4	1,812,096	2,751,996	2,884,866	
		5,238,784	10,734,932	15,987,757	31,961,473

Table 8

TOURISM EXPENDITURES, BY SUBREGION, 1978
(in dollars)

Sub-region	Quarter	Automotive	Food	Lodging	Total
1	1	$ 2,657,538	$ 4,674,190	$ 3,002,592	
	2	2,791,731	5,095,610	3,064,030	
	3	3,103,044	5,228,840	3,351,645	
	4	3,807,465	5,741,990	3,834,390	
		12,359,778	20,800,630	13,252,657	$ 46,413,065
2	1	61,646,124	48,537,400	45,691,624	
	2	56,811,855	48,567,610	50,563,771	
	3	75,200,824	56,142,910	50,436,616	
	4	68,811,243	54,374,960	42,984,430	
		262,470,046	207,622,880	189,676,441	659,769,367
3	1	1,463,331	2,066,440	1,605,803	
	2	1,572,309	2,420,600	1,703,445	
	3	1,760,991	2,559,490	2,027,266	
	4	1,738,097	2,596,350	1,691,084	
		6,535,728	9,642,880	7,027,598	23,206,206
4	1	4,676,706	5,304,230	4,477,722	
	2	4,489,746	5,917,740	7,151,699	
	3	4,881,009	6,511,490	8,682,724	
	4	5,082,114	5,738,000	4,538,125	
		19,129,575	23,471,460	24,850,270	67,451,305
5	1	1,686,575	2,622,380	5,567,054	
	2	1,624,338	2,366,450	4,931,722	
	3	1,652,382	2,557,020	8,902,169	
	4	1,604,780	2,572,980	3,526,310	
		6,568,075	10,118,830	22,927,255	39,614,160

Table 9

TOURISM EXPENDITURES, BY SUBREGION, 1979
(in dollars)

Subregion	Quarter	Automotive	Food	Lodging	Total
1	1	$ 3,346,057	$ 4,721,994	$ 3,458,167	
	2	4,023,877	5,155,137	3,738,870	
	3	4,822,675	5,145,732	3,785,096	
	4	5,595,876	5,494,572	3,816,478	
		17,788,485	20,517,435	14,798,611	$ 53,104,531
2	1	78,715,494	51,625,242	45,249,576	
	2	83,686,740	54,211,617	57,673,623	
	3	122,786,378	57,030,210	58,339,557	
	4	119,414,724	56,812,869	54,404,765	
		404,603,336	219,812,869	215,667,521	839,950,795
3	1	1,935,934	2,260,962	1,999,750	
	2	2,370,940	2,582,613	2,146,173	
	3	2,521,662	2,696,157	2,300,548	
	4	2,976,400	2,573,379	2,043,625	
		9,804,936	10,113,111	8,490,096	28,408,143
4	1	5,468,606	4,885,526	5,950,172	
	2	5,911,334	6,116,841	8,349,406	
	3	6,378,229	6,340,167	9,530,058	
	4	6,965,244	5,699,772	5,029,825	
		24,723,413	23,042,306	28,859,461	76,625,180
5	1	2,087,657	2,705,220	6,137,241	
	2	2,656,035	2,646,527	5,924,402	
	3	2,394,964	2,626,560	6,637,046	
	4	3,148,860	2,621,943	3,104,436	
		10,287,516	10,600,250	21,803,125	42,690,891

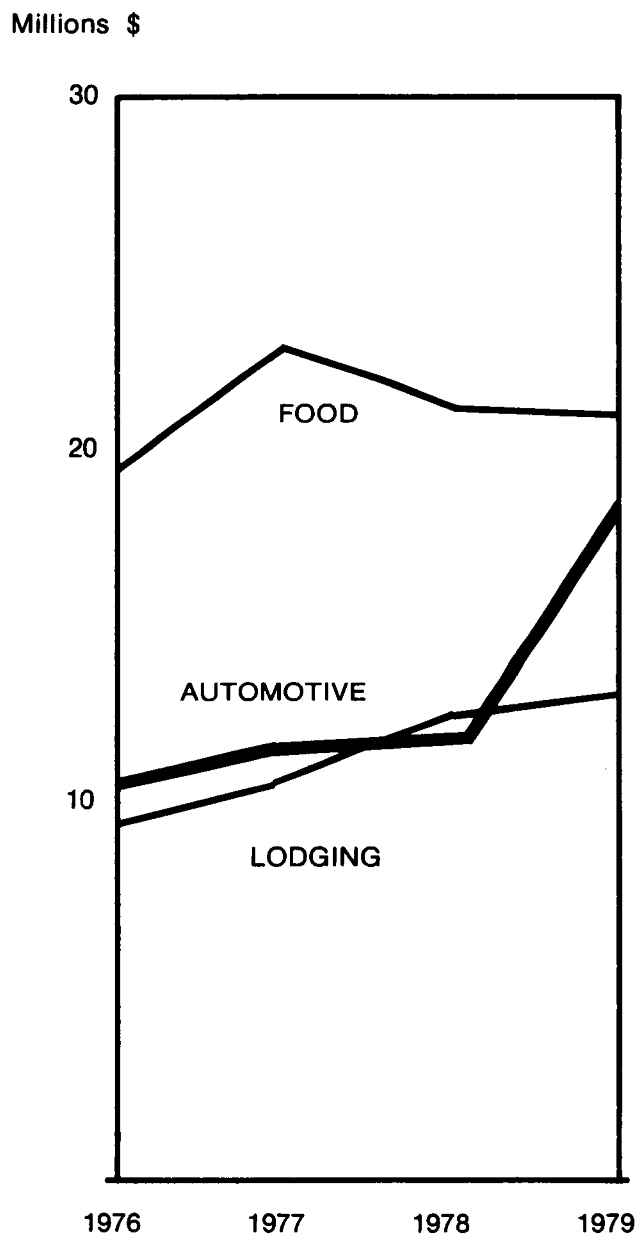


Figure 12

Estimated Tourism Activity
for 1979, Subregion 1

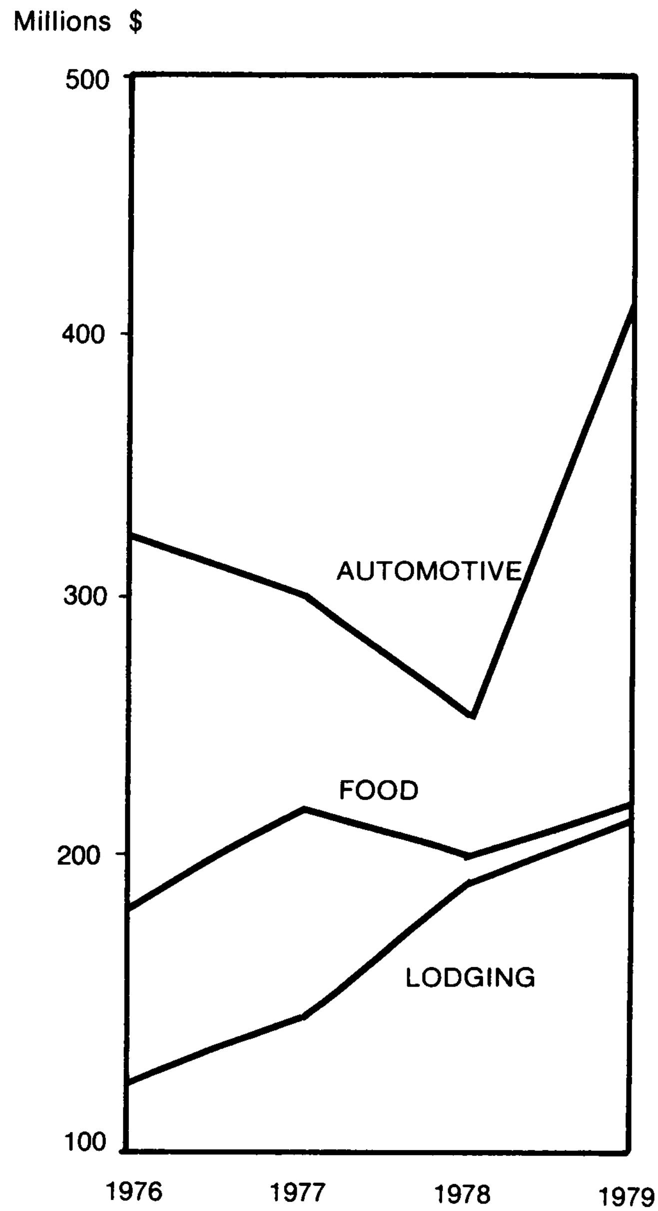


Figure 13

Estimated Tourism Activity
for 1979, Subregion 2

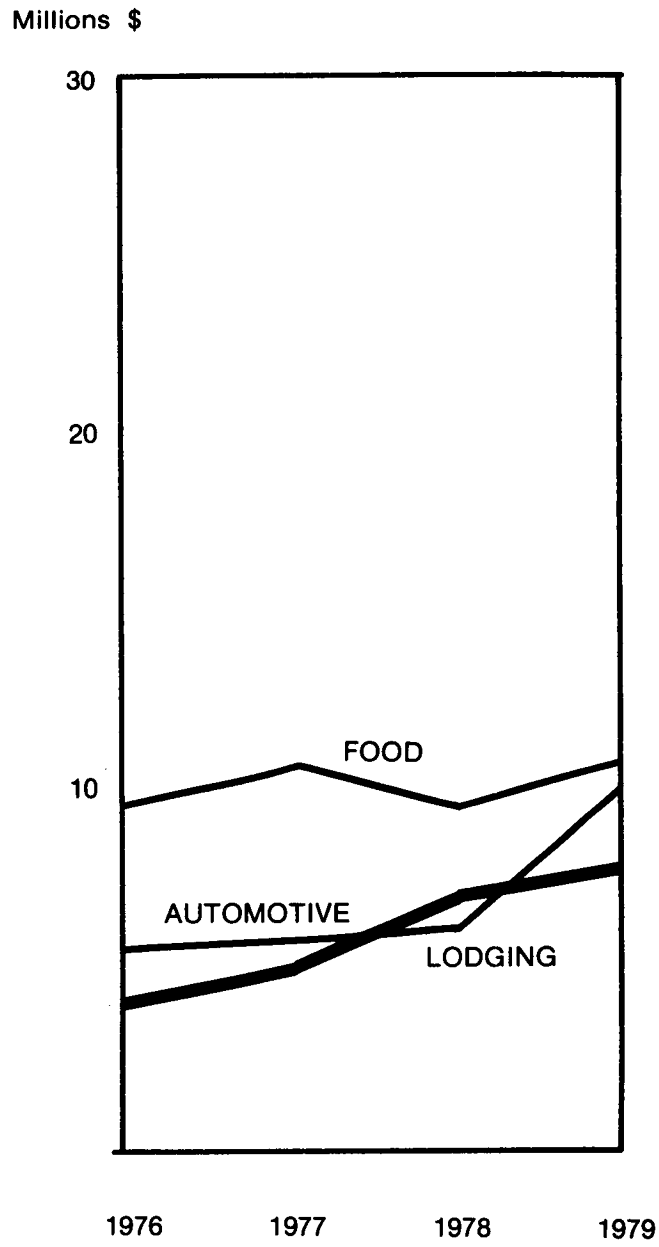


Figure 14

Estimated Tourism Activity
for 1979, Subregion 3

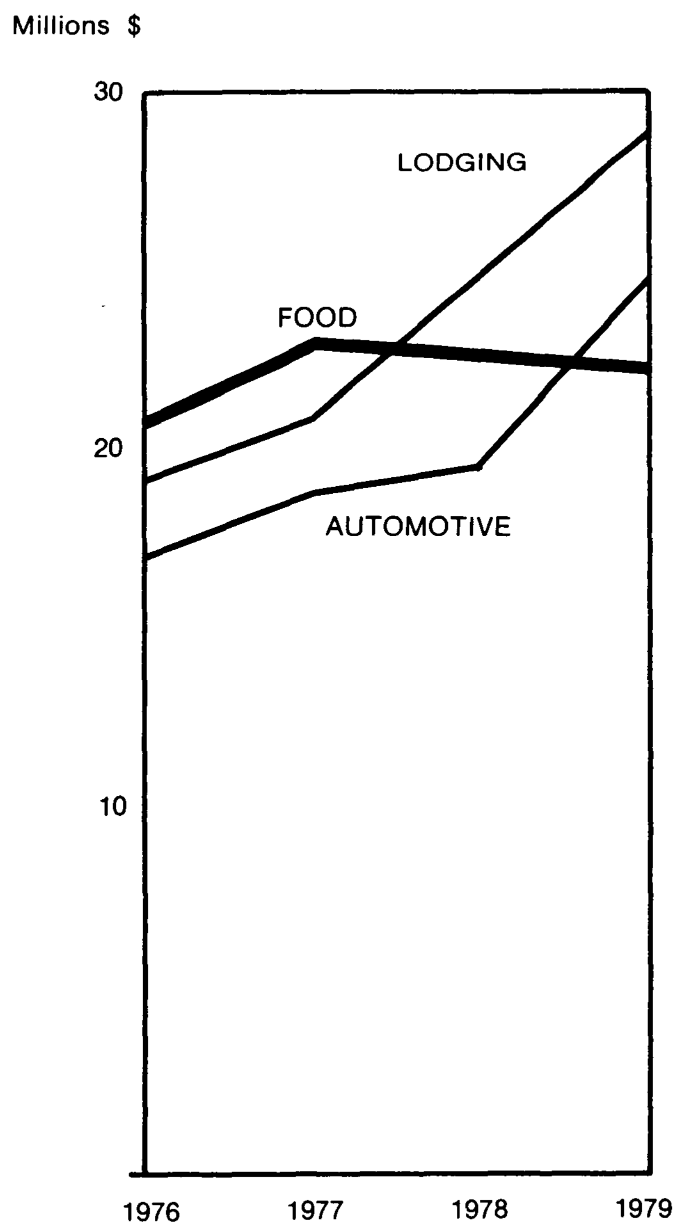


Figure 15

Estimated Tourism Activity
for 1979, Subregion 4

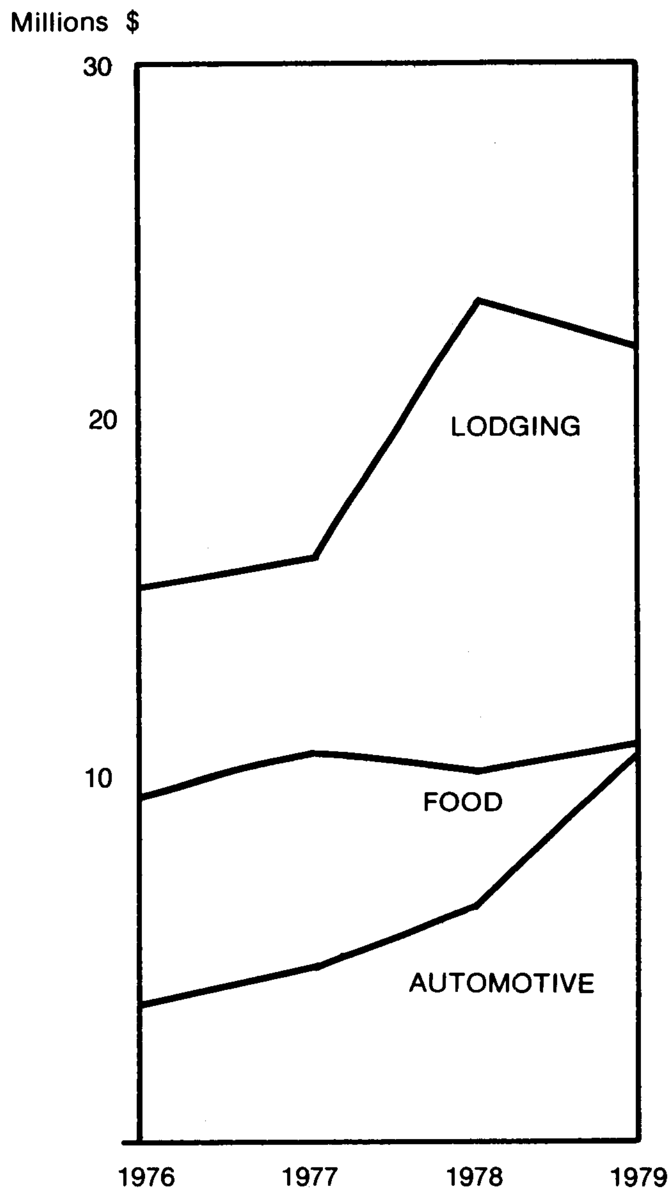


Figure 16

Estimated Tourism Activity
for 1979, Subregion 5

plans were under consideration by government agencies. One proposed a complete shutdown of all "recreation" travel on weekends. A 5-year energy plan was enacted in 1978, which proposed a tax on gas-guzzling cars, a shift from oil to coal in industries and power plants, and implementation of strong conservation measures. The awareness of gasoline problems increased greatly in intensity, dampening personal and business travel throughout the country. For a time, airplane fuel was more readily available, and air travel increased; and nationally, automobile travel dropped 12.5 percent in the first six months of 1979. Automobile travel dropped even below 1978 levels in May, the beginning of gas lines.

A special travel employment impact survey by the U. S. Travel Data Center (Frechtling: 1980) shows that, because of government policy in 1979, the heaviest burden of petroleum cutback was on the gasoline user--twice that of all other petroleum users, especially in the second and third quarters of 1979. By July 1979, gasoline supply had dropped 9.6 percent, and by December, it was down to 10.1 percent below 1978 levels. This forced a severe drop in travel that not only cut tourist business revenues, but in fact, caused layoffs, although the drop was not as severe in Texas as elsewhere. Compared with other regions of the United States, with a ratio of 211 persons per 100 businesses (New York and New Jersey), the southwest region (Missouri, Oklahoma, Arkansas, Arizona, New Mexico, and Texas) laid off 36 persons per 100 establishments.

These sporadic events provide some insight into the changing patterns of tourism during the same period covered by this study. This condition is reviewed to emphasize the difficulty of isolating individual variables, such as an oil spill.

REGIONAL ACTIVITY, 1976-79

A review of Figures 12-16 shows some strong regularities. For example, the curves for tourist activity in the food category (restaurants and drinking places) are remarkably similar for all subregions. The automotive (gasoline station) activity is reasonably consistent except for a dip in 1978 in Subregion II. The general rise from 1978 to 1979 for automotive is in actuality a drop in volume because of the dramatic increase in price (35.4%, 1979 over 1978). Review of the lodging (hotels, motels) tourism category shows a rather consistent pattern (although the slopes vary) with the exception of Subregion V, which included South Padre Island where the most severe impact of the IXTOC I oil spill was located. This is the only graph (Figure 16) that shows a drop from 1978 to 1979. This drop led the researchers to a conclusion that something unusual, probably the oil spill, had an impact in this region. However, one should not literally extrapolate this drop because it is not known whether some other circumstance actually pushed 1978 upward enough to exaggerate the drop in 1979. Another point should be made regarding a contamination inherent in the model, which may under-represent changes in food and automotive as compared with lodging. This is due to the fact that tourism gross receipts activity is a smaller proportion of total food and automotive than it is of lodging. Even though the tourism attribution is intended to show only the tourism segment, the model ratios varied; e.g., for 1979--automotive, .14; food, .17; lodging, 1.0. Therefore, these representations (Tables 6-9, Figures 12-16) do not conclusively provide direct evidence, but do raise questions about the Subregion V tourist activity.

EXPERIENTIAL INFORMATION

Even though the terms of reference for this project did not provide for conducting interviews along the coast, the researchers believed that this was essential. Therefore, for tourism, managers of 38 businesses and tourism agencies were interviewed. These interviews provided first-hand experience of those who had lived through the oil spill events. Some revealing information was obtained from this portion of the study. This information could be grouped into general and specific categories.

General Information

The estimation of impacts throughout the coast was not always consistent, apparently influenced by many variables. The inconsistent policy on allocation of gasoline to the various parts of the coast during this period influenced travel greatly and unevenly. In the Brownsville area, it was reported that the value of the peso dropped, depressing the number of visitors through that area in 1979. Generally, those areas closest to the beach were affected by the oil spill, and some businesses reported considerable loss of tourist activity. Some indicated that the shortages of water on South Padre Island had an even greater impact than the oil spill. The depressed business along the beach in this area was reported to have stimulated better business inland. One lodging business in Brownsville reported better business during the period as a reaction to the bad publicity and higher prices on the beach.

The central and upper reaches of the coast reported that their tourism was more dependent upon oil production and general industry than upon beach recreation. Therefore, they did not feel an impact of either oil spill.

Several respondents emphasized that where there was impact, it was particularly serious because of the timing--coming right within their peak tourist business period. In other words, any impact occurring during the summer months would influence business more than other times of the year.

Many respondents emphasized that, in their opinion, the exaggerated publicity accompanying the IXTOC I oil spill was far more serious than the actual oil tar on the beach. From Corpus Christi came the comment that tourism could be rebuilt more easily following a hurricane than after distorted publicity. Several indicated that the oil on the beach occurred at only a few specific locations and for only short periods; whereas, the publicity was more widespread and endured for a longer time.

Some evidence, although minor, was reported as to an increase in tourism resulting from the press and governmental agencies sending visitors to the area during the IXTOC I oil spill.

Several interviewees expressed more concern over the lost opportunities due to the adverse publicity that indicated oil would despoil the beach in August, which it did not. They believe that there would have been much less impact if only actual oil tar had occurred. The publicity greatly exaggerated the problem. One person stated that the press came to the Gulf coast seeking a disaster, but finding none, went to Mexico to take pictures of oil coming ashore and implied that the area was South Padre, Texas. On South Padre Island, it was reported that, even when oil slick did arrive on the beaches much after the peak of the season, it caused inconvenience for only two weeks.

Oil on beaches apparently is not a new phenomenon associated only with the two major events of concern in this project. Several long-time natives of the coastal region reported that oil-tar balls have been appearing on beaches since the discovery of the coast and were due mostly to natural seeps in the Gulf of Mexico. A survey of Galveston tourist beach users prior to these oil spills showed that 4.7 percent checked "tar on the beaches" among things disliked.

From one seasoned operator of several tourist businesses on the Texas Gulf coast came a philosophical approach to operating business there. He reported that oil spills, hurricanes, and other problems affecting business on a coast should be accepted by business as normal risks.

Specific Information

It was determined that there was no discernible impact on tourism from the sinking of the BURMAH AGATE. The subregion, most likely to be impacted, reported that the gasoline lines and subsequent price rise had an effect but was counteracted by a general increase of economic activity. One motel reported increases of business because of high prices and poor economy in the North. Travelers from the North increased in numbers and traveled through Subregion I for access to the lower areas of the Texas Gulf coast.

The interviews and other sources indicated losses of from 40 to 60 percent of usual business in August 1979 for the South Padre area. A few businesses reported as much as 80 percent loss, and some reported no losses at all. In one survey of 151 businesses (mostly tourist-oriented) in South Padre area, 112 (74 percent) reported a business drop from 20 to 80 percent during their peak periods of August through October 1979. In October four businesses were forced to close.

Documents obtained from the area that seemed to have the greatest impact are located in Appendix C. The "Joint Statement from Port Isabel-South Padre Island Chamber of Commerce and Port Isabel Merchants Association," December 6, 1979, contains data on local impressions of the IXTOC I oil spill. A statement of losses in room sales, prepared by Hilton Sea Island, was submitted to the mayor of South Padre Island, September 7, 1979. Harvey Courts and Marina, Port Isabel, prepared a statement of losses, and White Sands Motor Lodge and Marina presented its information on losses.

DERIVATION OF IMPACT

Among the documents describing the oil spill impact on the South Padre Island area was the report of a local survey taken within the area following the IXTOC I incident. (Appendix C) This survey reported a varying percentage impact (loss of business) for tourist-related businesses.

Inasmuch as the results in this survey were substantiated by the interviews, it seemed appropriate to use the data as a foundation for estimating overall impact. Furthermore, it appeared that the results were representative of the total number of businesses in the area in that the sample was large. A number of steps were used to calculate an estimated impact.

1. Because the apparent concentration of the impact was on South Padre Island area, it was necessary to break down the data of Subregion V, and especially Cameron County. Contact with the South Padre Island Chamber of Commerce (Communication with Ralph Thompson, October 20, 1981) indicated that the South Padre Island area represents approximately 25 percent of all tourism activity in Cameron County. (Table 10)

2. One part of the survey data (Appendix C) is based on August decreases in business. However, the survey was repeated in October, and indicated decreases nearly as serious as those encountered in August. The interviews, together with the surveys, provided the researchers sufficient evidence to assume that the decreases affected an estimated 50 percent of the total tourist business in the South Padre Island area for the year.

Table 10

Actual 1979 Tourism Activity

SECTOR	SUBREGION 5	CAMERON COUNTY	S. PADRE I. AREA
Automotive	$10,287,516	$9,820,911	$2,455,228
Food	10,600,250	10,244,268	2,561,067
Lodging	21,803,125	21,582,889	5,395,722

3. From these survey and interview data, together with the above assumptions, calculations for estimated impacts were developed as shown in Tables 11, 12, and 13. Given the time that the oil spills occurred, it can be assumed that South Padre Island businesses were affected during one-half of the calendar year, yielding the following percentage impacts:

Automotive	53.5/2 = 27 percent
Food	62.0/2 = 31 percent
Lodging	49.5/2 = 25 percent

4. When these percentage losses are applied to the South Padre Island area estimates for total tourism activity, the result is approximately $3.8 million. (Table 14). Because of the nature of the tourism data used throughout this study, it would appear that a tolerance of +/- 5 percent should be applied to these estimates. This would place the losses in the South Padre Island area from a low estimate of $3.6 million to a high estimate of $4.0 million.

5. Converted to the entire Subregion V, this results in the following estimates:

Decrease Due to Oil Spill

	Low Estimate	High Estimate
Automotive	7.7 percent	8.5 percent
Food	9.3	10.2
Lodging	7.3	8.0

During the progress of the study, an attempt was made to develop mathematical projections of 1979 levels of business activity for tourism based upon the levels of 1976 through 1978. These calculations were made; however, the limited number of years available as a base and the erratic performance during those years did not provide definitive results. The band of the projection was so wide that it did not appear to be meaningful. It did show, however, some indication that there was an unusual change in Subregion V.

IMPACTS ON EMPLOYMENT AND INCOMES

Information on the impact of the oil spills on employment and incomes from tourism is not included because of the lack of basic data. The Texas Employment Commission was willing to supply data for only two years, which was insufficient to provide a base for calculating trends. Furthermore, the data for the two years severely under-represented employment in these businesses, most of which are small with owner and family management, and were not revealed in wage earner data. Even the number of businesses was under-represented by as much as

Table 11.

ESTIMATED AUGUST 1979 DECREASE OF TOURISM LODGING
SOUTH PADRE ISLAND AREA

Average Percent Decrease	Survey Number	Percent	Estimated Number in Area	Percent x Number
5	0	0	0	0
15	1	4	1	15
25	1	4	1	25
35	8	31	9	315
45	3	12	4	180
55	6	23	7	385
65	2	7	2	130
75	4	15	4	300
85	1	4	1	85
95	0	0	0	0
T	26	100	29	Av. 49.5% Decrease

Table 12.

ESTIMATED AUGUST 1979 DECREASE OF TOURISM FOOD
SOUTH PADRE ISLAND AREA

Average Percent Decrease	Survey Number	Percent	Estimated Number in Area	Percent x Number
5	0	0	0	0
15	1	8	12	180
25	0	0	0	0
35	0	0	0	0
45	0	0	0	0
55	2	17	25	1375
65	6	50	72	4680
75	3	25	36	2700
85	0	0	0	0
95	0	0	0	0
	12	100	144	Av. 62.0% Decrease

Table 13.

ESTIMATED AUGUST 1979 DECREASE OF TOURISM AUTOMOTIVE*
SOUTH PADRE ISLAND AREA

Average Percent Decrease	Survey Number	Percent	Estimated Number in Area	Percent x Number
5	1	8	3	15
15	0	0	0	0
25	0	0	0	0
35	1	8	3	105
45	3	25	11	495
55	2	17	7	385
65	3	25	11	715
75	1	8	3	225
85	1	8	3	255
95	0	0	0	0
	12	99	41	Av. 53.5% Decrease

*Based on assumption that 1/3 of the reported "Miscellaneous" businesses were gasoline service stations.

Table 14

SOUTH PADRE ISLAND AREA
ESTIMATED DECREASES IN TOURISM ACTIVITY
DUE TO IXTOC I OIL SPILL

Sector	Est. 1979 without decrease	Est. decrease %	Est. Decrease	+5%	-5%
Automotive	$3,363,326	-27	$908,098	$953,503	$862,693
Food	$3,711,691	-31	$1,150,624	$1,208,156	$1,093,094
Lodging	$7,194,296	-25	$1,798,574	$1,888,503	$1,708,645
	$14,269,313		$3,857,296	$4,050,161	$3,664,431

100 percent.

SUBSTITUTION EFFECTS

Throughout the investigation, true substitution effects within tourism were not discernible, largely due to the relatively insignificant impact of the oil spills on overall tourism in the entire region. In perspective, the travel jitters, due to gasoline problems and escalating prices, seemed to be of much greater concern to tourists when making decisions about travel. Tourist travel to the coast may have been changed elsewhere because of adverse publicity and gasoline lines, particularly in the Houston area; however, there is no specific evidence to indicate that fact. A small amount of substitution existed in Subregion V with evidence that one motel in Harlingen replaced lodging closer to the beach during the peak of the oil spill publicity. Overall, substitution of tourism activity was of little significance.

POSITIVE IMPACT

This investigation revealed very little in the way of positive impacts on tourism from the oil spills. The only discernible impact was the occasional increase in lodging in areas away from the beach, observed only in Subregion V. A few reports in Harlingen indicated that visitors opted to stay there rather than the beach area when they learned of the IXTOC I oil spill threat. Any such impacts, however, were not quantifiable and were masked by other fluctuations in tourism activity.

NEGATIVE IMPACTS

This research effort resulted in two major conclusions regarding negative impact of the oil spills on tourism:

1. There was no apparent negative impact upon tourism in any subregion as a result of the BURMAH AGATE sinking. This does not imply that no tourism business was negatively affected, especially near the beach. Rather, when evaluated on a subregional basis, there was no total negative impact.

2. Impact of the IXTOC I oil spill was estimated as a decrease of tourist activity in Subregion V of approximately the following:

Automotive	8 to 9 percent	($ 863,000 to $ 954,000)
Food	9 to 10 percent	($1,093,000 to $1,208,000)
Lodging	7 to 8 percent	($1,709,000 to $1,889,000)
		3,665,000

Of equal, and perhaps even greater importance, was the negative indirect impact (see Appendix D). This research, especially the interviews, indicates that tourism was most greatly impacted, not only in Subregion V but throughout the Gulf coast in 1979, by the lost opportunities due to the adverse publicity accompanying the two oil spills, particularly that of the IXTOC I oil spill. While this is not quantified, it is supported by the interview testimony. One tourism leader capsuled this opinion by comparing the oil spills with hurricanes, another type of disaster impacting tourism. In his opinion, the hurricane is a much more definable occurrence with easier opportunities for remedy. Adverse publicity multiplies rapidly by word of mouth, the most important influence of tourist information, and is far more difficult to overcome. While tourists from Texas who are not interested in beach activities may ignore such publicity, others who have little other dependable information foundations may have been completely discouraged from coming to Texas and opted for another coastal state.

FUTURE RESEARCH NEEDS

Although not required by the terms of reference, another finding of great importance to this study and to future tourism studies is the general lack of sound models and adequate monitoring of tourism activity. Not until baseline information is of better quality can any impact on tourism be determined in the future. At present, estimates are built upon estimates, which of themselves are not based on sound or regular research. For Texas, it appears that the following improvements in tourism data are needed if better understandings of tourism or future impacts on tourism are to be determined:

1. Regular annual surveys of tourists (domestic and out-of-state) are needed to determine expenditure patterns (a) within separate regions of Texas; (b) by tourist classes; (c) by SIC code business categories; (d) by travel objective; (e) by origin; and (f) by quarter, to reflect seasonal differences.

2. A model of tourist activity monitoring should be developed for Texas and implemented on a regular basis by some agency of state government.

3. Regular annual inventories of the tourism supply should be made, classified by SIC codes. Present monitoring and data dissemination are inadequate, data are under-reported, and extremely difficult to obtain.

4. Any model for tourism activity should include regular measurement of employment, payroll, and taxes generated by travel.

5. Stricter definitions of tourism and recreation should be made to avoid the dilemma presented by the terms of reference for this study. Tourism includes many recreational items that should be included in tourism statistics.

CHAPTER IV

RECREATION

CHAPTER IV. RECREATION

I. INTRODUCTION

The objective of this report was to study the recreation services sector in a 19-county study area to assess the extent of impacts, if any, of the IXTOC I and BURMAH AGATE oil spills in 1979. The report is divided into three sections: (1) a background for coastal recreation, a rationale for studying spill impacts, procedures and assumptions and limitations; (2) data and information relative to recreation activity during the pre-spill (1974-1978) baseline period; and (3) a quantification of impacts associated with the two spills as well as a qualitative review of impact examples, discussion of the role of the media, and a review of future research needs.

COASTAL RECREATION BACKGROUND

Recreation is generally regarded as one of the largest and fastest growing coastal activities. Previous studies by the U.S. Heritage Conservation and Recreation Service (1979) show that water-based recreation activities, particularly those which require little investment or equipment, are among the most popular. This popularity, with the trend towards population concentration in the coastal margin, means an increasing demand for coastal recreation resources and services. Today, people are beaching, fishing, and boating more than ever before, creating crowding for others and overuse pressures on natural resources and man-made facilities. The demand for coastal recreation has grown rapidly as trends towards more leisure, discretionary income, and mobility enable larger segments of the population to seek recreation activity of all types.

Although the provision of coastal recreation resources and experiences is viewed by many to be a public responsibility, the private sector is also involved in providing the necessary man-made resource developments to lure visitors to the coastal region. The resultant public and private recreation resources or attractions, as Gunn (1979) refers to them, provide the necessary "energizing power" for a variety of other primarily private sector tourism components. To make this point relative to South Padre Island, both the beaches and the air conditioned hotel accommodations are primary components of the island's tourism and recreation activity. Without these components, other public and private investments may be meaningless. As Gunn suggests, tourism should be viewed as a functional system rather than a series of mutually exclusive and unrelated units. Recreation resources (public and private) and the opportunities they provide are a part of this functional system. To predict the extent to which various coastal areas are used for recreation, a look beyond the quantity and quality of natural resources available is needed in order to understand the spatial relationships of the area to adjacent urban populations; for example, coastal areas like Galveston and Corpus Christi-Padre Island, that are adjacent or within two to four hours of major urban areas, are the most heavily used recreation areas on the Texas coast.

Further, most coastal recreation activity takes place at or near the water's edge on the dry and wet sand or in the near-shore area. Most of the intrastructure development takes place on the shorelands in the immediate area, and to a lesser extent as one moves inland. Therefore, the coast as a recreation resource can be viewed as a narrow ribbon or band in which coastal recreation activity and investment are not equally distributed. In other words, identifiable centers of coastal recreation activity and investment are utilized to a much greater extent than other areas on the same coast.

COASTAL RECREATION IN A MULTIPLE-USE SETTING

Coastal recreation activity does not occur in a vacuum. Numerous constraints and moderating factors must be taken into account. Two major problem areas include the constraints posed by other coastal and marine uses that impact, or have the potential to impact on recreation activity and the privately owned coastal shorelines (dry sand) that are not accessible to the public. Because there are no boundaries around coastal waters used for recreation, it is a continuing challenge to mix recreation with other coastal and marine uses within a multiple-use framework. This challenge requires recreation resource planners to know something about other uses and their actual or potential impact on recreation values. Impacts of other coastal uses are of two types: direct and indirect. A direct impact, for example, would result from cargo handling and port areas that traditionally restrict access to large areas of the coast. Indirect impacts would involve community or industrial discharges rendering water quality unfit for some recreational activities. Indirect impacts on recreational uses may be difficult to assess until reduced visitation and local spending associated with recreation are identified.

Another significant issue involves the extent of public access to coastal shorelands. In the continental United States, less than 2 percent of the total coastal shoreline is in public ownership. In Texas, the Open Beaches Act establishes a presumption of the public's right to free and unrestricted access to state-owned beaches bordering on the seaward shore of the Gulf of Mexico and to areas extending to the line of vegetation bordering the Gulf, where the public has acquired a right of use or easement (Texas Natural Resources Code, Sec. 61.011 et seq.). In addition to the "wet sand" already owned by the State of Texas, the Texas Open Beaches Act directs state and local governments to protect any public easements over privately owned "dry sand" beaches as well.

Because of the Texas Open Beaches Act and the availability of public parks, recreational access on the coast is presently adequate (Texas Energy and Natural Resources Advisory Council, 1980).

Recreational uses of the State of Texas beaches and shorefront areas include swimming, boating, picnicking, fishing, beachcombing, surfing, temporary camping, and licensed mobile beach businesses. Specific data as may be available are provided in the baseline section of this report (Section II). Unfortunately, data relative to coastal recreational activity are not widely available and certainly are not available on a quarterly basis as suggested in the project specifications for this study. Although a series of surveys have been made relative to recreational activity in the coastal zone, they are usually designed for purposes other than an oil spill assessment in a particular area and, therefore, often have limitations that cannot be overcome. Some of these limitations are discussed in the baseline section of this report.

PREVIOUS OIL SPILLS AND DAMAGE ASSESSMENTS

The fact that the Gulf Coast is a critical recreation resource for Texas residents, as well as residents of the various plains states, is reason enough to be concerned with other resource uses that may impact on the area's recreational values. There is also a basis for concern when 20 to 30 percent of all oil spills in the United States occur in the Gulf of Mexico region (Moe 1979). However, nobody could prepare for the two major oil spills that would impact like a one-two punch on the Texas coast in 1979. At 0030 hours on June 3, 1979, the exploratory well IXTOC I located in the Bay of Campeche, approximately 43 nautical miles northwest of Ciudad del Carmen, Mexico, suffered an uncontrolled oil well blowout, which produced the world's largest oil spill to date--a daily loss of 1.3 million gallons of light crude. The oil came ashore in Texas at South Padre Island on August 7, 1979, and it was ultimately estimated that more than 130 million barrels of oil spilled in the Gulf (Texas House of Representatives Committee on Environmental Affairs 1980). As impacts of IXTOC I continued to be felt on the Texas coast, a collision of the Liberian-registered tanker (BURMAH AGATE) and the Liberian freighter (MIMOSA) on November 1, 1979, produced the largest oil spill in United States' waters for the year. Approximately 62,000 barrels of oil were released unburned in the water. Table 15 provides the chronological events regarding the two spills on the Texas coast.

Before the oil stopped flowing into the Gulf of Mexico, damage assessment studies were underway. NOAA and EPA (1979) recognized the need for a cooperative (state and federal) damage assessment program with as many interests represented as possible for a comprehensive and accurate evaluation of total

Table 15

CHRONOLOGY OF OIL SPILL EVENTS IN 1979-1980 ON THE TEXAS COAST

June 3, 1979	IXTOC I blowout (1.3 million gallons/day, 30,000 barrels/day)
August 7, 1979	Oil comes ashore at South Padre Island
August 11, 1979	"So far it is not serious--it is a big to do about nothing at this point," Governor William Clements
November 1, 1979	**BURMAH AGATE** and **MIMOSA** collide
November 9, 1979	Oil from the **BURMAH AGATE** spill hits beaches at San Jose Island near Port Aransas
November 20, 1979	Heavy oil coats Galveston beaches
January 9, 1980	Fire on the **BURMAH AGATE** burned out
March 26, 1980	IXTOC I is capped

damage. Just as there have been numerous past oil spills, numerous attempts have been made to assess damages associated with the spills. The Santa Barbara blowout in 1969 was the first major oil spill for which a damage assessment was attempted. As reported by Nash et al. (1972), studies on tourism and recreation impacts of this spill showed no net damage to tourism in the Santa Barbara area, although "beachfront motel and restaurant owners may have suffered." Other tourism revenues in the region acted to compensate for revenues lost at the water's edge. The socioeconomic assessment study of the Santa Barbara spill was much more sophisticated than the one for the 1967 Torrey Canyon Tanker spill off Lands End, England. Burrows et al. (1974) point out that it was impossible "to attribute monetary valuations to the ecological damage sustained as a consequence of Torrey Canyon oil." As a result, external costs of damage were reported as "extensive but unquantifiable." No mention was made of impacts on coastal recreation and tourism.

With regard to the AMOCO CADIZ supertanker spill in 1978, less attention was directed to social and economic effects than biological effects. In an issue of the Marine Pollution Bulletin, directed exclusively to the AMOCO CADIZ spill, not one of the nine papers contained in the issue focused attention on the area of social and economic impacts. Besides some inconclusive visitor statistics (French tourism was off but the cold summer may have played a role here!) reported by Spooner (1978), she nevertheless concluded that "the impact of this vast spill on the Bretons and others has been psychological, aesthetic, and economic." Without any dollar estimates made of these impacts, this sounds much like the unquantifiable costs reported by Burrows et al. (1974) for the Torrey Canyon spill.

In 1976, the ARGO MERCHANT ran aground off the coast of Massachusetts, spilling 170,000 barrels of fuel oil. A massive scientific investigation of effects began immediately and was coordinated by the NOAA/USCG Spilled Oil Research Team. As pointed out by NOAA and EPA (1979):

> The ARGO MERCHANT spill studies, although scientifically sound, were inconclusive and did not, for the most part, quantify impacts on natural resources in the region. Nevertheless, this scientific effort was the first step toward damage assessment contingency planning in the United States (p. 1-2).

Rappaport et al. reported recreation and tourism impacts were studied and that, perhaps due to the timing of the spill (December, 1976), impacts were not considered serious.

This overview of previous oil spills and their respective damage assessment efforts was made for several reasons. First, it demonstrates the relatively primitive state of the art with regard to the assessment of social and economic impacts associated with oil spills. Second, it demonstrates that damage assessment efforts have become more focused and sophisticated with the passing of time and the increasing frequency and magnitude of spills. And finally, it points to the need to develop new methods and techniques for social and economic damage estimates and to develop new measures for evaluating impacts on nonmarket resources. The purpose of this project, besides evaluating and quantifying the economic impacts of the IXTOC I and BURMAH AGATE oil spills on recreation on the Texas Gulf coast, is to provide an approach for evaluating spill effects that could be used elsewhere.

PROCEDURES

To assess the impacts of the IXTOC I oil spill on recreation, several procedural steps were necessary. First, it was necessary to separate artificially the areas of recreation and tourism for purposes of this analysis, a difficult task because these two areas of activity and expenditure are so interrelated. Details of the rationale for the separation are provided in Chapter III. Once the two areas of study were separated, those businesses involved in recreation in the 19-county coastal study area (Figure 17) were identified.

Since the terms of reference for this study were concerned with contact sales of recreation products and services, it was necessary to deal with sales or tax data. Therefore, after identifying what was a part of recreation and what was a part of tourism, the most recent Standard Industrial Classification (SIC) Manual (Executive Office of the President, Office of Management and Budget 1972) was consulted to ascertain which SIC categories gave the most appropriate coverage of the recreation industry. Many of the businesses and services intuitively considered a part of recreation earlier did not match SIC categories. Two sectors were chosen to represent recreation as defined in this study. These sectors along with their related SIC codes are shown in Table 16. A listing in Appendix E provides detailed information on the specific types of recreation service businesses included in the miscellaneous category, 799. Several SIC categories include businesses, other than recreation, that are of little or no consequence to this study and tended to contaminate the data. However, the only way to avoid the extraneous information was the elimination of the category. For example, marinas are very important to recreation but, unfortunately, are found with 19 other kinds of business in SIC category 4469 (including oil spill clean-up, marine wrecking, and cargo salvaging). Because marinas cannot be segregated from the businesses in this category, they were not included in the analysis. Also, in SIC

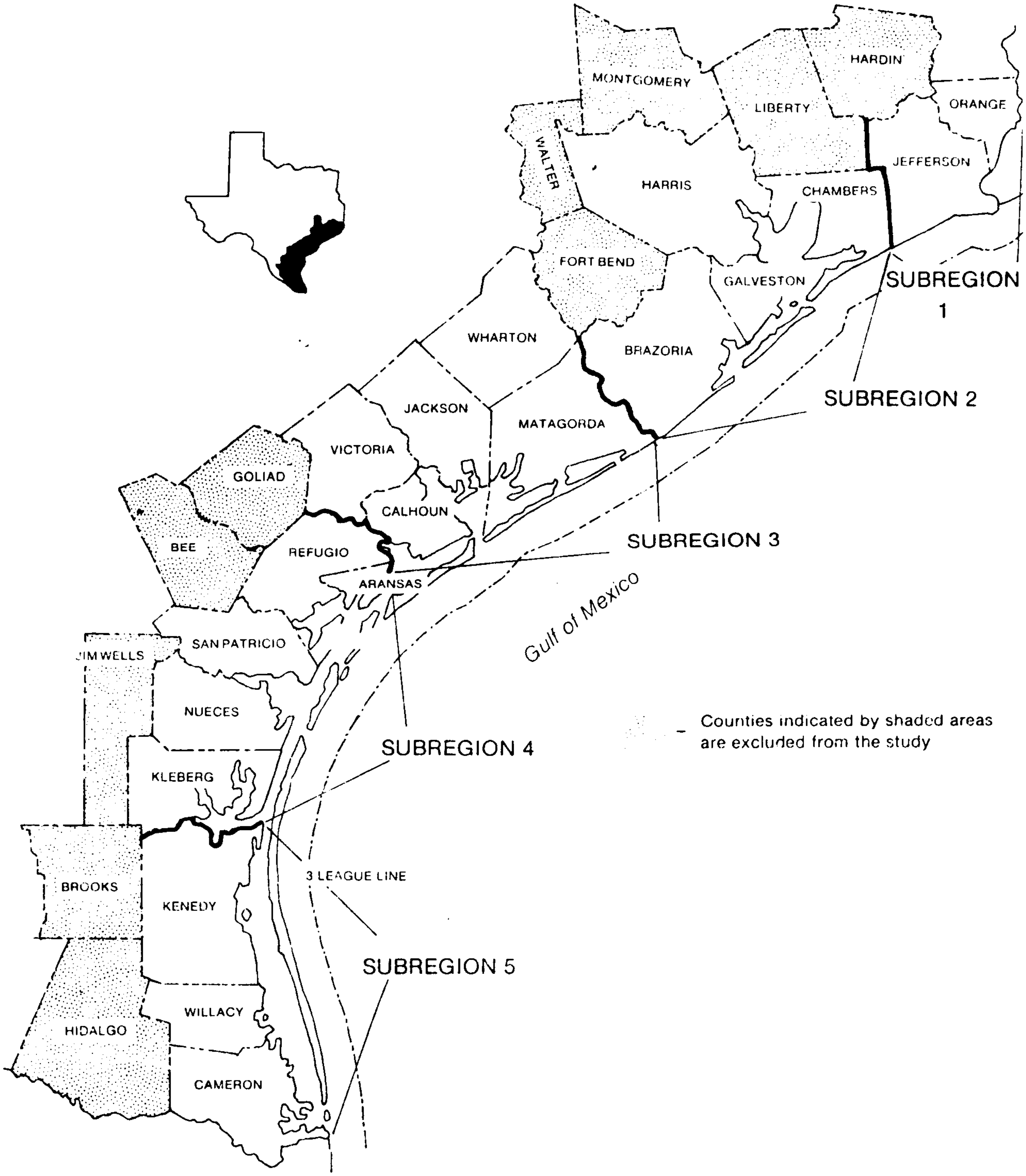


Figure 17

TEXAS COASTAL COUNTIES STUDY AREA

Table 16

RECREATION SECTORS AND RELATED SIC CODES

Sector	Name	SIC Code	Name
50	Other Retail	591	Drug Stores and Proprietory Stores
		592	Liquor Stores
		594	Sporting Goods Stores and Bicycle Shops, Book Stores, Jewelry Stores, Hobby, Toy and Game Shops, Camera & Photographic Supply Stores, Gift, Novelty and Souvenir Shops
		598	Fuel and Ice Dealers
		599	Misc. Retail
57	Recreational Services	783	Motion Picture Theaters and Drive-Ins
		791	Dance Studios and Schools
		793	Billiard and Pool Establishments and Bowling Alleys
		794	Racetracks and Professional Sports Clubs
		799	Misc. Amusement and Recreation Services

category 799 (Miscellaneous Amusement and Recreation Services), many recreation services might have been impacted by an oil spill. However, because some services and businesses were not likely impacted and no way to make a separation within the category, the entire category was included, with the assumption that all contained therein was relevant to the recreation service industry. A different case is posed for boat dealers (SIC 555). Since it was impossible to identify the extent of boat dealer's sales that were coastal-related (as opposed to boat sales for inland boating activity), the category was discarded in its entirety. Although the categories chosen to represent the recreation services category are less than optimal in terms of how coastal recreation (as it might be impacted by an oil spill) is defined, they are nevertheless the best data available.

After determining the SIC categories that were pertinent to this study, it was necessary to obtain the required data on total sales, employment, and wages. Data relative to sales in each county in the study area for the baseline period (1974-1978) were secured from the Texas Comptroller's Office. The Texas Employment Commission was contacted to secure employment and wages data for the baseline period as well, but unfortunately was unable to provide all the necessary data. Only data for 1978, 1979, and 1980 (first and second quarters) were made available to us, thus providing coverage for only one year in the baseline study period.

Once quarterly sales data were available for all 19 counties in the study area for the baseline period 1974-1978, the data for those selected SIC categories (Table 16) were recorded on work sheets so that sector totals could be tallied and analyses could commence. First, quarterly data were transformed on a county basis by expenditure category by year, using a work sheet contained in Appendix F. Next, county data were consolidated to yield subregional quarterly totals by expenditure category by year. A subregional work sheet is contained in Appendix G. Once this data reduction task was complete, the quarterly subregion totals were used to generate a trend line for each recreation-related sector (Figures 18-23).

Concurrently with the analysis of sales data, interviews were conducted with owners and managers of business establishments within the two recreation-related sectors in the study area. The purpose of the interviews was to secure information on the extent of lost sales, and hence, lost business income. An effort was made to achieve broad coverage of the various businesses that comprise each sector as well as good geographic coverage within each subregion. A field trip was made to the South Padre Island-Port Isabel area in late April 1981, to complete the series of personal interviews and to get a first-hand look at the study area.

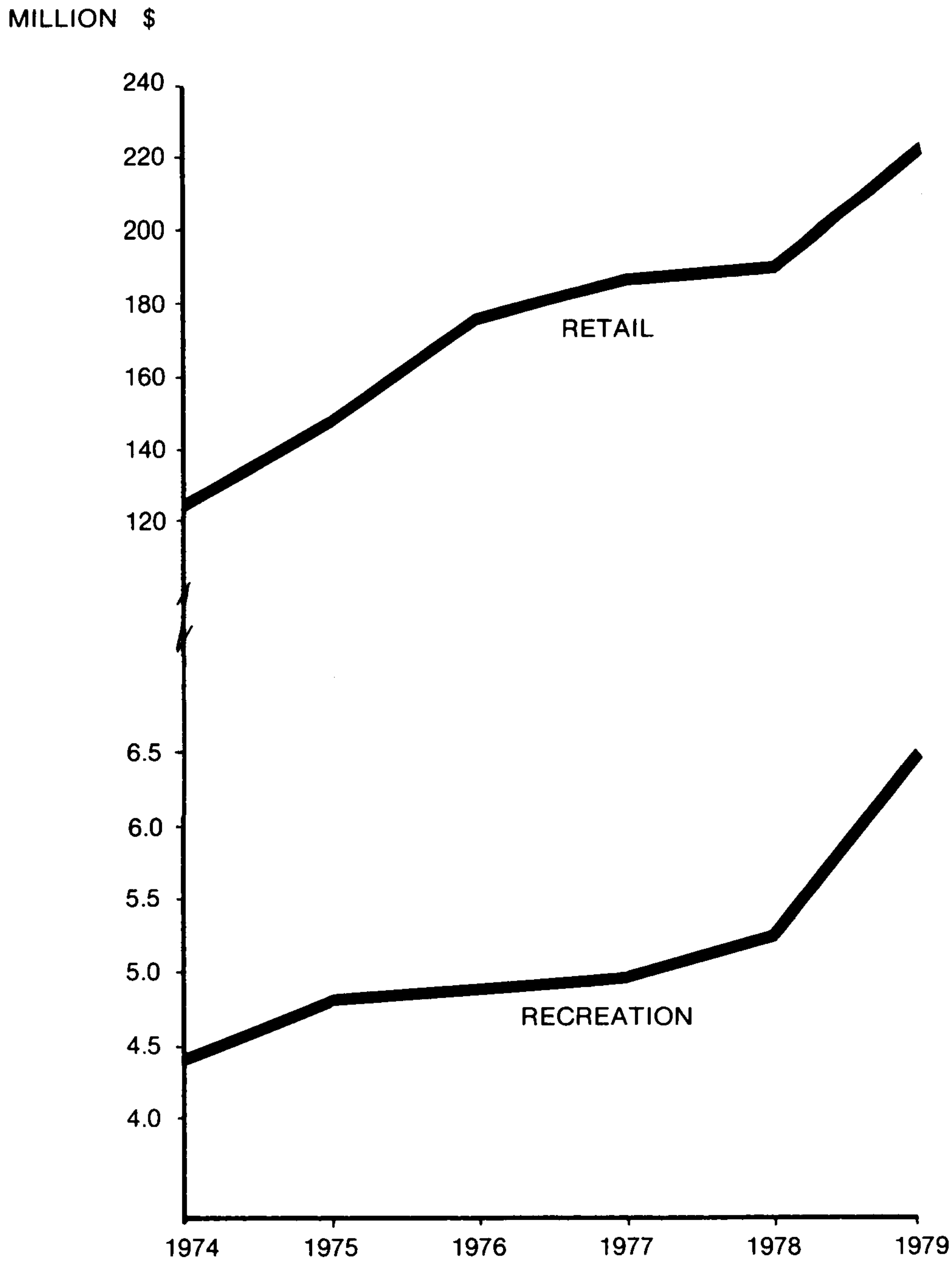


Figure 18

Other Retail and Recreation Expenditures 1974 to 1979
for Subregion 1

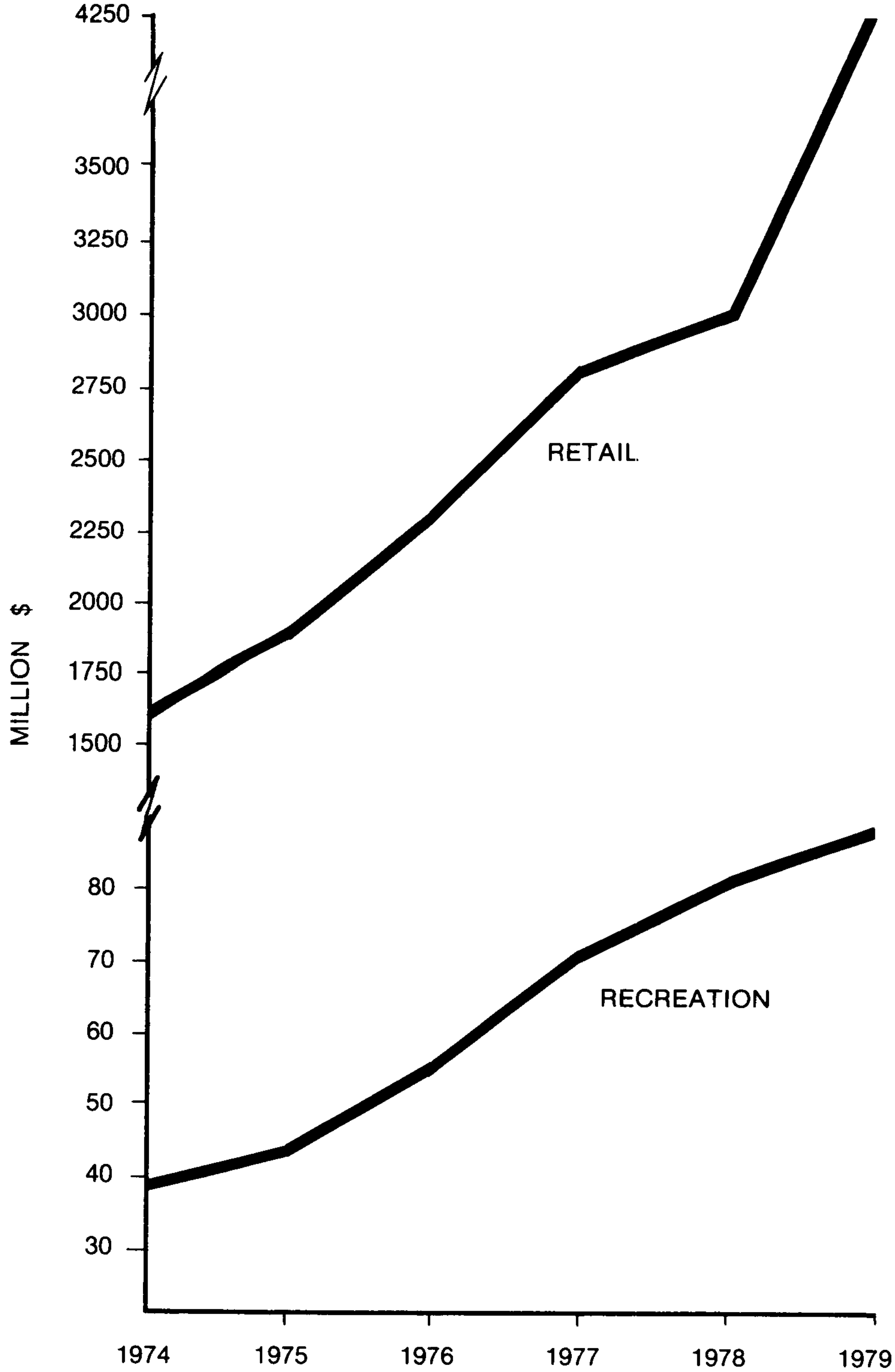


Figure 19

Other Retail and Recreation Expenditures 1974 to 1979 for Subregion 2

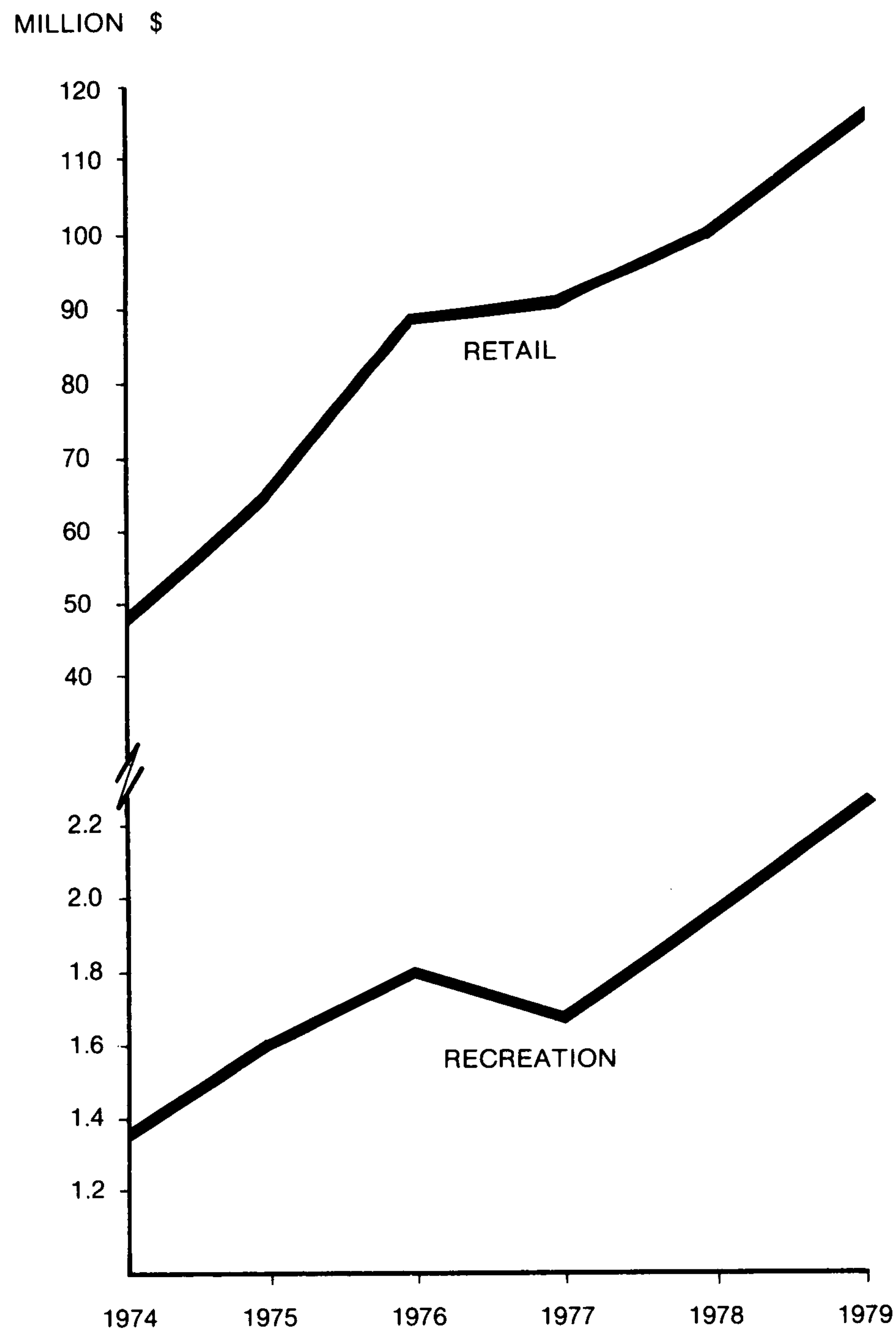


Figure 20

Other Retail and Recreation Expenditures 1974 to 1979 for Subregion 3

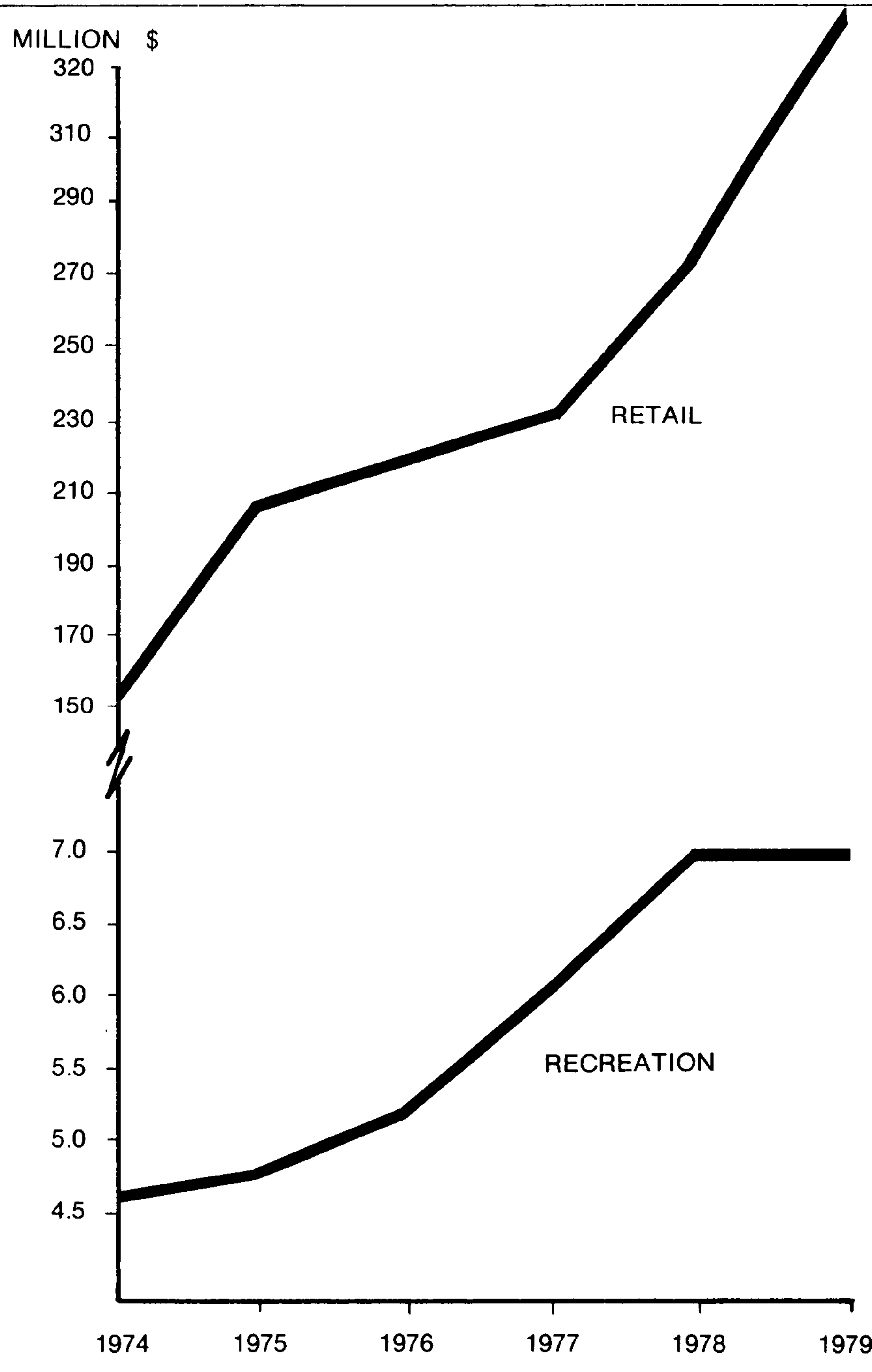


Figure 21

Other Retail and Recreation Expenditures 1974 to 1979 for Subregion 4

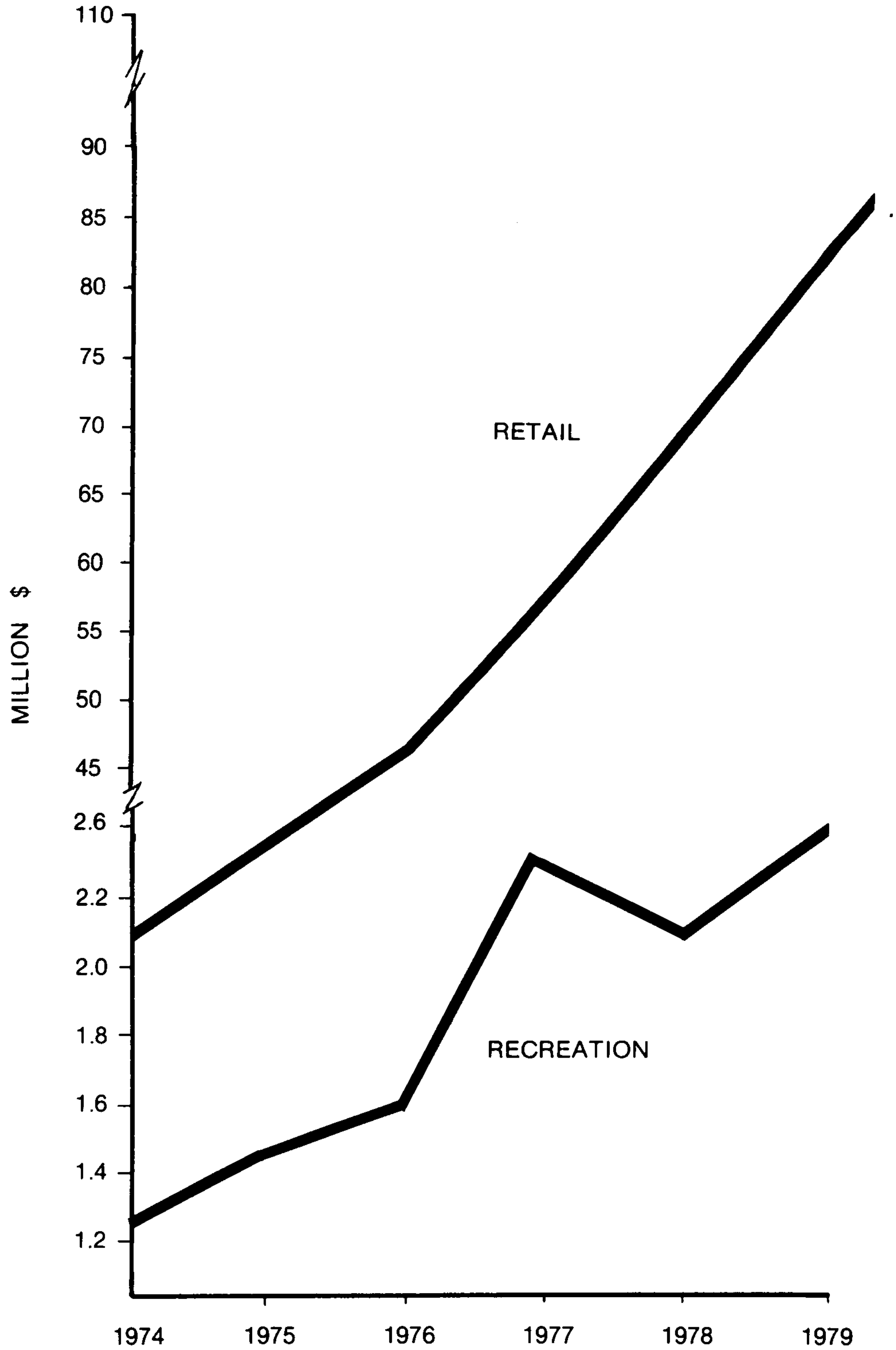


Figure 22

Other Retail and Recreation Expenditures 1974 to 1979 for Subregion 5

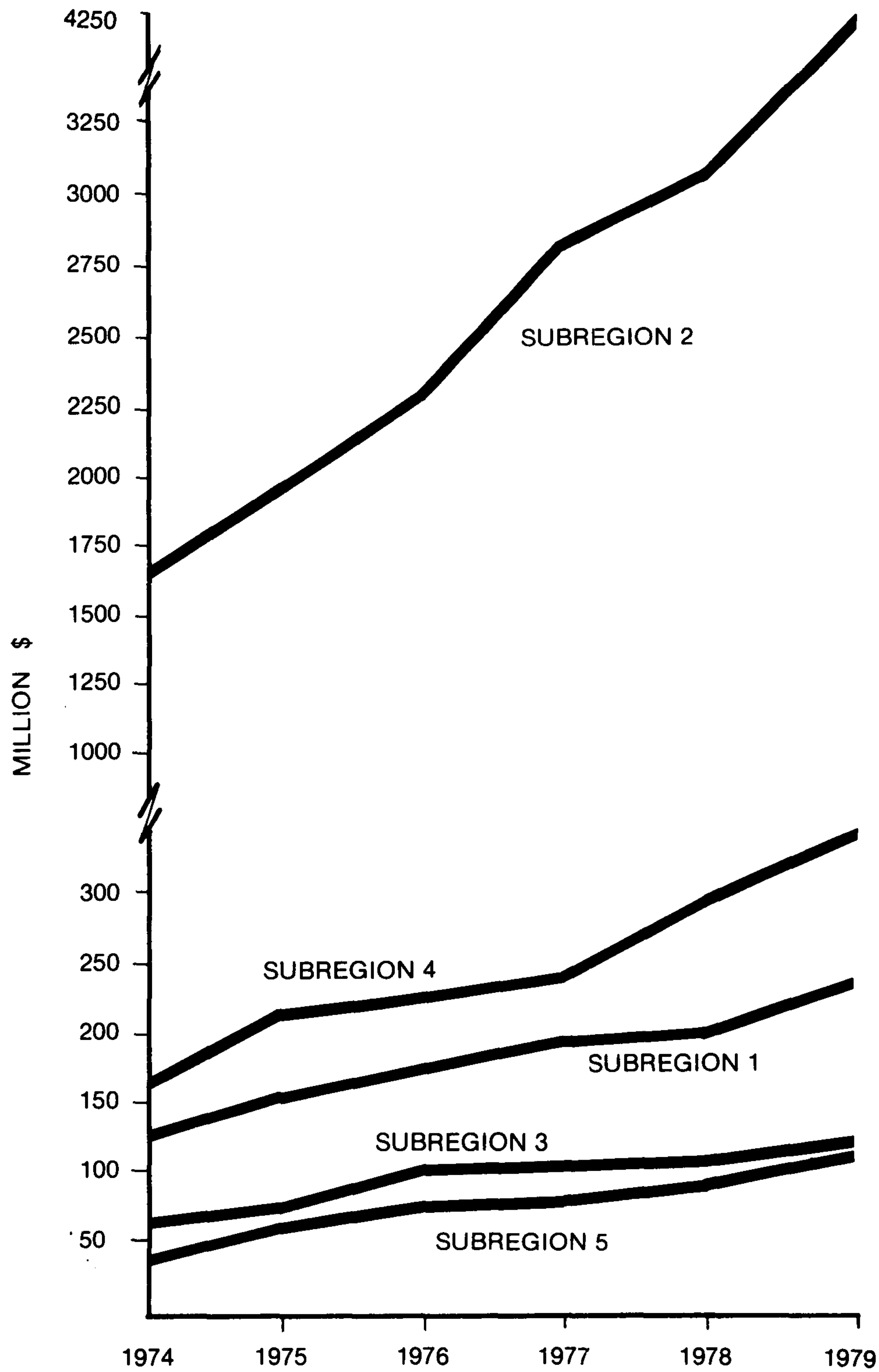


Figure 23

Combined Recreation and Retail Expenditures For All Subregions

1974-1979

Once the interviews were complete, it was necessary to make some adjustments in the estimated percentages of lost income since nearly all of the losses attributed to the oil spills were incurred in Gulf-front communities or coastal margin. A procedure based on a ratio of general retail sales (all retail sales, not just recreation) between the county level and the major Gulf-front city was used to discount reports of lost sales in the coastal margin. This discounting was necessary to avoid over-generalizing the extent of lost sales in the coastal margin to other unaffected areas in each coastal county. Adjusted percentages were computed to represent the extent of lost sales in each subregion. These adjusted percentages were then applied to actual 1979 retail sales figures to arrive at an estimate of what sales would have been without the oil spills. In this way, it was possible to derive a dollar value for the extent of loss attributed to the spills.

ASSUMPTIONS AND LIMITATIONS

In the completion of any study or report, important problems, assumptions, and limitations must be stated clearly and understood from the outset.

1. The research contract required a separation of recreation and tourism for analysis purposes. Since these two are really inseparable, this can be done only artificially. This is an important consideration if one wants to make comparisons between the findings of this study and other descriptive findings reported in the recreation and tourism literature.

2. The data used to establish a baseline of recreation activity in the study area left much to be desired. However, in lieu of recreation business data collected expressly for the study region, the sales data from the Comptroller's Office were the best information available. With the SIC classifications available to represent the diversity and complexity of the recreation-related sectors, it was necessary to accept the data as they were found, recognizing that the total sales values derived were underestimates. In addition to the fact that there is much cash business in any coastal recreation economy, there was a problem of disclosure with the Comptroller's data. When only three or four businesses were in any particular 3-digit SIC classification in a county, no financial data were provided to protect the confidentiality of the small number of businesses involved.

3. The sales data are assumed to have been reported by businesses to the Comptroller's Office in a consistent fashion according to some established procedures so that increases can be studied and understood.

4. The extent of expenditures for other retail and recreation services attributable specifically to coastal community residents or visitors were impossible to determine. Therefore, it was necessary to focus on level of expenditure in the study area without knowing who made the expenditure.

5. There was considerable variation in the 1974-1979 subregional totals for each recreation sector. Numerous events occurred and were unevenly felt throughout the 19-county study area during the baseline period. Any one, or a combination of the following events, could have had a profound impact on actual expenditures during the 1974-1978 baseline period: the peso devaluation, drought, hurricanes, the Middle East oil embargo, inflation, gasoline prices, gasoline rationing, and the unavailability of gasoline.

6. The number of interviews conducted to establish the extent of business loss in each subregion was limited given the number and variability of recreation businesses and potential differences within each subregion. However, the contract did not call for, nor did it provide funding for, survey research with a representative sample of business proprietors. Alternatively, a small number of interviews were completed to secure quantitative and qualitative information in support of the estimates of business losses.

7. With regard to the interviews completed, people presumably reported their business loss honestly, as no independent means of verification was possible. Some problems with recall were expected since our inquiries occurred nearly two years after the spills occurred. People were expected to overestimate their losses in an effort to enhance their chances for compensation or follow-up action at some later date. Since there were no means available to know the extent to which these biases were present, caution was exercised when calculating average sector losses in each subregion.

8. Impacts (if any) were found to have occurred in Gulf-front communities, and in the absence of detailed data there were no impacts at all in inland areas or in coastal areas without Gulf access. This assumption is supported by the findings of Nash et. al. (1972) with regard to the impacts of the Santa Barbara spill on tourism and recreation. They found that, while shore-front tourism businesses were impacted heavily, other tourism establishments inland had increased business for a net tourism gain in the region. Also, as they pointed out, this finding in no way diminishes the extent of business loss felt by the shorefront establishments.

II. BASELINE ASSESSMENT

To establish a baseline, an appraisal was made of recreation supply and participation in the study area to establish the major centers of recreation activity, followed by a presentation of gross sales data for the two recreation-related sectors on a subregional basis. Finally, quarterly subregion totals for the baseline period 1974-1978 were used a) to predict estimated sales for 1979 without the oil spills and b) to provide a framework for understanding levels of actual expenditures in 1979.

COASTAL RECREATION SUPPLY

Although detailed inventory data are contained in the Texas Outdoor Recreation Plans (1975, 1980), several specific recreation resources were selected to show how coastal recreation resource supply was distributed on the Texas coast. Figure 24 shows distributions of recreation service establishments (SIC classifications 783-799) as calculated from gross sales data provided by the Texas Comptroller's Office. Figures 25, 26, 27, and 28 show the distribution of state areas managed by the Texas Parks and Wildlife Department, marinas, charter boats, and party boats on the Texas coast, respectively. Generally, these figures provide support for the conclusion that the major recreation resource centers on the Texas coast include Galveston, Nueces, and Cameron Counties. Although Harris County has the greatest number of recreation service establishments in the study area, few are related specifically to coastal recreation. Harris County is the primary origin of many visitors to the coastal zone.

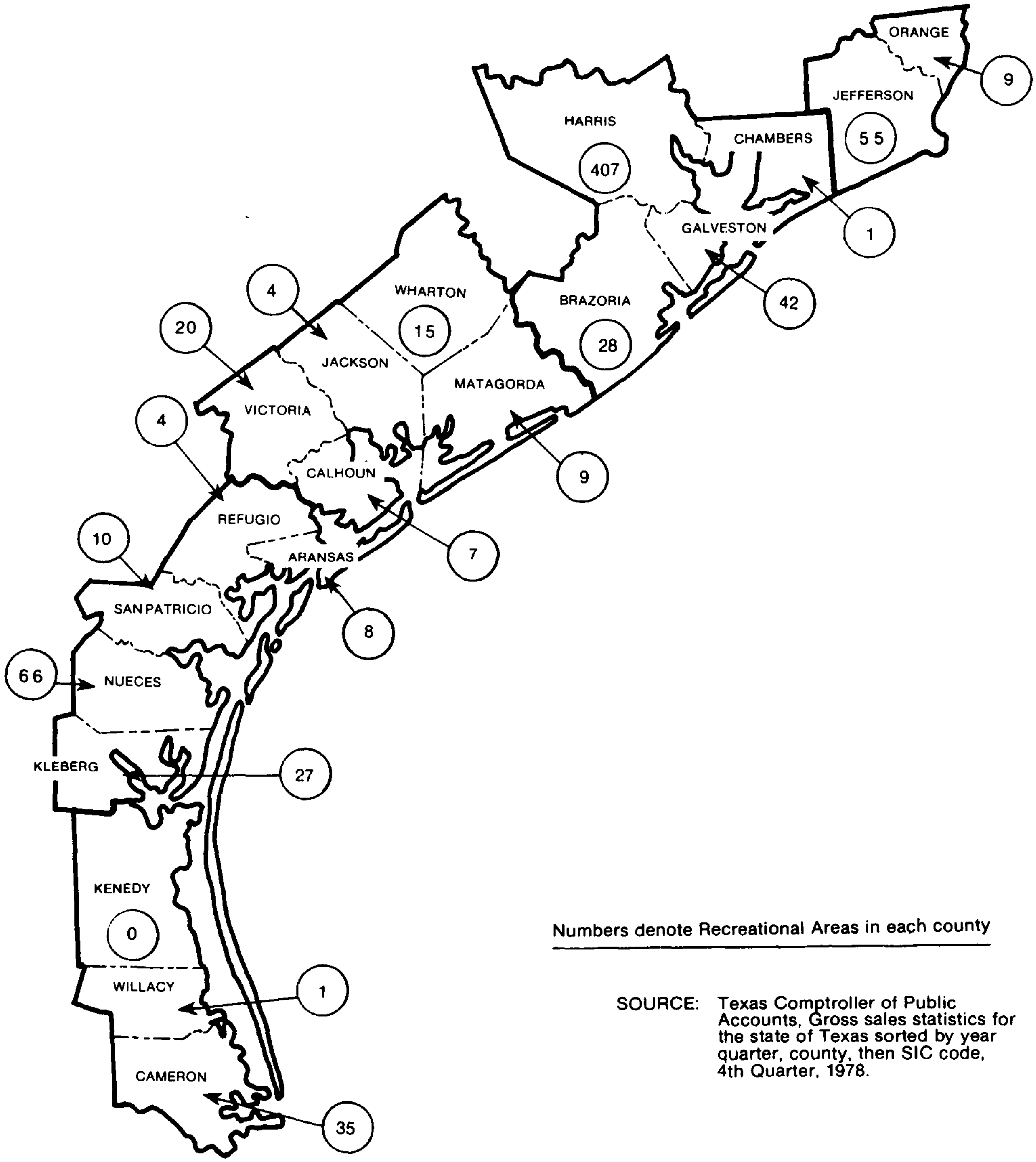
COASTAL RECREATION PARTICIPATION

Based on the data and projections of coastal recreation participation shown in Table 17, it is also possible to determine the major centers of recreation activity on the Texas coast. The top five ranked counties (for 1968, 1980, 2000) in terms of resident, nonresident, and out-of-state coastal recreation participation are Galveston, Nueces, Brazoria, Aransas, and Cameron. In terms of the subregions used in this report, this translated into Subregions II, IV, and V, respectively.

For the five counties with the highest level of coastal recreation participation, the most frequent activities are listed in Table 18. As discussed earlier, those recreation activities that require little or no investment (fishing, swimming, surfing, picnicking, walking, and nature study) are among the most popular. When considering boating activity, approximately 66 percent of the Texas boat fleet are less than 16 feet in length (Beardsley 1976).

GROSS SALES DATA

Raw quarterly sales data for the two recreation-related

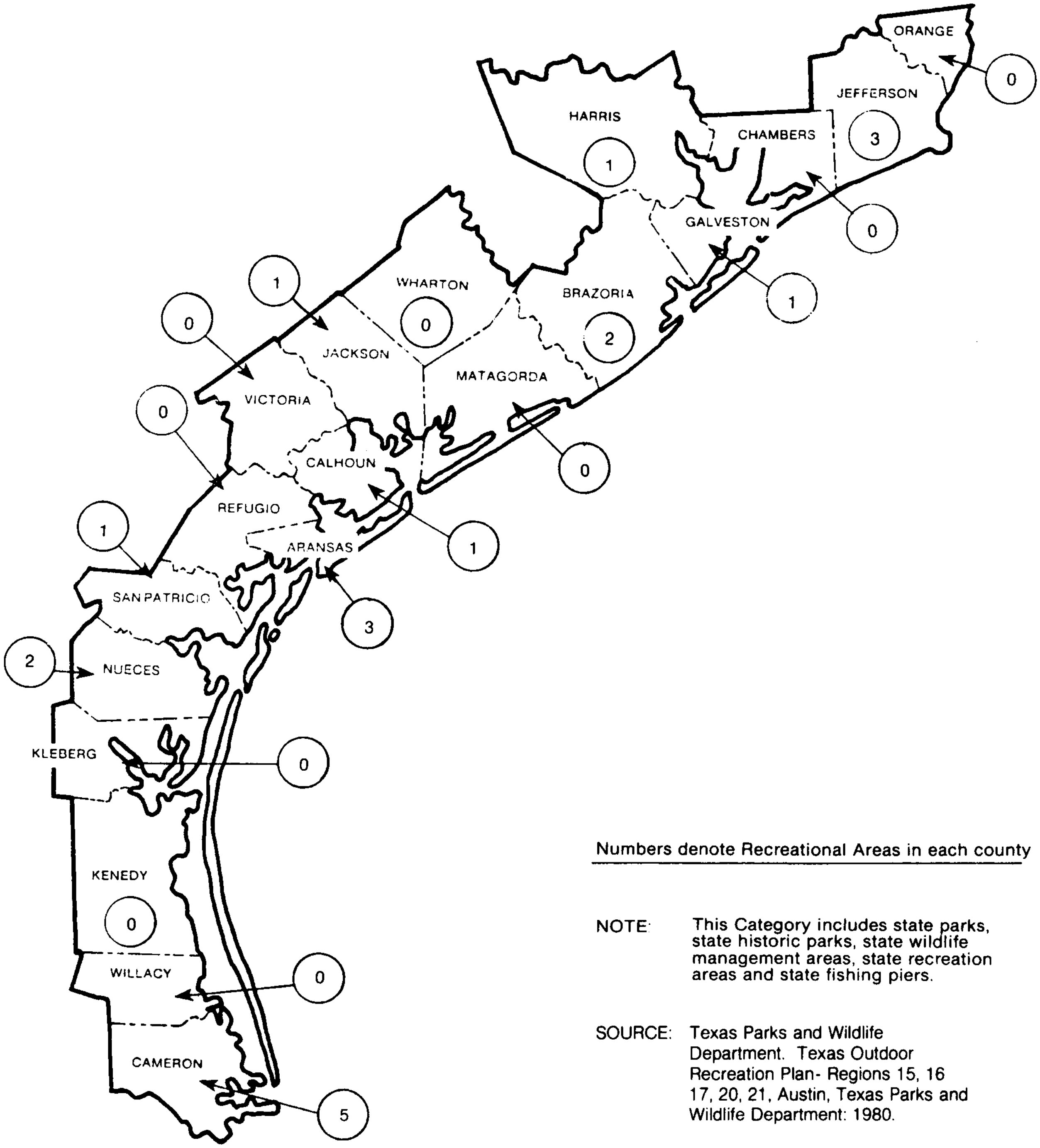


Numbers denote Recreational Areas in each county

SOURCE: Texas Comptroller of Public Accounts, Gross sales statistics for the state of Texas sorted by year quarter, county, then SIC code, 4th Quarter, 1978.

Figure 24

Distribution of Recreation Service Establishments in the Study Area



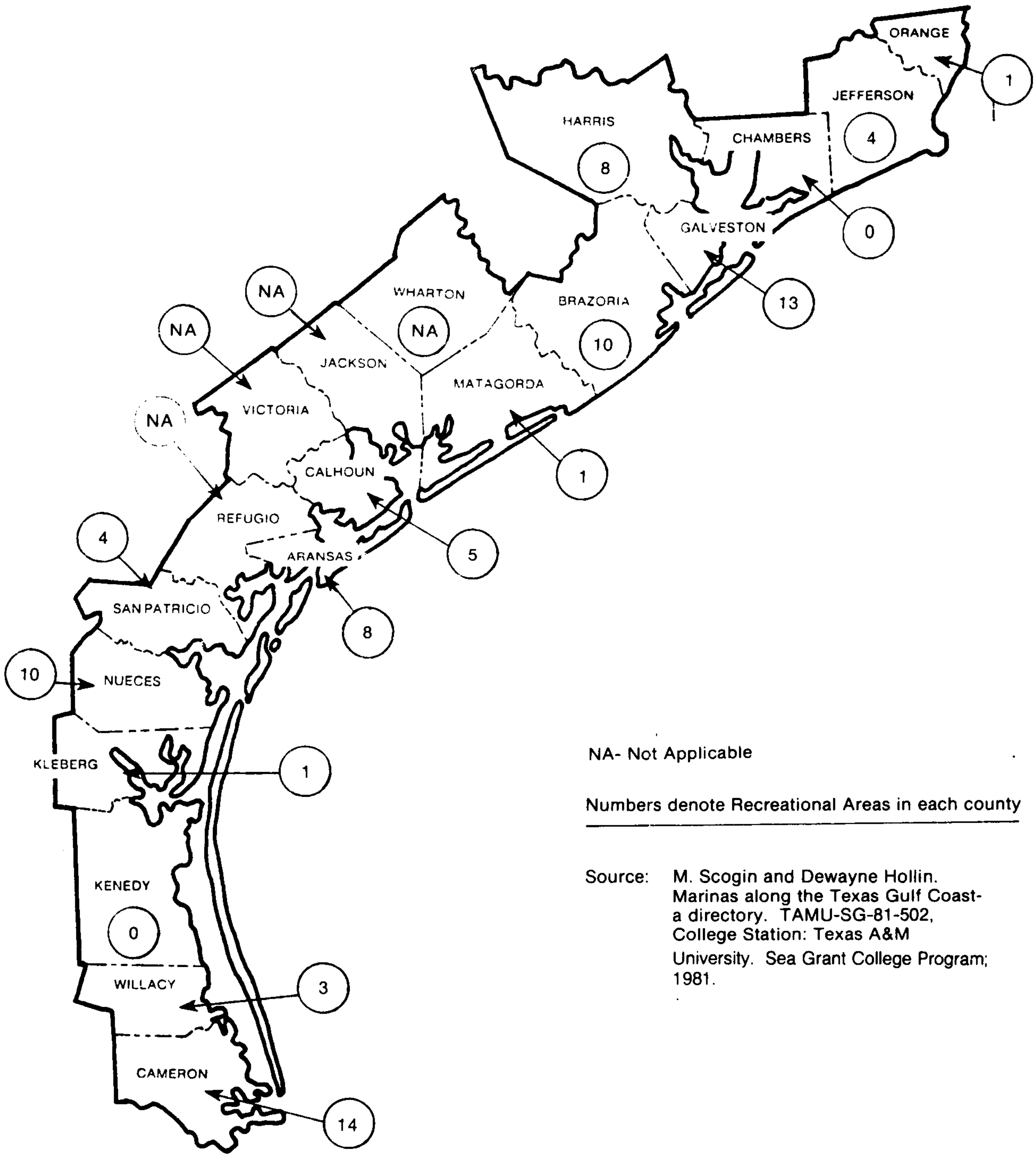
Numbers denote Recreational Areas in each county

NOTE: This Category includes state parks, state historic parks, state wildlife management areas, state recreation areas and state fishing piers.

SOURCE: Texas Parks and Wildlife Department. Texas Outdoor Recreation Plan- Regions 15, 16 17, 20, 21, Austin, Texas Parks and Wildlife Department: 1980.

Figure 25

Distribution of Areas Managed by the Texas Parks and Wildlife Department in the Study Area



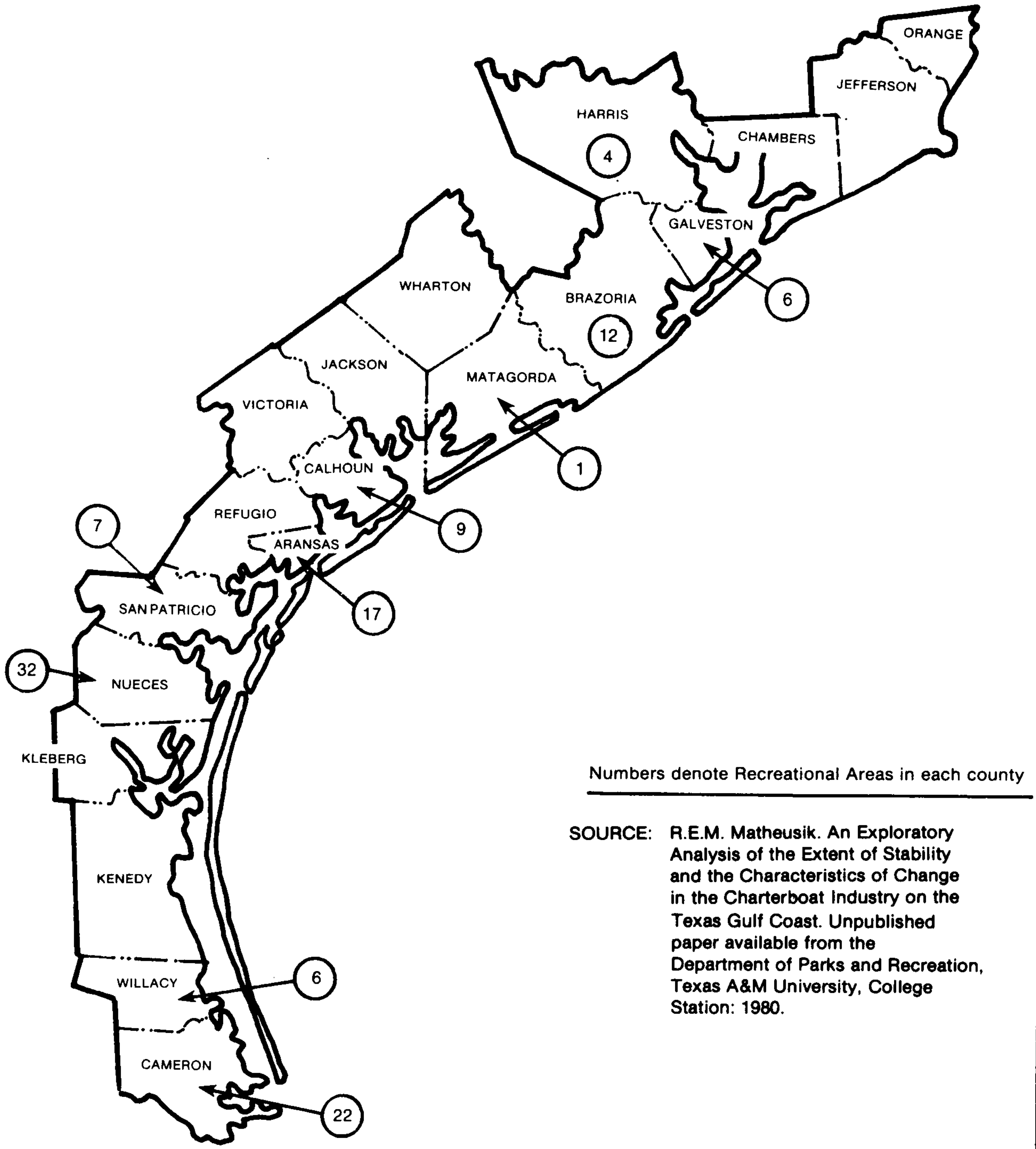
NA- Not Applicable

Numbers denote Recreational Areas in each county

Source: M. Scogin and Dewayne Hollin. Marinas along the Texas Gulf Coast- a directory. TAMU-SG-81-502, College Station: Texas A&M University. Sea Grant College Program; 1981.

Figure 26

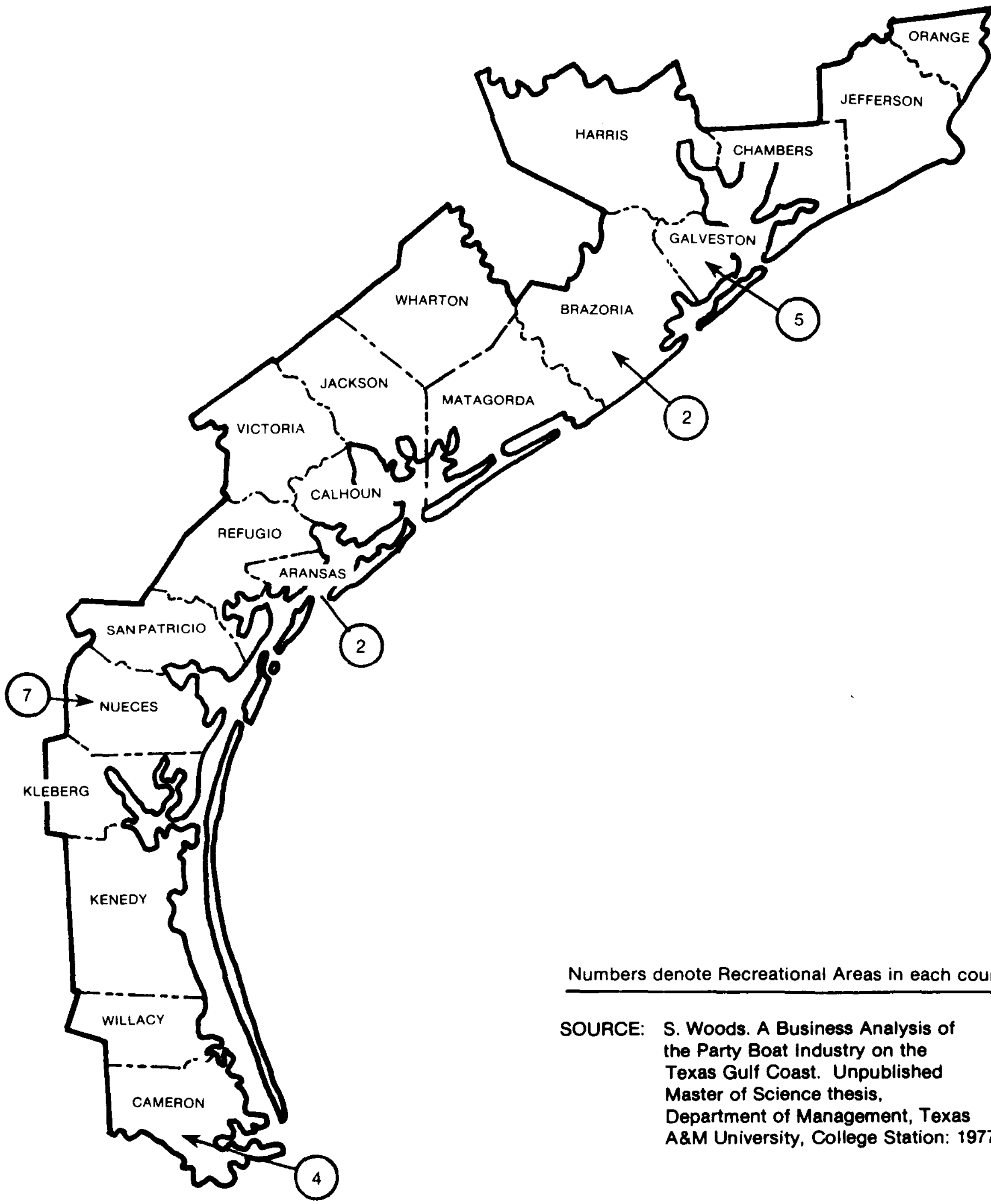
Distribution of Gulf Coast Marinas in the Study Area



SOURCE: R.E.M. Matheusik. An Exploratory Analysis of the Extent of Stability and the Characteristics of Change in the Charterboat Industry on the Texas Gulf Coast. Unpublished paper available from the Department of Parks and Recreation, Texas A&M University, College Station: 1980.

Figure 27

Distribution of Charter Boat Operators in the Study Area



Numbers denote Recreational Areas in each county

SOURCE: **S. Woods. A Business Analysis of the Party Boat Industry on the Texas Gulf Coast. Unpublished Master of Science thesis, Department of Management, Texas A&M University, College Station: 1977.**

Figure 28

Distribution of Party Boat Operators in the Study Area

Table 17

CURRENT AND PROJECTED RECREATION PARTICIPATION 1968-2000 BY ANNUAL ACTIVITY DAYS FOR ALL COASTAL ACTIVITIES

	Total Resident, Non-resident, and Out-of-State Participation Days					
County	1968	Rank	1980	Rank	2000	Rank
Orange	7,300		15,700		33,500	
Jefferson	646,000		2,743,300		5,905,200	
Chambers	475,400		1,418,700		3,683,800	
Harris	1,967,300		3,512,700		7,681,700	
Galveston	11,839,100	1	23,262,500	2	48,491,200	1
Brazoria	2,926,900	3	6,297,000	3	14,490,800	3
Wharton	NA		NA		NA	
Matagorda	745,700		1,838,900		4,568,200	
Jackson	18,600		23,900		36,800	
Victoria	NA		NA		NA	
Calhoun	779,400		1,469,000		2,576,300	
Refugio	183,100		461,700		846,700	
Aransas	2,618,100	4	5,180,300	4	9,385,600	4
San Patricio	2,298,600		3,544,800		5,410,900	
Nueces	10,016,900	2	23,928,300	1	47,850,300	2
Kleberg	667,600		2,566,900		5,318,100	
Kenedy	917,000		2,977,500		6,189,300	
Willacy	335,500		571,000		785,800	
Cameron	2,328,400	5	4,760,700	5	7,482,200	5

Notes

1. Totals include resident and non-resident participation occurring in rural areas. Boating, fishing, skiing, surfing, swimming, picnicking, walking/hiking, and nature study data were included for resident and non-resident participation occurring in urban areas. Boating, fishing, swimming, camping and picnicking data included out-of-state participation occurring in rural areas.

2. Data were drawn from the 1975 rather than 1980 Texas Outdoor Recreation Plan because the latter aggregated county data into regions which did not coincide with the coastal subregions under study in the IXTOC I Impact Assessment Report.

3. NA was used to designate these counties in the study area for which no comparable data were available.

Source: Texas Parks and Wildlife Department. Texas Outdoor Recreation Plan-Outdoor Recreation on the Texas Gulf Coast. Austin: Texas Parks and Wildlife Department; 1975.

Table 18

TOP-RANKED ACTIVITIES FOR SELECTED COUNTIES IN THE STUDY AREA

	1968		1980		2000	
County	Rank	Activity	Rank	Activity	Rank	Activity
Galveston	1	Fishing	1	Fishing	1	Fishing
	2	Swimming	2	Swimming	2	Swimming
	3	Surfing	3	Surfing	3	Surfing
	4	Picnicking	4	Picnicking	4	Boating
	5	Boating	5	Boating	5	Picnicking
Nueces	1	Fishing	1	Swimming	1	Fishing
	2	Swimming	2	Fishing	2	Swimming
	3	Picnicking	3	Picnicking	3	Surfing
	4	Camping	4	Camping	4	Boating
	5	Boating	5	Walking	5	Picnicking
Brazoria	1	Fishing	1	Fishing	1	Swimming
	2	Swimming	2	Swimming	2	Fishing
	3	Surfing	3	Surfing	3	Picnicking
	4	Picnicking	4	Picnicking	4	Walking
	5	Boating	5	Boating	5	Nature Study
Aransas	1	Fishing	1	Fishing	1	Fishing
	2	Swimming	2	Swimming	2	Swimming
	3	Boating	3	Boating	3	Surfing
	4	Camping	4	Picnicking	4	Boating
	5	Picnicking	5	Camping	5	Picnicking
Cameron	1	Fishing	1	Fishing	1	Swimming
	2	Boating	2	Boating	2	Fishing
	3	Skiing	3	Skiing	3	Boating
	4	Camping	4	Camping	4	Picnicking
	5	Swimming	5	Swimming	5	Camping

Source: Texas Parks and Wildlife Department. Texas Outdoor Recreation Plan-Outdoor Recreation on the Texas Gulf Coast. Austin: Texas Parks and Wildlife Department; 1975.

sectors (other retail and recreation services) secured from the Texas Comptroller's Office were first transformed on a county basis by expenditure category and totaled by recreation sector by year. Next, county data were consolidated to yield subregional quarterly totals by expenditure category and by recreation sector by year (Tables 19-24). These annual subregional totals for 1974-1978 were used to create a series of trend lines (Figures 18-23). A linear regression routine was used to make projections of annual expenditures for 1979. Due to the variation in the data or perhaps the small number of data points, the projections were generally below the actual levels of expenditure reported by the Texas Comptroller's Office. Alternately, the actual 1979 level of gross sales was used directly, in conjunction with interview data (relative to lost business due to the spills), to ascertain the dollar value of impact attributed to the spills. Even though projections from the baseline period were not used, the baseline period provided a useful framework for understanding the dynamics of expenditures in the recreation sectors after the spill occurred. Tables 25 and 26 include annual other retail and recreation services for the entire coastal study area for 1974-1979. Figure 23 is useful for demonstrating the relationship between subregions when expenditure in the two recreation-related sectors are combined. As expected, the energizing power of the urban areas is demonstrated in support of Subregions II and IV as the primary recreation centers on the Texas coast.

EMPLOYMENT DATA

Baseline information on employment in the recreation-related sectors cannot be provided because of a lack of basic data. Because the Texas Employment Commission was unwilling to supply data for the baseline period, sufficient data for calculating trends were unavailable. Further, data on employment and income would have grossly under-represented the recreation sector because so many businesses are owner-operated and family-run and hence not responsible to the Texas Employment Commission.

III. OIL SPILL IMPACTS ON RECREATION ACTIVITIES IN THE STUDY AREA

In order to assess the impacts of the IXTOC I and BURMAH AGATE oil spills, it was necessary to utilize quantitative as well as qualitative information. In addition to the information contained in reports, testimony and hearing documents, much of the necessary information for this impact assessment was derived from a series of 53 onsite and telephone interviews conducted with the owners or managers of business establishments in the five subregions.

Table 19

RECREATION-RELATED EXPENDITURES BY SUBREGION, 1974

Sub-region	Quarter	Sector: Other Retail	Sector: Recreation	Subregional Total
1	1	$ 27,828,493	$ 1,014,021	
	2	30,683,385	1,194,965	
	3	31,641,299	1,199,706	
	4	34,607,221	1,054,512	
		124,760,398	4,463,204	$ 129,223,602
2	1	340,833,780	6,825,552	
	2	376,807,455	10,059,015	
	3	410,098,814	12,222,599	
	4	503,631,294	9,376,939	
		1,631,371,343	38,484,105	1,669,855,448
3	1	9,555,561	283,610	
	2	11,062,711	365,079	
	3	14,348,850	376,271	
	4	14,619,722	357,720	
		49,586,844	1,382,680	50,969,524
4	1	33,754,676	820,277	
	2	34,247,353	1,063,185	
	3	48,356,639	1,048,413	
	4	40,280,554	1,763,126	
		156,639,222	4,695,001	61,334,223
5	1	10,870,697	338,857	
	2	11,286,906	319,987	
	3	12,326,216	324,543	
	4	13,530,456	272,146	
		48,014,275	1,255,533	49,269,808

Table 20

RECREATION-RELATED EXPENDITURES BY SUBREGION, 1975

Sub-region	Quarter	Sector: Recreation	Sector: Other Retail	Subregional Total
1	1	$ 39,079,253	$ 997,547	
	2	31,625,552	1,330,577	
	3	31,628,300	1,283,149	
	4	41,868,466	1,223,879	
		144,201,571	4,835,152	$ 149,036,723
2	1	382,856,849	8,615,266	
	2	448,088,709	11,868,700	
	3	460,380,073	12,119,182	
	4	611,176,798	11,384,169	
		1,902,502,429	43,987,317	1,946,489,746
3	1	14,143,020	312,834	
	2	15,835,984	438,802	
	3	15,353,549	435,106	
	4	20,048,838	401,564	
		65,381,391	1,588,306	66,969,697
4	1	44,452,414	1,034,502	
	2	40,886,427	1,200,829	
	3	45,912,257	1,276,844	
	4	71,807,234	1,270,611	
		203,058,332	4,782,786	207,841,118
5	1	14,576,594	413,257	
	2	12,883,824	364,947	
	3	14,222,475	341,870	
	4	17,903,651	360,997	
		59,586,544	1,481,070	61,067,614

Table 21

RECREATION-RELATED EXPENDITURES BY SUBREGION, 1976

Sub-region	Quarter	Sector: Other Retail	Sector: Recreation	Subregional Total
1	1	$ 42,510,075	$ 1,122,864	
	2	43,435,536	1,686,593	
	3	41,873,513	1,115,843	
	4	50,583,075	983,226	
		178,402,199	4,908,526	$ 183,310,725
2	1	502,971,173	12,042,302	
	2	521,246,201	13,882,819	
	3	554,699,907	15,957,584	
	4	715,507,220	13,666,551	
		2,294,424,501	55,549,256	2,349,973,757
3	1	17,823,140	440,664	
	2	29,130,391	583,527	
	3	18,591,414	377,748	
	4	22,569,368	424,327	
		88,114,313	1,826,266	89,940,579
4	1	48,555,716	1,166,821	
	2	50,641,349	1,407,012	
	3	48,717,183	1,387,976	
	4	58,510,006	1,181,418	
		216,424,254	5,143,227	221,567,481
5	1	17,416,476	475,788	
	2	17,521,657	370,218	
	3	17,484,190	360,040	
	4	17,403,697	340,716	
		69,826,020	1,546,762	71,372,782

Table 22

RECREATION-RELATED EXPENDITURES BY SUBREGION, 1977

Sub-region	Quarter	Sector: Other Retail	Sector: Recreation	Sub regional Total
1	1	$ 41,482,773	$ 1,232,368	
	2	46,658,815	1,343,806	
	3	47,230,772	1,276,994	
	4	55,170,433	1,113,983	
		190,542,793	4,967,151	$ 195,509,944
2	1	612,779,728	13,765,763	
	2	667,426,472	19,488,376	
	3	657,776,785	21,347,080	
	4	861,734,973	17,680,973	
		2,799,717,958	72,282,192	2,872,000,150
3	1	19,971,665	334,011	
	2	21,519,146	403,459	
	3	21,231,042	487,269	
	4	26,683,642	464,206	
		89,405,495	1,688,945	91,094,440
4	1	51,738,978	1,213,620	
	2	56,356,383	1,481,200	
	3	58,562,845	1,553,745	
	4	67,049,108	1,854,446	
		233,707,314	6,103,011	239,810,325
5	1	15,728,253	431,264	
	2	17,923,220	797,881	
	3	18,629,789	479,471	
	4	22,065,384	542,868	
		74,346,646	2,251,484	76,598,130

Table 23

RECREATION-RELATED EXPENDITURES BY SUBREGION, 1978

Sub-region	Quarter	Sector: Other Retail	Sector: Recreation	Subregional Total
1	1	$ 41,513,512	$ 1,160,402	
	2	45,259,366	1,384,852	
	3	48,527,297	1,335,538	
	4	58,346,321	1,319,118	
		193,646,496	5,199,910	$ 198,846,406
2	1	729,921,845	16,737,372	
	2	528,550,689	21,143,432	
	3	836,888,601	25,008,016	
	4	977,704,149	18,890,898	
		3,073,065,284	81,779,718	3,154,845,002
3	1	21,033,223	474,503	
	2	22,746,412	338,215	
	3	24,501,419	599,445	
	4	30,749,231	533,452	
		99,030,285	1,945,615	100,975,900
4	1	60,738,065	1,307,209	
	2	66,479,832	1,680,403	
	3	68,553,658	1,815,085	
	4	78,320,814	2,135,849	
		274,092,369	6,938,546	281,030,915
5	1	18,409,292	531,633	
	2	20,018,963	482,899	
	3	21,467,294	547,235	
	4	23,611,339	564,999	
		83,506,888	2,126,766	85,633,654

Table 24

RECREATION EXPENDITURES BY SUBREGION, 1979

Sub-region	Quarter	Other Retail	Recreation
1	1	$ 48,805,058	$ 1,381,361
	2	46,335,888	1,522,128
	3	56,961,622	1,686,248
	4	73,612,836	2,120,721
		225,715,404	6,710,458
2	1	861,311,571	17,158,523
	2	929,635,328	23,906,199
	3	957,868,806	24,880,097
	4	1,343,688,997	22,145,243
		4,092,504,511	88,090,062
3	1	23,034,221	505,190
	2	28,191,822	714,790
	3	27,476,153	569,738
	4	36,659,231	594,763
		115,361,427	2,384,481
4	1	71,437,703	1,501,216
	2	96,902,585	1,610,844
	3	75,094,461	1,882,569
	4	88,322,254	1,931,378
		331,757,003	6,926,007
5	1	22,321,260	640,477
	2	25,560,302	738,532
	3	27,718,214	677,848
	4	36,179,290	584,064
		111,779,066	2,640,921

Table 25

ANNUAL TEXAS COASTAL RECREATION EXPENDITURES FOR 1974-1979

Year	Actual Annual Expenditures
1974	$ 46,261,639
1975	57,674,631
1976	68,974,037
1977	87,292,783
1978	97,990,555
1979	106,751,929

Table 26

ANNUAL TEXAS COASTAL OTHER RETAIL EXPENDITURES FOR 1974-1979

Year	Actual Annual Expenditures
1974	$ 2,010,372,082
1975	2,374,730,267
1976	2,847,191,287
1977	3,387,720,206
1978	3,723,341,322
1979	4,877,117,411

Businesses at the water's edge, as well as farther inland in each county, were selected with emphasis given to coastal locations where impacts were most likely to be felt. Each individual interviewed was asked to estimate the extent of business loss he/she incurred in 1979, 1980, and 1981 due to the impact of oil spills. Many of these same individuals had been polled previously as to the extent of their monthly losses in August and October 1979, in preparation for the hearings held in Corpus Christi before a House of Representatives Committee. As a result, some additional time was necessary to assist them to think in terms of annual rather than monthly loss. Most of those who were interviewed were very cooperative. Several even took the time to consult their financial records before providing a final estimate. In addition to securing estimates of financial loss, inquiries were made as to specific examples of losses incurred. Thus, questioning yielded a considerable amount of qualitative information that was useful in supporting the conclusions of this research. Losses were reported only for 1979; not one person interviewed indicated continuing losses for 1980 and 1981.

The interviews yielded a series of percents (across a variety of recreation-related businesses) in each subregion. The percentages in the affected coastal communities were averaged for each sector and for each subregion. The raw estimates derived from these interviews are shown in Table 27.

ASSESSING OIL SPILL IMPACTS ON THE RECREATION INDUSTRY

Interviews conducted inland in each coastal county revealed that impacts were considerably less than those felt in the coastal communities (particularly those on the barrier islands which were directly impacted by the spill). For example, an owner of a liquor store chain in the lower Rio Grande Valley revealed that his Padre Island store was the only one that showed a loss during this period, and he attributed the loss directly to the IXTOC I spill. Representatives of a zoo and theater in Brownsville reported that their business was generally unaffected by the spill. If anything, they felt that their business might have been stimulated as a result of the spill. Similarly, it is inconceivable that a recreation service business in North Harris County would be noticeably affected by the spill.

The effects of the spill were presumably felt locally in the coastal communities, and a means was needed to discount the lost business values reported in the interviews to avoid overgeneralizing the extent of lost business to other unaffected areas within each coastal county and/or subregion. Therefore, the alternative assumption, namely that there was no impact on business except in the coastal communities, was chosen as a more reasonable approach because interviews had

Table 27

RAW ESTIMATES OF PERCENT LOST BUSINESS ATTRIBUTED TO OIL SPILLS BY SUBREGION, 1979

Category	Subregion				
	I	II	III	IV	V
Other Retail (%)	0	4	0	34	39
Recreation Services (%)	0	4	0	27	50

revealed that the extent of business loss varied directly with proximity to the beach. Clearly, business losses occurred in the other retail and recreation service sectors outside the coastal community that could be attributed to the spill. There was no systematic data base, however, that would allow an understanding of the extent of loss here, or how the extent of loss varied by business type or location within the study area.

To make the necessary discounting of the raw values shown in Table 27, Mr. John McVey of the Texas Comptroller's Office was contacted to secure general retail sales data (1979) for the three coastal communities and their respective counties that were most directly impacted by the spill. The coastal communities were South Padre Island-Port Isabel, Port Aransas, and Galveston. These data were used to create a ratio of general retail sales at the county level to general retail sales in the coastal community. Using this procedure, it was determined that the City of Galveston accounted for 14 percent of the total retail sales in Galveston County in 1979. Port Aransas and South Padre Island-Port Isabel each accounted for 2 percent of the total retail sales of Nueces and Cameron counties, respectively. These total retail sales percentages were used for differentiating between coastal community gross receipts in the recreation sector from recreation expenditures in the rest of each county. Further, these percentages were used to discount the values shown in Table 27 to reflect the oil spill impact in each respective subregion rather than only the affected coastal community. In addition to providing a more accurate view of the spill and its impacts, this procedure was necessary in order to link up with the study area revision of the Texas Input-Output Model developed by Restrepo & Associates. As indirect impacts were analyzed on a subregional basis, the percentage of lost business was transformed into this format as well (see Appendix H).

The percentages shown in Table 28 reflect oil spill impacts as they were spread across expenditures in each subregion. Although these figures appear relatively low and inconsequential, two points should be remembered. First, these losses were not equally distributed within each subregion. Rather, they were absorbed by a small number of businesses close to the water's edge. Second, this is a conservative estimate in that the impact was at least this high. Additional impacts were possibly felt in the recreation-related sector inland in the study region, but there was no reliable means of calculating the losses.

Once the revised percentages were calculated, they were applied to the subregional 1979 totals of gross receipts for the other retail and recreation services sectors to calculate the level of gross receipts without the spill. The differences between these predicted levels of gross receipts without the spill and actual 1979 gross receipts are shown as direct

Table 28

ADJUSTED ESTIMATE OF PERCENT LOST BUSINESS BY SUBREGION, 1979

Category	Subregion				
	I	II	III	IV	V
Other Retail (%)	0	.02	0	.3	1
Recreation Services (%)	0	.02	0	.5	2

economic impacts of the oil spills in Table 29. Summing losses in gross receipts across the three affected regions reveals a total direct economic loss of $3,098,616.00 for the recreation sectors.

Several points must be made in support of the data shown in Tables 28 and 29. Subregion V, which included South Padre Island and Port Isabel, accounted for the largest amount of lost business receipts in both recreation-related categories. From the interviews, as well as published reports on the physical impacts of the oil spill, these losses were assumed to be attributable to the IXTOC I spill. The spill, as well as the attendant statewide and national media coverage, occurred during the height of the summer season in the South Padre area. Similarly, the impacts shown for Subregion IV were attributed to IXTOC despite the findings of Kana et al, which showed that oil from the BURMAH AGATE spill reached this area as well. As this latter spill occurred in early November 1979, which is an off-season period for Subregion IV, it was not expected that the BURMAH AGATE spill had any substantial economic impact in this area.

Data in Table 29 does not show any direct economic impacts from the two spills on Subregions I and III. This does not mean that oil was not experienced in these areas, but rather that those who were interviewed did not report any impact on their business that could be attributed to the oil spills. Also, Subregions I and III are not major coastal recreation centers. From the interviews, recreational activity apparently was not interrupted despite any physical presence of oil. Neither of these areas received any great amount of media attention with regard to the movement of spills along the coast.

The impacts shown for Subregion II can be directly attributed to the BURMAH AGATE and MIMOSA collision and spills. Several reasons suggest that if an oil spill had to occur near Galveston, it should occur in November. Interviews revealed that many recreation businesses were closed during this off season. This is also the time of the year when the principal wind regime shifts from prevailing southeasterly winds to a pattern of short-lived but strong northerly winds. The strong polar air masses or "northers" produced a strong nearshore surface flow in a southwesterly direction during most of the spill period. Reports indicate that local authorities moved quickly and completely to remove the oil from Galveston Island's fine-grained sand beaches. The impact on recreation services, therefore, was particularly slight.

IMPACT EXAMPLES AND BACKGROUND

During the process of interviewing, people provided a great deal of additional qualitative information that was

Table 29

DIRECT ECONOMIC IMPACTS OF THE OIL SPILLS BY SUBREGION, 1979

Category	Subregion				
	I	II	III	IV	V
Other Retail ($)	0	835,205	0	1,026,053	1,129,082
Recreation Services ($)	0	17,978	0	36,452	53,846
Total ($)		853,183		1,062,505	1,182,928

useful in better understanding the impact of the spills on recreation activities. In the South Padre Island area, for example, several charter boat operators reported that fishing was at its best during the spill. One operator reported sighting more than 200 whales and enjoyed higher-than-usual catches of yellow fin tuna, and marlin during the spill.

The charter boats, which depend on an established local and regional clientele, continued to operate during the spill and were not impacted nearly so much as the party boats, which depend more on a tourist clientele. Most of the party boat operators attributed their loss of trade to the media, which described the spill as a total disaster and did not report that fishing was much better than usual. To operate during the spill, charter fishermen had to absorb some unusual costs. One fisherman reported that he had to discard approximately $100 worth of line in each fishing reel after every three trips because it became hopelessly fouled with oil. It was necessary for the operators to clean the raw water filters in their boats to avoid overheating problems, and to clean the tar from their boats after each trip to avoid an accumulated buildup.

Tar and oil apparently adhered to everything; virtually nothing escaped. The oil was on people's feet, was tracked into motels and restaurants, on carpets and walkways, and presented maintenance people with a continuing challenge. Many people purchased a product called "Tar-off" from local shops and souvenir stores to remove the oil from their feet.

Several recreation service businesses provided support for the notion that oil spill impacts were not equally distributed in each subregion. Business at a go-kart track (on a barrier island but not at the water's edge) reported a loss of only 1 percent for 1979. Interviewees reported that their business suffered during August, but was better at other times due to the number of curiosity seekers in the area who came to see the spill. An operator suggested that to some degree substitution was occurring. Because families could not swim or go to the beach, they decided to go to the go-kart track. The proprietor of an amusement park (not on a barrier island) reported different results. He believed that his sharp decline in business was due to fewer tourists coming to the beach and the area, and hence fewer potential customers at his park. Further, the proprietor of a sporting goods chain reported that his business was off only at the store that was patronized by tourists, but his other stores appeared unaffected.

In Subregion II, charter boat and other recreation service businesses in Freeport were unaffected by the BURMAH AGATE spill while the City of Galveston took a "direct hit."

Nearly every interviewee spoke about the role played by the media. Most believed that the media attention given to the June 3, 1979, IXTOC I blowout had an effect on their businesses long before the oil reached the beaches at South Padre Island on August 7, 1979. The impact of the media on recreation choice behavior is a topic worthy of further discussion, and will be discussed later in this report.

IMPACTS ON EMPLOYMENT AND WAGES

Due to the relatively short duration of spill effects and the low levels of impact in the subregions shown in Table 29, the calculation of the impact on full-time employment would not be meaningful. Early in the project, serious consideration was given to calculating an average wage level for individuals employed in the recreation-related sector and to viewing the data in Table 29 in terms of the number of full-time equivalents affected. This idea was discarded because of the relatively low impact levels, and interviews revealed that the impact on employment was minimal and of short duration. Several examples were given where hours were reduced for seasonal help, and weekend help were laid off.

SUBSTITUTION EFFECTS

With the relatively low levels of impact reported in the recreation services sector, it would be extremely difficult to detect any substitution effects, if any, outside the study area. Further, it would be impossible to establish any cause-effect relationship with increased use of recreation areas outside the study area.

Earlier, some examples of substitution effects within the study area were reported. Though no data are available, it is reasonable to assume that visitors to the lower Rio Grande Valley spent more of their time and money in the Brownsville-McAllen border area than in previous years. Funds earmarked for recreational expenditures were probably used for recreational or other purposes at unaffected locations within the study area.

A case for substitution within the region can be made by examining traffic counts taken at the causeways to Padre Island and Mustang Island by the State Department of Highways and Public Transportation (Figures 29 and 30) and the gross receipts data provided by the Texas Comptroller's Office (Figures 18 through 23). The former data set shows an increase (90,000 vehicles) between 1978 and 1979 gaining access to South Padre Island and a decrease (approximately 120,000 vehicles) for the Mustang-North Padre Island area. The Comptroller's data show a general increase in each of the five Subregions. This would be consistent with the finding of no oil spill impact in Subregion I and II. Further, for Subregions II, IV,

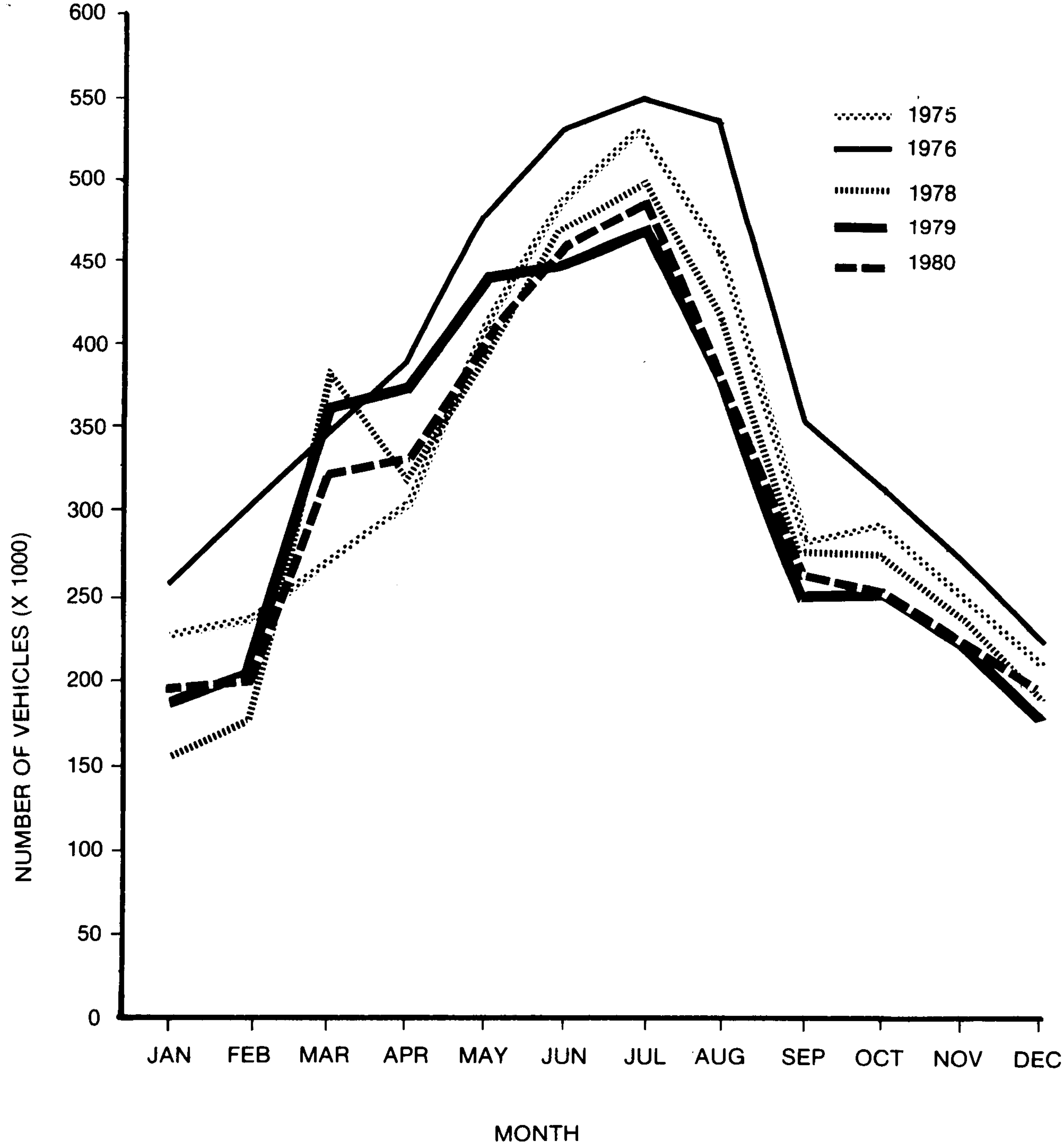


Figure 29

Number of Vehicles Accessing Mustang-North Padre Island by Means of the JFK Causeway and Port Aransas Ferry

(1975, 1976, 1978, 1979, 1980)

Source: Texas Department of Highways and Public Transportation

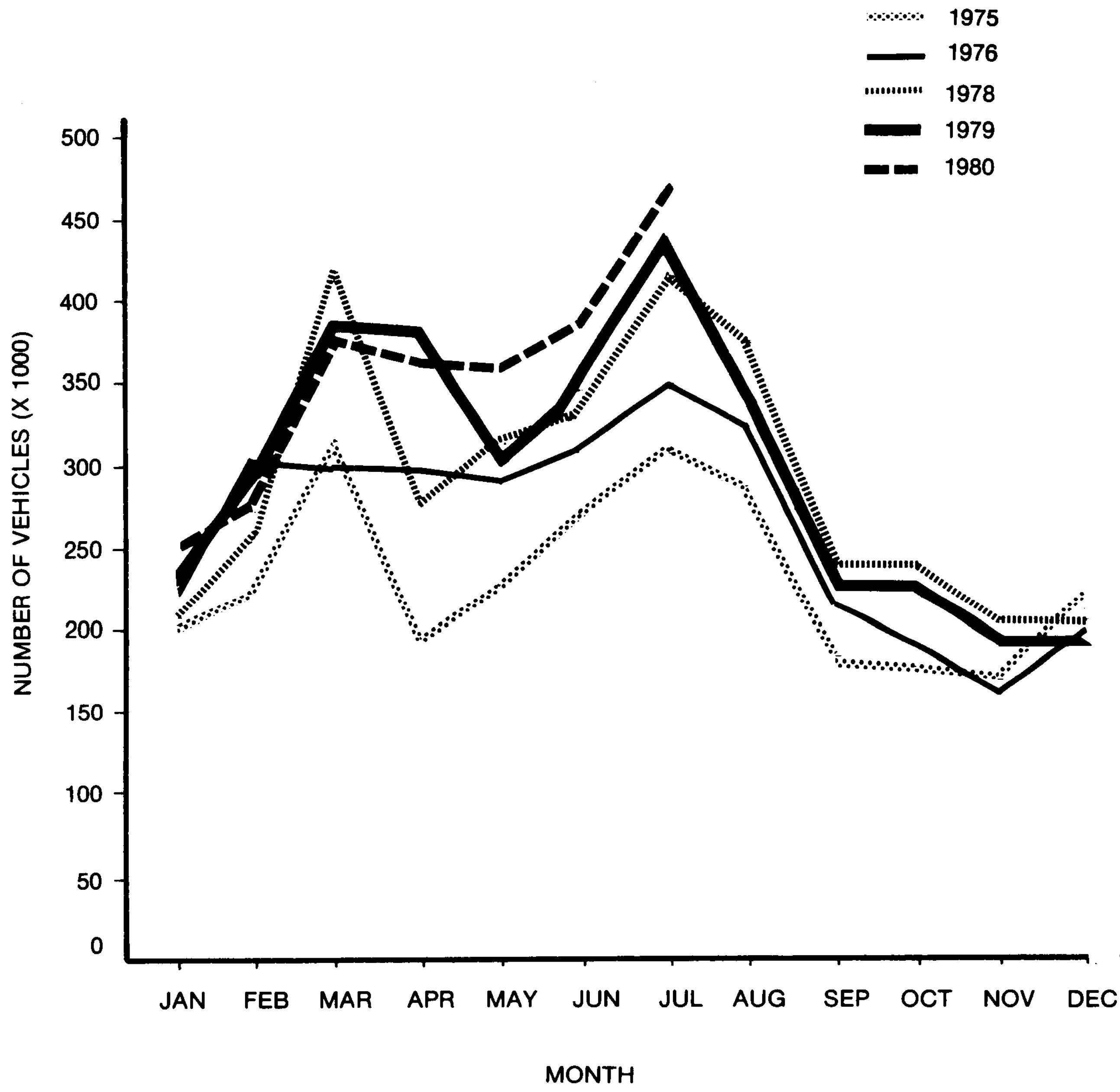


Figure 30

Number of Vehicles Accessing South Padre Island
by Means of the Queen Isabella Causeway
(1975, 1976, 1978, 1979, 1980)

Source: Texas Department of Highways and Public Transportation
Note: Data for 1980 Missing (3 months) due to Hurricane Allen

and V, it would suggest that those who were likely to visit the Gulf front communities in the late summer-early fall period probably made recreation-related expenditures elsewhere in the subregion. This is consistent with information known about summer-fall Gulf coast visitors; that is, they are more likely to be regional Texans than out-of-state visitors (Fedler, 1978; Bednarz, 1980; Scogin 1980).

Spill impact might have been more severe had the spill occurred during the late winter-early spring on the South Texas coast when there is an influx of out-of-state visitors or winter Texans. If this group had been displaced or reduced, the region and the state would have been deprived of their expenditures entirely. This was not the case with the regional Texas population who apparently spent their money for other recreation-related services at home or elsewhere in each of the affected subregions.

Visitation to the South Padre and North Padre areas appear to have been affected by factors besides the IXTOC I oil spill. For example, in the North Padre Island area, visitation for 1978 through 1980 was generally below 1975 and 1976 levels (Figure 29). Although this was not the case for visitation to the South Padre Island area, there are few differences in visitation between the latter halves of 1978 and 1979 (Figure 30). Visitation here was generally well above 1975-1976 levels. In assessing impacts related to the spills, these trends must be, and were, given full consideration.

NET IMPACT EFFECTS

Although net impacts are difficult to quantify, they can be discussed in light of the business losses reported in Table 29. In addition to the reported losses of businesses operating at the water's edge (dry sand area and shorelands), other losses were possibly incurred further inland in each of Subregions II, IV, and V. However, it can be argued that these were offset to some degree by the expenditures of those involved in monitoring and cleaning up the spill or in reporting on spill-related events for the news media. If a trade-out of expenditures can be accepted at face value without any supporting data, which are apparently lacking, then the figures in Table 29 are the best available information. These data appear intuitively reasonable from that which is known about the spills and their duration, with the highest and lowest levels of impact (in percentages and in dollars) in Subregions V and II, respectively. The estimates of impact are based on information from personal interviews and, therefore, can be regarded as conservative estimates of total impact. No attempt has been made to generalize effects reported at the water's edge to the entire subregion in an effort to produce a large, albeit unsupportable, estimate of impact.

Negative Effects

It was concluded that three Gulf-front communities together suffered a direct economic loss of $3.1 million in recreation-related gross business receipts. As was seen in Table 27, the estimates of lost business ranges from 34 to 50 percent in Gulf-front communities on the South Texas coast. Approximately $2.2 million of the total $3.1 million loss in gross receipts occurred in the cities of South Padre Island, Port Isabel, and Port Aransas and was attributed to the IXTOC I oil spill. The remaining $850 thousand loss in gross receipts was incurred in the City of Galveston and was attributed to the BURMAH AGATE spill.

Positive Effects

As shown previously in the Santa Barbara spill, the data here suggest that the recreation business loss at the water's edge was offset with additional recreation-related spending elsewhere in the subregions. Figures 18-23 show other retail and recreation expenditures for 1974-79 and generally indicate an increasing trendline for 1979 (the spill period). For reasons of timing and the population affected, as discussed earlier in the substitution section, the three affected subregions (II, IV, and V) were not negatively impacted. By this, it is meant that 1979 levels of gross receipts exceeded 1978 levels in every case (except for recreation business receipts in Subregion IV which remained about the same).

Even with cost of living increases and inflationary effects considered, it is significant that there was no massive decrease in regional gross receipts originally thought to accompany the world's largest oil spill. In contrast to the impacted Gulf front communities, the subregions were not impacted by the spill with the exception as noted previously. If the subregions were not significantly affected by the two oil spills, it is unlikely that the state or nation was affected in any noticeable way.

THE ROLE OF THE MEDIA

As mentioned earlier, the role played by the media with regard to oil spill impacts on the study area was a topic of considerable controversy among nearly all who were interviewed. Several persons suggested that the media coverage was biased against the region in some premeditated way in an effort to discredit a sunbelt area. Most, however, suggested that, if the public had known the facts about the spill (i.e., that the oil did not come ashore until August 7, that oil spill clean-up operations were in place to handle the oil, and that sport fishing was apparently unaffected), they would have come to the coast; and the recreation-related impacts would not have been so great. Interestingly, the recreation-related impacts proved not to be as significant as many people first thought in the fall of 1979.

Whether the media acted to shape people's recreation choice behavior, i.e., where they decided to go on their vacation and weekend trips, is a topic worthy of further investigation. A substantial body of literature deals with the factors that influence trip-distribution in outdoor recreation. For example, Cesario (1969) postulated that recreational travel is a function of three constructs: relative attractiveness, relative accessibility, and the characteristics of the population. With regard to the impact that an oil spill might have, attention must be focused on relative attractiveness.

Place attraction can be defined as the appeal of a place to an individual for use during participation in a recreation activity (Doering 1977:22). Previous research has shown that an individual has limited and imperfect knowledge of the characteristics of the environment and that his recreation choice behavior is a function of this knowledge. The concept of cognitive image plays an important role here. Environmental cognition is defined as the continuing process by which information about the environment is acquired, evaluated, and amalgamated with existing beliefs (Downs and Stea 1973). Environmental perception is the process by which an individual becomes aware of the information.

Previous studies have provided support for the concept that recreational places are defined and used in accordance with individual cognitive images. Research by Ditton and Goodale (1972, 1973) has shown that individual cognitive images were strongly associated with whether an individual used a particular waterbody for recreation and, if so, which area of the waterbody was used. In the case of the IXTOC I oil spill, individuals' cognitive images of the coast were probably impacted to some degree by the media, which helped them to determine whether they made a trip to the coast and, if so, the specific location. To understand the dynamics of the IXTOC I oil spill impacts or those of future oil spills, one must have a better understanding of the socio-psychological dimensions of coastal recreation choice behavior. To understand how the media might have affected people's cognitive images of the coast, one must first know something about their cognitive images of the coast and the importance they associate with various coastal characteristics. Unfortunately, there is no such data base available relative to cognitive images of the Texas coast. Therefore, the aspects of the media coverage that impacted most on people or the specific impact the media might have had on coastal recreation behavior patterns cannot be ascertained.

A recent study dealt specifically with the role of the media in influencing perceptions (Rappaport et al., 1981).

They reported that socioeconomic damages associated with the ARGO MERCHANT oil spill were not evident, although survey results showed a public perception of widespread and serious damage. Rappaport and his colleagues sought to combine a discriminant analysis of five broad categories of independent variables (demographic, water activity, general media habits, spill discovery information sources, and spill effects information sources) with theories dealing with human behavior and the media in a disaster setting to explain the opinions of residents, who erroneously believed that the ARGO MERCHANT oil spill produced substantial economic damage. As the researchers pointed out, it is difficult to prove whether the media has reinforced cognitive images that have already been formed, or has caused a cognitive image to be held. They generally viewed the media as a "gatekeeper" and further suggested that "once the press advocates the existence of substantial damages, the subsequent withdrawal of such claims does not alter the damage perceptions for a large part of the population." The strength of the television media was also emphasized in that the visual image produced seems to have had a dramatic effect on the perceptions of those who believed damage had occurred. Further, those who perceived damage used a greater number of sources of information about the spill, perhaps suggesting a multimedia-reinforcement effect. Rappaport and his colleagues concluded by suggesting that "those engaged in allocating resources for oil spill management should assign a higher priority to educating both the general population and multiple forms of media. Failure to do so may produce burdensome legislation resulting from the reaction of an uninformed and angry electorate reinforced by media performing a gatekeeper function."

FUTURE RESEARCH NEEDS

In addition to the need for research that focuses on the socio-psychological dynamics of oil spill events and the role of the media (reinforcing, converting, causal, or benign) in a disaster situation, several other aspects of oil spill impact assessment are worthy of research attention.

The approach used by Restrepo and Associates to study the economic effects of the IXTOC I oil spill was generally macro in orientation. The objective here was to produce an estimate of direct and indirect impacts of the spill on a particular study area as well as to produce a methodology that could be used to assess the impacts of other major spills. In addition, a need exists for a micro research focus on spill effects and should be addressed more fully during and after a spill with a series of case studies. Using this approach, additional information, albeit mostly qualitative, might be revealed relative to social and economic effects. Just as biological observers are dispatched to every major spill, there may be a need for individuals trained in the social sciences to be involved at the spill site making observations and identifying indicators of impact.

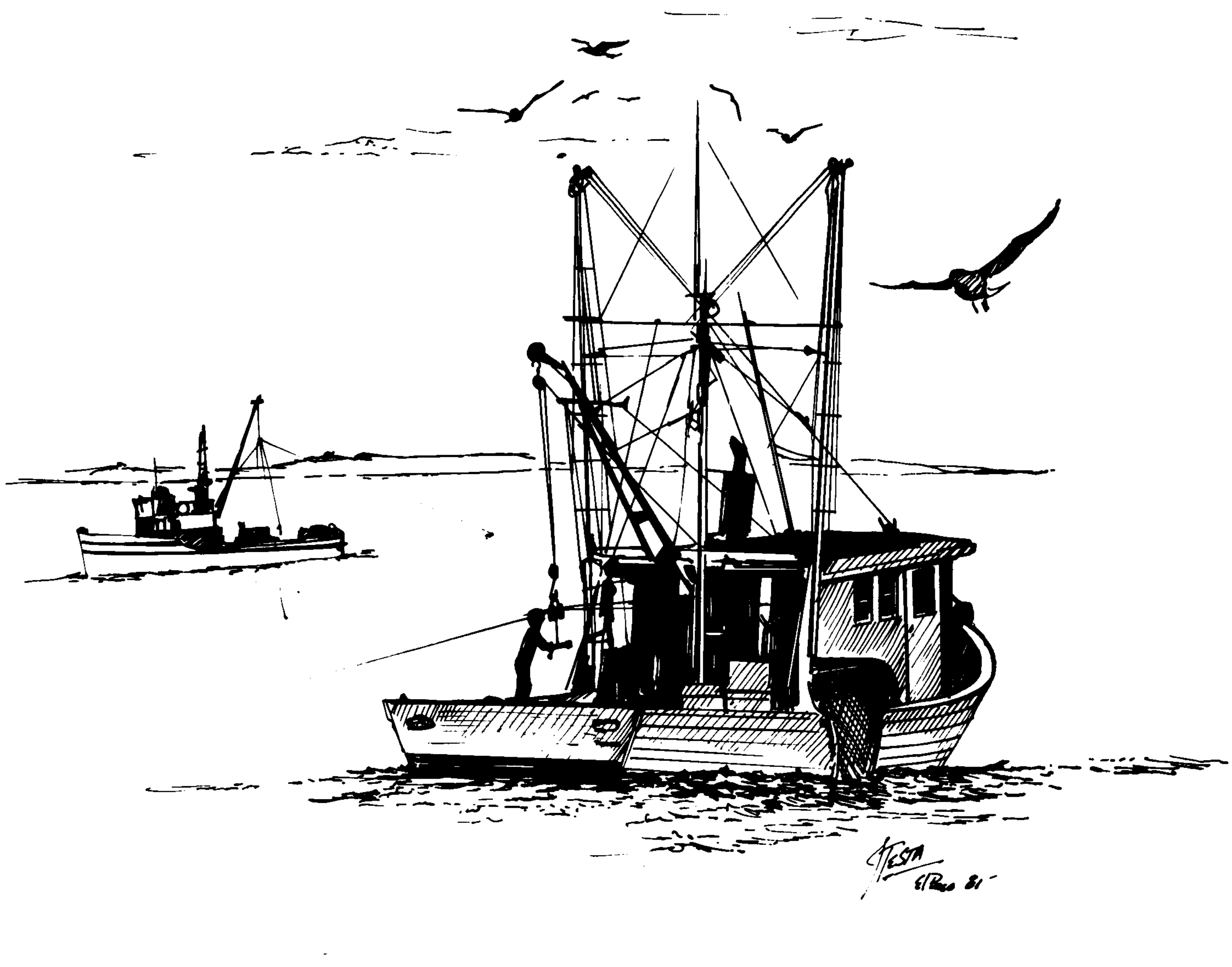
Recreation and tourism tradespeople in coastal areas where there is a high risk of spills need to become more involved in local oil spill contingency planning. Among other concerns, they need to have an information system identified and in place that will yield accurate estimates of social and economic impacts once a spill has been controlled.

Also, there is a need for additional research relative to the extent of recreation activity in the coastal zone. Unlike the lodging and restaurant sectors of tourism, much recreational activity takes place without a market transaction. Information about the extent of public goods such as fishing, boating, swimming, hiking, and camping are not likely to be included in expenditure data on a SIC basis, since they were consumed at little or no cost. Some indirect understanding of these activities can be achieved through the existing expenditure data but not the extent of participation with available participation data. It should not be assumed that these activities are unimportant, because participants are likely to make other expenditures in the local economy. If the impacts of oil spills on specific recreation activities and their participants are to be understood, information will be required on the intensity, location, and patterns of outdoor recreation activities that might be impacted. Without such a data base and information system, impacts on recreation are likely to be understated because only activities that include a market transaction can be observed.

CHAPTER V

COMMERCIAL FISHING

V



CHAPTER V. COMMERCIAL FISHING

I. INTRODUCTION

The commercial fishing industry of Texas is an important component of the economy of the coastal area of the state, particularly the small cities and villages that provide a base of operation for fishing fleets. The industry is dominated by the harvesting sector. Much of the production is sold and shipped in a relatively unprocessed form. Shrimp constitutes by far the most important part of the fishery, recently averaging in excess of 75 percent of landings and 95 percent of the value of landings in Texas.

The commercial fishing industry is very sensitive to a wide array of environmental and economic variables. The biological nature of the resource makes it exceptionally sensitive to environmental conditions such as rainfall, fresh water inflow, temperature, pollutants, and other similar factors that govern reproduction, growth, movement, and natural mortality. Economic considerations include the common property, open access, nature of the resource, the large proportion of total U.S. shrimp supplies coming from imports, extreme sensitivity of shrimp demand to fluctuations in the economy, and the dependence of the harvesting sector on inputs, particularly fuel, which in recent years have escalated much more rapidly in price than general price levels in the economy. The crab, oyster, and finfishing industries of Texas are sensitive to most, if not all, of these same variables.

PURPOSE OF ANALYSIS

As discussed in preceding sections, the purpose of this study is to determine the magnitude of the impact, if any, of two 1979 oil spills in the western Gulf of Mexico on the economy of the coastal areas of Texas. The commercial fishing component of that economy is examined in this section. Analysis of this question requires that the effects be separated from the normal variability, which occurs in the industry, as associated with the diverse and numerous environmental and economic factors noted above.

As will be seen in the discussion that follows, this is not an easy task. Difficulties exist, not only because of the wide array of factors and their own inherent variability, but because little is known about the relationship between the level and value of landings and both the environmental and economic variables. The appearance of a new or significantly increased factor (oil spill) can be examined only in relation to the natural processes occurring on a continuing basis in the fishery.

GENERAL PROCEDURES

The analysis is directed towards a conclusion regarding the impact of the oil spills on the ex-vessel value of fish (both finfish and shellfish) landed in Texas during the 3-year study period 1979-1981. The ex-vessel value is the primary economic variable used to measure the output of the harvesting level of the Texas commercial fishing industry and is the product of the quantity of landings and the price per unit. The effect of the oil spill would be expected to affect total value through an impact on the quantity or volume landed. Therefore, the analysis focuses primarily on an examination of trends and variability in quantity landed. Economic considerations, such as the possible reduction in value per pound due to oil contamination or changes in operating costs, are also examined.

Data for the analysis are of two basic types, secondary and primary. Secondary data on landings, effort, and value were obtained from published and unpublished sources collected primarily by the National Marine Fisheries Service (NMFS) and the Texas Parks and Wildlife Department (TPWD) and constitute the generally accepted official data set for these variables. General limitations of these data are discussed below, and specific problems are noted as appropriate in the discussion of the results.

Primary data were collected for this study through a series of interviews completed either in person or by telephone. The sample consisted of persons knowledgeable about the Texas fishing industry, including fishermen, dockside dealers, biologists, marine advisory agents, and local businessmen. An extensive survey of this group was not conducted as part of this study due to the lack of funding; however, these sources were considered important in developing an overall view of the possible impacts. A limited sample, therefore, of individuals, located in those areas of the region most likely to be impacted were selected. The information gained was used as a supplement to the analysis of the secondary data set.

Data on shrimp landings, effort, and value are collected through a system of NMFS port agents who regularly visit dockside dealers and interview fishermen. Data on other species are generally collected by TPWD through the use of a regular reporting form submitted by first handlers, which indicate quantity purchased and price by species.

ASSUMPTIONS AND LIMITATIONS

A general question exists among users of the landings data regarding the completeness of the data as incentives, and opportunities for some under-reporting are always a concern.

For analyses where knowledge of the absolute level of landings is important, under-reporting can be a major problem. However, where the main point under examination is whether a change may have resulted from some specific event, the problem is less significant. The implicit assumption is that the degree of under-reporting or other measurement error is relatively unchanged over time.

Another problem, more critical for the analysis, is the time lag involved in obtaining some of the data. The occurrence of the oil spills is not very far removed from the date of this study of their effects. The process of collecting, verifying, and publishing the data may consume as much as three or four years, particularly for data on fishing effort (days fished). For this study, data were obtained both from published sources for earlier years and from unpublished sources, where available, for the most recent years. Preliminary data are so indicated.

Attempting this analysis so soon after the occurrence of the oil spills necessarily eliminates the perspective which could be provided by a more complete and definitive set of data on both landings and the factors influencing landings. This is particularly true with respect to the availability of the results of studies on the water quality and biological effects of the oil spills. Since analyses of these aspects of the oil spills were still underway at the time of this study, no biological basis for inferring economic effects could be established. This observation provides a frame of reference for evaluating the results in the light of data not yet available and is not intended to detract from the conclusions.

In the next section, the general characteristics of the fishery, the species, and participating individuals and firms are reviewed. The data directly pertaining to the effects of the oil spills are presented in the third section, and conclusions regarding the direct effects follow the analysis. The direct effects are then used in a discussion of indirect impacts in the last section of this chapter.

II. BASELINE ASSESSMENT

FISHING ACTIVITY

Industry Organization and Structure

The harvesting level of the industry consists of a fleet of vessels and boats that operate both in the bays and offshore waters of Texas. Commercial fishing is designated as Standard Industrial Classification (SIC) group number 091 with the finfish industry (0912), shellfish (0913) and miscellaneous marine products (0919) as the main components.

Vessels (5 gross tons or larger) are considered capable of fishing in offshore waters and may operate in all parts of the Gulf of Mexico, although their effort is concentrated off the Texas coast. The term boats refers to smaller craft (less than 5 gross tons) operating in bays and near shore areas. In 1976, 1,923 vessels and 1,055 boats were reported to be operating in Texas, a decrease in vessels from the peak in 1973 of 2,436. The number of boats was highest in 1975 at 1,338. These estimates are based on National Marine Fisheries Service data related to craft reporting landings, but may represent underestimates of the total number of vessels operating commercially. This will be discussed in more detail in the later section on employment and fishing effort.

Several distinct commercial fishing groups exist in Texas. In the shrimp fishery, the smaller bay fleet represents one distinct group which has little in common, except the resource, with firms using larger vessels for trawling offshore. Commercial finfishermen represent a third group, while some others concentrate on oyster or crab harvesting. Conflicts arise among these groups, as well as between them and sport fishing, industrial or development interests. The focus of these conflicts is usually on the use of the fish resource and the bay or estuarine systems upon which they depend (Griffin et al.).

The first level of sale in the industry occurs at dockside. In most ports several dealers maintain facilities to offload and handle finfish and shellfish. Much of the dockside sales are focused on shrimp, but oysters, crabs, and finfish can be unloaded and sold in all major ports. This dockside market for fish and shellfish represents the first level at which the value of seafood is established. Prices set at this stage are used to determine the returns to crew members who are paid on a share basis.

Three major port areas - Brownsville-Port Isabel, Aransas Pass-Rockport (including Nueces County), and Freeport - account for about 70 percent of shrimp landings and 75 percent of value (Tables 30 and 31). Since shrimp is the dominant species, this distribution would not likely change significantly if all fish were included (Figure 31). Approximately a dozen smaller ports service the needs of regional and local fishing activity.

In 1977, shrimp was handled by over 100 dockside dealers, 48 of which were in the four largest ports and accounted for about two-thirds of the volume and over 70 percent of the value. Finfish, crabs, and oysters are drawn primarily from the bays and are sold to these dealers as well as other specialized dockside buyers.

Since seafood processing is not a major part of the Texas commercial fishing industry, much of the shrimp from the middle

Table 30

ANNUAL LANDINGS OF SHRIMP BY PORT, TEXAS 1976-1980

	IN METRIC TONS						SHARE OF TOTAL	CUM. SHARE
	1976	1977	1978	1979	1980	AVERAGE	%	%
Aransas Pass/Rockport	4300.7	5358.1	4607.5	4009.0	4124.6	4480.0	20.1	20.1
Freeport	3709.6	4704.7	4431.8	2030.8	2815.9	3538.6	15.9	36.0
Brownsville	2653.3	3872.6	3587.6	3197.8	3010.1	3264.3	14.6	50.6
Port Isabel	2870.3	3708.9	3132.6	2783.0	2697.2	3038.4	13.6	64.2
Nueces Co.*	928.6	1395.0	1324.9	1396.2	1509.0	1310.8	5.9	70.1
Galveston Co.	1231.7	1199.0	1488.7	1057.3	1557.1	1306.8	5.9	76.0
Galveston	1225.1	1319.6	1120.2	684.8	730.2	1016.0	4.6	80.6
Port Arthur	728.7	698.0	685.5	738.9	1029.9	776.2	3.5	84.1
Palacios	582.5	730.7	676.6	931.5	941.8	772.6	3.5	87.6
Port Lavaca	425.7	673.9	655.1	568.5	569.8	578.6	2.6	90.2
Seadrift	278.1	492.5	386.8	477.3	500.9	427.1	1.9	92.1
Seabrook	493.6	359.2	310.7	102.8	371.6	327.6	1.5	93.6
All Others**	1362.3	1754.4	1588.7	1297.4	1191.3	1438.8	6.4	100.0
Total	20790.2	26266.6	23996.7	19275.3	21049.4	22275.8		

*Nueces County landings are mostly at the port of Aransas. The county line runs through the port area.

**Includes Port O'Connor, Port Mansfield, Anahuac, Matagorda & Riviera

SOURCE: Unpublished NMFS data

Table 31

VALUE OF SHRIMP LANDINGS BY PORT, TEXAS 1976-1980

	1976	1977	1978	1979	1980	Average	Share of Total	Cum. Share
	(000 Dollars)						%	%
Aransas Pass/Rockport	$ 27713.4	$ 28430.4	$ 30751.5	$ 36188.1	$ 31139.3	$ 30844.5	22.7	22.7
Freeport	21916.9	24333.5	28316.7	17968.4	20672.0	22641.5	16.6	39.3
Brownsville	16380.4	20568.7	23314.8	29704.3	22781.7	22550.0	16.6	55.9
Port Isabel	17908.1	18336.5	19025.3	24473.8	20035.7	19955.9	14.7	70.6
Nueces Co.*	5041.7	6427.9	7019.9	9696.4	9264.7	7490.1	5.5	76.1
Galveston Co.	5593.8	4762.8	7362.3	6674.3	8149.3	6508.5	4.8	80.9
Galveston	6286.6	5752.5	6184.1	5513.3	4719.9	5691.3	4.2	85.1
Port Arthur	3617.3	3166.3	2910.9	4805.1	5065.8	3913.1	2.9	88.0
Palacios	3265.0	3501.4	3887.4	5605.8	6063.8	4464.7	3.3	91.3
Port Lavaca	2172.4	2678.7	3049.2	3204.9	3306.1	2882.3	2.1	93.4
Seadrift	620.9	1096.0	859.1	1678.2	1840.8	1219.0	0.9	94.3
Seabrook	1515.7	1240.2	1269.1	443.8	1556.3	1205.0	0.9	95.2
All Others**	6092.1	6597.4	7160.6	7049.2	5864.6	6552.8	4.8	100.0
TOTAL	$118124.3	$126892.3	$141110.9	$153005.6	$ 140460.0	$ 135918.6		

*Nueces County landings are mostly at the port of Aransas. The county line runs through the port area.

**Includes Port O'Connor, Port Mansfield, Anahuac, Matagorda and Riviera

Source: Unpublished NMFS data.

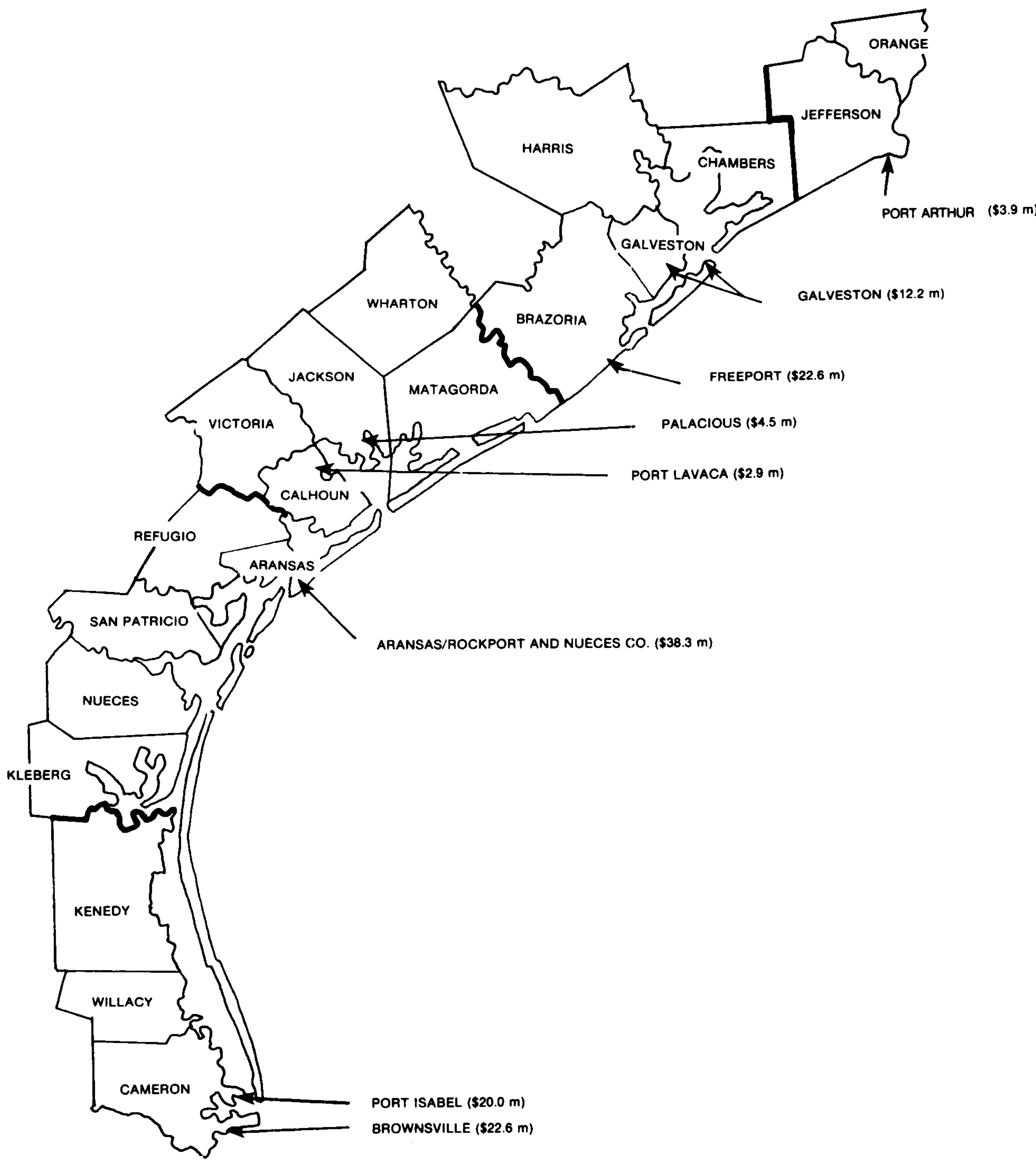


Figure 31

Commercial Fishing Activities in Texas as Indicated by Annual Average Value of Shrimp Landings by Port, 1976-1980 and upper coast is shipped out of state in unfrozen form directly after unloading. The majority of the rest of the shrimp is graded, sized, frozen in 2.27 kilogram boxes, and stored for later distribution. This activity is concentrated in the Brownsville area, although some grading and freezing capacity is located at other major ports. Other shellfish are subjected to varying amounts of processing, but in no case does this represent a major industry. A few small crab-picking plants exist along the coast, and some small oyster-shucking plants are also in operation seasonally. A few finfish processors handle significant volumes; but for the most part, these species are sold with a minimum level of processing.

In 1978, 60 processing plants were operating in Texas, according to NMFS statistics. The number of processors was down from 88 in 1970 and represented about 14 percent of the total plants in the Gulf Coast region. Yearly average employment in these plants was 1,733 in 1978, down from 2,978 in 1970. Employment in Texas plants represented about 11 percent of the Gulf total, indicating that Texas plants were smaller than average.

Measured at the ex-vessel level, landings of all fish in Texas in 1979 were estimated at nearly $159 million (Table 32), approximately three times the value of all fish in 1970. To gain some perspective, the value of fish is compared to cash receipts from agricultural crops and livestock, another primary producing sector, in the 19-county study area. In 1979 the value of fish was approximately 20 percent of the value of agricultural production. Although some variation has occurred from year to year, 20 percent seems to be a representative average and no significant trend is apparent. For some communities, however, the fishing industry is much more important than agriculture or most other industries. In Aransas County, for example, agricultural cash receipts were approximately $1.7 million in 1979, while the value of shrimp alone landed at Rockport and Aransas Pass (including the Nueces County part of the port of Aransas) is estimated to be in excess of $60 million (Table 31); such is the case in many of the smaller coastal communities.

In relation to the total U.S. fishing industry, Texas' share of landings has declined over the past decade to approximately 1 percent of total U.S. landings of all fish in 1978 and 1979 (Table 33), down from nearly 3 percent in the early part of the decade when large quantities of menhaden were being landed in Texas ports. As a share of value, however, Texas is much more important with about 7 percent of total U.S. value in 1979. This, however, is down noticeably from 10 percent in the early part of the decade (Figure 32).

Table 32

VALUE OF LANDINGS IN RELATION TO TOTAL AGRICULTURAL CASH RECEIPTS FOR 19-COUNTY STUDY AREA, 1970-1979

	Total Agriculture Cash Receipts	Total Value of all Fish	Value of Fish as Percent of Agr. Receipts
	(000 dollars)		%
1970	$ 288196	$ 53243.6	18.5
1971	324370	69776.7	21.5
1972	366969	84987.8	23.5
1973	561933	91479.1	16.3
1974	582116	71791.6	12.3
1975	546421	92659.5	17.0
1976	586400	127056.4	21.7
1977	604444	134135.9	22.2
1978	720960	147989.6	20.5
1979*	813895	158952.0	19.5

* Preliminary

Source: Texas County Agriculture statistics, Texas Landings, annual summary and Texas Commercial Harvest statistics, 1978 - 1979.

Table 33

LANDINGS AND VALUE OF LANDINGS. UNITED STATES AND TEXAS
1970-1980

	TOTAL LANDINGS			VALUE		
YEAR	U.S.*	TEXAS**	TEXAS SHARE OF U.S.	U.S.*	TEXAS**	TEXAS SHARE OF U.S.
	(METRIC TONS)		%	MILLIONS OF DOLLARS		%
1970		51710.1			$ 53	
1971	2276149.8	60782.0	2.7	$ 651	70	10.7
1972	2179987.3	35380.5	1.6	748	85	11.4
1973	2203574.3	30844.6	1.4	937	91	9.7
1974	2253016.4	29483.8	1.3	932	72	7.7
1975	2212192.7	27215.8	1.2	977	93	9.5
1976	2443980.7	29937.4	1.2	1349	127	9.4
1977	2357797.3	33566.2	1.4	1515	134	88
1978	2734282.8	30391.0	1.1	1854	148	8.0
1979***	2842692.5	25855.0	0.9	2234	159	7.1
1980***	2940215.9			2237		

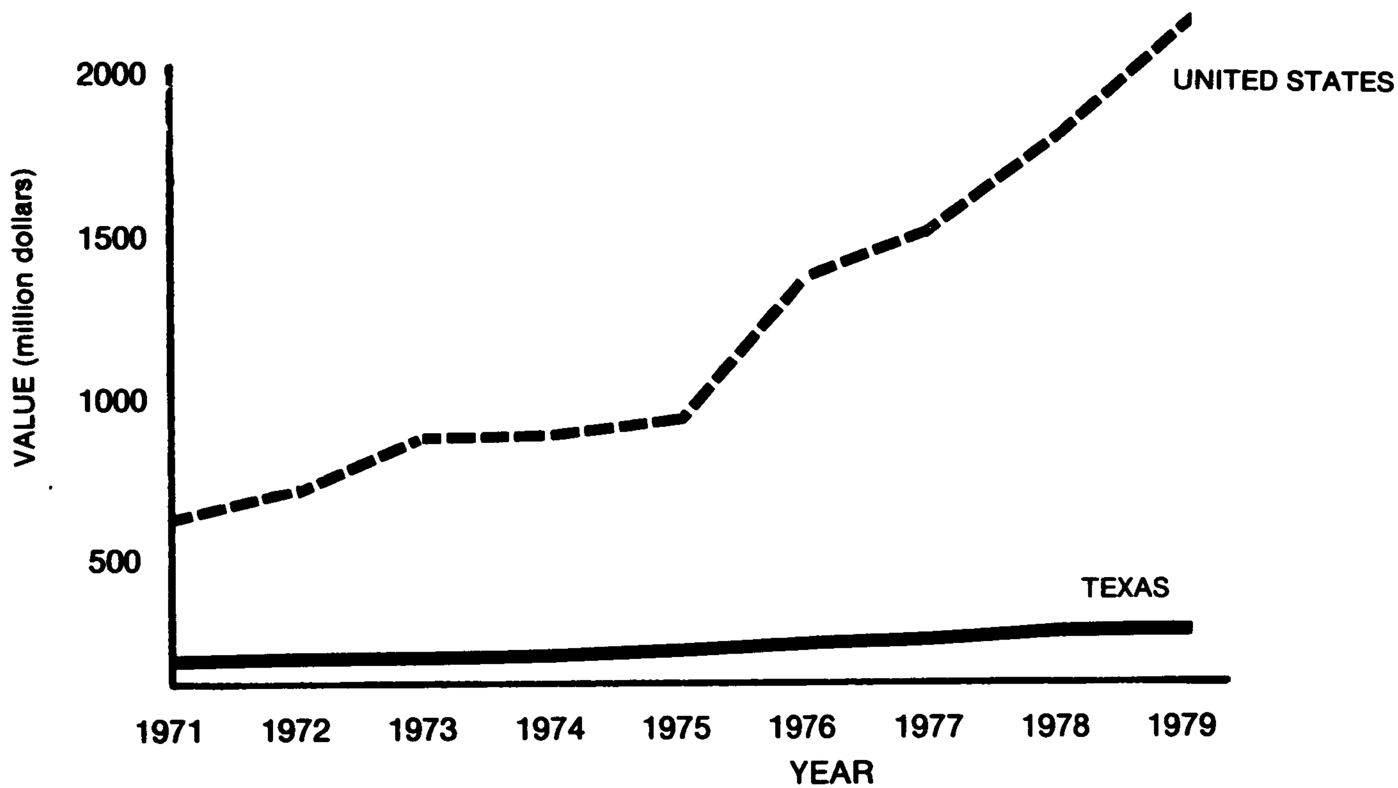
*SOURCE: Fisheries of the United States, 1980

**SOURCE: Texas landings annual summary, 1970-1978 and Texas Commercial Harvest Statistics, 1978-1979 and 1979-1980

***Preliminary

Figure 32

Value of Landings, Commercial Fisheries, United States and Texas, 1971-1979.



Overview of Important Species

As indicated above, shrimp represents by far the most important segment of the Texas commercial fishing industry. In recent years shrimp has consistently accounted for approximately 75 percent of landings and 95 percent of the value of landings (Tables 34 and 35), and other shellfish and finfish account for the remainder. Over the past decade, excluding the effects of the menhaden fishery which existed in Texas for only the first two years (1970-71), the trend in landings in general has been down. The total value of landings, however, nearly tripled primarily due to the effect of increasing prices for shrimp; whereas, the value of finfish landings has not changed substantially.

Shellfish: The recent experience for the important shellfish species is revealed in Tables 36 and 37. Crabs (primarily blue crabs) are the second most important species in volume, averaging about 12 percent of total shellfish, but produce less dollar value than oysters, the other major shellfish species. During the 1975-1979 period, an average 1,007 metric tons of oysters (meats) valued at approximately $2.2 million, were landed in Texas. About 3,328 metric tons of crabs, valued at approximately $1.6 million, were landed annually.

Of the three major shrimp species of the Gulf of Mexico (brown, pink, and white), brown shrimp are the most important in Texas. Over the past five years, brown shrimp have accounted for 64 percent of the total landings of shellfish in the state. White shrimp are also important, averaging about $27.6 million per year, while other shrimp (including primarily royal reds and seabobs) account for a very small share of the total.

Finfish: Landings and value for the finfish species over recent years are presented in Tables 38 and 39. Total finfish averaged about $2.6 million dollars over the 1975-76 period with spotted sea-trout and red drum (redfish) being the most important individual species at $0.7 million each. Black drum and red snapper are the next most important commercial species, having an average value of about $0.4 million dollars each. These four species accounted for over 80 percent of the value of commercially landed finfish in Texas in the last five years.

The most important aspect of the finfish data is the large drop in landings that occurred in 1977, particularly evident for redfish and to some degree for sea-trout and black drum. This break is thought to be associated with significant new restrictions on bay fishing gear, which were instituted in 1977, and relatively lower landings appear to have continued each year since 1977.

Swordfish and tuna are not included in this data because,

Table 34

COMMERCIAL LANDING OF SHRIMP, TOTAL SHELLFISH, TOTAL FINFISH AND ALL FISH 1970-1979 TEXAS

Year	Shrimp (Heads off)	Total Shellfish	Finfish	Total All Fish	Shrimp in Share of Total
	METRIC TONS				%
1970	25128.8	29760.0	21954.4*	51714.4	48.6
1971	24383.3	29174.9	31604.4*	60779.3	40.1
1972	27716.0	32435.3	3064.4	35499.7	78.1
1973	23322.0	27510.7	3299.0	30809.8	75.7
1974	22398.1	25730.3	3611.5	29341.8	76.3
1975	20080.0	23597.2	3459.8	27057.0	74.2
1976	21262.7	26057.0	3673.0	29730.5	71.5
1977	26278.2	31205.6	2401.3	33607.0	78.2
1978	23995.3	28255.5	2352.1	30607.6	78.4
1979**	19439.0	23640.7	2062.6	25703.4	75.6

* In 1970-1971 very large quantities of menhaden were landed in Texas. Since 1972 this has been insignificant.

** Preliminary

Table 35

VALUE OF COMMERCIAL FISHERIES LANDINGS (EX-VESSEL) FOR SHRIMP, TOTAL SHELLFISH, FINFISH AND ALL FISH 1970-1979, TEXAS

	SHRIMP	TOTAL SHELLFISH	FINFISH	TOTAL ALL FISH	SHRIMP AS SHARE OF TOTAL
	(000 DOLLARS)				%
1970	$ 48613.5	$ 51163.8	$ 2079.7	$ 53243.5	91.3
1971	64191.1	67147.7	2629.0	69776.7	92.0
1972	80098.7	83259.3	1728.5	84987.8	94.2
1973	86879.5	89523.3	1955.8	91479.1	95.0
1974	67679.1	69629.9	2161.7	71791.6	94.3
1975	87902.3	90243.4	2415.9	92659.4	94.9
1976	11981.0	124165.1	2891.3	127056.4	94.4
1977	126858.3	131796.8	2339.1	134135.9	94.6
1978	141111.0	145324.4	2665.2	147989.6	95.4
1979*	153005.7	156268.2	2660.5	158928.7	96.3

*Preliminary

Source: Texas Landings, Annual Summary, 1970-1978 and Texas Commercial Harvest Statistics 1978-1980 (Preliminary)

Table 36

COMMERCIAL LANDINGS OF SHELLFISH IN TEXAS, 1965, 1970-1979

	Shrimp (Headsoff)							
	Brown & Pink	White	Other	Total Shrimp	Crab	Oysters (Meats)	Squid	Total
				(Metric Tons)				
1965	17664.4	4191.2	28.7	21884.3	1643.0	2193.3	10.8	25731.4
1970	19510.8	5617.3	.8	25128.9	2506.3	21204	4.4	297600
1971	20214.6	4150.4	18.3	24383.3	2635.3	2152.0	4.3	29174.8
1972	22543.1	5165.9	7.0	27716.0	2932.2	1784.6	2.4	32435.2
1973	16247.8	6778.9	295.3	23322.1	3121.2	1065.0	2.4	27510.7
1974	16769.0	5219.1	410.1	22398.2	2761.3	564.1	6.8	25730.4
Average 1970-74	19057.1	5386.3	146.3	24589.7	2791.3	1537.2	4.1	28922.3
1975	15560.6	4306.7	212.7	20080.0	2717.7	796.5	2.9	23597.1
1976	16581.5	4570.0	104.2	21262.7	3024.8	1760.3	9.3	26057.1
1977	20483.9	5720.1	74.3	26278.3	3741.5	1179.6	6.3	31205.7
1978	17619.2	6334.6	41.5	23995.3	3388.2	865.0	7.0	28255.5
1979	14335.8	4901.8	201.4	19439.0	3770.1	431.6	0.4	23640.8
Average 1975-1979	16916.2	5168.0	126.8	22211.0	3328.4	1006.6	5.1	26555.3
Share of Total Shellfish (%)	(63.7)	(19.5)	(0.5)	(83.6)	(12.5)	(3.8)	(0.0)	(100.0)**

* Preliminary

** Does not add due to rounding

Source: Texas Landings, Annual Summary, 1970 - 1978 and Texas Commercial Harvest Statistics 1978 - 79, 1979 - 80 (Preliminary)

Table 37

VALUE OF COMMERCIAL LANDINGS OF SHELLFISH IN TEXAS 1965, 1970-1979

	SHRIMP							
	Brown & Pink	White	Other	Total Shrimp*	Crabs	Oysters (Meat)	Squid	Total Shellfish*
				(000 Dollars)				
1965	25539.8	5692.8	8.1	31240.7	286.0	1538.5	2.4	33067.6
1970	38406.7	10206.5		48613.2	508.7	2040.7	0.9	51163.5
1971	53129.7	11055.9	5.6	64191.2	567.2	2387.9	1.5	67147.8
1972	64873.6	15219.0	6.2	80098.8	652.6	2507.2	0.8	83259.4
1973	63571.8	23034.6	273.0	86879.4	830.4	1812.6	0.8	89523.2
1974	51249.3	16094.2	335.5	67679.0	832.4	1115.8	2.7	69629.9
Average 1970-1974	54246.2	15122.0	124.1	69492.3	678.3	1972.8	1.3	72144.7
1975	71586.5	16161.7	154.1	87902.3	947.7	1392.0	1.4	90243.4
1976	96406.3	23406.2	68.5	119881.0	1179.3	3100.2	4.6	124165.1
1977	101995.9	24627.2	235.2	126858.3	1946.7	2991.7	4.1	131800.8
1978	102155.8	38922.5	32.7	141111.0	2003.8	2205.6	4.4	145324.8
1979**	117711.6	34895.1	399.0	153005.7	2146.1	1116.1	0.3	156268.2
Average 1975-1979	97971.2	27602.5	177.9	125751.6	1644.7	2161.1	3.0	129560.4
1980**	113980.3	25867.7	432.0	140280.1				

*Total may not add due to rounding

**Preliminary. Shrimp value from unpublished NMFS data.

SOURCE: Texas Landings Annual Summary, 1965, 1970-1978 and Texas Commercial Harvest Statistics, 1978-1979.

Table 38

LANDINGS OF MAJOR FINFISH SPECIES, TEXAS 1965 and 1970-79

	Croaker	Black Drum	Red Drum (Red fish)	Flounders	Groupers	Spotted Sea Trout	Sheepshead	Red Snapper	All Other Food Fish	Menhaden Bait & Animal Food**	Total Finfish
						(Metric Tons)					
1965	.4	666.9	241.6	132.7	61.2	533.5	87.8	1003.3	348.0	28091.9	31167.3
1970	48.6	355.0	719.5	134.8	26.9	524.7	79.6	415.7	105.7	19543.9	21954.5
1971	24.8	516.4	903.0	144.7	62.41	674.7	60.6	491.0	158.8	28568.1	31604.4
1972	26.4	528.4	665.8	205.8	44.2	680.1	107.7	561.6	183.0	61.4	3064.4
1973	55.6	547.9	760.9	155.1	45.5	893.1	122.2	354.4	214.3	150.0	3299.0
1974	78.0	615.4	871.6	230.0	38.6	905.4	167.7	337.0	226.3	141.5	3611.5
Average (1970-74)	46.7	512.6	784.2	174.1	43.5	735.6	107.6	431.9	177.6	9692.9	12706.8
1975	52.6	779.1	961.8	223.4	32.4	823.0	144.6	284.6	52.0	106.3	3459.9
1976	51.3	948.2	920.5	198.2	31.4	802.2	171.9	224.6	238.2	86.8	3673.5
1977	13.9	659.3	431.3	141.0	10.0	610.9	133.3	199.6	117.9	83.2	2401.3
1978	13.5	810.3	392.3	109.9	15.8	528.4	149.7	171.1	121.0	39.8	2351.9
1979*	9.1	694.2	311.7	105.4	6.5	467.3	184.2	97.4	138.2	48.7	2062.7
Average (1975-79)	28.3	778.2	603.5	155.6	19.2	646.4	156.8	195.4	133.5	72.9	2789.9

* Preliminary

**Includes Menhaden beginning in 1970 NMFS

Source: Texas Landings 1965, 1970-78 and Texas Commercial Harvest Statistics 1978-79, TP&WD

Table 39

VALUE OF MAJOR FINFISH SPECIES TEXAS 1965 and 1970-78

	CROAKER	BLACK DRUM	RED DRUM (RED FISH)	FLOUNDERS	GROUPERS	SPOTTED SEA TROUT	SHEEPSHEAD	RED SNAPPER	ALL OTHER FOOD FISH	MEHADEN BAIT & ANIMAL FOOD*	TOTAL FINFISH*
					(Dollars)						
1965	$ 56	$ 136039	$ 137872	$ 72783	$ 13459	$ 320859	$ 16984	$ 628137	$ 43008	$ 1124295	$ 2493522
1970	6113	83854	349903	64844	5617	256583	14647	379923	14544	903649	2079677
1971	2942	116800	484326	75603	13459	357363	9722	495127	21785	1051919	2629046
1972	3414	135384	408799	119735	10729	420068	19634	571984	33113	5629	1728479
1973	8859	154350	539316	105275	14498	645900	24500	401532	41218	20399	1955847
1974	11324	221396	614094	149081	10950	645124	26497	415792	49071	18377	2161706
Average (1970-74)	6530	142357	479288	102908	11051	465008	19000	452875	31946	399995	2110951
1975	11185	207772	795253	176032	11212	701095	27246	393442	77728	14949	2415914
1976	11533	508810	887991	181177	13019	796660	41323	353157	83000	14619	2891289
1977	3956	399800	511536	170836	5154	723176	28813	420875	51258	23748	2339152
1978	3747	607767	596477	174307	8432	771420	39335	391695	64363	9677	2665220
Average (1975-78)	7605	431037	697814	175588	9454	748088	34179	389792	69087	15748	2557894

*Includes Menhaden in 1965, 1970 and 1971

SOURCE: Texas Landings 1965, 1970-1978.

while the Texas Parks and Wildlife Department collects data on finfish sales at the point of the first sale if in Texas, the swordfish longlining fishery in Texas is a very recent phenomenon. Typically, swordfish, although landed in Texas, are not sold until they reach an eastern market. Therefore, sales are not recorded in Texas, and statistics are not readily available. From other sources, estimated 1980 landings of swordfish in Texas were about 350 metric tons, and tuna landings in the same year were estimated at 500 metric tons.

In summary, the overwhelming importance of the shrimp fishery in relation to the other Texas commercial fishing industry is evident. Small changes in shrimp landings or value of landings can completely overshadow the rest of the industry. The fishing sector, although of major importance in some communities, is a relatively small part of the economy of the 19-county study region or major subregion.

EMPLOYMENT AND EFFORT

Participation and activity in commercial fish harvesting can be measured in a number of different ways. The available data are generally not precise and often conflict, so that no one single measure is available. The number of fishermen and fishing craft are estimated annually for Texas by NMFS, based on records of vessels reporting landings in the State. The number of vessels holding commercial fishing licenses of various types is reported annually by the Texas Parks and Wildlife Department. The Texas Employment Commission (TEC) maintains records, which may be accessed for recent years, on covered employees and wages paid by 3-digit SIC codes, including commercial fisheries (091). Also, the amount of effort as measured by days fished (24-hour equivalents) is estimated by NMFS for the shrimp fishery and several subcategories.

Employment and Craft

Based on NMFS estimates 6,569 persons were employed in commercial fishing in Texas in 1976 (Table 40). This is the latest published figure in the series and indicates, in itself, one of the problems of using these data for analysis of recent trends. Of the 6,569 persons, 5,315 were employed on vessels (as defined earlier) and 1,254 on boats, and 95% of them were employed full time. Employees in Texas accounted for approximately 23 percent of all similarly employed persons in the Gulf States. Employment in Texas, however, appears to be concentrated on larger craft, as Texas accounts for 35 percent of fishermen on vessels but only 10 percent of those on boats.

The number of commercial fishing craft operating in Texas, estimated from the same source, was 2,978 in 1976 (Table 41). The 1,923 vessels reported for 1976 represented 37 percent of

Table 40

NUMBER OF FISHERMEN BY EMPLOYMENT STATUS AND TYPE OF CRAFT, TEXAS 1965 AND 1970-1976

	Fishermen on Vessels			Fishermen on Boats			
Year	Full time	Part time	Total	Full time	Part time	Total	Total
1965			4504	937	769	1706	6210
1970			5183	735	393	1128	6311
1971			5852	754	470	1224	7076
1972			5747	646	488	1134	6881
1973			6758	669	395	1064	7822
1974			5704	624	259	883	6587
1975			5009	936	520	1456	6465
1976	5303	12	5315	960	294	1254	6569
Gulf-wide 1976	14,928	219	15,147	7979	4942	12921	28068
Texas as share of gulf 1976 %			(35.1)			(9.7)	(23.4)

SOURCE: Fisheries statistics of the United States, NMFS.

Table 41

NUMBER OF VESSELS AND BOATS REPORTING LANDINGS IN TEXAS 1965, 1970-1976 AND ESTIMATE FOR 1980

	Shrimp, Otter Trawls			All Operating Units		
	Vessels*	Boats**	Total	Vessels*	Boats**	Total
1965	1371	845	2216	1499	1264	2763
1970	1723	420	2143	1819	867	2686
1971	1931	506	2437	2046	891	2937
1972	1900	438	2338	2047	786	2833
1973	2294	430	2724	2436	773	3209
1974	2006	387	2393	2082	716	2798
1975	1758	844	2602	1823	1338	3161
1976	1828	688	2516	1923	1055	2978
1980***	1850	700	2550			

*Vessels are craft of 5 gross tons or longer

**Boats are craft under 5 gross tons

***Estimate from Gulf of Mexico Shrimp Management Plan (revision), Gulf of Mexico Fisheries Management Council.

****Exclusive of duplication

SOURCE: Fisheries statistics of the United States, NMFS.

vessels in the Gulf, while the 1,055 Texas boats accounted for only about 10 percent of boats in the Gulf. Overall, only 20 percent of all commercial craft, reported operating in the Gulf, were Texas based fleets.

The shrimp fleet in Texas numbered 2,516, which includes some craft operating in more than one fishery. A recent estimate of the Texas shrimp fleet places it at 1,850 vessels and 700 boats in 1980 (Table 41).

While these estimates are reasonably representative of the majority of the Texas commercial harvesting industry, they likely underestimate the true population. Some craft, particularly small "trailerable" boats, may land their catch in small quantities in areas where data collection is not regularly maintained. Therefore, they may never show up in the NMFS statistics.

License data from Texas indicate a larger number of fishermen and commercial fishing craft (Table 42). In 1979-80 (Texas fiscal year September 1979 - August 1980) 23,958 commercial fishing licenses were issued. Because of their relatively low cost, many sport fishermen purchase commercial licenses, even though they have little or no intention of selling their catch. This is not considered a useful measure of true employment in commercial fishing.

The commercial fishing boat license covers most of the fishing other than shrimp and provides some indication of the number of craft involved (Table 42). However, many of these craft are small trailerable boats and are not actively involved in full-time, or even significant part-time, commercial fishing. Despite this qualification, if one wanted to measure the total number of people who interacted commercially with the fishing resource in some way, no matter how slight, the boat and vessel license statistics might be a useful representation. In 1979, 1,530 commercial fishing boat licenses were issued.

Commercial shrimp boats and vessels in Texas are required to have at least one of three types of licenses depending on their activity: Gulf shrimping, bay shrimping, or bait shrimp harvesting. Many boats carry more than one license; therefore, the total of 9,797 licenses for 1979-1980 (Table 42) overstates the true number of craft involved. One study analyzed these data in several ways and found that as many as 40 percent of the licenses are issued to vessels that hold another type of commercial shrimp license (Warren). This same kind of overlap may also occur between shrimp and commercial fishing boat licenses.

A reasonable estimate of the true number of craft involved in commercial fishing in Texas falls between the NMFS estimate and the license data of TPWD. It is likely much closer to the

Table 42

NUMBER OF SELECTED TYPES OF COMMERCIAL FISHING LICENSES ISSUED, TEXAS 1971-1977

Year*	General Commercial Fishermen	Commercial Fishing Boat	Shrimp Boat** Gulf	Shrimp Boat** Bay	Shrimp Boat** Bait	Shrimp Boat** Total***
1971	36498	1330	3341	3995	1265	8601
1972	38007	1336	3368	3974	1365	8707
1973	32121	1482	3202	3616	1570	8288
1974	27289	1277	2764	3523	1404	7691
1975	26651	1336	2573	2917	1406	6896
1976	27134	1601	2881	3232	1449	7562
1977	28653	1386	3173	3768	1521	8462
1978****	30644*****	1726	3364	4444	1752	9560
1979****	23958	1530	3308	4473	2016	9797

*Year beginning September 1.

**Includes boats and vessels

***Total includes duplication where one boat holds more than one commercial shrimp license.

****Unpublished data from TPWD

*****Tidal water commercial fishermen (name change)

SOURCE: Texas Parks and Wildlife Department Annual report 1972-73 through 1977-78 and unpublished TPWD data.

NMFS data and probably falls in a range from 3,000 to 3,500 craft. The number of fishermen involved also is likely closer to the NMFS estimate and probably ranges in the area of 7,000 to 8,000 persons. If one considers the average crew size of three on a Gulf shrimper, two on a bay shrimp boat, and less than two on other fishing vessels, the relative relationship between craft and fishermen indicated in the estimates above seems reasonable. However, a larger number of craft and fishermen have commercial contact with fisheries in Texas if all of the weekend and marginally commercial fishermen, who are often fully employed in another occupation, are included.

The Texas Employment Commission is also a source of employment data. These data were not discussed earlier because they are of limited value in providing information on commercial fishing. The TEC data includes only covered employees, meaning those employees who are included under specified state employment legislation. In the fishing industry, most labor is provided by some combination of the owner (self-employed person) and a crew that works on a share basis and is thus a subcontractor. Since neither the owner nor crew works for an hourly wage, they generally are not included in TEC statistics. Data were available from TEC for only 10 quarters from 1978 through 1980 (Table 43) and were summarized for the 19-county study area. The employees who are represented in these data are assumed to be office personnel, maintenance workers, and other shoreside employees of commercial fishing firms.

A definite seasonal pattern in the data coincides with the shrimp-harvesting season. In 1978 average employment was 1,818 persons, with a peak of 2,109 in the third quarter. In 1979 the average was 1,994, with a peak of 2,177 in the third quarter. Average quarterly wages paid per covered employee also increased seasonally and likely reflects greater hours worked during the peak of the season. The overlap existing between the employees cited here and those included in the NMFS data is not possible to estimate. A complete estimate of total employment in commercial fishing in Texas must include both covered and non-covered employees, but the NMFS does not provide that degree of data disaggregation.

Fishing Effort

Another factor related to the number of craft and number of fishermen is the amount of time spent actually fishing. Such data exist only for the shrimp fishery in Texas. The NMFS makes estimates from sample surveys conducted throughout the year in conjunction with the development of landings data. Effort is expressed as days fished, each of which represents one 24-hour period actually spent trawling for shrimp. For the period 1975-1979, the NMFS estimated an average of 92,610 days fished per year by vessels and boats associated with the

Table 43

COVERED EMPLOYEES AND WAGES PAID, PERSONS EMPLOYED IN COMMERCIAL FISHERIES (SIC 091), 21-COUNTY STUDY AREA OF TEXAS BY QUARTERS 1978-1980

Year and Quarter		Average Number of Employees	Total Wages Paid	Quarterly wages Paid per Covered Employee
		(000 Dollars)		(Dollars)
1978				
	1	1576	$ 3742.5	$ 2375
	2	1570	3586.9	2285
	3	2109	8940.8	4239
	4*	2015	9881.2	4904
1979				
	1	1744	5210.3	2988
	2	1866	6757.9	3622
	3	2177	9683.2	4448
	4	2128	9928.0	4665
		1994		
1980				
	1	1309	3116.6	2381
	2	1288	2558.1	1986

*Excludes Harris County

SOURCE: Unpublished data from Texas Employment Commission shrimp landings reported in Texas ports (Table 44). A generally increasing trend over the decade reflects increasing numbers of shrimp vessels and boats. Variation from year to year largely reflects economic and biological conditions that influence the owners' decisions regarding when and how much to fish. As expected in Texas, the largest share (about two-thirds) of the effort is associated with brown shrimp.

PERSONAL INCOME

Personal income estimates are not available in sufficient detail to provide a definitive set of data for commercial fishing industry in the study area. For Texas, personal income derived from "forestry, fisheries, and other" was $48 million in 1979 or about 6.2 percent of the U.S. total for the same industry sectors (Table 45). This percentage is roughly comparable to Texas' share of total value of fish landed as illustrated earlier in Table 33.

Relative to total personal income in Texas, these same industry sectors account for less than one-tenth of one percent (Table 46). Fisheries alone would likely be no more than one-half of that amount if it could be disaggregated from forestry. County-level statistics are not available for any level of disaggregation that would provide useful data on fisheries.

SUMMARY OF INDUSTRY OVERVIEW

The Texas commercial fishing industry landed fish valued at $159 million in 1979, with shrimp by far the dominant species consistently accounting for 95 percent of the ex-vessel value. Processing of seafood in Texas is a small industry relative to Texas' share of harvested value.

Approximately 3,000 to 3,500 craft are employed in a significant way in commercial harvesting of fish in Texas. Total employment is impossible to estimate precisely but is projected to be in the range of 7,500 to 10,000, depending on how many part-time and weekend fishermen are included. The Texas shrimp-trawling fleet averaged 92,610 days fished over the last five years, two-thirds of which was for brown shrimp.

The analysis of the trends in some of these data series, as affected by the occurrence of the oil spills in 1979, is presented in the next section. The major consideration in the analysis is the separation of oil spill effects from other unrelated factors and natural variation in the fishery. The next section deals with both the analysis of effects and the significance of other factors in explaining variation in landings and value statistics.

Table 44

EFFORT IN THE SHRIMP FISHERY AS EXPRESSED BY DAYS FISHED FROM TEXAS PORTS, BY SPECIES 1970-1979.

Year	Days Fished			
	Brown Shrimp	White Shrimp	All Others	Total
1970	55905	22031	1945	79881
1971	70088	19693	861	90642
1972	61222	28697	870	90789
1973	52482	39697	3475	95654
1974	51640	26150	1560	79350
Average 1970-74	58267	27254	1742	87263
1975**	49846	23063	1488	74397
1976	65980	27660	2060	95700
1977	69150	30149	1471	100770
1978	69774	34374	538	104686
1979	62748	23344	1407	87499
Average 1975-79	63500	27718	1393	92610***

*One day fished represents a 24 hour period of actual shrimp trawling

**Data by species for 1975 was unavailable: estimated from relative distribution by species over preceding five years.

***Does not add due to rounding

SOURCES: 1970-1974 and 1975 total estimated from unpublished NMFS data. 1976-1979 unpublished estimates by NMFS, TIMS, Miami Center.

Table 45

Total Personal Income for Forestry, Fisheries and Other, United States and Texas, 1975-1977

Year	United States	Texas	Texas Share
	PERSONAL INCOME FOR FORESTRY, FISHERIES AND OTHER		
	(million dollars)		%
1975	568	31	5.5
1976	757	47	6.2
1977	776	48	6.2

Source: Survey of Current Business. Bureau of Economic Analysis U.S. Department of Commerce. Vol. 58, No. 10, P. 32, October 1978.

Table 46

Total Personal Income in Texas and Share from Forestry, Fisheries and Other, 1975-1977

YEAR	A TOTAL LABOR AND PROPRIETOR'S INCOME	B PERSONAL INCOME FOR FORESTRY, FISHERIES AND OTHER	SHARE B IS OF A
	(million dollars)		%
1975	52,637	31	.058
1976	60,252	47	.078
1977	68,144	48	.074

Source: Survey of Current Business, Bureau of Economic Analysis, U.S. Department of Commerce, Volume 58, No. 10, p. 39, October 1978.

III. IMPACT ASSESSMENT

The main focus of this section is to determine if any measurable economic impact was associated with the effect of the oil spills on the commercial fisheries of Texas. The analysis depends on both primary and secondary data and information. Evidence collected directly from fishermen, biologists, and other informed observers of the industry was thought to be the most crucial in identifying and quantifying the factors and effects involved. Since a detailed survey of the industry was not possible, a sample of representative firms and individuals was selected and interviewed on a personal basis.

SUMMARY OF OIL SPILL EVENTS

The oil from the IXTOC blowout appeared off the Texas coast in August of 1979 coming ashore on Gulf beaches at that time and in subsequent months. Although small amounts of oil may have entered the bays, significant quantities were not detected in ecologically important estuarine areas. Skimmer booms were used in a number of places to prevent oil from moving through the passes into the bay waters.

At Cedar Bayou, the pass between San Jose and Matagorda Island was closed with sand in September 1979. In that oil had reached this point and the skimmer boom did not stay in place, sand was used to close the pass completely. This particular pass was reopened by the force of Hurricane Allen in August of 1980 at a point about two miles north. This pass has historically closed itself and reopened further north followed by a period of southward migration. At the time of sand filling in 1979, it was in the process of closing itself and was considered to be of minor importance as a source of in-migration of commercially important fish species. No other passes were closed by sand filling as an oil spill control measure. The use of a skimmer boom should not significantly influence the movement of important fish species through the passes.

The BURMAH AGATE sinking in November of 1979 created an oil spill in the Galveston island area. Some oil appeared in the main channels and some fishing gear was fouled, but no significant quantities were reported in the neighboring bays or estuaries.

INTERVIEWS

Information was sought from interviewees in two general areas: (1) biological relationships thought to be important and (2) direct evidence regarding effects on quantity or quality of seafood landed. The scientific literature and fishery biologists were the main sources regarding the current understanding of the effects of oil spills on fishery resources. Commercial fishermen and dockside handlers, marine advisory specialists, and government resource management agents were contacted regarding direct effects on landings.

Biological Relationships

A crucial question basic to the analysis of economic effects is whether any biological evidence exists that damage occurred to specific fish populations. A detailed background on the environmental and biological relationship involved is provided in the report of the Committee on Environmental Affairs of the Texas House of Representatives (March 10, 1980). A large section of this report is devoted to identification and description of species that could potentially be affected and the mechanisms through which such effect might be expressed. No evidence was available at that time, however, as to whether such effects had occurred during, or as a result of, the oil spills in question.

The environmental and biological background and potential for damage are discussed fully in that section of the report and are not repeated here. Discussions with scientists and agency personnel, responsible for evaluating biological specimens and other evidence collected since the oil spills, revealed in general that no biological basis exists for projecting a direct, economically significant impact on commercially important species.

At the time of this writing (August 1981), these analyses are not yet complete. Also, they do not rule out the potential for some longer-term effect. What has been completed indicates that no aromatic hydrocarbons were found in the tissues of commercially important fish and shellfish sampled. Some of the species further down the food chain may have been affected, but the analyses are not complete, and thus no evidence is available to project a possible impact.

A modeling approach to evaluation of the oil spill impacts could be conceptualized, but limitations in understanding and specifying the underlying biological parameters preclude its usefulness in the present analysis. The effects of naturally occurring factors such as freshwater inflow, water temperature, and currents are imprecisely understood at best. The addition of a change in another factor, such as the presence of oil contaminants, could be modeled only if the system as it naturally existed was reasonably well represented (modeled) originally.

In summary, the evidence collected to date on the biological effects provides no basis for projecting an economically significant impact on commercial fisheries. These data are still incomplete, and some longer-term effects may yet be identified. However, it is likely that these effects, should they occur, would be expressed in small increments over a period of years beyond the 1979-1981 study period investigated. Additionally, the magnitude of long-term effects could be so small as to be lost in the normal variation that occurs in commercial fisheries landings.

While fish populations could be damaged by high concentrations of hydrocarbons associated with an oil spill, it is not known whether such concentration occurred at locations and at times that would have significantly affected commercial landings during the study period. In the absence of definitive data, the burden of identifying effects falls entirely on direct and indirect measures of fishing results or landings. Even if such data should show some unusual variation during the study period, no documented biological basis exists for attributing the damage to the oil spills.

Effects on Fishermen

Interviews with fishermen and local businessmen uncovered little evidence of a significant economic impact. Some effects were expected to be expressed in terms of altered fishing operations or temporary geographic shifts in the concentration of fishing effort. In general, these were found to be minimal and not capable of being usefully quantified. Direct effects on the quantity of fish landed were found to be generally nonexistent as observed by interviewees.

During the early stages of the oil spills, significant concern about the effect of the oil on the quality of seafood products was evident. A negative economic effect could have been expressed through lower prices for damaged products that had been landed. Interviews with personnel in the agencies responsible for monitoring shellfish and other seafood, however, did not reveal any cases of contaminated products landed in Texas that were related to the oil spills. One publicized incident was found to involve seafood contaminated from diesel fuel, and the product was voluntarily destroyed by the owner.

Summary of Interview Evidence

It was the clear consensus of interviewees in this study that there was no significant measurable impact at the industry level associated with the oil spills. This was confirmed in the lack of biological evidence linking the effects of the oil spills to damage to the fishery resource. In view of these results, the objective data on landings are now evaluated to determine if any break from the trend is observed.

TRENDS IN LANDINGS

The primary effect, if any, would expectedly be expressed through a change in commercial fish landings by Texas fishermen. Therefore, the focus in the following discussion is on landings data rather than value. The effect on landings then can be translated to value using the appropriate prices and assumptions regarding price flexibilities at the ex-vessel level of the industry.

Data on landings for all important species were presented in Tables 36 and 38 in the preceding section. The period 1970-1978 just preceding the study period is examined in terms of the historical variation in landings for important species including shrimp, crabs, oysters, and finfish (Table 47). Oysters, the most variable, show a standard deviation greater than 40 per cent of the annual mean landings. Crabs exhibit a more consistent series with a coefficient of variation of less than 15 per cent. Total shrimp shows a relatively low coefficient of variations, but when disaggregated, more variability is noted. White shrimp landings have been relatively more variable than those for brown and pink combined.

Quarterly landings of each of the important series are presented in Table 48. These data show the seasonal variation that occurs for each species. As discussed earlier, the sources of this seasonal and annual variation are both biological and economic. Obviously, the seasonal effect is primarily biological and tracks the natural cycle of each species. Year-to-year variation is also greatly affected by natural factors. In modeling such a system, environmental conditions would be a major factor along with economic variables influencing dockside prices, profitability, and fishing effort. Using such a model, combined with estimates of the values for the independent variables, would enable a projection of the landings for each species through the study period.

As discussed above, the current level of knowledge regarding the important biological and environmental relationships preclude using a model as a helpful approach. Data on the potential independent variables are generally not available for recent periods, which means that projections of the dependent variables would be based on projections of the independent variables, thus failing to account for the known variability in these factors.

The annual data series were subjected to simple time trend analysis, which were estimated for the years 1970-1978 and projected through the study period, 1979-1981. Confidence intervals (95 per cent) were also estimated in association with the projected annual landings. This approach is relatively

Table 47

MEAN, RANGE AND STANDARD DEVIATION FOR TEXAS SHELLFISH AND FINFISH ANNUAL LANDINGS

1970-1978

	1970-1978 Mean	Range Low	Range High	Standard Deviation	Coefficient of Variation	1979 Landings
		Metric Tons			%	Metric Tons
Brown Shrimp*	18392.3	15560.6	22543.1	2379.8	12.9	14335.8
White Shrimp*	5318.9	4150.4	6778.9	893.5	16.8	4901.8
Total Shrimp*	23840.5	20080.0	27716.0	2399.9	10.1	19439.0
Crabs	2981.0	2506.30	3741.5	392.2	13.2	3770.1
Oysters (meats)	1365.3	564.1	1784.6	598.0	43.8	431.6
Finfish**	3035.7	2352.6	3673.5	528.3	17.4	2062.7

* Heads-off Weight

**Excludes Menhaden

Source: Calculated from Table 36 and 38

Table 48

Quarterly Reported Commercial Landings for Selected Shellfish Species, Totaled Shellfish, Finfish and all Fish, Texas 1970-1980

Year and Quarter		SHRIMP (HEADS OFF) BROWN & PINK	WHITE	OTHER	TOTAL	CRABS	OYSTERS (MEAT)	TOTAL SHELLFISH*	FINFISH	TOTAL ALL FISH
		(Metric Tons)								
1970	1	2115.4	290.0		2405.4	226.7	1052.5	3684.9	655.4	4340.3
	2	2751.5	1244.4		3995.9	602.5	198.2	4797.0	5887.9	10684.9
	3	9756.3	1980.2	0.1	11736.6	936.9	33.9	12710.6	14424.3	271.34.9
	4	4887.7	2102.6	.6	6991.0	740.0	835.8	8567.4	986.8	9554.3
Total		19510.9	5617.3	.7	25128.9	2506.3	2120.4	29760.0	21954.5	51714.5
1971	1	2102.4	347.8		2450.2	352.8	1082.1	3885.9	793.5	4678.8
2	2	2112.2	769.9		2882.2	856.2	275.3	4016.5	14505.2	18521.6
3	3	10760.7	787.3		11548.0	842.8	58.7	12450.3	10925.8	27912.1
4	4	5239.3	2245.3	18.3	7509.0	583.4	735.9	8822.8	844.0	9666.8
Total		20214.6	4150.4	18.3	24383.4	2635.2	2152.0	29174.4	31604.4	60779.3
1972	1	2278.6	720.4		2999.1	435.0	754.6	4188.9	783.5	4972.5
2	2	3741.3	1245.8	3.2	4990.3	1025.8	111.7	6129.2	746.3	6875.5
3	3	12157.3	1351.6		13508.8	970.2	46.6	14526.2	760.1	15286.3
4	4	4365.9	1848.0	3.8	6217.7	501.4	871.7	7591.0	774.4	8365.4
Total		22543.1	5165.9	7.0	27716.0	2932.2	1784.6	32435.3	3064.4	35499.7
1973	1	1907.2	434.6		2250.9	387.4	621.7	3260.0	730.0	3990.0
	2	3784.1	616.3	1.2	4401.7	969.4	74.6	5446.9	970.5	6417.4
	3	7432.7	2129.3		9562.0	1017.4	49.6	10629.7	785.0	11414.7
	4	3123.7	3689.7	294.2	7107.5	747.1	319.2	8174.2	813.5	8987.7
Total		16247.8	6779.0	295.3	23322.1	3121.2	1065.0	27510.8	3299.0	30809.0
1974	1	1826.3	848.3	132.4	2988.4	432.4	177.4	3600.6	997.9	4598.6
	2	2332.3	1039.1	5.6	3377.0	945.3	54.4	4379.1	821.5	5200.6
	3	8839.2	1228.2	1.6	10069.0	845.1	38.4	10953.9	878.0	11831.9
	4	3771.2	2103.5	89.0	5963.7	538.6	293.9	8157.5	914.1	7710.8
Total		16769.0	5219.1	410.1	22398.1	2761.3	564.1	25730.3	3611.5	29341.9
1975	1	1108.5	482.8	16.6	2061.4	443.8	382.9	2888.6	818.7	3707.3
	2	2849.7	884.7	0.4	3734.7	756.4	95.3	4586.8	739.3	5326.1
	3	7272.9	748.3	0.6	8021.8	802.4	48.2	8873.6	977.5	9851.1
	4	3876.0	2190.9	195.1	6262.1	715.1	270.2	7248.2	924.4	8172.6
Total		15560.6	4306.7	212.7	20080.0	2717.8	796.5	23597.2	3459.9	27057.1

Table 48

Quarterly Reported Commercial Landings for Selected Shellfish Species, Totaled Shellfish, Finfish and all Fish, Texas 1970-1980 (Continued)

Year and Quarter		SHRIMP (HEADS OFF) BROWN & PINK	WHITE	OTHER	TOTAL	CRABS	OYSTERS (MEAT)	TOTAL SHELLFISH *	FINFISH	TOTAL ALL FISH
		(Metric Tons)								
1976	1	1584.3	513.5	64.4	2162.2	598.8	616.9	3379.0	834.0	4215.9
	2	2793.6	906.4	4.3	3704.2	909.8	190.1	4811.1	858.4	5669.6
	3	8848.9	1612.3	1.3	10462.5	936.4	140.3	11540.1	1035.5	12575.6
	4	3354.8	1544.7	34.3	4933.8	579.8	812.8	6326.7	942.7	7269.4
Total		16581.5	4577.0	104.2	21262.7	3025.0	1760.3	26056.9	3673.5	29730.5
1977	1	917.1	139.2	3.3	1059.6	366.8	605.5	2032.1	787.6	2819.7
	2	3022.5	303.0	37.8	3363.3	1137.8	188.3	4690.7	576.6	5267.3
	3	12025.6	2337.9		14363.5	1264.1	94.7	15725.8	485.6	16211.4
	4	4518.9	2939.9	33.2	7492.0	972.7	291.0	8757.0	551.5	9308.5
Total		20483.9	5720.1	74.3	26278.3	3741.5	1179.6	31205.7	2401.4	33607.0
1978	1	1788.1	411.8	0.7	2200.6	485.5	556.51	811.1	811.8	4054.4
	2	3315.0	515.8	0.5	3831.4	1079.1	121.8	451.5	451.5	5486.7
	3	9094.0	2039.0		11133.0	1080.7	60.0	458.6	458.6	12735.1
	4	3422.3	3367.9	40.3	6830.3	742.8	126.7	630.7	630.7	8331.9
Total		17619.2	6334.6	41.5	23995.3	3388.2	865.0	2352.6	2352.6	30608.1
1979	1	1581.4	232.9	5.6	1819.8	249.2	334.3	767.8	767.8	3171.2
	2	3871.6	479.6	1.0	4352.1	1094.4	62.6	484.0	484.0	5994.6
	3	5928.6	1583.7	.04	7512.3	1375.6		334.09	333.9	9223.9
	4	2954.3	2605.6	194.9	5754.7	1050.9	34.7	476.8	476.8	7317.2
Total		14335.8	4901.8	201.4	19439.0	3770.1	431.6	2062.7	2062.7	25707.0
1980	1	839.6	240.5	83.3	1163.4	794.7	337.6	529.6	529.6	2825.3
	2	2627.4	365.2	3.6	2996.2	1268.8	120.4	467.1	467.1	4852.5

* Includes squid landings (not shown)

SOURCE: Texas Landings Annual Summary, 1970-1978, NMFS and, Texas Commercial Harvest Statistics, 1978-1979 and 1979-1980 (Preliminary), TPWD.

simple and is not intended to account for the important sources of variation, but provides a general trend with a measure of variation against which the actual landings, where available, can be measured.

The projections resulting from these trends are presented in Table 49. The trend line for crabs was the only one that was significant at the 5 percent level. Oysters were significant at the 10 percent level, while all the others failed to meet the criterion. This indicates that, for most of the landings series, there was not a statistically significant trend over the 1970-1978 period, and that one could use the mean for making a projection just as well as the trend line. The important point in this analysis, however, is not the projection itself as much as the variability around the projection. When using the mean, the standard deviation is used as the measure of variance, while the confidence interval around the trend line is used where a statistically significant trend exists.

For 1979, the only year of the study period in which annual landings are available, crabs and oysters both fell within the confidence interval, although for crabs the projection was low and for oysters the projection was high (Table 49). The oyster season was closed for several months of 1979 for reasons unrelated to the oil spills, resulting in a reduction in third- and fourth-quarter landings.

Shrimp and finfish landings were also within the range of normal variability, using the mean and standard deviation as a basis for comparison (Table 47), since the trend line was not significant. In each case, landings in 1979 were within 2 standard deviations of the mean. For finfish, an obvious drop in landings followed regulatory changes in 1977. The 1979 finfish landings were well below the 1970-1978 average, but only modestly below 1977-1978 levels.

Shrimp landings were very low in 1979 even though they fell within the range of "normal" variation (two standard deviations). This was due primarily to a very bad brown shrimp season, which was predicted in late spring of 1979 by the TPWD based on their assessment of bay conditions, sampling, and run-off associated with unusually heavy rainfall that year. White shrimp landings, although below average for the year, were not as significantly affected.

The quarterly shrimp landings data were further examined using a trend line with quarterly dummy variables to account for seasonal changes. As expected, the model was highly significant due to the inclusion of the seasonal effects. Actual quarterly landings for shrimp fell within the confidence limits of the prediction in all quarters except for July-September 1979, when it was considerably below projected levels

Table 49

ACTUAL AND PREDICTED VALUES AND CONFIDENCE INTERVALS FOR TEXAS COMMERCIAL LANDINGS OF SELECTED SPECIES USING STRAIGHT LINE TRENDS, 1979-1981

Species and Year	Predicted Mean Value	Predicted Confidence Limit (95%) Lower	Predicted Confidence Limit (95%) Upper	Actual Landings
		(Metric Tons)		
Crabs				
1979	3533	3075	3992	3770
1980	3643	3112	4176	
1981	3754	3147	4362	
Oysters				
1979	677	- 176	1530	432
1980	540	- 450	1530	
1981	402	- 728	1533	
Finfish* **				
1979	2968	2000	3936	2063
1980	2955	1832	4078	
1981	2942	1658	4225	
Total Shrimp**				
1979	22590	18367	26815	19439
1980	22341	17437	27244	
1981	22091	16490	27697	
Brown & Pink Shrimp**				
1979	16778	12721	20836	14336
1980	16456	11745	21165	
1981	16133	10753	21512	
White Shrimp**				
1979	5646	4039	7254	4902
1980	5712	3846	7578	
1981	5777	3646	7908	

*Excludes Menhaden

**Trend lines not significant at 10 percent level

(Table 50). July-September is the main harvest period for brown shrimp, the species most affected by the unusually poor conditions in early 1979.

White shrimp landings fell within the confidence limits in all quarters where data were available, except for the second quarter of 1980 when landings were slightly below the lower limit. This drop was not large enough, however, to cause total shrimp landings to be outside the confidence interval in that quarter (Table 50). Unusually dry conditions in the winter and spring of 1980 have been suggested as an explanation for the decline in landings of white shrimp.

Poor economic conditions in 1979 and 1980 also influenced landings to some degree through a reduction in fishing effort (Table 44). Costs and prices were such that shrimp trawling failed to cover variable costs for many operators except for trips during the peak of the season when maximum catch rates could be expected.

The price of diesel fuel jumped dramatically during 1979 from 48 cents per gallon (12.7 cents a litre) in January to 86 cents (22.7 cents a litre) by December. Economic effects of this magnitude likely had an effect on the level of fishing effort and, therefore, contributed to reduced 1979 landings.

Total shrimp landings were examined relative to changes in the estimated days fished (Table 51). A general decline is evident over the last decade. Landings per day fished were down in 1979, but no lower than 1976. There is no evidence in this trend of any measurable impact of the oil spills.

DIRECT EFFECTS

The information discussed above, drawn from interviews and an analysis of trends in landings, provides a basis for assessing the effects of the oil spills. These effects are presented below.

Effects on Fishing Activity

When the oil from the IXTOC blowout first appeared in offshore Texas areas, there was much concern with regard to the potential effects on fishing activity. In retrospect, with available data, it appears that there were only slight effects on fishing operations and no measurable effect on the quantity or value of landings by Texas commercial fishermen.

Fishing operations were altered in some cases in shrimp trawling to avoid areas where oil concentrations were the greatest. This affected only Gulf shrimpers as there is no evidence that significant quantities of oil penetrated bay fishing areas. A few instances of trawls or other gear fouled

Table 50

ACTUAL AND PREDICTED QUARTERLY COMMERCIAL LANDINGS OF TOTAL SHRIMP USING 1970-1978 TREND WITH SEASONAL DUMMY VARIABLES, TEXAS 1979-1981

Year & Quarter		Predicted Mean Value	Predicted Confidence Level 95% Lower	Predicted Confidence Level 95% Upper	Actual Landings*
		(Metric Tons)			
1979	1	1974	891	3057	1820.0
	2	3496	2414	4579	4352.1
	3	10844	9761	11926	7512.3
	4	6276	5194	7359	5755.0
1980	1	1911	719	3104	1163.4
	2	3434	2242	4626	2996.2
	3	10781	9589	11974	
	4	6214	5022	7406	
1981	1	1849	539	3159	
	2	3372	2061	4682	
	3	10718	9409	12029	
	4	6152	4841	7462	

*Data on actual landings not available after second quarter 1980

Table 51

SHRIMP LANDINGS RELATIVE TO DAYS FISHED, TEXAS 1970-1979

	Total Shrimp Landing (Metric Tons)	Days Fished	Tons Per Day Fished
1970	25128.9	79,881	.315
1971	24383.4	90,642	.269
1972	27716.0	90,789	.305
1973	23322.1	95,654	.244
1974	22398.1	79,350	.282
1975	20080.0	74,397	.270
1976	21262.7	95,700	.222
1977	26278.3	100,770	.261
1978	23995.3	104,686	.229
1979	19439.0	87,499	.222

SOURCE: Calculated from Tables 36 and 44 by oil were also reported. On balance, however, these effects were not found sufficiently large to be measurable in economic terms for either the total Texas commercial fishing industry or any specific coastal economic region.

Fishing activity may also be measured in terms of the quantity and value of landings. Analysis of available data failed to yield any evidence of a direct impact of the oil spills on either the quantity or value of commercial landings of shrimp, Texas' most valuable fishery. Although landings were down in 1979, this was found to be linked directly to environmental conditions in bay waters preceding the oil spills. In summary, the commercial fishing industry of Texas did not sustain direct economic effects of a magnitude sufficient to be measurable or to have an impact on other sectors of the economy.

Effect on Employment

There is no continuing data series on total employment in commercial fishing that would be sensitive to the seasonal or short term effects of an incident such as the oil spill. As no measurable impact was found on fishing activity, it is inferred that there was no effect on employment.

Effect on Personal Income

As discussed in an earlier section there is no data series on personal income specific to the commercial fishing industry in the study region. As with employment, it is inferred that, from the lack of direct effects on fishing activity, there was no effect on the personal income derived from commercial fishing in Texas as a result of the oil spills.

Substitution Effect

Since direct effects were not measurable, it is concluded that there were no substitution effects resulting from the oil spills' impacts on commercial fishing.

Net Impacts

Positive Impacts: There were no documented positive impacts of the oil spills on the commercial fishing industry of Texas.

Negative Impacts: Although there are no quantifiable negative impacts on the fishing industry, several negative considerations should be noted.

1. The disruption of fishing fleet operations represents a negative impact, although the level of this disruption in the cases studied here was not large enough to have

a measurable industry-wide impact.

2. Early reports of the possibility of the appearance of oil contaminated shrimp in the market place could have had a negative impact on prices. Apparently a well managed program of quality checks and information dissemination, as well as the absence of any confirmed cases of contaminated products, prevented this from becoming a significant factor in these cases. It should be noted, however, that uncertainty of this type could have a significant impact on dockside prices under other circumstances.

3. While there are no measurable impacts of the oil spill on the fishing sector of the economy in the shortrun, studies on the longer term biological impacts are not yet complete. Results of such studies should be reviewed, when available, for any evidence that suggests a biological basis for inferring an economic impact.

Balance of Impacts: On balance there were no quantifiable economic effects of the oil spills on the commercial fishing industry of Texas.

No indirect economic impact was calculated for the Commercial Fishing sector, since no measurable evidence was found that would support the case of a direct impact as a result of the oil spills. Indirect economic impacts, by definition, are a function of direct economic impact. The absence of any direct economic impact means no indirect economic impact.

IV. SUMMARY AND CONCLUSIONS

In terms of potential economic impacts, the most important consideration for Texas is the shrimp fishery, which represents over 95 percent of the value of landings. Evidence does not exist that indicates the oil spills affected the biological activity of shrimp or other important commercial species. Analysis is still underway that may reveal some evidence of potential long-term significance, but to date there is no biological basis for projecting a significant negative impact on commercial landings.

Information gathered from industry participants and knowledgeable observers indicates that no measurable impacts occurred on landings or value of landings. While some small impact on fishing patterns was suggested, it was not significant in terms of measurable industry-level effects.

Analysis of secondary data relating to commercial landings supports the direct observations obtained. Data for the study period, where available, indicate that commercial landings have been well within the range of natural variation. Brown shrimp landings, off considerably in 1979, are most plausibly explained by the predictable effects of unusual environmental conditions earlier that year. After considering natural variability, there is no evidence in the secondary data to indicate a decline in landings of any commercial species due to the effects of the oil spills.

There is no significant direct economic effect of the oil spills on the commercial fishing industry of Texas measurable at the regional or major subregional levels. Additionally, there are no measurable indirect economic effects that stem from the impact on the commercial fishery sector.

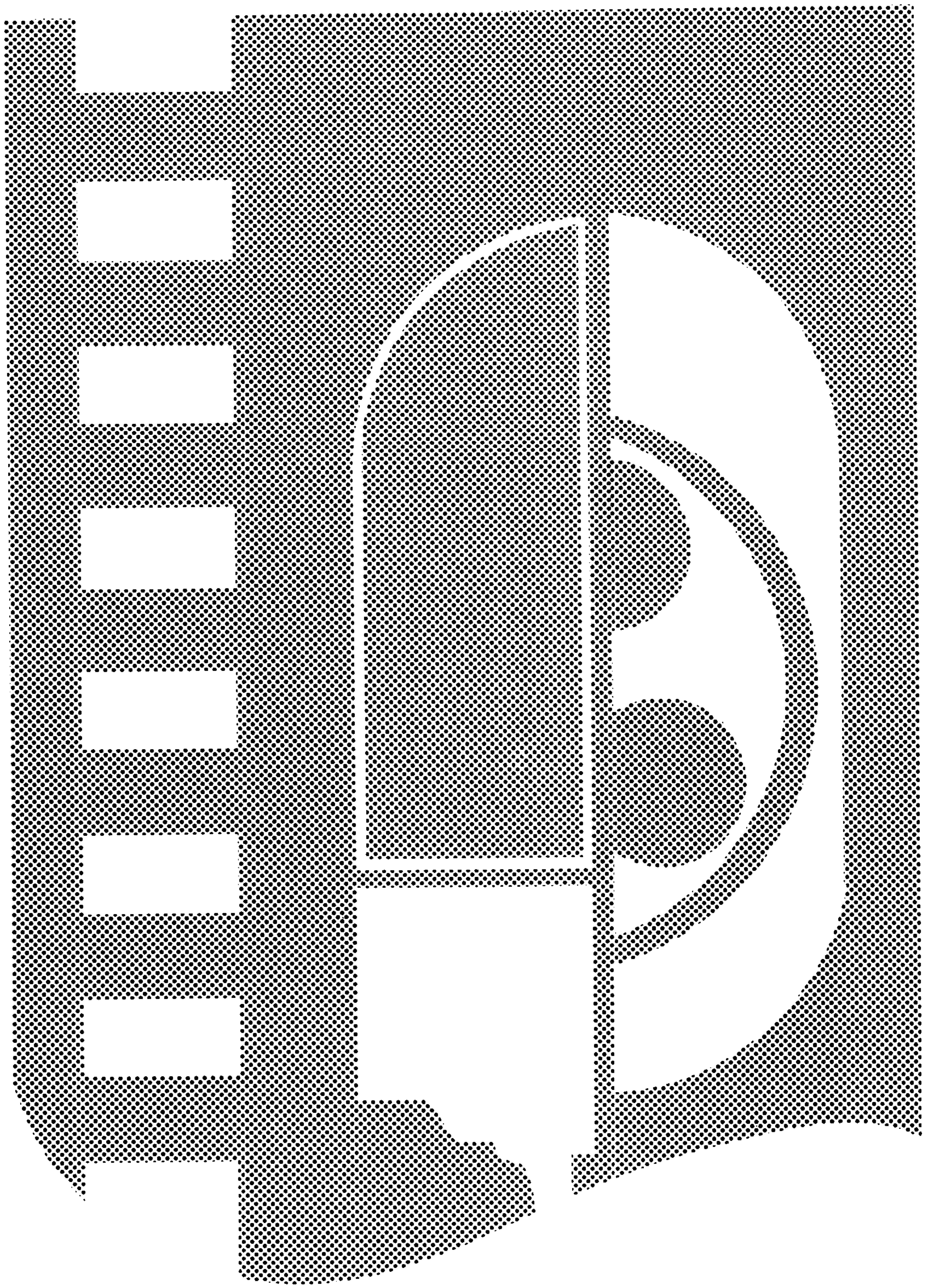
Two limitations of this analysis should be noted: The first limitation is that data are not yet available for the full study period, particularly estimates relating to fishing effort and factors influencing abundance. The effects of these variables should be accounted for in future research efforts. Related to this is the need for an improved understanding of the biological systems involved and their response to the introduction of various levels of pollutants in the form of oil. With these studies as a basis, a more detailed assessment could be made of the landings data, which would permit the sorting out of the various effects.

The second main limitation is the lack of a full-scale system of primary data collection from fishermen, dealers, and other firms potentially impacted. This is an expensive undertaking, which is perhaps not warranted if the impacts are not expected to be great. On the other hand, it is difficult to document with any precision the magnitude of the effects without such a study. The current state of knowledge of the fishery and secondary data cannot support the identification and estimation of impacts of a relatively small magnitude.

This study clearly indicates that the effects in this case were of such a minor nature (at least in the shortrun) that no assessment using any reasonable amount of resources would have improved the ultimate estimate significantly. It further suggests that the decision not to conduct a large-scale primary data collection, relating to commercial fishing impacts, was appropriate.

CHAPTER VI

MEDIA COVERAGE



CHAPTER VI. MEDIA ANALYSIS

INTRODUCTION

The purpose of this chapter is to provide a description of the various media coverages conducted during June 1979 through May 1981 on the blowout of the IXTOC I oil well and subsequent oil spill. A variety of news media was sampled (journals and magazines, television news reports, and newspaper articles) from a variety of sources (indexes, private companies, etc.) The sampling procedure was not a probabilistic one (i.e. it did not conform to a sampling technique). Rather, the information presented should be viewed as representative of the population of the news coverage that was presented to the public. It is important to remember the powerful impact that the media has in shaping our perceptives of this historical event, and in shaping our subsequent decisions that are based on those perceptions.

METHODS

Media coverage of the IXTOC I oil well blowout and the BURMAH AGATE's sinking and oil spill was obtained by a systematic search of the 1) indexes of eight major newspapers, 2) the Readers Guide to Periodical Literature and 3) televised news reports during the period of June 1979 through April 1980.

The newspaper indexes that were searched are:

Chicago Tribune	6/79 to 12/80
Christian Science Monitor	6/79 to 12/80
Houston Post	1/80 to 12/80
London Times	6/79 to 12/80
Los Angeles Times	6/79 to 12/80
New Orleans Times-Picayune	6/79 to 12/79
New York Times	6/79 to 9/80
Wall Street Journal	6/79 to 12/80
Washington Post	4/80 to 5/80

The magazine indexes that were searched are:

Audubon	6/79 to 12/80
Aviation Week and Space Technology	6/79 to 12/80
Business Week	6/79 to 12/80
The Nation	6/79 to 12/80
National Geographic	6/79 to 12/80
Newsweek	6/79 to 12/80
Oil and Gas Journal	6/79 to 12/80
Outdoor Life	6/79 to 12/80
People Magazine	6/79 to 12/80
Science News	6/79 to 12/80
Time	6/79 to 12/80
U.S. News and World Report	6/79 to 12/80

The televised news coverages that were reviewed are:

KPRC-TV (CBS)	Houston	8/3/79 to 8/20/79
KHOU-TV (ABC)	Houston	8/3/79 to 8/22/79
KTRK-TV (NBC)	Houston	8/6/79 to 8/16/79

The 1979 index to the Houston Post was not available; thus, only the 1980 index was searched. Due to the large number of references to the articles in the 1979 index to the New Orleans Times Picayune, and time constraints, the 1980 index for this paper was not searched.

Cumulative indexes for 1980 were not available for the New York Times and Washington Post. In addition, the January 1980 through March 1980 indexes for the Washington Post were not available. Monthly indexes to the New York Times from January 1980 through September 1980 were searched with the last reference to a relevant article being in June 1980. For the Washington Post, the April 1980 index contained the last reference to an article that was concerned with either the BURMAH AGATE sinking or the IXTOC I oil well blowout.

The televised news coverage was obtained from Broadcast News Company in Houston, a firm that specializes in the video-recording of news events. The majority of the televised coverage was limited to the period when the oil affected the Texas coast.

To obtain a comprehensive coverage of the references to the information, several categories or headings in each of the indexes were used in conducting the search. There was some overlap, with references appearing under more than one heading. The list of the reference headings that were used in the search and references under which the articles on the IXTOC I or BURMAH AGATE incidents appeared are:

Accidents	Petroleum Environmental Issues
Ship Accidents Mexico	Texas Offshore Oil
Water Pollution PEMEX	

There were a total of 593 newspaper, magazine and televised reports located (see Appendix I). These reports were read, abstracted, and ordered into eight classifications for further analysis. Each source was classified according to its content and its major emphasis or focus. If the source contained more than one topic as its content, the topic which was given the most emphasis was used to classify the source. The sources were classified as falling into one of the eight categories: BURMAH AGATE Collision, Capping Attempts of the IXTOC I, Cost of the IXTOC I Blowout, Environmental Issues, Commercial Fishing, Tourism, Legal/Political, and Informational. A description of the criteria used to classify the sources into the eight categories is given below.

BURMAH AGATE Collision

Sources placed in this category dealt with the November, 1979 collision of the BURMAH AGATE oil tanker and the freighter MIMOSA. If the content of the source was concerned with any aspect of the BURMAH AGATE collision, such as the ship's fire or leaking oil, the article was included in this category.

Capping Attempts of the IXTOC I Oil Well

The sources that were classified as capping attempts were concerned with all attempts to cap the IXTOC I well or slow down the flow of oil from the well. Such attempts included pumping cement into the well, pumping lead and steel balls into the well, placing the "Sombrero" over the well, drilling two directional relief wells to relieve pressure on the IXTOC I and finally capping the well. Sources that dealt with the status of the various capping attempts, the rate of oil flowing from the IXTOC I, and predictions on when the oil well would be capped, were also included in this category.

Cost of the IXTOC I Blowout

The content of these sources dealt with the actual or predicted cost of capping the well, cleaning up the oil spill, protecting the beaches and the environment, and the cost in lost revenue of spilled oil.

Environmental Issues

The content of the sources placed in this category dealt with the positive and negative effects of the IXTOC I oil spill on the environment (beaches, wildlife, birds, and marine life) and with the efforts to protect or guard the environment from the oil spill. These environmental issues included airlifting baby Ridely turtles from oil ladened waters, the oil patches and tar balls washing ashore on the Texas beaches, the placing of oil booms to protect ecologically sensitive areas (Laguna Madre, Port Mansfield, or Matagorda Bay), the attempts at protecting the endangered whooping crane, the oil pollution of estuaries and of the sea, and proposed or funded studies on the environmental effects of the oil spill.

Commercial Fishing

Sources placed in this category were the effects of the IXTOC I oil spill on the fishing and/or shrimp industries. If the content of the sources described how the oil spill was affecting the fisherman's livelihood, the shrimp or oyster harvest, and shrimp or fish production, it was placed in this category.

Tourism

Sources that contained information about the positive and negative effects of the IXTOC I oil spill on the tourist industry, including the hotel, motel, restaurant, and recreational businesss of South Texas were placed in this category. Some of the topics were: tourists cleaning their oil stained feet, whether the oil spill was the cause of the reduction in tourism, economic losses to the tourist industry as a result of the oil spill, and advertising campaigns initiated by the tourist industry to once again attract tourists to the area.

Legal/Political Issues

The sources in this classification contained information on issues related to the liability of the IXTOC I incident including actual or potential lawsuits. Sources that were included were: President Lopez-Portillo's response to the United States concerning payment for damages, testimonies before hearings or committees, and compensation from Mexico for the damages caused by the oil spill. Sources concerned with lawsuits included the U.S. Department of Justice suing SEDCO, the U.S. Department of Justice suing PERMARGO, the State of Texas suing SEDCO, PEMEX, and PERMARGO, and suits filed by local businesses for compensation for damages and lost revenue. Political issues included United States and Mexico relations, negotiations between the United States and Mexico concerning the oil spill, and talks between President Carter and President Lopez-Portillo.

Informational

Some of the articles placed in the informational category could not be placed in any of the other categories because the content of the article was divided among several categories. These articles contained some information on the status of capping the well, the effect of the oil on tourism, fishing and the environment, and the progress of litigation. Also included in this category were articles that dealt with the amount of oil already lost or being lost each day, reconnaissance flights tracking the oil slicks, and articles that described the events of the IXTOC I oil well blowout.

RESULTS

The sample size of the media coverage of the IXTOC I oil well blowout and BURMAH AGATE sinking consisted of a total of 593 separate reports. The media coverage breaks down into 527 newspaper reports, 38 magazine and journal articles, and 28 televised reports.

Although the collected sample cannot be considered to have a basis in probability (the sample is not a true random sample), it can be considered to be indicative of the coverage provided by the media institutions of this country.

Analysis of the sources indicates that 32 or 5.4% of sample reported the collision, sinking, and subsequent oil spill of the oil tanker BURMAH AGATE with the freighter MIMOSA. Of the total reports, 102 (17.20%) dealt with the causes and capping of the IXTOC I oil well blowout; 10 (1.69%) dealt with the direct and indirect costs of the oil well blowout; 53 (8.94%) described the effects of the IXTOC I oil spills on the environment; 16 (2.70%) reported the impact the oil spill had on the fishing industries; 213 (35.92%) provided the public with a brief history of the disaster and an update on the status of the spill; 137 (23.10%) provided information on the litigation and/or political negotiations that were associated with the oil spill; 28 (4.72%) discussed the effects of the oil spill on tourism; 25% or 7 of the 28 of the sources that dealt with tourism were carried by the television medium. An analysis by the media sampled is presented in Table 52.

Examination of Figure 33 indicates that the majority of the media coverage occurred during the month of August 1979. This corresponds to the approximate arrival of the oil in American waters. Plotting the categories (Figure 34) for classifying the information through time indicates that the information increases as August 1979 approaches, peaks during September, and tapers off in October.

The tables that are presented in this chapter are easy to read and understand. To facilitate the reader's comprehension of Table 52 and following tables (as they are in the same format), the following example is presented:

		ENVIRONMENT	FISHING	
MEDIA	KHOU-TV	5 (a) 8.3 (b)	10 16.6	15 (e) 25.00 (f)
	N.Y. TIMES	20 33.3	25 31.7	45 75.00
		25 (c) 41.6 (d)	35 58.3	60 (g) 100.00 (h)

(a) The number of environmental stories presented by KHOU-TV (5).

(b) The percent of environmental stories covered from the total number of stories (5/60 = 8.3%).

(c) The total number of environmental stories (25).

Table 52

BLM MEDIA DATA BY CATEGORY
(NUMBERS OF ARTICLES BY MEDIA BY CATEGORY)

MEDIA	BURMAH AGATE	CAPPING	COST	ENVIRONMENT	FISHING	INFORMATION	LEGAL/POLITICAL	TOURISM	GALVESTON OIL	TOTAL
L A Times	1	5	1	2	2	13	6	3	0	33
Chicago Trib	2	6	0	3	0	11	4	0	0	26
Christ Sci	2	4	0	2	0	9	6	1	0	24
London Times	0	1	0	2	0	11	1	0	0	15
Houston Post	1	6	1	9	2	21	18	2	0	60
Wash Post	0	2	0	3	0	8	5	1	2	21
New Orleans T P	12	9	1	2	2	38	10	1	0	75
Audobon	1	1	0	0	0	1	0	0	0	2
People Mag	0	0	0	0	0	1	0	0	0	1
Oil Gas Jour	0	0	0	0	0	1	0	0	0	1
Wall Str Jour	0	6	1	0	4	3	4	0	0	18
Science News	0	0	0	0	0	2	0	0	0	2
N Y Times	13	13	0	6	0	32	15	3	0	82
Nat Geo	0	0	0	0	0	1	0	0	0	1
Newsweek	0	1	1	0	0	3	0	0	0	5
Time	0	0	0	0	0	2	0	0	0	2
USNWR	0	0	0	0	0	2	0	0	0	2
The Nation	0	0	0	0	0	1	0	0	0	1
Outdoor Life	0	0	0	1	0	0	0	0	0	1
Aviation Week	0	0	0	0	0	1	0	0	0	1
Business Week	0	0	0	0	0	0	1	0	0	1
Dallas News	0	3	1	1	2	9	11	2	0	29
Ft Worth S T	0	0	0	0	0	2	2	1	0	5
Dallas T H	0	9	1	2	0	3	14	0	0	29
Austin A S	1	20	2	9	2	12	18	3	0	67
Corpus Christi C	0	4	0	1	0	8	6	2	2	21
San Ant Exp	0	2	0	1	0	3	5	0	0	11
San Ant News	0	1	0		0	0	0	0	0	1
Houston Chron	0	5	0	2	0	2	2	0	0	11
Jour of Commer	0	2	0	0	0	0	0	0	0	2
Corpus Christi T	0	1	0	0	0	0	0	0	0	1
Lufkin News	0	0	0	0	0	2	0	0	0	2
Port Arthur News	0	1	0	0	0	0	0	0	0	1
Wichita Falls	0	0	0	0	0	0	1	0	0	1
San Ant Light	0	0	1	0	0	1	2	1	0	5
Daily Texan	0	0	0	1	0	1	1	0	0	3
Austin Citi	0	0	0	0	0	0	1	0	0	1
Houston Break	0	0	0	0	0	1	0	0	0	1
KPRC TV	0	0	0	1	1	4	0	3	0	9
KHOU TV	0	0	0	3	1	3	2	1	0	10
KTRK TV	0	0	0	2	0	1	2	4	0	9
Total	32	102	10	53	16	213	137	28	2	593

Figure 33

PLOT OF MEDIA THROUGH TIME

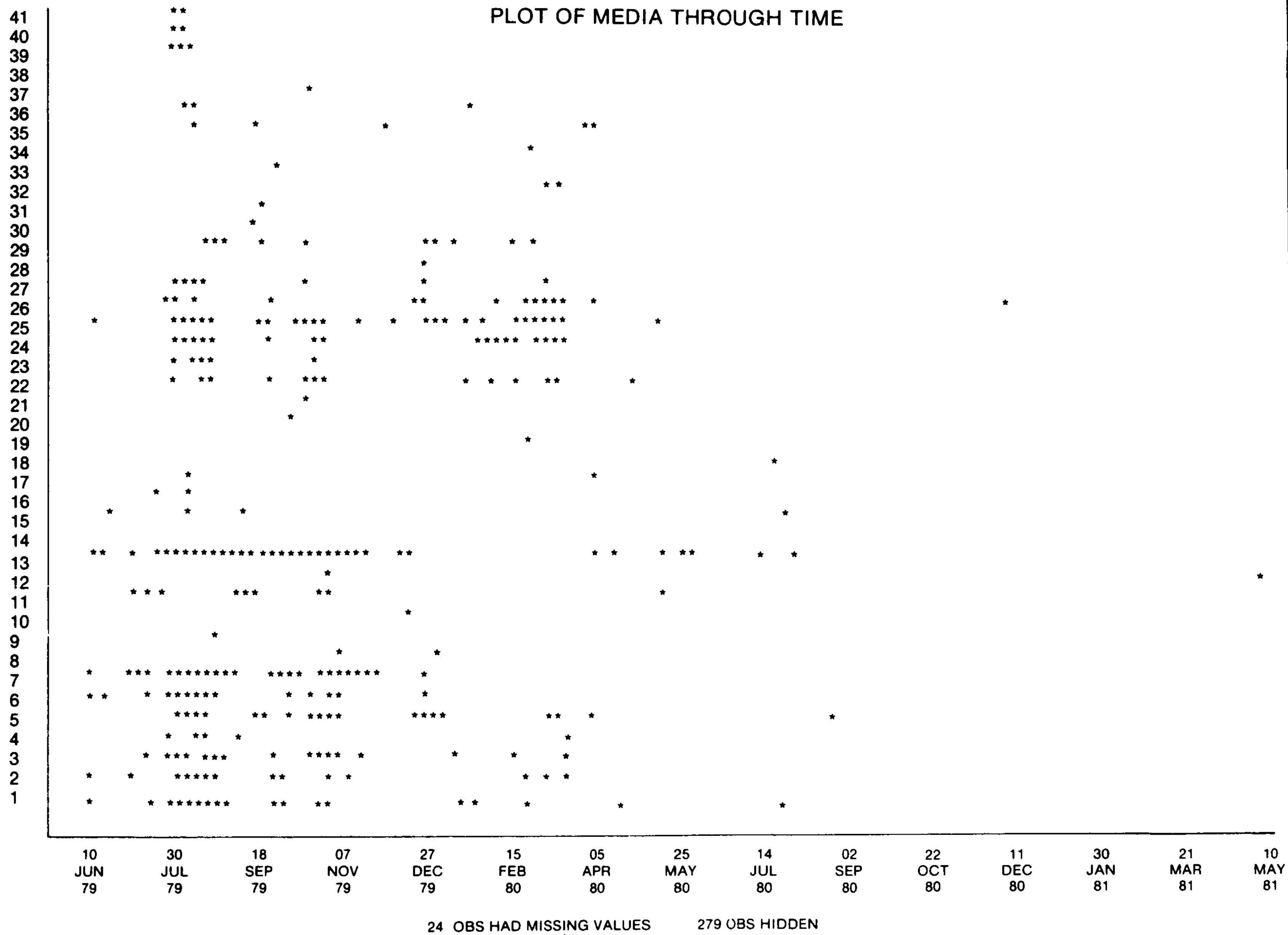
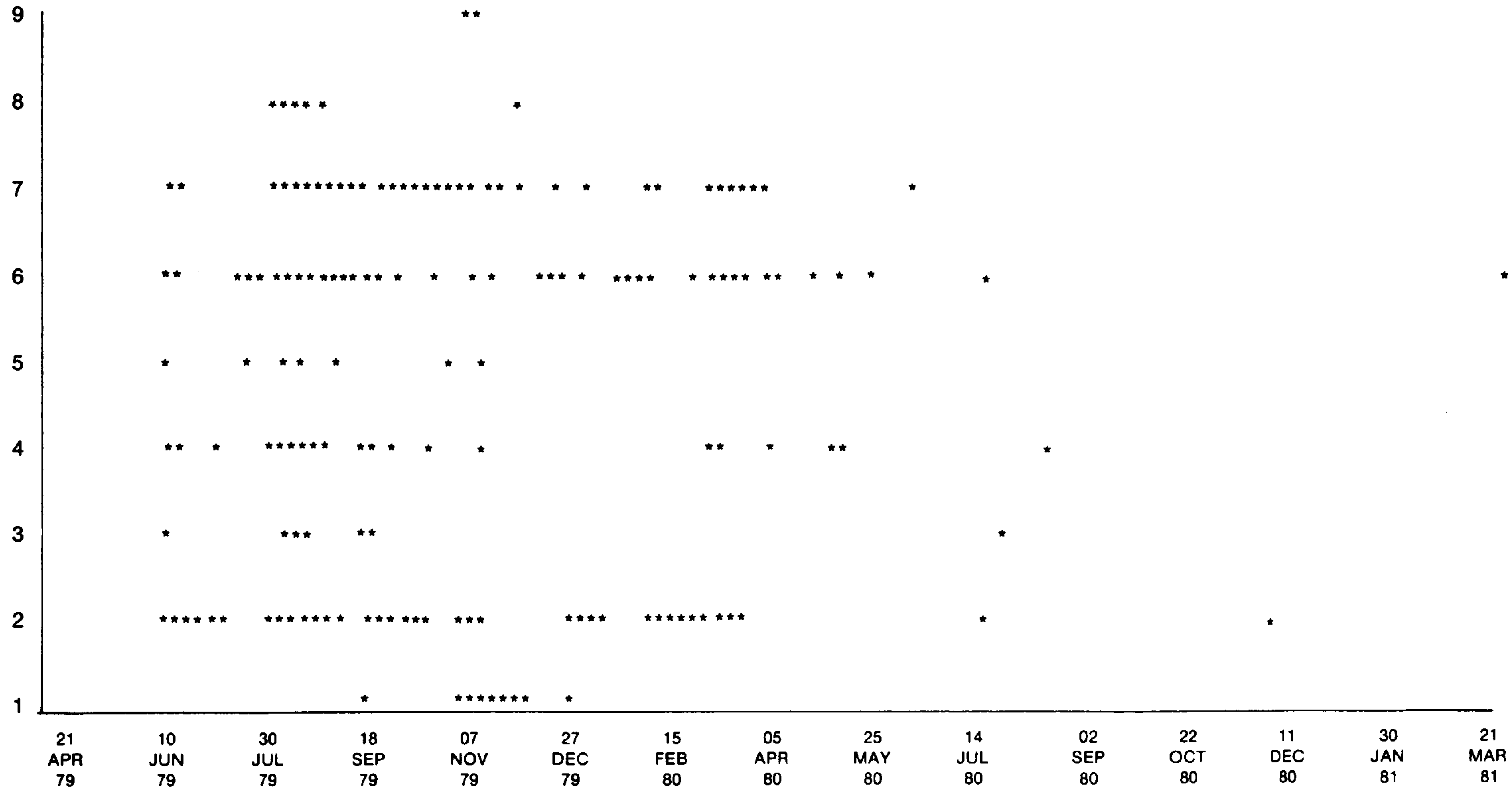


Figure 34

PLOT OF CATEGORIES THROUGH TIME



NOTE: 24 OBS HAD MISSING VALUES 410 OBS HIDDEN

(d) The percent of all environmental stories covered from the total number of stories (25/60 = 41.6%).

(e) The total number of stories presented by KHOU-TV (15).

(f) The percent of all KHOU-TV stories covered from the total number of stories (15/60 = 25.00%).

(g) The total number of stories (60).

(h) The total percent (100%).

Most of the data collected in the sample size were newspaper articles. Five hundred twenty-seven newspaper stories from 23 newspapers were collected. The paper with the most entries was the N.Y. Times (n = 82) followed by the New Orleans Times-Picayune (n = 75). For the newspapers situated along the Texas coastline, the Houston Post had 60 entries. Ten of the newspapers were in the state of Texas.

For the Houston Post and the New Orleans Times-Picayune, this does not represent the total number of articles for the years 1979 and 1980. The 1980 index for the New Orleans T-P was not searched, and the 1979 index for the Houston Post was not searched. Articles were clipped from the Houston Post as they appeared during 1979.

The geographical distribution of 17 newspapers is shown in Figure 35. Each geographic region of the United States, except the Northwest region, was represented by at least one newspaper. The IXTOC I oil spill was described by three newspapers in the Northeast and 10 in the Southwest.

The circulation figures for these 17 newspapers used in the sample are given in Table 53. These figures are based on the September 30, 1980 circulation level for the evening editions. As shown in Table 53, there were two newspapers which had over a million subscriber circulation (the Los Angeles Times and the Wall Street Journal). Three of the newspapers had over one-half million circulation. These were the Washington Post, the Chicago Tribune and the New York Times.

Of the 527 newspaper articles, 32 (6.07%) dealt with the BURMAH AGATE's collision with the freighter MIMOSA and subsequent oil spill. Of the articles 94 (17.8%) carried information on the capping attempts of IXTOC I well blowout. The articles described the events surrounding the blowout and the various capping methods. Eight newspaper articles (1.52%) described the cost factors; associated with these costs was information on the liabilities of the organizations involved with the IXTOC I venture. Forty-six (8.7%) presented stories on the various environmental dangers and government studies

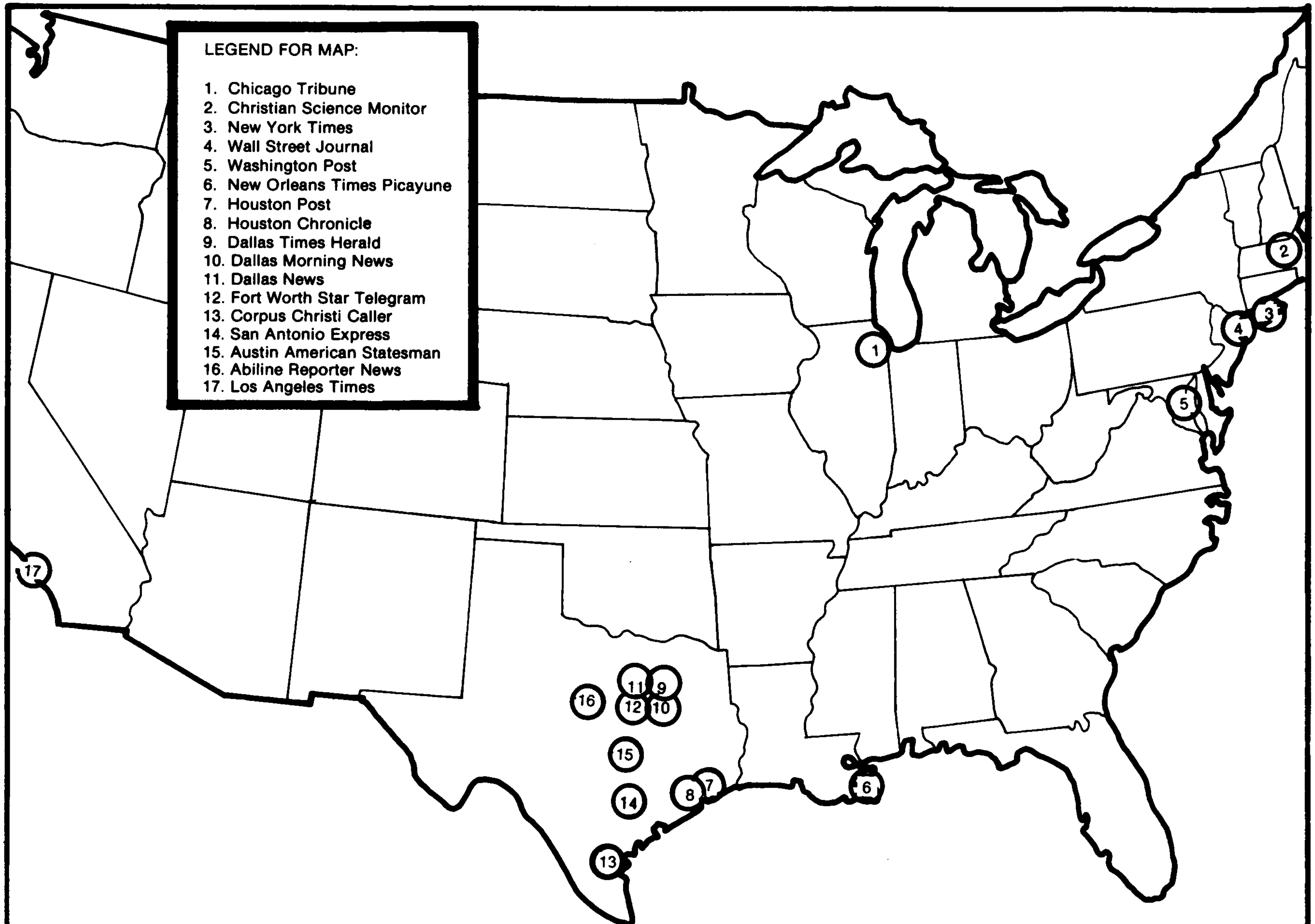


Figure 35

DISTRIBUTION OF NEWSPAPER SOURCES

Table 53

Circulation Figures*

Abiline Reporter News	48,323
Austin American Statesman	128,815
Chicago Tribune	784,388
Christian Science Monitor	165,020
Corpus Christi Caller	69,945
Dallas Morning News	286,955
Dallas News	286,781
Dallas Times Hearald	247,629
Fort Worth Star Telegram	135,271
Houston Chronicle	356,288
Houston Post	331,172
Los Angeles Times	1,000,942
New Orleans Times-Picayune	288,448
New York Times	873,255
San Antonio Express	79,901
Wall Street Journal	1,838,891
Washington Post	584,500

*According to circulation September 30, 1980, 1981 Editor and Publishers International Yearbook, Editor and Publisher, New York, New York, 1981.

that were commissioned to research the environmental impact of the oil spill.

Ten (1.89%) of the articles were devoted to commercial fishing. The articles describe the effects on the shrimpers and fishers (having to venture farther out than normal, thus incurring higher costs). Of the articles 187 (35.9%) were placed in the informational category. Congruent with the category description, these articles presented historical chronology of the IXTOC I blowout and subsequent effects on the affairs of man and nature. One hundred twenty-eight (24.2%) dealt with the legal and political actions associated with the IXTOC I spill. These articles provided readers with information on the various parties liable for damages and the interaction with the associated political components. Of the articles 18, (3.4%) dealt with the impact of the spill on the tourism/recreation industries of the Texas coastline.

Figures 36 and 37 illustrate the temporal order of the newspaper coverage that was devoted to the IXTOC I oil well blowout and the sinking of the BURMAH AGATE. Figure 36 presents an analysis of the categories through time. Category 1--the sinking of the BURMAH AGATE is a short-term event--with the stories clustering about November 7, 1979. Category 7--the stories, which fit the category of legal/political, had a much longer history of news coverage. Figure 37 illustrates the newspapers total coverage (over categories) through time. Most of the newspapers that were part of the sample presented information to the public during the months of August, October, and March. These dates correspond approximately to the time of the oil entering U.S. waters and the capping of the IXTOC I well.

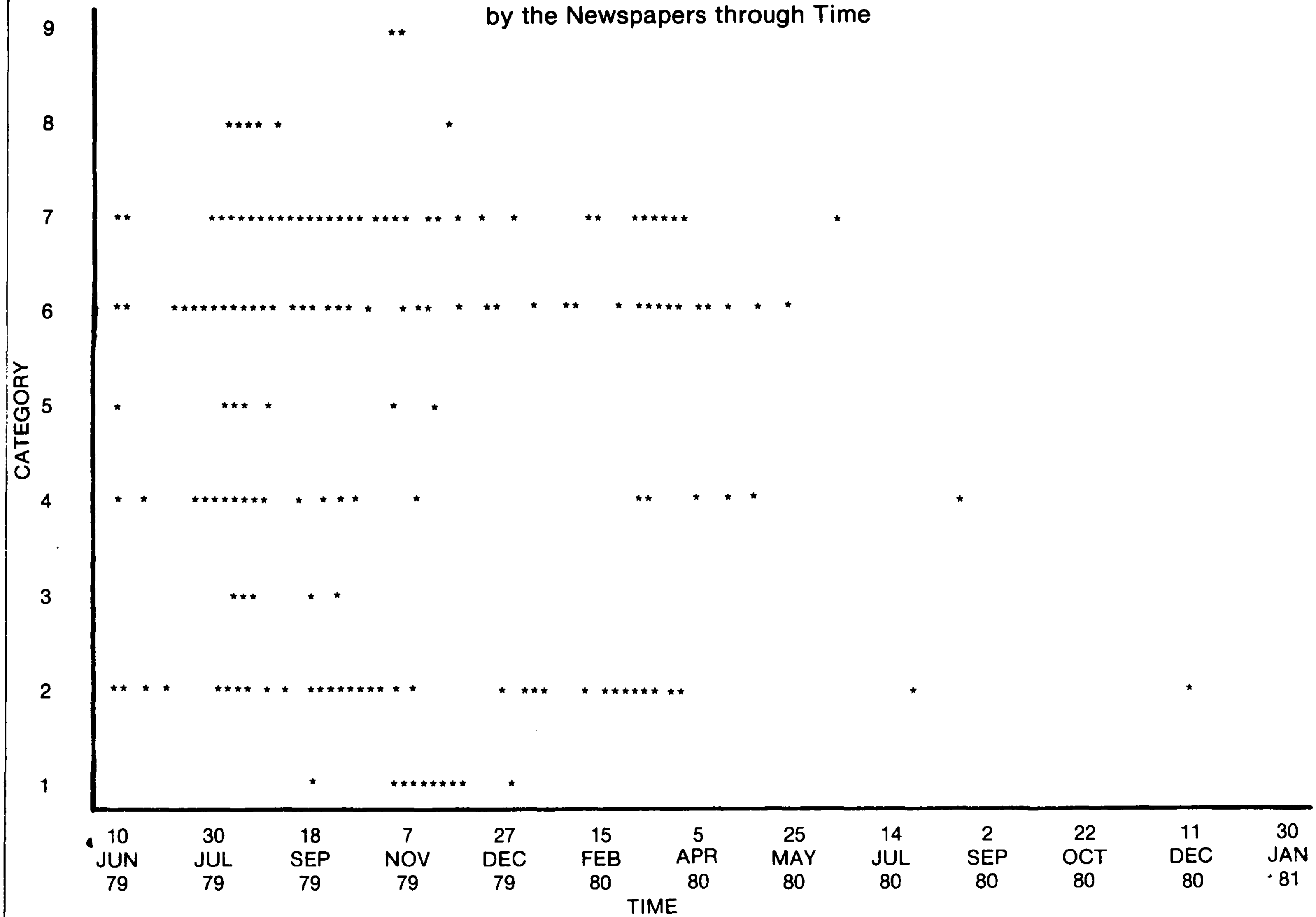
The newspaper articles' informational impact or ability to communicate ideas and effect changes in the behavior patterns of the public is very significant. The content of these articles, especially the language chosen to describe the events surrounding the IXTOC I oil well blowout, could have modified the public's behavior.

Thirty-eight of the 593 sources of information were collected from journals and magazines. The magazines and journals varied in the audience market; from business (Business Week, Wall Street Journal) to science (Science News, Aviation Week) to popular/informational types of magazines (People, Time, Newsweek). Due to the sampling procedures, the sample is not a true representative of the population.

Table 54 presents an analysis of the journal and magazine articles by the title of the journal or magazine and the category that the article was deemed to fit. Of the articles, 8 (21.05%) dealt with the capping procedures (primarily the Wall Street Journal). Two (5.20%) of the articles dealt with

Figure 36

Plot of Categories Covered
by the Newspapers through Time



NOTE: 23 OBS HAD MISSING VALUES 342 OBS HIDDEN

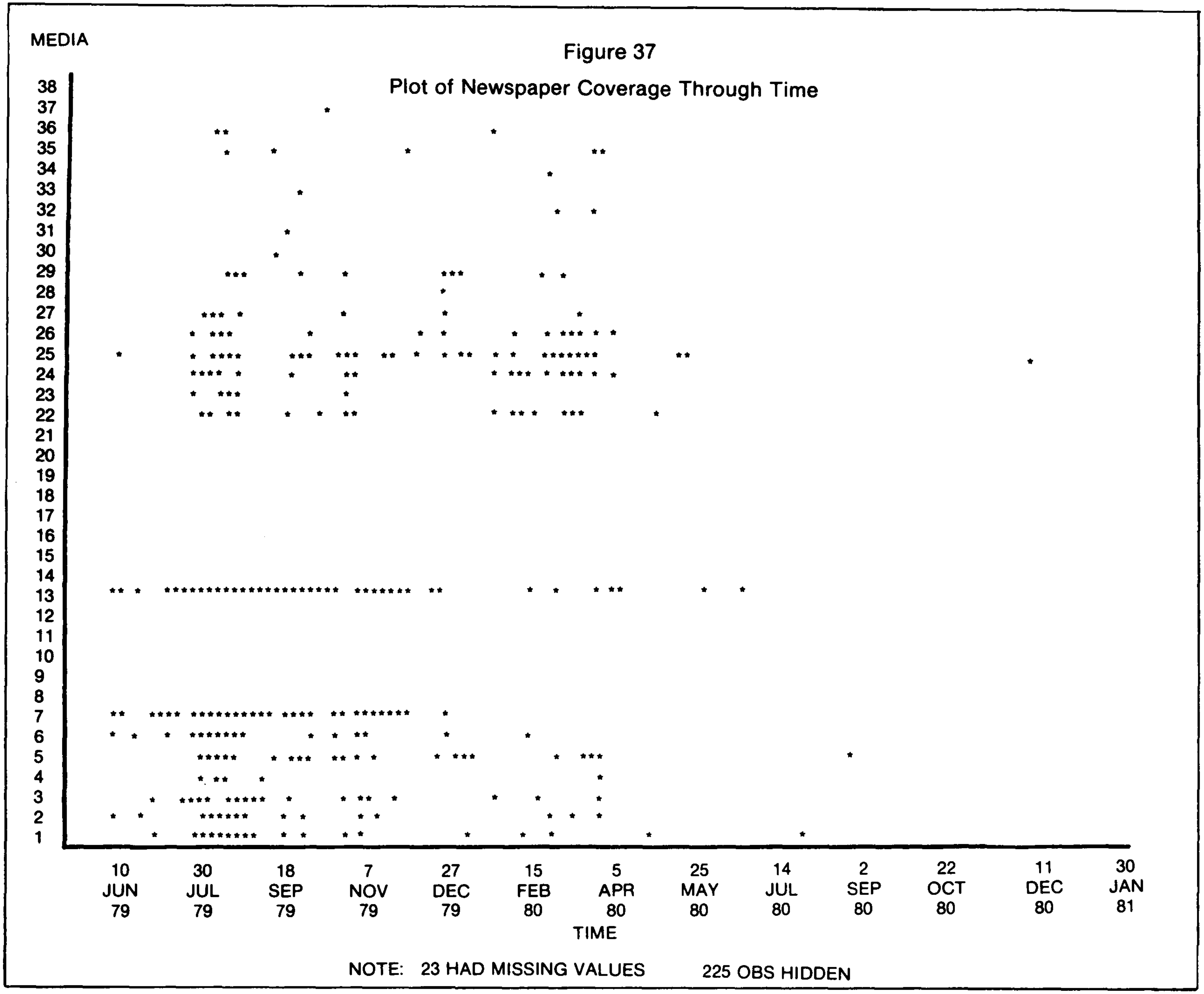


Figure 37

Plot of Newspaper Coverage Through Time

Table 54

BLM MAGAZINE DATA
TABLE OF MEDIA BY CATEGORY

MEDIA	CAPPING	COST	ENVIRONMENT	FISHING	INFORMATION	LEGAL/POLITICAL	TOTAL
Audubon	1	0	0	0	1	0	2
People Mag	0	0	0	0	1	0	1
Oil Gas Jour	0	0	0	0	1	0	1
Wall Str Jour	6	1	0	4	3	4	18
Science News	0	0	0	0	2	0	2
Nat Geo	0	0	0	0	1	0	1
Newsweek	1	1	0	0	3	0	5
Time	0	0	0	0	2	0	2
USNWR	0	0	0	0	2	0	2
The Nation	0	0	0	0	1	0	1
Outdoor Life	0	0	1	0	0	0	1
Aviation Week	0	0	0	0	1	0	1
Business Week	0	0	0	0	0	1	1
TOTAL	8	2	1	4	18	5	38

the cost of the IXTOC I oil well blowout. One (2.63%) of the articles discussed commercial fishing effects; five (13.00%) dealt with the legal and political issues of the oil well blowout. The major focus of most of the articles (18 or 47%) fit into the category of providing information on the progressions of the oil spill and its subsequent effects.

Figures 38 and 39 portray the relationship between the category into which the article fell, the journal or magazine's title, and the period of time in which the article was presented to the public. Figure 39 shows the plot of the magazines that were selected for the sample and the time they were presented to the public. Figure 38 illustrates the categories of the articles as they appeared in time. Most of the articles appeared before the oil entered U.S. waters (June and July). The last article appeared in Science News (May 2, 1981) and covered the chronological development of the oil slick.

The journal and magazine publications cater to a specific segment of the market. The cross section of the journals and magazines sampled, although not conforming to a planned sampling technique, presents a view of the IXTOC I oil well blowout and subsequent oil slick, in language, jargon and content of interest to the particular market on which the journal or magazine focuses. The main point is that a wide cross section of the U.S. public was exposed to pictures, drawings, and content that surrounded the events of the IXTOC I oil spill.

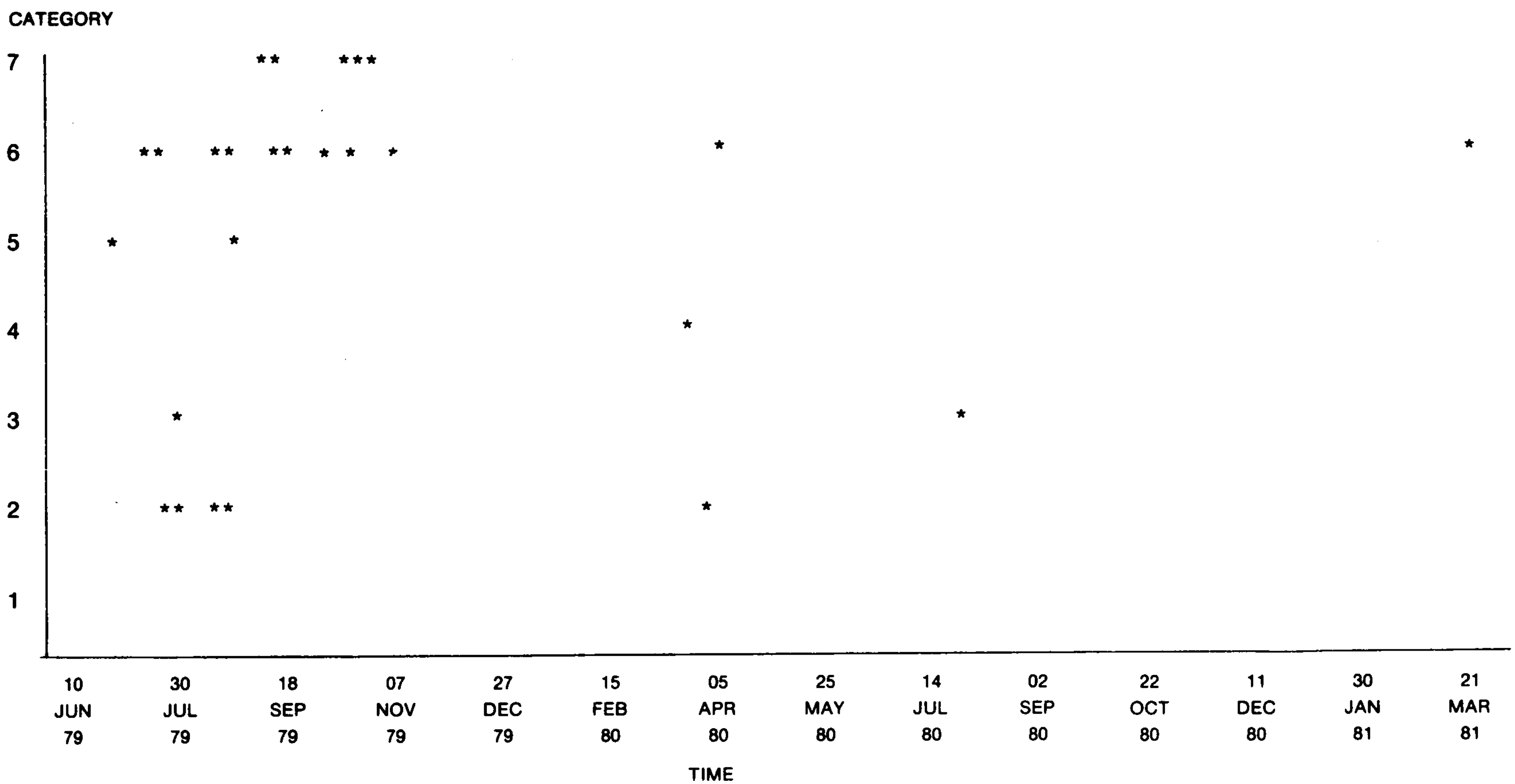
Television, a medium of social importance, provided coverage on the IXTOC I oil well blowout and its subsequent effects on the Texas coastal region. In this sample, three local channel affiliates (KHOU, KPRC, and KTRK) located in Houston, Texas and their major news networks (ABC, CBS, and NBC) presented televised news coverage in the form of early morning news magazines and evening news reports. These reports brought the events surrounding the IXTOC I oil well blowout and the resulting oil slick and its environmental/economic/sociological effects into the presence of the viewing public.

Although the duration of the televised news medium was relatively short, when compared to the amount of time that the other media devoted to the oil spill, the potential for shaping the public's image of the spill and its results should not be underestimated. The coverage lasted less than 2 weeks (August 3, 1979 to August 15, 1979) as shown by the plot of the television stations against time (Figure 40). For the four days (August 6, 1979 to August 10, 1979) all three stations carried stories on the oil slick's impact on the Texas coastal region.

Table 55 presents a breakdown of the televised news

Figure 38

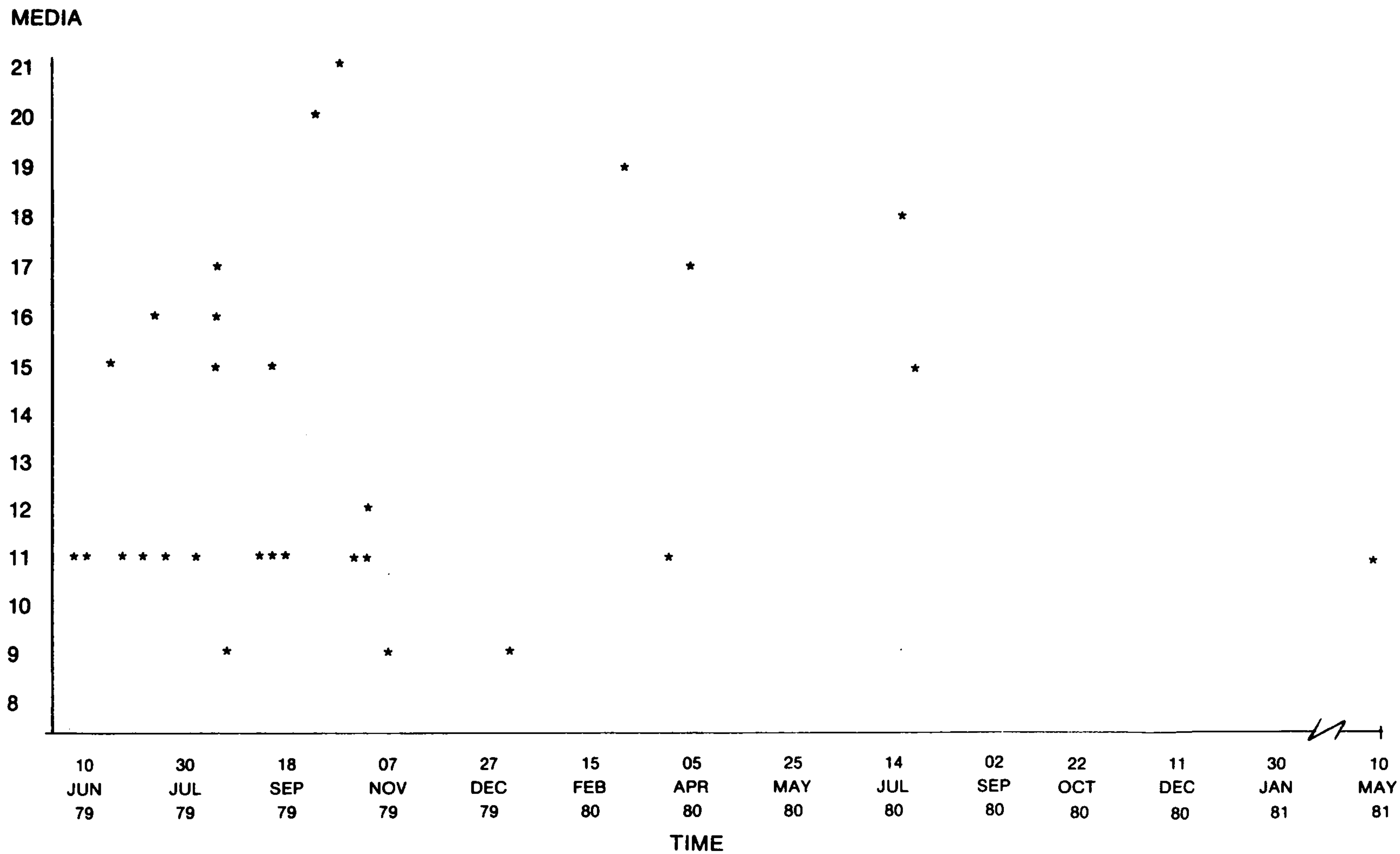
PLOT OF MAGAZINE CATEGORIES THROUGH TIME



NOTE: 1 OBS HAD MISSING VALUE 6 OBS HIDDEN

Figure 39

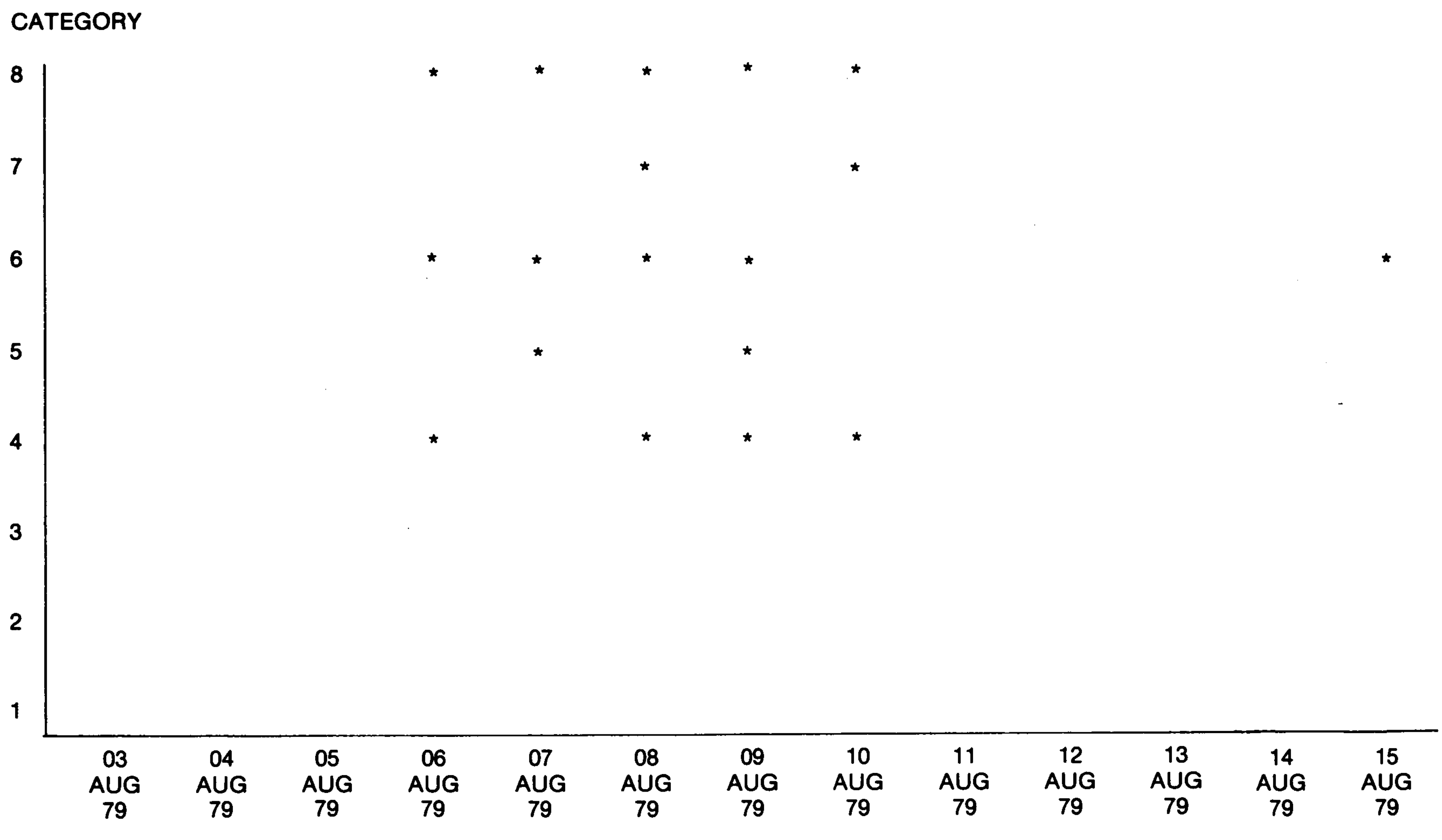
PLOT OF NUMBER OF MAGAZINE ARTICLES THROUGH TIME



NOTE: 1 OBS HAD MISSING VALUES 7 OBS HIDDEN

Figure 40

BLM T.V. DATA SUMMARY
(BY DATE OF AIRING AND CATEGORY)



NOTE: 9 OBS HIDDEN

Table 55

BLM T.V. DATA BY CATEGORY
(NUMBER OF AIRED REPORTS BY CATEGORY)

	CATEGORY				
MEDIA	ENVIRONMENT	FISHING	INFORMATION	LEGAL/ POLITICAL	TOURISM
KPRC TV	1	1	4	0	3
KHOU TV	3	1	3	2	1
KTRK TV	2	0	1	2	4
TOTAL	6	2	8	4	8

N=28

reports by the station and by the content of the report. Of the 28 reports in this sample, 6 (21.43%) focused on environmental issues (the birth of the Ridely sea turtle or a discussion with a NOAA scientist, who was studying the effects of the oil slick on the environment); 2 (7.14%) focused on the effects of the IXTOC I's oil slick on the fishing industry (interviewing fishermen and asking for their assessment of the situation); 8 (28.57%) provided general information on the oil spill (describing how the spill occurred, the various preparations made for the defense of the coast, the progress of the oil slick as it approached the Texas coastline and impact the oil slick had on the people and the environment.)

While it would be wrong to accuse the televised news coverage of sensationalism, one story, carried by the local and national networks, devoted a significant amount of time to a "monster" tar ball--some 10 feet in diameter--that had washed ashore on one of the beaches. The visual impact of the "giant" tar ball, as opposed to the tar ball more commonly found (1-5 inches) on the beaches, certainly left an impression in the minds of the viewing public.

Four reports (14.29%) covered the legal/political aspects of the oil spill. These reports were covered in the later period (August 8 to August 10) of the reporting and consisted primarily of Texas State Official's visits to the region and their assessment of the situation.

One of the largest blocks of time was devoted to coverage of tourism. Of all televised news reports, 8 (28.57%) examined the effects of the spill and the effects of the media's coverage of the spill on the Texas coastal region's tourist industry. Tourists were interviewed, in situ, and asked their opinion of the oil slick and its effect on their decision to visit and recreate on the Texas coast. The majority of the interviewees expressed disappointment and disgust with the results of the oil slick upon their vacation. Corpus Christi's Mayor McGee and Director of the Tourist Bureau, Ralph Thompson were interviewed and expressed an opinion that the media did have a negative impact on the tourist industry, and that the beaches along Padre Island were safe and relatively clean for tourists.

The sample of the television coverage does not have a basis in probability because it did not conform to a sampling procedure, yet it can be indicative of the news that was reported across the nation (due to the affiliate news-sharing network). Figures for the extent of the viewing audience were not available, and as a result, no estimates of the volume of the viewing public could be made. The density of the televised coverage was relatively compact when compared with the other medium's coverage of the oil slick's impact. Despite the limitations, there is an intuitive notion that this particular form of news medium had more power in shaping the public's view of the situation and events that occurred along the Texas coastal region.

CONCLUSION

One major untested hypothesis is: "Did the media coverage affect the coastal tourist economy?" Donald Roberts, a noted mass communication expert, postulates a cause and effects communication model, ". . . A communication is judged to have an effect to the extent that it is followed by an observable response on the part of the receiver which appears to derive the message."[3] Roberts further classifies his model by stating, "Communications do not directly mediate overt behavior. Rather, they tend to affect the way a receiver organizes his image of the environment and this influences the way he behaves."[4]

One indirect indicator of tourist behavior are traffic counts at a strategic location. Traffic counts at Station S-161, located at the Flour Bluff entrance to Padre Island were obtained from the Nueces County (Pct. 4) Commissioner's office. The traffic counts are 2-way counts (on and off the Island) for all vehicles.

Figure 41 plots the traffic counts vs. media coverage. The slope of the curve is distinctly negative (slope is down) and falls sharply during the month of August. The media coverage has several peaks--one at June 10, 1979 corresponding to the blowout of the IXTOC I and a major peak during the month of August. Notice that the peak in media coverage corresponds to the decrease in the traffic counts at the Flour Bluff entrance to Padre Island.

Pearson product-moment correlation coefficients were calculated for these variables: dependent = traffic count, independent = number of newspaper articles, number of magazine and journal articles, number of televised reports, and total number of reports.

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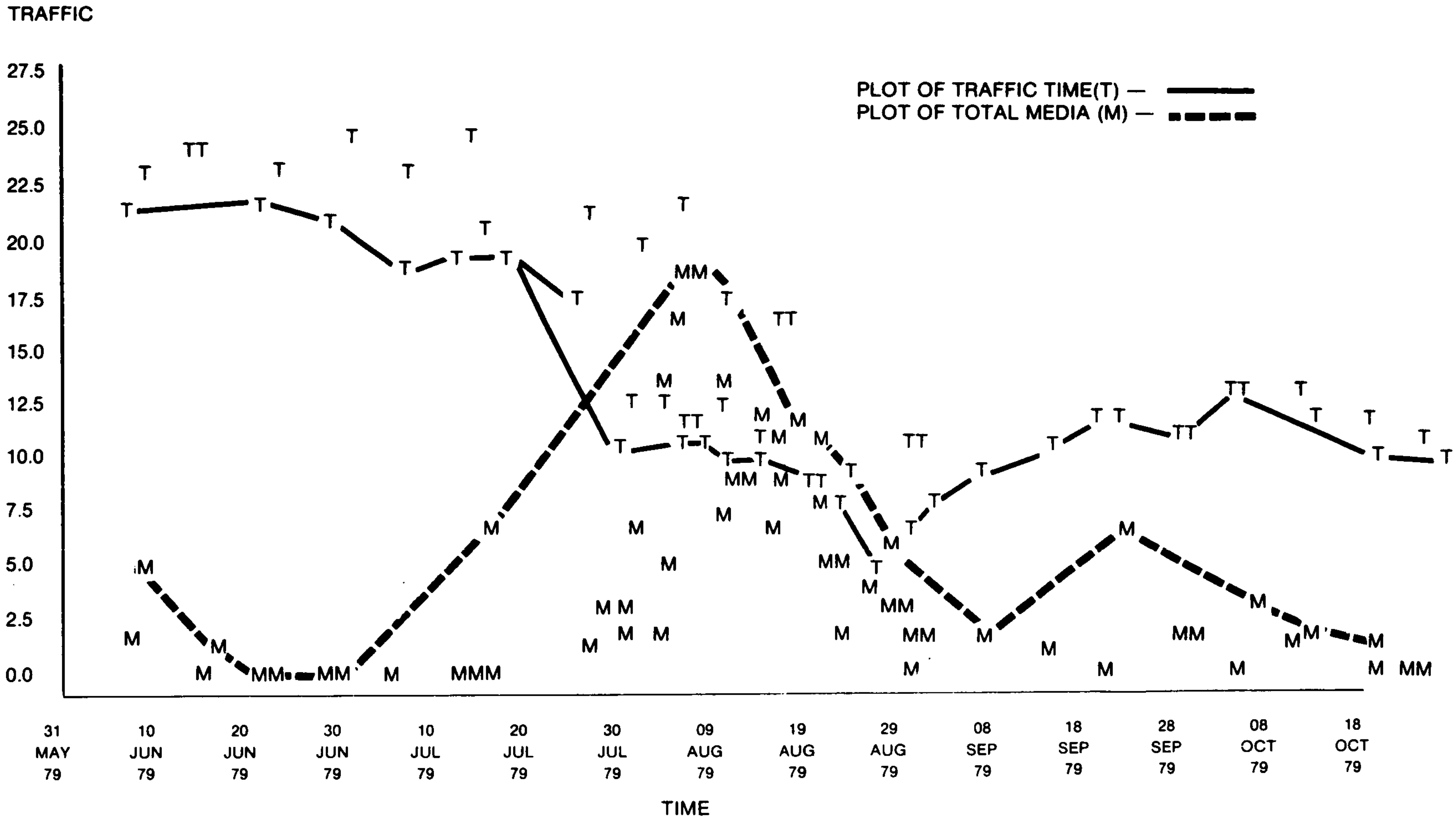
[3]"Nature of Communication Effects," p. 358, The Process & Effect of Mass Communication, Edited by Wilbur Schramm and Donald Roberts, University of Illinois Press, Urbana, Illinois, 1971.

[4]Ibid, p. 361.

Figure 41

GRAPH OF IXTOC MEDIA COVERAGE (M) AND TRANSFORMED TRAFFIC COUNTS (T)



NOTE: 5 MEDIA OBS HIDDEN

Pearson Correlation Coefficients

	Total	Newspapers	Magazines	TV
Traffic	-0.2898	-0.2797	-0.2999	-0.1210
Count	0.0202	0.0252	0.1600	0.3408

The upper value is the Pearson product-moment correlation coefficient. The lower number is the observed significance level under the hypothesis that Pearson's rho is equal to zero.

All of the Pearson product-moment correlation coefficients are negative. This indicates that the linear relationship between the variables has a downward slope. This may be interpreted to mean: as the number of media stories that are presented to the public rises, there is a concurrent decline in the traffic count. Pearson's product-moment correlation coefficient for the variables: total number of reports, number of newspapers and number of magazines are significant at the 0.05 level of significance. This means that 95 out of 100 samples will show a correlation that does not have the value of zero. This does not establish a clear cause and effect relationship between the news media and the observed traffic counts, nor does it establish a relationship between the news media and the decline in expenditures that were documented in previous chapters.

A stepwise regression procedure was conducted for the variables (dependent = traffic count) and did not produce a multiple regression equation that satisfactorily explained the amount variance that is inherent in the variables.

The number of information sources and their relatively high density (August/September/October of 1979) may have reshaped the public's viewpoint of the Texas coastal region and changed the public's subsequent behavior from approach to avoidance of the beaches. As a direct result, the tourism and recreation industries along the coastline may have suffered an economic loss.

ACKNOWLEDGEMENT

A/A

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APPENDIX A

SAMPLE STATE DEPARTMENT OF HIGHWAYS AND PUBLIC TRANSPORTATION (SDHPT) REPORT

THE 1979 REPORT ON
THE TEXAS VISITOR INDUSTRY

Statistics concerning out-of-state visitors to Texas during 1979 are presented in three parts and consist of grand totals, a detailed profile of auto visitors, and a summation of data relative to travelers by commerical carriers. Comparisons to figures contained in the 1978 report are made in all categories.

The report includes national and international visitors to the state, but does not reflect travel within Texas by Texans.

PART 1: GRAND TOTALS

Number of Visitors to Texas				
	1979	**% of Visitors**	1978	% of Visitors
By automobile	**19,340,000**	**(77.6%)**	20,898,000	(81.1%)
By air, bus, rail	**5,579,000**	**(22.4%)**	4,855,000	(18.9%)
Totals	**24,919,000**	**(100%)**	25,753,000	(100%)
Expenditures				
	1979	**% of Expend.**	1978	% of Expend.
By auto visitors	**$3,563,261,000**	**(73.7%)**	$3,313,054,000	(76.5%)
By air, bus, rail visitors	**1,274,362,000**	**(26.3%)**	1,020,316,000	(23.5%)
Totals	**$4,837,623,000**	**(100%)**	$4,333,370,000	(100%)

PART 2: AUTO VISITOR PROFILE

("Short-term" visitors stayed less than 30 days, "long-term," a month or more.)

EXPENDITURES

	Per Person Per Day		Per Party Per Day		Per Party/Per Trip		Total Spending	
	1979	1978	1979	1978	1979	1978	1979	1978
U.S. Visitors (short term)	$19.76	$17.44	$51.37	$47.26	$ 349.82	$ 314.77	$2,216,885,000	$2,089,108,000
U.S. Visitors (long term)	10.08	9.14	20.87	20.65	1,485.24	1,535.52	813,040,000	801,708,000
Foreign Visitors (short term)	19.78		60.73	51.58	521.07	411.11	173,340,000	111,692,000
Foreign Visitors (long term)	13.97	8.38	43.88	28.14	2,932.35	2,137.54	109,604,000	72,592,000
Mexican Visitors*	–	–	–	–	1,163.91	1,010.35	250,392,000	237,954,000
						TOTALS	$3,563,261,000	$3,313,054,000

*From reports provided by the U.S. Travel Service, U.S. Dept. of Commerce. Data for Mexican visitors are included only where indicated and are incorporated in all applicable totals.

VISITOR VOLUME & AVERAGE LENGTH OF STAY

	Average Length of Stay		Percent of All Auto Visitors		Number of Auto Visitors	
	1979	1978	1979	1978	1979	1978
U.S. Visitors (short term)	6.81 days	6.66 days	85.2%	86.1%	16,477,000	17,986,000
U.S. Visitors (long term)	71.15 days	74.36 days	5.8	5.6	1,133,000	1,180,000
Foreign Visitors (short term)	8.58 days	7.97 days	5.3	4.6	1,021,000	970,000
Foreign Visitors (long term)	66.83 days	75.95 days	0.6	0.6	117,000	114,000
Mexican Visitors*	–	–	3.1	3.1	592,000	648,000
				TOTALS	19,340,000	20,898,000

*From reports provided by U.S.T.S. and the U.S. Immigration and Naturalization Service

AVERAGE GROUP SIZE

	1979	1978
U.S. Visitors (short term)	2.60 persons	2.71 persons
U.S. Visitors (long term)	2.07 persons	2.26 persons
Foreign Visitors (short term)	3.07 persons	3.57 persons
Foreign Visitors (long term)	3.14 persons	3.36 persons
Mexican Visitors*	2.75 persons	2.75 persons

*From reports provided by U.S.T.S.

HOW THE DOLLAR WAS SPENT

	Auto Expense		Food		Lodging		Entertainment		Other	
	1979	1978	1979	1978	1979	1978	1979	1978	1979	1978
U.S. Visitors (short term)	28.7¢	21.2¢	24.9¢	25.6¢	23.6¢	24.5¢	8.5¢	9.3¢	14.3¢	19.4¢
U.S. Visitors (long term)	30.2	19.1	24.8	26.0	23.5	25.0	6.6	7.6	14.9	22.3
Foreign Visitors* (short term)	26.7	20.2	23.5	26.3	23.7	26.1	7.0	9.7	19.1	17.7
Foreign Visitors* (long term)	31.7	18.8	21.4	28.2	16.2	27.6	8.6	10.0	22.1	15.4

*Excluding Mexican Visitors

TOP 30 CITIES VISITED
(Incorporates Multiple Responses by Visitors)

Rank 1979	Rank 1978	City	1979 Visits U.S. Visitors (short term)	U.S. Visitors (long term)	Foreign Visitors* (short term)	Foreign Visitors* (long term)	Total Est. Person Visits
1	3	Dallas	5,529,900	252,400	351,500	22,000	6,155,800
2	1	San Antonio	4,503,000	430,100	410,300	52,300	5,395,700
3	2	Houston	4,405,700	308,600	338,500	41,800	5,094,600
4	4	El Paso	2,784,400	223,900	359,800	13,700	3,381,800
5	7	Fort Worth	2,175,500	107,100	86,900	9,700	2,379,200
6	5	Austin	1,872,600	155,000	147,100	69,200	2,243,900
7	6	Galveston	1,583,400	103,500	143,900	10,400	1,841,200
8	8	Corpus Christi	1,335,800	194,300	97,000	18,700	1,645,800
9	10	Brownsville	1,136,800	296,700	81,100	14,800	1,529,400
10	11	Laredo	979,900	132,300	85,100	12,600	1,209,900
11	12	Arlington	1,034,400	16,900	15,900	2,900	1,070,100
12	19	McAllen	667,000	259,200	26,000	9,000	961,200
13	9	Amarillo	762,200	38,900	69,600	2,200	872,900
14	17	Harlingen	519,500	221,000	19,500	9,400	769,400
15	14	Del Rio	582,600	87,600	78,600	7,600	756,400
16	22	South Padre Island	598,800	89,100	44,700	2,900	735,500
17	20	Abilene	547,300	22,000	82,900	6,100	658,300
18	16	Waco	585,500	41,500	23,800	4,700	655,500
19	13	Beaumont	538,600	29,200	44,700	2,500	615,000
20	18	Texarkana	426,500	49,800	35,300	1,400	513,000
21	23	Wichita Falls	359,100	25,200	30,300	700	415,300
22	15	Fort Stockton	366,700	21,300	25,600	1,400	415,000
23	25	Johnson City	372,400	23,100	15,500	–	411,000
24	24	Tyler	352,600	23,400	17,700	–	393,700
25	21	Van Horn	291,700	27,400	19,800	400	339,300
26	–	San Marcos	256,000	19,800	13,300	2,200	291,300
27	26	Denton	269,300	11,900	6,100	–	287,300
28	28	Lubbock	258,100	16,600	9,000	2,200	285,900
29	30	Fredericksburg	224,600	33,200	19,100	700	277,600
30	–	Mission	134,800	100,200	3,200	3,200	241,400

*Excluding Mexican Visitors

AREAS VISITED BY U.S. AND FOREIGN AUTO VISITORS

(Incorporates Multiple Responses by Visitors)

Rank 1979	Rank 1978	Area	1979 Visits U.S. Visitors (short term)	U.S. Visitors (long term)	Foreign Visitors* (short term)	Foreign Visitors* (long term)	Total Est. Person Visits
1	1	North	7,764,000	352,200	426,500	24,200	8,566,900
2	2	East	5,727,000	405,200	399,500	44,000	6,575,700
3	3	West	4,671,400	390,800	492,500	29,200	5,583,900
4	5	Hill Country	4,015,900	390,500	318,000	61,600	4,786,000
5	4	Gulf Coast	3,750,900	393,700	281,200	29,600	4,455,400
6	6	South	3,306,800	385,800	271,500	36,400	4,000,500
7	7	Rio Grande Valley	2,308,100	640,000	145,300	29,200	3,122,600
8	8	Central	2,249,400	174,500	120,400	59,800	2,604,100
9	9	Panhandle	1,176,800	64,500	94,500	4,700	1,340,500

*Excluding Mexican Visitors

ORIGIN OF U.S. VISITORS

States (by Region)	Short Term 1979	Short Term 1978	Long Term 1979	Long Term 1978	Rank 1979	Rank 1978
GREAT LAKES COUNTRY	**25.0%**	25.1%	**42.2%**	43.5%	**(1)**	(1)
Illinois	**5.8**	6.0	**6.6**	7.6	**3**	3
Indiana	**2.6**	2.9	**3.7**	3.4	**14**	12
Iowa	**2.7**	2.4	**5.5**	4.9	**12**	16
Michigan	**4.5**	4.3	**9.7**	10.1	**6**	6
Minnesota	**3.3**	3.0	**6.5**	6.5	**9**	10
Ohio	**3.5**	3.9	**4.7**	5.5	**10**	8
Wisconsin	**2.6**	2.6	**5.5**	5.5	**13**	14
FRONTIER WEST	**25.6%**	21.0%	**14.2%**	13.1%	**(2)**	(3)
Arizona	**2.5**	2.4	**1.4**	1.0	**16**	17
Kansas	**4.2**	3.4	**3.8**	3.0	**8**	9
Missouri	**5.1**	4.6	**4.7**	4.8	**5**	7
New Mexico	**2.3**	2.0	**0.9**	1.3	**18**	18
Oklahoma	**11.5**	8.6	**3.4**	3.0	**1**	2
THE SOUTH	**22.7%**	24.3%	**9.5%**	9.0%	**(3)**	(2)
Alabama	**1.3**	1.5	**0.6**	0.8	**23**	25
Arkansas	**3.6**	2.7	**1.8**	1.6	**11**	15
Florida	**4.7**	6.0	**2.2**	2.4	**7**	5
Georgia	**1.6**	1.8	**0.5**	0.4	**21**	20
Kentucky	**0.7**	0.8	**0.9**	0.5	**32**	33
Louisiana	**5.8**	6.3	**1.1**	0.9	**4**	4
Mississippi	**1.4**	1.6	**0.6**	0.4	**22**	22
North Carolina	**1.1**	1.3	**0.6**	0.6	**28**	28
South Carolina	**0.7**	0.8	**0.4**	0.4	**33**	32
Tennessee	**1.8**	1.5	**0.8**	1.0	**20**	23
FAR WEST	**10.7%**	11.8%	**12.9%**	13.4%	**(4)**	(4)
Alaska	**0.2**	0.2	**0.2**	0.2	**47**	47
California	**7.8**	8.5	**7.4**	8.6	**2**	1
Idaho	**0.3**	0.3	**0.5**	0.6	**39**	37
Nevada	**0.3**	0.2	**0.6**	0.4	**40**	42
Oregon	**1.0**	1.1	**2.0**	1.6	**29**	30
Washington	**1.1**	1.5	**2.2**	2.0	**26**	21
MOUNTAIN WEST	**4.9%**	4.5%	**8.4%**	7.7%	**(5)**	(6)
Colorado	**2.1**	1.8	**3.1**	2.9	**19**	19
Montana	**0.3**	0.2	**0.4**	0.3	**41**	44
Nebraska	**1.2**	1.2	**2.1**	1.8	**24**	27
North Dakota	**0.2**	0.3	**0.9**	0.9	**42**	38
South Dakota	**0.4**	0.4	**1.0**	0.9	**35**	35
Utah	**0.4**	0.4	**0.4**	0.5	**36**	36
Wyoming	**0.3**	0.2	**0.5**	0.4	**38**	43
GEORGE WASHINGTON COUNTRY	**5.1%**	6.1%	**5.0%**	5.7%	**(6)**	(5)
Delaware	**0.2**	0.2	**0.1**	0.5	**45**	45
Dist. of Columbia	**0.1**	0.1	**–**	0.1	**50**	50
Maryland	**0.9**	1.2	**0.7**	0.7	**30**	29
Pennsylvania	**2.3**	2.8	**2.9**	3.0	**17**	13
Virginia	**1.2**	1.5	**0.7**	1.1	**27**	24
West Virginia	**0.4**	0.3	**0.6**	0.3	**37**	39

States (by Region)	Short Term 1979	Short Term 1978	Long Term 1979	Long Term 1978	Rank 1979	Rank 1978
EASTERN GATEWAY	3.8%	4.6%	4.6%	4.2%	(7)	(7)
New Jersey	1.2	1.5	1.4	0.9	25	26
New York	2.6	3.1	3.2	3.3	15	11
NEW ENGLAND STATES	2.1%	2.4%	3.0%	3.2%	(8)	(8)
Connecticut	0.5	0.6	0.5	0.7	34	34
Maine	0.2	0.3	0.1	0.5	44	41
Massachusetts	0.8	0.9	1.1	1.1	31	31
New Hampshire	0.2	0.3	0.6	0.4	43	40
Rhode Island	0.2	0.2	0.3	0.2	48	48
Vermont	0.2	0.1	0.4	0.3	46	46
THE ISLANDS	0.1%	0.2%	0.2%	0.2%	(9)	(9)
Hawaii	0.1	0.1	*	0.1	49	49
Puerto Rico	*	0.1	0.1	0.1	51	51
Virgin Islands	*	—	0.1	—	52	—

*less than 0.1%

ORIGIN OF FOREIGN VISITORS

Country	% of Foreign 1979	% of Foreign 1978	Rank 1979	Rank 1978
Mexico	34.4%	37.4%	1	1
Canada	26.6	33.9	2	2
Great Britain	9.1	5.4	3	4
Germany	8.5	5.8	4	3
Australia	3.0	2.1	5	5
Switzerland	2.7	2.1	6	6
The Netherlands	2.5	1.2	7	7
France	2.0	1.1	8	9
Israel	0.9	0.6	9	12
Sweden	0.8	1.2	10	8
Austria	0.8	0.3	11	15
Denmark	0.7	0.9	12	10
Japan	0.7	0.4	13	14
South Africa	0.5	0.6	14	11
Argentina	0.2	0.2	15	18
China	0.2	—	16	—
Iran	0.2	0.2	17	17
Italy	0.2	0.1	18	22
Brazil	0.2	0.2	19	20
Russia	0.2	—	20	—
Norway	0.2	0.4	21	13
Greece	0.1	—	22	—
India	0.1	—	23	—
Ireland	0.1	0.1	24	25
Yugoslavia	0.1	—	25	—
All other foreign	5.0	4.7		

PURPOSE OF VISIT

(Incorporates Multiple Responses by Visitors)

	Vacation Only		Vacation & Other		Visit Friends/ Relatives Only		Visit Friends/Rel. & Other		Passing Thru Only		Passing Thru & Other	
	1979	1978	1979	1978	1979	1978	1979	1978	1979	1978	1979	1978
U.S. Visitors (short term)	22.1%	22.7%	45.9%	49.1%	10.8%	9.6%	37.0%	38.3%	5.3%	5.2%	16.8%	19.0%
U.S. Visitors (long term)	40.0	39.8	41.7	42.3	4.7	4.2	35.6	35.7	1.5	1.3	9.9	9.8
Foreign Visitors* (short term)	30.5	35.7	56.6	51.8	2.7	3.2	26.2	22.8	5.3	5.3	34.5	33.1
Foreign Visitors* (long term)	40.4	40.0	40.4	46.7	5.5	5.0	30.3	35.0	–	0.8	9.2	7.5

	Business Only		Business & Other		Moving to Texas Only		Moving to Texas & Other		Convention Only		Convention & Other	
	1979	1978	1979	1978	1979	1978	1979	1978	1979	1978	1979	1978
U.S. Visitors (short term)	5.8%	4.9%	10.5%	10.0%	2.5%	1.8%	2.5%	2.5%	1.6%	1.4%	3.6%	3.7%
U.S. Visitors (long term)	4.5	5.3	10.7	9.6	2.5	2.3	5.5	5.9	0.1	0.3	2.4	3.2
Foreign Visitors* (short term)	2.4	1.1	6.6	6.4	1.0	0.2	2.9	2.0	0.2	0.2	2.0	2.9
Foreign Visitors* (long term)	12.8	4.2	5.5	10.8	–	0.8	3.7	4.2	–	–	–	4.2

*Excluding Mexican Visitors

TOURING TEXAS

"Touring" describes visitors who traveled in two or more areas of the state and journeyed in excess of 1,550 miles.

U.S. Visitors (short term)		U.S. Visitors (long term)		Foreign Visitors* (short term)		Foreign Visitors* (long term)		Total	
1979	1978	1979	1978	1979	1978	1979	1978	1979	1978
2,362,200	2,543,100	600,000	634,600	192,600	175,500	53,200	64,700	3,208,000	3,417,900

*Excluding Mexican Visitors

MILES DRIVEN IN TEXAS

U.S. Visitors (short term)		U.S. Visitors (long term)		Foreign Visitors* (short term)		Foreign Visitors* (long term)	
1979	1978	1979	1978	1979	1978	1979	1978
1,036	1,055	2,698	2,755	1,210	1,248	2,592	2,579

*Excluding Mexican Visitors

AGES — HEADS OF PARTIES

	Under 25		25-34		35-49		50-64		65+	
	1979	1978	1979	1978	1979	1978	1979	1978	1979	1978
U.S. Visitors (short term)	5.5%	5.4%	13.8%	14.0%	21.3%	22.6%	40.7%	40.3%	18.7%	17.7%
U.S. Visitors (long term)	3.7	4.9	4.7	5.2	6.4	6.9	42.0	45.4	43.2	37.6
Foreign Visitors* (short term)	15.2	11.1	25.9	25.2	24.5	24.5	27.0	27.8	7.4	11.4
Foreign Visitors* (long term)	10.6	4.4	12.5	13.9	14.4	15.6	42.3	36.5	20.2	29.6

*Excluding Mexican Visitors

LODGING
(Incorporates Multiple Responses by Visitors)

	Motel/Hotel Only		Motel/Hotel & Other		Private Home Only		Private Home & Other		Rec. Vehicle Only	
	1979	1978	1979	1978	1979	1978	1979	1978	1979	1978
U.S. Visitors (short term)	35.5%	36.6%	29.2%	29.6%	14.2%	13.0%	21.7%	22.3%	9.9%	9.2%
U.S. Visitors (long term)	8.8	7.7	34.1	32.8	3.3	4.3	21.8	20.1	27.0	29.9
Foreign Visitors* (short term)	36.4	36.9	34.5	35.0	7.3	6.1	16.8	14.8	10.3	11.7
Foreign Visitors* (long term)	7.3	8.3	36.4	45.8	15.5	14.2	25.5	25.8	22.7	19.2

	Rec. Vehicle & Other		Camping Only		Camping & Other		Apartment Only		Apartment & Other	
	1979	1978	1979	1978	1979	1978	1979	1978	1979	1978
U.S. Visitors (short term)	11.6%	12.0%	3.4%	3.6%	11.5%	12.3%	1.3%	1.0%	2.6%	2.6%
U.S. Visitors (long term)	33.5	29.6	2.5	2.8	25.9	23.8	3.1	3.7	10.0	10.5
Foreign Visitors* (short term)	11.3	11.3	9.2	8.7	13.4	16.9	0.5	–	2.5	1.8
Foreign Visitors* (long term)	22.7	24.2	1.8	3.3	19.1	16.7	3.6	0.8	13.6	14.2

*Excluding Mexican Visitors

FAMILY INCOME

	Under $7,000		$7,000-12,000		$12,000-16,000		$16,000-22,000		Over $22,000	
	1979	1978	1979	1978	1979	1978	1979	1978	1979	1978
U.S. Visitors (short term)	5.5%	6.5%	15.1%	17.2%	15.5%	17.0%	21.7%	23.0%	42.2%	36.3%
U.S. Visitors (long term)	10.1	12.6	27.1	33.7	21.2	19.3	19.6	17.1	22.0	17.3
Foreign Visitors* (short term)	8.4	10.6	14.8	16.7	15.8	17.0	21.6	21.0	39.4	34.7
Foreign Visitors* (long term)	8.3	14.0	29.2	32.7	20.8	12.2	17.7	14.9	24.0	26.2

*Excluding Mexican Visitors

VISITED TEXAS BEFORE

	Yes		No	
	1979	1978	1979	1978
U.S. Visitors (short term)	78.2%	74.9%	21.8%	25.1%
U.S. Visitors (long term)	82.3	82.8	17.7	17.2
Foreign Visitors* (short term)	25.9	29.9	74.1	70.1
Foreign Visitors* (long term)	42.7	50.4	57.3	49.6

*Excluding Mexican Visitors

VISITED MEXICO DURING TEXAS TRIP

	Yes		No	
	1979	1978	1979	1978
U.S. Visitors (short term)	27.1%	28.3%	72.9%	71.7%
U.S. Visitors (long term)	69.1	68.9	30.9	31.1
Foreign Visitors* (short term)	41.1	45.7	58.9	54.3
Foreign Visitors* (long term)	71.3	66.9	28.7	45.7

*Excluding Mexican Visitors

PART 3: VISITORS BY AIR, BUS, RAIL

Mode	Number of Visitors 1979	Number of Visitors 1978	Spending per Person Per Trip 1979	Spending per Person Per Trip 1978	Total Spending 1979	Total Spending 1978
U.S. Visitors by Air	4,570,000	3,974,000	$231.07	$218.69	$1,055,956,000	$869,089,000
Mexican Visitors by Air*	154,000	134,000	423.24	367.40	65,080,000	49,092,000
Foreign Visitors by Air*	132,000	62,000	423.24	367.40	56,027,000	22,647,000
Visitors by Bus	651,000	626,000	134.57	116.15	87,654,000	72,684,000
Visitors by Rail	72,000	59,000	134.57	116.15	9,645,000	6,804,000
TOTALS	5,579,000	4,855,000			$1,274,362,000	$1,020,316,000

*Arriving directly in Texas

DATA SOURCES:

AMTRAK
Civil Aeronautics Board
Greyhound Lines, Inc.
International Association of Convention & Visitor Bureaus
Major business/convention hotels/motels in 13 Texas metro areas
National Archives and Records Service
New Mexico Transportation Company, Inc.
Oklahoma Transportation Company
TNM&O Coaches, Inc.
Trailways
U.S. Immigration & Naturalization Service
U.S. Travel Data Center
U.S. Travel Service (U.S. Department of Commerce)
21,000 auto travel parties from out of state.

Compiled by
State Department of Highways and Public Transportation, Travel & Information Division
Box 5064, Austin, Texas 78763.

APPENDIX B

COUNTY WORKSHEET FOR SIC DATA ACQUIRED FROM THE TEXAS COMPTROLLER OF PUBLIC ACOUNTS

APPENDIX B

COUNTY WORKSHEET FOR SIC DATA ACQUIRED FROM THE TEXAS COMPTROLLER OF PUBLIC ACCOUNTS

Total Sales (1974-1978)

____________ County
name

1st Quarter, _____ (year)

	SIC	
Other Retail	591	________
	592	________
	594	________
	598	________
	599	________
	Total	
Rec Services	783	________
	791	________
	793	________
	794	________
	799	________
	Total	

3rd Quarter, _____ (year)

	SIC	
Other Retail	591	________
	592	________
	594	________
	598	________
	599	________
	Total	
Rec Services	783	________
	791	________
	793	________
	794	________
	799	________
	Total	

2nd Quarter, _____ (year)

	SIC	
Other Retail	591	________
	592	________
	594	________
	598	________
	599	________
	Total	
Rec Services	783	________
	791	________
	793	________
	794	________
	799	________
	Total	

4th Quarter, _____ (year)

	SIC	
Other Retail	591	________
	592	________
	594	________
	598	________
	599	________
	Total	
Rec Services	783	________
	791	________
	793	________
	794	________
	799	________
	Total	

APPENDIX C

TOURISM SURVEY DATA

HILTON SEA ISLAND
Beach Hotel and Condominiums

September 7, 1979

Mayor Glenn McGehee
Town of South Padre Island
P. O. Box 2072
South Padre Island, TX 78597

RE: Cancellations/Loss of Business Due to Mexican Oil Spill

Dear Mayor McGehee:

You have inquired of our property regarding the loss of business as the result of the Mexican oil spill. It is very difficult for us to specifically attribute cancellations to the oil spill because many cancellations come through our computer reservation system, but we have experienced an extra-ordinary number of cancellations for the month of August.

Based on the reservations that we had already received, multiplied by the number of days they were for, we have determined that for the month of August the Hilton Sea Island suffered a loss in room sales and condominium income of approximately $118,500. This figure does not include any loss of sales for food and beverage which these people would have obviously spent. I would specifically say that approximately ten (10%) per cent of these were normal cancellations and the balance would be directly attributed to the oil spill and the adverse publicity therefrom.

As soon as we develop figures for the month of September, we will advise you. If you should have any questions about this matter, please don't hesitate to contact the undersigned.

Very truly yours,

HILTON SEA ISLAND

Paul Y. Cunningham, Jr.

PYC:ls

500 Padre Boulevard P.O. Box 2081 South Padre Island, Texas 78578 512/943-2685

December 6, 1979

Joint Statement

from

Port Isabel-South Padre Island Chamber of Commerce

and

Port Isabel Merchants Association

In the course of events surrounding the recent IXTOC I oil spill, we feel that business interests in the Port Isabel-South Padre Island area have been overlooked.

Business in this area has been seriously affected, first with the obvious impact of lost tourist trade in the peak of the season, and secondly, with the long range effects of the oil spill. Oil is still coming ashore in small quantities and tourists show a reluctance to commit for vacations in the future as a result. We do not feel our problems are over.

Those of us living in high risk coastal areas pay higher insurance premiums for protection against hurricanes and floods. Oil spills cannot be insured.

We feel the U.S. Government has a responsibility to protect its citizens against the actions of foreign government and foreign business be they accidental or intentional.

While we are grateful for the recent SBA disaster declaration, we feel the relief is only temporary and, therefore, need the type of relief offered under HR 5577.

Attached is a survey of the economic effect on businesses in the Port Isabel-South Padre Island area as compiled by the Chamber of Commerce.

Prepared by

Bill Heinze

port isabel
south padre island
chamber of commerce

p.o. box 2098
s. padre island,
texas 78597

Survey of the Economic Impact of the Mexican IXTOC I Oil Spill on Business of the Laguna Madre Area, August and October, 1979

The following data was collected by personnel of the Port Isabel/South Padre Island Chamber of Commerce, September 4-6, 1979, to ascertain the percent difference in business of August, 1979, as compared to August, 1978, and again on November 19-23, 1979, to determine percentage difference between October, 1978 and October, 1979.

In September, one hundred thirty five (135) businesses were surveyed by telephone, one hundred three (103) responded. In November, ninety seven (97) businesses were contacted and seventy one (71) responded as follows:

percentage of decreased business	number of responses-Sept.	number of responses-Oct.
0-10	3	4
11-20	3	4
21-30	3	9
31-40	14	8
41-50	15	3
51-60	19	11
61-70	20	2
71-80	17	3
81-90	8	3
91-100	1	1
	103	48
number reporting increases		11
number reporting same amount		8
closed during reporting period		4
Grand total		71

Survey, page 2

The breakdown of responses by category of business for August is as follows:

percentage of decreased business	accommodations	restaurants	retail stores	Misc*
0-10	0	0	0	3
11-20	1	1	0	1
21-30	1	0	1	1
31-40	8	0	3	3
41-50	3	0	3	9
51-60	6	2	5	6
61-70	2	6	3	9
71-80	4	3	7	3
81-90	1	0	4	3
91-100	0	0	0	1
total	26	12	26	39

The breakdown of responses by category of business for October is as follows:

0-10	1	0	2	1
11-20	0	0	4	0
21-30	4	0	1	4
31-40	2	0	3	3
41-50	0	1	1	1
51-60	5	0	3	3
61-70	1	0	1	0
71-80	1	0	0	2
81-90	2	0	0	1
91-100	1	0	0	0
up	2	0	5	4
same	3	0	5	0
temp. closed	0	3	1	0
total	22	4	26	19

*Misc. category includes such businesses as gas stations, auto repair shops, hair dressers, marinas, fishing charter captains, etc.

Comments:

- the above information is intended to be base-line data collected at what is expected to be the beginning of an extended period of decreased business

- information was requested in percentages rather than absolute dollar figures to protect the confidentiality of the reporting businesses

- with inflation and the increased growth of business experienced earlier in the year, the level of business as compared to the budgeted projections for August 1979 would show even greater losses

- the pervasive effect of the decrease in tourism on the total economy of the area may be seen; less dollars are brought into and spent in the communities, less dollars are spent within the communities

- in October four businesses were closed temporarily due to the lack of business

- although business in general is becoming less seasonal, fall has traditionally been a slower time for business

prepared by:

Sue MacFarland Groves,
Manager

WHITE SANDS MOTOR LODGE & MARINA
PORT ISABEL, TEXAS

SUMMARY OF LOSSES INCURRED BECAUSE OF MEXICAN OIL SPILL

William D. and wife Ann M. Suhr have owned the White Sands Motor Lodge & Marina in Port Isabel, Texas, since August 1, 1973. The motel consists of 13 kitchen units and 17 motel units.

The month of August is traditionally the best in total room rentals and accounts for approximately one eighth of total annual receipts.

The following comparisons will show the losses incurred through August 31, 1979, because of the Mexican oil spill, and reduced tourist activity.

MOTEL OCCUPANCY

MONTH OF AUGUST (31 days)

	13 Kitchens 403 Unit Rentals 13 x 31	17 Motel Units 527 Unit Rentals 17 x 31
1976	401	521
1977	401	525
1978	402	526
1979	139	246

Usually the motel has no vacancies in either motel or kitchen units during the month of August. In August 1979 the kitchen units were approximately 34% occupied, while the motel units were approximately 46% occupied.

The situation for September and following months is no brighter since oil spillage continues and the Mexican oil well is not capped. We anticipate losses for August to be about $5,000.00 and losses for September, October, and November to be about the same.

Unless the oil spillage is stopped in the near future losses for the winter tourist season which begins about December 1st could be considerably more. The problems is compounded because generally fixed expenses continue without much reduction. Debt service, taxes, and insurance remain the same although there may be slight reductions in labor, utilities, and maintenance.

Extra expenses have already been incurred for carpet cleaning, and cleaning of walkways and parking lots. At least two room carpets will have to be replaced.

We estimate a loss to date of approximately $6,000.00 with additional estimated losses for the year reaching as much as $30,000.00.

HARVEY COURTS & MARINA

P.O. BOX 1066 - PORT ISABEL, TEXAS 78578

PHONE: 512-943-1001

YOUR HOSTS:
SONJA and DAN WILKINS

Motel

Date	Occupancy Rate
July 21 to July 31st	45%
Aug. 1 to 6	90%
Aug. 7 to 30	20%
Aug. 31 to Sept. 3	65%
Sept. 4 to 30	1%

This consists of a 24 efficiency unit

Marina

Date	Charters
August 1 to 6	4
August 7 to Sept. 3rd	1
Sept. 3 to Sept. 30th	0

Bait

Date	Sold
August 1 to 6th	90%
August 6 to 28	20%
August 28	no bait

Since the talk of the oil slick from July 21st to Sept. 3rd, we estimate a loss of $12,000.00.

Dan E. Wilkins
(T/S)

APPENDIX D

TOURISM INDIRECT ECONOMIC IMPACT

APPENDIX D

TOURISM INDIRECT ECONOMIC IMPACT

INTRODUCTION

Estimates of indirect economic impacts associated with the tourism group, which is comprised of Automotive, Eating and Drinking Establishments, and the Lodging sectors, need to be interpreted in the same manner as the impact estimates for the recreation group discussed in a separate chapter. Briefly, indirect economic impacts refer to changes in the activity levels of some initiating sector. To illustrate, a decline in hotel gross receipts due to, say, higher gas prices represents the direct impact. The hotel sector is, then, the initiating sector for various indirect economic impacts. A decline in hotel gross receipts means, in addition, a decline in expenditures for laundry services, lavatory notions, and the like. A decline in the purchase of these services and items means further that the respective suppliers will purchase less of those things required in the operation of their businesses, and so on it goes.

For interpretative purposes, recall from the earlier chapter on methodology that a regional point of view--not an establishment point of view--was assumed with respect to impact measurement. Important here is the realization that an area or regional analysis of economic impact conceals the extent of economic impact at the establishment level. The previous section on the discussion of the current direct economic impact provided some information on the variation of economic impact at the establishment level.

INDIRECT IMPACT ASSESSMENT MODEL

The model used to estimate the current indirect, induced-by economic impact associated with the oil spills on tourism was a regional input-output framework. This model is separate from the baseline framework just discussed. In fact, the baseline framework provided the direct impact information for the input-output model to measure indirect economic impacts.

Eighteen different regional input-output models, each containing 65 economic sectors, were constructed for this study. A listing of the economic sectors contained in these models is given in Table D-1. The construction of these different input-output models reflects 1) the delineation of six impact study areas, comprising the total 19-county study region and 5 subregional divisions within the total study region, and 2) the establishment of a 3-year study period, 1979-1981. An extensive discussion of 1) general input-output analysis and 2) how input-output models were developed for this study can be found in the Input-Output Model for Economic

Table D-1

Sector Descriptions

Sector No.	Sector Title
1	Crop Production
2	Livestock & Livestock Products
3	Agricultural Supply, Ginning & Agri. Services
4	Primary Forestry
5	Commercial Fishing
6	Crude Pet. & Natural Gas
7	Natural Gas Liquids
8	Oil and Gas Services
9	Other Mining
10	Construction
11	Meat Products
12	Dairies
13	Grains
14	Bakeries and Foods
15	Beverages
16	Textiles
17	Wood and Furniture
18	Newspapers & Printing
19	Chemicals
20	Petroleum
21	Plastic, Leather, and Glass
22	Clay, Stone, and Cement
23	Metals
24	Machinery
25	Electrical Equipment
26	Transportation Equipment
27	Other Manufacturing
28	Railroad
29	Motor Vehicle
30	Water Transportation
31	Air and Other Transportation
32	Telephone
33	Radio and Television
34	Other Communication
35	Gas Services
36	Electric Services
37	Water and Sanitary Services
38	Wholesale Automotive
39	Groceries
40	Farms, Wholesale, Machine Products
41	Machinery Wholesale, Machine Products
42	General Wholesale
43	Retail Lumber Yards

Table D-1 cont'd

Sector No.	Sector Title
44	Retail, Equipment Supply
45	Retail, Department Stores
46	Food Stores
47	Retail, Automotive and Apparel
48	Retail, Furniture
49	Eating and Drinking Establishments
50	Other Retail
51	Banking
52	Other Finance, Insurance, & Real Estate
53	Legal Services
54	Lodging
55	Personal Services
56	Advertising & Other Business Services
57	Recreational Services
58	Auto Service and Repairs
59	Doctors
60	Hospitals
61	Education
62	Colleges
63	Other Services
64	Outdoor Recreation
65	Households
66	Sector Totals

Analysis Instructional Manual.

While a full discussion of input-output models and the use of such models for economic impact assessment purposes is beyond the scope of this report, it is important to discuss the interpretation of sector output multipliers that can be derived from input-output models and that were used in this study to measure indirect economic impact.

Sector output multipliers are derived from the so-called total requirements table of an input-output model. (See a discussion in the Instructional Manual cited earlier for an interpretation of total requirements tables.) The interpretation of a sector output multiplier is quite straightforward. Consider, for example, the output multiplier for the Lodging sector of Subregion V, which is given in the last row and column of Table D-2. The output multiplier for the Lodging sector of Subregion V is shown to be 1.255657 for 1979. Simply put, this sector output multiplier means that a current direct impact on the Lodging sector of $1.00, which is the same thing as saying a $1.00 change in sector output, results in a total economic impact of approximately $1.26. (The $1.26 reflects the output multiplier of 1.255657 rounded to the nearest whole cent.) The total economic impact is defined here as the $1.00 of current direct economic impact, plus $0.26 of current indirect, induced-by impact.

Reasons for the occurrence of indirect economic impacts or effects are apparent, and many illustrations have been cited throughout this report. Applying this output multiplier of approximately 1.26 in a hypothetical way, the total negative economic impact on Subregion V due to a decline in the Lodging sector's gross revenue of, say, $340,000, would be $428,400 of total economic impact ($340,000 x 1.26 = $428,400). The $340,000 is the direct economic impact and the difference of $88,400 is the indirect economic impact ($428,400 - $340,000 = $88,400).

The following discussion of the indirect estimates associated with the oil spills needs to be interpreted in the above manner. Clearly, if the direct economic impact is insignificant, then it follows that the indirect economic impact will be significant. In short, indirect economic effects follow the direct economic effects.

Importantly, notice that the Lodging sector output multiplier of 1.255657 for Subregion V for 1979, given in Table D-2 is shown as a sum of individual sector coefficients. (The sector numbers given in the first column of Table D-2 pertain to the 65 economic sectors used in the construction of the input-output models for the study. Sector names along with the sector numbers are given in Table D-1.) These coefficients provide a breakdown of economic impact by sector. Consider,

Table D-2

Output Multiplier Coefficients
for Subregion Five, 1979

Sector Number	Automotive	Eating and Drinking	Lodging
1	0.000096	0.037273	0.001742
2	0.000053	0.008431	0.001314
3	0.000024	0.003766	0.000312
4	0.000007	0.000010	0.000024
5	0.000018	0.003013	0.000434
6	0.000117	0.000166	0.000321
7	0.000012	0.000013	0.000008
8	0.000001	0.000001	0.000002
9	0.000009	0.000010	0.000039
10	0.001319	0.000941	0.006860
11	0.000038	0.013836	0.002032
12	0.000182	0.006247	0.002659
13	0.000000	0.000000	0.000000
14	0.000442	0.066743	0.010696
15	0.000140	0.002128	0.007166
16	0.000135	0.000248	0.001851
17	0.000213	0.000315	0.000744
18	0.012626	0.005568	0.007218
19	0.000069	0.000350	0.000448
20	0.000000	0.000000	0.000000
21	0.000043	0.000085	0.000052
22	0.000131	0.000135	0.000530
23	0.000232	0.000557	0.000696
24	0.000494	0.006308	0.002027
25	0.000946	0.001512	0.001506
26	0.006488	0.000633	0.000478
27	0.000086	0.000110	0.000091
28	0.000457	0.001228	0.002124
29	0.002057	0.003413	0.002382
30	0.000008	0.000120	0.000039
31	0.002088	0.001848	0.003491
32	0.005506	0.002934	0.015131
33	0.009769	0.004631	0.003983
34	0.000010	0.000007	0.005951
35	0.001144	0.001648	0.003190
36	0.014250	0.017820	0.030875
37	0.000181	0.000407	0.000411
38	0.000613	0.000031	0.000015
39	0.000112	0.030716	0.016748
40	0.000008	0.000983	0.000166
41	0.001289	0.001663	0.001378

Table D-2 Cont'd.

Sector Number	Automotive	Eating and Drinking	Lodging
42	0.002200	0.007763	0.012774
43	0.000030	0.000083	0.000119
44	0.000018	0.000268	0.000063
45	0.000001	0.000001	0.000231
46	0.000016	0.005005	0.005742
47	1.000000	0.001743	0.001284
48	0.000000	0.000001	0.000000
49	0.000936	1.000000	0.002597
50	0.000543	0.003522	0.002512
51	0.007482	0.005617	0.009270
52	0.018332	0.018992	0.015905
53	0.002224	0.002820	0.008666
54	0.000922	0.000780	1.000000
55	0.001409	0.001511	0.009508
56	0.004602	0.003169	0.004031
57	0.000046	0.020251	0.000260
58	0.001474	0.005672	0.003805
59	0.000036	0.000101	0.000035
60	0.000025	0.000034	0.000023
61	0.005526	0.006271	0.034869
62	0.002384	0.002755	0.005065
63	0.000745	0.000734	0.003255
64	0.000094	0.000124	0.000508
Total Output Multiplier	1.110454	1.313062	1.255657

Source: 1979 Regional Input-Output Model for Subregion Five, _Input-Output Model for Economic Analysis Instructional Manual_.

for example, the sector coefficient of 0.012774 for the sector numbered 42, which is the wholesale sector called General Wholesale. This coefficient means that the current indirect induced-by economic impact to the General Wholesale sector for Subregion V, as a result of a $340,000 change in the gross revenue for the Lodging sector, would be $4,343 ($340,000 x 0.012774 = $4,343.16). The $4,343 is part of the total indirect economic impact of $88,400 computed earlier. The indirect economic impact estimates associated with the oil spills, provided in part of this section, are disaggregated by sector in this same manner. The interpretation of these disaggregated sector impacts is the same as it is for the above hypothetical illustration.

Before turning to a presentation of the results, an accounting feature common to most input-output models needs to be reviewed. With the exception of the retail sector called Eating and Drinking Establishments, all sector outputs for retail and wholesale trade sectors are usually defined on a gross margin basis, rather than on a total gross receipts basis, which are sales minus cost of goods sold. Figures given in Table D-2 on direct economic impacts will show that the direct impact on the Automotive sector, which represents a decline in gasoline sales, has been converted to a gross margin. Appropriate retail and wholesale gross margins were derived from information contained in the 1972 Texas Input-Output Model.[1]

NEGATIVE INDIRECT IMPACT ASSESSMENTS

As already established, the direct economic impact estimate for the Automotive sector of $908,098 for Subregion V for 1979, (Table D-3), had to be modified to conform to the gross margin accounting feature used in the formulation of retail trade activity for the input-output models. A gross margin coefficient of 0.29509 was used for the Automotive Sector, and the modified direct impact estimate for the Automotive Sector, along with the direct impact estimates for the other two tourism sectors, are given in Table D-3.

Note from Table D-3 that the only subregion to show a direct economic impact from the oil spills is Subregion V, where the impact occurred only during 1979. Moreover, note that the estimated direct economic impact for Subregion V is not sizeable, indicating that the area did not experience a substantial decline in tourism trade. Furthermore, Subregion V did not experience any sizeable indirect economic impacts from the oil spills. This finding is supported by indirect impact

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[1]The Texas Input-Output Model, 1972, Texas Department of Water Resources, LP-24, March, 1978.

Table D-3

Summary of Direct Economic Impacts, by Subregion for 1979, Adjusted for Input-Output Model

Sector Name		Subregion One	Subregion Two	Subregion Three	Subregion Four	Subregion Five
Automotive	%	0	0	0	0	
	$	0	0	0	0	(\$908,098 x 0.29509) = \$267,971
Restaurants	%	0	0	0	0	
	$	0	0	0	0	\$1,150,624
Lodging	%	0	0	0	0	
	$	0	0	0	0	\$1,798,574

Source: Table 14, South Padre Island Area Estimated Decreases in Tourism Activity Due to IXTOC I Oil Spill, Chapter III, Tourism.

figures given in a later table.

Multiplying the direct impact estimates of Table D-3, times the (sector coefficient) output multipliers of Table D-2, yielded the indirect induced-by economic impacts recorded in Table D-4. The very limited indirect economic impacts shown in Table D-4 suggest little more than rounding error. The inter-industry transactions data used in the construction of the Texas Input-Output Model of 1972 were rounded to the nearest millions of dollars. The regional input-output models constructed for this study are based on the Texas model, and therefore, reflect the same degree of rounding. What this means is that indirect impact estimates of less than $1 million need to be interpreted with extreme caution. The only figures in Table D-4 to exceed $1 million are for Sectors 49 and 54 of columns three and four, respectively. These figures, however, are the estimated direct economic impacts for these two sectors. No indirect economic impacts exceeded $1 million.

In conclusion, it appears that the overall indirect economic impact, due to the oil spills, was quite limited. The very low indirect impact estimates given in Table D-4 must be interpreted in light of the degree of rounding involved in the construction of the input-output models.

Substitution and Positive Indirect Assessments.

The indirect economic impact assessment model used in this study, that is, the input-output framework, requires estimates of direct economic impacts in order to calculate indirect economic impacts. Since there were no identifiable and/or measureable direct substitution and/or positive economic effects associated with the oil spills, there is no basis to measure any indirect substitution and/or positive economic effects. In short, it can be assumed that there were no such effects within the study region as a result of the oil spills.

FUTURE RESEARCH NEEDS

Although not called for by the terms of reference, another finding of great importance to this study and to future tourism studies, is the general lack of sound models and adequate monitoring of tourism activity to measure direct economic impacts. The most elaborate model to estimate indirect economic impacts depends first on the ability to measure direct effects. Not until baseline information is of better quality can any impact on tourism be determined in the future. At present, estimates are built upon estimates, which indicates that the following improvements in tourism are necessary:

1. Regular annual surveys of tourist (domestic and out-of-state) are needed to determine expenditure patterns (a) within separate regions of Texas; (b) by tourist classes; (c)

Table D-4

Total Economic Impacts, by Sector for Subregion Five, 1979*

Sector Number	Automotive	Eating and Drinking	Lodging
1	26	42,887	3,133
2	14	9,701	2,363
3	6	4,333	561
4	2	12	43
5	5	3,467	781
6	31	191	577
7	3	15	14
8	0	1	4
9	2	12	70
10	353	1,083	12,338
11	10	15,920	3,655
12	49	7,188	4,782
13	0	0	0
14	118	76,796	19,238
15	38	2,449	12,889
16	36	285	3,329
17	57	362	1,338
18	3,383	6,407	12,982
19	18	403	806
20	0	0	0
21	12	98	94
22	35	155	953
23	62	641	1,252
24	132	7,258	3,646
25	254	1,740	2,709
26	1,739	728	860
27	23	127	164
28	122	1,413	3,820
29	551	3,927	4,284
30	2	138	70
31	560	2,126	6,279
32	1,475	3,376	27,214
33	2,618	5,329	7,164
34	3	8	10,703
35	307	1,896	5,737
36	3,819	20,504	55,531
37	49	468	739
38	164	36	27
39	30	35,343	30,123
40	2	1,131	299
41	345	1,913	2,478

Table D-4 Cont'd.

Sector Number	Automotive	Eating and Drinking	Lodging
42	590	8,932	22,975
43	8	96	214
44	5	308	113
45	0	1	415
46	4	5,759	10,327
47	267,971	2,005	2,309
48	0	1	0
49	251	1,150,624	4,670
50	146	4,052	4,518
51	2,005	6,463	16,673
52	4,912	21,853	28,606
53	596	3,245	15,586
54	247	897	1,798,574
55	378	1,739	17,101
56	1,233	3,646	7,250
57	12	23,301	468
58	395	6,526	6,844
59	10	116	63
60	7	39	41
61	1,481	7,216	62,714
62	639	3,170	9,110
63	200	845	5,854
64	25	143	914

Source: Derived from Tables D-2 and D-3.

by SIC code business categories; (d) by travel objective; (e) by origin; and (f) by quarter, to reflect seasonal differences.

2. A model of tourist activity monitoring should be developed for Texas and implemented on a regular basis by some agency of state government.

3. Regular annual inventories of the tourism supply need to be made, classified by SIC codes. Existing methods of monitoring and data dissemination are incomplete, under-reported, and extremely difficult to obtain.

4. Any model for tourism activity should include regular measurement of employment, payroll, and taxes generated by travel.

5. Stricter definitions of tourism and recreation should be made to avoid the dilemma presented by the terms of reference for this study. Tourism includes many recreational items which should be included in tourism statistics.

APPENDIX E

LISTING OF COMPONENT BUSINESSES IN CATEGORIES 799

E

APPENDIX E

LISTING OF COMPONENT BUSINESSES IN SIC CATEGORIES 799 (MISC. AMUSEMENT AND RECREATION SERVICES)

7992 Public Golf Courses

Establishments primarily engaged in the operation of golf courses open to the general public on a fee basis. Membership golf and country clubs are classified in Industry 7997. Miniature golf courses and golf driving ranges are classified in Industry 7999.

Golf clubs, nonmembership
Golf courses, public: operation of

7993 Coin-operated Amusement Devices

Establishments primarily engaged in operating coin-operated amusement devices, either in their own or in other places of business. Such amusement devices include juke boxes, pinball machines, mechanical games, slot machines, and similar types of amusement equipment. Amusement arcades and parlors are also included in this industry.

Amusement device (coin-operated) parlors
Amusement machines, coin-operated: operation of
Arcades, amusement
Gambling establishments, primarly operating coin-operated machines
Gambling machines, coin-operated: operation of
Music distribution systems, coin-operated

7996 Amusement Parks

Establishments known as amusement parks, kiddie parks, etc., which group together and operate in whole or in part a number of attractions such as mechanical rides, amusement devices, refreshment stands and picnic grounds. Amusement concessionaires operating within the park are classified in Industry 7999.

Amusement centers, and parks (not fairs, circuses or carnivals)
Amusement parks
Kiddie parks
Piers, amusement
Theme parks (amusement)

7997 Membership Sports and Recreation Clubs

Sports and recreation clubs which are restricted to use by members and their guests. Country, golf, tennis and yacht clubs are included in this industry. Health and physical culture clubs are included in Industry 7299.

Athletic clubs and gymnasiums, membership
Aviation clubs, membership
Baseball clubs--little leagues
Bathing beaches, membership
Beach clubs, membership
Bridge clubs, membership
Clubs, membership: sports and recreation
Country clubs, membership
Flying fields, maintained by aviation clubs
Golf clubs, membership
Gun clubs, membership
Hunt clubs, membership
Recreation and sports clubs, membership
Riding clubs, membership
Shooting clubs, membership
Sports and recreation clubs, membership
Swim clubs, membership
Tennis clubs, membership
Yacht clubs, membership

7999 Amusement and Recreation Service, Not Elsewhere Classified

Establishments primarily engaged in the operation of sports, amusement, and recreation services, not elsewhere classified, such as bathing beaches, swimming pools, riding academies and schools, carnival operation, exposition operation, game parlors, horse shows, picnic grounds operation, rental of rowboats and canoes, and shooting galleries. Establishments operating amusement parks and classified in Industry 7996; those operating coin-operated amusement devices in Industry 7993; and those operating membership sports and recreation clubs in Industry 7997.

Aerial tramways, amusement or scenic
Amusement concessions
Amusement rides
Animal and reptile exhibits, commercial
Animal shows, in circuses, fairs, and carnivals
Aquariums, commercial
Art galleries, commercial
Astrologers
Baseball instruction schools
Basketball instruction schools
Bath houses, independently operated
Bathing beaches, nonmembership
Boat rental, pleasure
Boats, party fishing: operation of
Bookies
Bookmakers, race
Botanical gardens, commercial
Bowling instruction
Bridge clubs, nonmember
Bridge instruction
Cable lifts, amusement or scenic, operated separately from lodges
Canoe rental
Carnival operation
Cave operation
Circus companies
Concession operators, amusement devices,rides
Day camps

7999 (continued)

Exhibition operation
Exposition operation
Fairs, agricultural: operation of
Fireworks display service
Fishing lakes, operation of
Fortune tellers
Gambling establishments, not primarily operating coin-operated machines
Gambling machines, except coin-operated: operation of
Game parlors (not coin-operated)
Games, teaching of
Go-kart raceway operation
Go-kart rentals
Golf courses, miniature: operation of
Golf driving ranges
Golf, pitch-n-putt
Golf professionals, not operating retail stores
Gymnasium, operation of: nonmembership
Horse shows
Houseboat rentals
Hunting guides
Judo instruction
Karate instruction
Motorcycle rental
Museums, commercial
Natural wonders, tourist attraction: commercial
Observation tower operation
Off-track betting
Pack trains, for amusement
Parachute training (for pleasure
Phrenologists
Physical culture schools (gymnasiums)
Picnic grounds operation
Ping pong parlors
Planetaria, commercial
Rental of beach chairs and accessories
Rental of bicycles
Rental of golf carts
Rental of rowboats, canoes
Rental of saddle horses
Reptile or animal exhibits commercial
Riding academies, schools
Riding stables
Scenic railroads,amusement
Shooting galleries
Skating instruction, ice or roller
Ski instruction
Ski lifts, cable lift, ski towers: operated separately from lodges
Ski rental concessions
Slot-car race tracks
Sports instructors, professional: for golf, skiing, swimming, etc.
Sports professionals
Swimming instruction
Swimming pools
Tennis clubs, nonmember
Tennis courts, outdoor and indoor: operation of - nonmembership
Tennis professionals
Ticket sales offices for sporting events contract
Tourist attractions, natural wonder: commercial
Tourist guides
Trampoline operation
Wax figure exhibitions
Yoga instruction
Zoological gardens, commercial

Source: Executive Office of the President, Office of Management and Budget, Standard Industrial Classification Manual, U.S. Government Printing Office; 1972.

APPENDIX F

COUNTY EXPENDITURES WORKSHEET

F

APPENDIX F

YEAR ____________________

QUARTER ____________________

PAGE ____________________

COUNTY EXPENDITURE WORKSHEET

COUNTY	SIC	GROSS RECEIPTS	FACTOR	554	581	701-704

APPENDIX G

SUBREGIONAL WORKSHEET FOR COUNTY TOTALS OF SIC DATA ACQUIRED FROM THE TEXAS COMPTROLLER OF PUBLIC ACCOUNTS

G

APPENDIX G

SUBREGIONAL WORKSHEET FOR COUNTY TOTALS OF SIC DATA ACQUIRED FROM THE TEXAS COMPTROLLER OF PUBLIC ACCOUNTS

Total Sales (1974-1978) (33)

__________ Sub-region
#

1st Quarter,_____(year)

County Total

Other
Retail

Total

Rec
Service

Total

3rd Quarter,_____(year)

County Total

Other
Retail

Total

Rec
Service

Total

2nd Quarter,_____(year)

County Total

Other
Retail

Total

Rec
Service

Total

4th Quarter,_____(year)

County Total

Other
Retail

Total

Rec
Service

Total

APPENDIX H

RECREATION INDIRECT ECONOMIC IMPACT

H

APPENDIX H

RECREATION INDIRECT ECONOMIC IMPACT

INTRODUCTION

Indirect economic impact, as noted in other chapters of this report, refers to the differing rounds of transactions (that is, purchase/sales) that occur as a result of an initial change in some economic unit's level of activity. The initial change is the direct economic effect or impact, and all subsequent and related changes in economic activity are the indirect economic impacts. Recall that in view of the funding level and study requirements of this study, indirect impact estimates are limited to the "induced-by" impacts.

A decline in Recreation Services, which, in part, makes up the Recreation category for this study, is the direct economic impact that is initiated by some exogenous event, such as an oil spill. But, the decline in Recreation Services, measured in gross receipts, means a decline in expenditures for paint and hardware supplies, tractor fuel, and the like, used in the operation of recreation services. A decline in the demand for these items means further that the respective suppliers will purchase less of those things required in their operations, and so on it goes as the initial economic impact ripples across the economic landscape. The combined changes in economic activity beyond the direct impact, as illustrated here, is referred to as the indirect, induced-by economic impact. The total economic impact, which is the sum of the direct and indirect impacts, is some multiple of the direct economic impact, reflecting the well-established notion of an impact multiplier.

INDIRECT IMPACT ASSESSMENT MODEL

The model used to estimate the indirect economic impacts associated with the oil spills and recreation was a regional input-output framework. Eighteen regional input-output models, each containing 65 economic sectors, were constructed for this study. A listing of the sectors contained in these models is provided in Table H-1. The construction of the 18 input-output models reflects 1) the delineation of six impact study areas, comprising the total 19-county study region and five subregional divisions within the total study region, and 2) the establishment of a 3-year study period, 1979-1981. An extensive discussion of 1) general input-output analysis and 2) how input-output models were developed for the study areas can be found in the Input-Output Model for Economic Analysis Instructional Manual.

As with any analytical model, several key assumptions were necessary as part of the formulation of an input-output framework specific to the needs of the study. These

Table H-1

Sector Descriptions

Sector No.	Sector Title
1	Crop Production
2	Livestock & Livestock Products
3	Agricultural Supply, Ginning & Agri. Services
4	Primary Forestry
5	Commercial Fishing
6	Crude Pet. & Natural Gas
7	Natural Gas Liquids
8	Oil and Gas Services
9	Other Mining
10	Construction
11	Meat Products
12	Dairies
13	Grains
14	Bakeries and Foods
15	Beverages
16	Textiles
17	Wood and Furniture
18	Newspapers & Printing
19	Chemicals
20	Petroleum
21	Plastic, Leather, and Glass
22	Clay, Stone, and Cement
23	Metals
24	Machinery
25	Electrical Equipment
26	Transportation Equipment
27	Other Manufacturing
28	Railroad
29	Motor Vehicle
30	Water Transportation
31	Air and Other Transportation
32	Telephone
33	Radio and Television
34	Other Communication
35	Gas Services
36	Electric Services
37	Water and Sanitary Services
38	Wholesale Automotive
39	Groceries
40	Farms, Wholesale, Machine Products
41	Machinery Wholesale, Machine Products
42	General Wholesale
43	Retail Lumber Yards

Table H-1 cont'd

Sector No.	Sector Title
44	Retail, Equipment Supply
45	Retail, Department Stores
46	Food Stores
47	Retail, Automotive and Apparel
48	Retail, Furniture
49	Eating and Drinking Establishments
50	Other Retail
51	Banking
52	Other Finance, Insurance, & Real Estate
53	Legal Services
54	Lodging
55	Personal Services
56	Advertising & Other Business Services
57	Recreational Services
58	Auto Service and Repairs
59	Doctors
60	Hospitals
61	Education
62	Colleges
63	Other Services
64	Outdoor Recreation
65	Households
66	Sector Totals

assumptions are adequately discussed in the Instructional Manual cited earlier. Anyone unfamiliar with input-output analysis should especially read portions of the Instructional Manual to acquire a working knowledge of impact multipliers and impact estimates.

While the full discussion of the subject of assumptions and input-output analysis will not be repeated here, it is significant, however, to highlight one important analytical feature of the models. The inter-industry relationships (transactions) expressed in regional input-output models reflect average relationships (transactions). This means that the models measure average changes (or, impacts), rather than marginal changes (or, impacts). This important point can best be seen with the use of a simple hypothetical illustration. Suppose that the total gross receipts for the lodging sector of an area economy in 1979 was $183.2 million. Suppose further that the lodging sector purchased $1.8 million in lavatory items from the wholesale trade sector. This means that on the average approximately one cent of lavatory items was used for every dollar of gross output of the lodging sector ($1.8 million/$183.2 million = 0.0098). Suppose now that the gross output of the lodging sector increased by $10 million. If the average input relationship of 0.0098 is used, then the increased purchase of lavatory items is estimated to $98,000 ($10,000,000 x 0.0098). In this case, an average input relationship is being used to measure an expenditure effect associated with a marginal change in the gross output of the lodging sector.

What has just been discussed is not unique to input-output analysis. Most econometric models are characterized by average relationships. The derivation of average relationships rather than marginal relationships, reflects the current state of available statistical information and research budget limitations. Especially at the substate level, data inadequacies preclude the development of an analytical model built on marginal relationships. A basic awareness of the distinction between average and marginal relationships is important for gauging the practical worth of impact estimates based on average relationships.

NEGATIVE INDIRECT IMPACT ASSESSMENTS

Based on the sector definitions used in the construction of the input-output models, recreation is comprised of two sectors--Other Retail Trade and Recreation Services. See Table H-1 for a complete listing of the sectors used in the input-output models. Estimates of the direct impacts associated with the oil spills are given in an earlier table.

It is important to make clear that the direct impact estimates of Table H-2 were derived independently of the input-

Table H-2

Summary of Direct Economic Impacts, by Subregion, for 1979

Sector Name		Sub-region One	Sub-region Two	Sub-region Three	Sub-region Four	Sub-region Five
Other Retail	%	0	0.02	0	0.3	1.0
	$	0	($835,205) x(0.27369)= $228,587	0	($1,026,053) x(0.27369)= $280,820	($1,129,082) x(0.27369)= $309,018
Recrea. Serv.	%	0	0.02	0	0.5	2.0
	$	0	($17,978) x(1.00000)= $17,978	0	($36,452) x(1.00000)= $36,452	($53,846) x(1.00000)= $53,846

Source: Table 29, Direct Economic Impacts of the Oil Spills by Subregion, 1979; Chapter IV Recreation.

output models. The purpose of the input-output models was to estimate the indirect economic impacts. This will be explained later in greater detail as part of the discussion of Tables H-5 and H-6.

The use of the information contained in Table H-2 for the Other Retail Trade sector required modification before it could be used in the input-output models. With the exception of the sector called Eating and Drinking Establishments, sector outputs recorded in an input-output model for retail and wholesale trade sectors are defined on a gross margin basis rather than on a gross output (receipts) basis, which are sales minus cost of goods sold. The modified or adjusted direct impact figures for the Other Retail sector are given in Table H-2.

The indirect economic impact estimates, Tables H-5 and H-6, were calculated on the basis of the information contained in Table H-2 and the output multiplier coefficients of Tables H-3 and H-4. The output multiplier coefficients come from the regional input-output models developed for this study. These models are contained in the <u>Instructional Manual</u>. Notice that the output multiplier figures of Tables H-3 and H-4 pertain only to Subregions II, IV, and V for 1979. Measureable evidence of any direct impact was found only in these three subregions for 1979. Regional input-output models and output multipliers were developed for the other two subregions, however.

To illustrate the method for calculating the figures contained in Tables H-5 and H-6, the indirect economic impact estimate of $132 for Sector 31 (Air and Other Transportation) in Subregion II (Table H-5) was calculated by multiplying the direct impact estimate of $17,978 (Table H-2) for Recreation Services for Subregion II times the output multiplier coefficient for the Air and Other Transportation sector (Table H-3) ($17,978 x 0.007319 = $132). All other figures shown in Tables H-5 and H-6 were similarly derived.

The figures given in Tables H-5 and H-6 need to be interpreted as negative measures of economic impact, since the oil spills, in general, had an adverse effect on the coastal economy of Texas. With the exception of the trade sectors, these impact measures indicate negative changes in sector <u>gross output</u> levels. Since trade sector activity is measured on a gross margin basis, with the exception of the retail sector called Eating and Drinking Establishments, the impact figures for these sectors measure a decline in <u>gross margin</u> revenues, which are sales minus cost of goods sold.

Notice that Tables H-5 and H-6 show the direct impacts along with the various indirect impacts. The direct impacts are noted in the Other Retail Trade and Other Services rows and

Table H-3

Output Multiplier Coefficients for
Recreation Services, 1979

Sector Number	Subregion Two	Subregion Four	Subregion Five
1	0.000067	0.000414	0.000512
2	0.000030	0.000195	0.000252
3	0.000016	0.000136	0.000157
4	0.000027	0.000023	0.000014
5	0.000073	0.000041	0.000085
6	0.002102	0.003268	0.000232
7	0.000234	0.001055	0.000005
8	0.000072	0.000159	0.000001
9	0.000193	0.000066	0.000055
10	0.011938	0.012473	0.010863
11	0.000403	0.000306	0.000181
12	0.000518	0.000807	0.000834
13	0.000079	0.000068	0.000000
14	0.001838	0.001024	0.002060
15	0.000499	0.000224	0.000495
16	0.000177	0.001349	0.001363
17	0.005602	0.002325	0.000421
18	0.031487	0.024827	0.024801
19	0.004204	0.003757	0.000229
20	0.007663	0.006575	0.000000
21	0.000425	0.000237	0.000033
22	0.001579	0.001132	0.000742
23	0.011021	0.001192	0.001311
24	0.000634	0.000893	0.000499
25	0.000505	0.000029	0.000478
26	0.000258	0.000607	0.000335
27	0.001591	0.000347	0.000132
28	0.000631	0.000429	0.000345
29	0.004016	0.003612	0.003563
30	0.000079	0.000059	0.000032
31	0.007319	0.002869	0.007177
32	0.004966	0.004974	0.004871
33	0.012740	0.012577	0.012784
34	0.000016	0.000020	0.000018
35	0.001268	0.000833	0.002223
36	0.018335	0.024345	0.024107
37	0.001603	0.002844	0.000376
38	0.000138	0.000028	0.000019
39	0.015956	0.012393	0.015867
40	0.000014	0.000031	0.000036
41	0.008282	0.006762	0.007043

Table H-3 cont'd.

Sector Number	Subregion Two	Subregion Four	Subregion Five
42	0.020037	0.012516	0.011194
43	0.000179	0.000196	0.000176
44	0.000034	0.000041	0.000051
45	0.000002	0.000001	0.000001
46	0.000186	0.000179	0.000172
47	0.001017	0.001157	0.001198
48	0.000020	0.000021	0.000019
49	0.006203	0.005849	0.005571
50	0.002562	0.002521	0.002347
51	0.008815	0.005520	0.006164
52	0.065134	0.035697	0.023955
53	0.004060	0.002493	0.002836
54	0.000820	0.000543	0.000367
55	0.003781	0.003723	0.003049
56	0.031311	0.023195	0.008858
57	1.000000	1.000000	1.000000
58	0.003411	0.002887	0.002617
59	0.002626	0.002563	0.002487
60	0.000145	0.000122	0.000079
61	0.021695	0.025276	0.025279
62	0.005605	0.004563	0.007950
63	0.005079	0.003018	0.000740
64	0.000127	0.000547	0.000255
Total Output Multipliers	1.341443	1.267129	1.229916

Source: Regional Input-Output Models for Subregions Two, Four, and Five; _Input-Output Model for Economic Analysis Instructional Manual_.

Table H-4

Output Multiplier Coefficients for
Other Retail Trade, 1979

Sector Number	Subregion Two	Subregion Four	Subregion Five
1	0.000044	0.000251	0.000339
2	0.000024	0.000173	0.000231
3	0.000003	0.000041	0.000057
4	0.000021	0.000018	0.000011
5	0.000064	0.000037	0.000077
6	0.002764	0.005719	0.000146
7	0.001537	0.007912	0.000359
8	0.000111	0.000369	0.000001
9	0.000048	0.000022	0.000008
10	0.001966	0.001577	0.001144
11	0.000289	0.000228	0.000134
12	0.000531	0.000839	0.000863
13	0.000065	0.000058	0.000000
14	0.001651	0.000949	0.001898
15	0.000186	0.000082	0.000181
16	0.000073	0.000551	0.000556
17	0.004402	0.001882	0.000342
18	0.019659	0.015380	0.015223
19	0.002143	0.001947	0.000095
20	0.012380	0.011962	0.000000
21	0.000166	0.000092	0.000013
22	0.000399	0.000225	0.000118
23	0.001238	0.000110	0.000102
24	0.000293	0.000048	0.000237
25	0.000402	0.000027	0.000402
26	0.000282	0.000741	0.000403
27	0.000251	0.000047	0.000018
28	0.000455	0.000409	0.000345
29	0.002067	0.001881	0.001780
30	0.000065	0.000061	0.000009
31	0.002442	0.000933	0.002062
32	0.008574	0.009084	0.009003
33	0.007076	0.006918	0.006951
34	0.000012	0.000015	0.000013
35	0.000817	0.000529	0.001392
36	0.011122	0.014558	0.014228
37	0.000579	0.000983	0.000126
38	0.000351	0.000084	0.000057
39	0.000126	0.000087	0.000103
40	0.000011	0.000027	0.000032
41	0.002830	0.002298	0.002248

Table H-4 cont'd.

Sector Number	Subregion Two	Subregion Four	Subregion Five
42	0.005248	0.003102	0.002584
43	0.000033	0.000029	0.000022
44	0.000003	0.000004	0.000006
45	0.000030	0.000025	0.000030
46	0.000027	0.000022	0.000018
47	0.002994	0.003512	0.003700
48	0.000000	0.000000	0.000000
49	0.002040	0.001730	0.001513
50	1.000000	1.000000	1.000000
51	0.011549	0.007759	0.008820
52	0.067874	0.037448	0.025084
53	0.005254	0.003426	0.003977
54	0.001801	0.001566	0.001395
55	0.000384	0.000344	0.000246
56	0.028968	0.021540	0.008220
57	0.000150	0.000123	0.000070
58	0.010431	0.009374	0.008487
59	0.000132	0.000074	0.000048
60	0.000100	0.000066	0.000035
61	0.023017	0.027018	0.026898
62	0.006983	0.005766	0.010028
63	0.002961	0.001679	0.000402
64	0.000090	0.000378	0.000170
Total Output Multipliers	1.257585	1.214139	1.163053

Source: Regional Input-Output Models for Subregions Two, Four, and Five; Input-Output Model For Economic Analysis Instructional Manual.

Table H-5

Total Economic Impacts, by Sector, for Recreation Services, 1979

Sector Number	Subregion Two	Subregion Four	Subregion Five
1	1	15	28
2	1	7	14
3	0	5	8
4	0	1	1
5	1	1	5
6	38	119	12
7	4	38	0
8	1	6	0
9	3	2	3
10	215	455	585
11	7	11	10
12	9	29	45
13	1	2	0
14	33	37	111
15	9	8	27
16	3	49	73
17	101	85	23
18	566	905	1,335
19	76	137	12
20	138	240	0
21	8	9	2
22	28	41	40
23	198	43	71
24	11	3	27
25	9	1	26
26	5	22	18
27	29	13	7
28	11	16	19
29	72	132	192
30	1	2	2
31	132	105	386
32	89	181	262
33	229	458	688
34	0	1	1
35	23	30	120
36	330	887	1,298
37	29	104	20
38	2	1	1
39	287	452	854
40	0	1	2
41	149	246	379

Table H-5 cont'd.

Sector Number	Subregion Two	Subregion Four	Subregion Five
42	360	456	603
43	3	7	9
44	1	1	3
45	0	0	0
46	3	7	9
47	18	42	65
48	0	1	1
49	112	213	300
50	46	92	126
51	158	201	332
52	1,171	1,301	1,290
53	73	91	153
54	15	20	20
55	68	136	164
56	563	846	477
57	17,978	36,452	53,846
58	61	105	141
59	47	93	134
60	3	4	4
61	390	921	1,361
62	101	166	428
63	91	110	40
64	2	20	14

Source: Derived from Tables H-2 and H-3.

Table H-6

Total Economic Impacts, by Sector, for Other Retail Trade, 1979

Sector Number	Subregion Two	Subregion Four	Subregion Five
1	10	70	105
2	5	49	71
3	1	12	18
4	5	5	3
5	15	10	24
6	632	1,606	45
7	351	2,222	111
8	25	104	0
9	11	6	2
10	449	443	354
11	66	64	41
12	121	236	267
13	15	16	0
14	377	266	587
15	43	23	56
16	17	155	172
17	1,006	529	106
18	4,494	4,319	4,704
19	490	547	29
20	2,830	3,359	0
21	38	26	4
22	91	63	36
23	283	31	32
24	67	13	73
25	92	8	124
26	64	208	124
27	57	13	6
28	104	115	107
29	472	528	550
30	15	17	3
31	558	262	637
32	1,960	2,551	2,782
33	1,617	1,943	2,148
34	3	4	4
35	187	149	430
36	2,542	4,088	4,397
37	132	276	39
38	80	24	18
39	29	24	32
40	3	8	10
41	647	645	695

Table H-6 Cont'd.

Sector Number	Subregion Two	Subregion Four	Subregion Five
42	1,200	871	799
43	8	8	7
44	1	1	2
45	7	7	9
46	6	6	6
47	684	986	1,143
48	0	0	0
49	466	486	468
50	228,587	280,820	309,018
51	2,640	2,179	2,726
52	15,515	10,516	7,751
53	1,201	962	1,229
54	412	440	431
55	88	97	76
56	6,622	6,049	2,540
57	34	35	22
58	2,384	2,632	2,623
59	30	21	15
60	23	19	11
61	5,261	7,587	8,312
62	1,596	1,619	3,099
63	677	471	124
64	21	106	53

Source: Derived from Tables H-2 and H-4.

are the direct impact figures given in Table H-3. Thus, Tables H-5 and H-6 record total economic impacts.

Most important, notice that the dollar magnitude of the various sector impacts is quite low. In fact, these figures may reflect little more than spurious accuracy, since the inter-industry transactions data used in the construction of the 1972 Texas Input-Output Model, which was used to develop the regional models for this study, were rounded to the nearest million dollars. What these low impact estimates support is the conclusion that evidence made available to the research team of Restrepo and Associates could not be used to support a statement of a major net economic loss either at the regional level, or at the subregional levels, due to the oil spills.

In summary, then, the analysis of indirect, induced-by economic relationships associated with recreation at the subregional area did not indicate any significant indirect economic impacts associated with the oil spills. By inference, what was found to be the case at the subregional level applies also for the entire 19-county study region.

The input-output models developed for the study did generate impact estimates at the subregional level (Tables H-5 and H-6), but these estimates must be carefully interpreted in light of the degree of rounding on inter-industry transactions used in the construction of the 1972 Texas Input-Output Model, which was used to develop input-output models for this study. The accounting of inter-industry transactions reported in the Texas model are rounded to the nearest million dollars. This degree of rounding is certainly appropriate for the Texas economy. It is also appropriate for the oil impact study region, but the impact figures given in Tables H-5 and H-6 are, therefore, subject to spurious accuracy. However, sector impact figures less than $1 million can be considered insignificant anyway, particularly when viewed at the regional level. Recall that for the purpose of this study, economic impact was defined at the regional level rather than at the establishment level. There are no sector impact figures shown in Tables H-5 and H-6 that exceed $1 million.

RECOMMENDATIONS

The approach used by Restrepo and Associates to study the economic effects of the oil spills was generally macro in orientation to be consistent with the study specifications and objectives set forth by the Bureau of Land Management. The objective here was to produce an estimate of direct and indirect economic impacts of the spills on a particular study area, which was defined by the Bureau of Land Management, as well as to produce a methodology that could be used to assess the impacts of other major spills.

In addition, a need exists for a micro research focus on spill effects and should be addressed more fully during and after a spill with a series of case studies. Using this approach, additional information, albeit mostly qualitative, might be revealed relative to social and economic effects. Just as biological observers are dispatched to every major spill, there may be a need for individuals trained in the social and economic sciences to be involved at the spill site, making observations and identifying indicators of impact.

Recreation and tourism tradespeople in coastal areas where there is a high risk of spills need to become more involved in local oil spill contigency planning. Among other concerns, they need to have an information system identified and available that will yield accurate estimates of social and economic impacts once the spill has been controlled. Without such an impact assessment information system, it will be very difficult to fabricate one that will yield accurate and comprehensive estimates after a spill has occurred.

The previous research area points to the need for additional research relative to the extent of recreation activity in the coastal zone. Unlike the lodging and restaurant categories, much recreational activity takes place without a market transaction. Information about the extent of public goods such as fishing, boating, swimming, hiking, and camping are not likely to be included in expenditure data on an SIC basis since they were consumed at little or no cost. Some indirect understanding of these activities can be achieved through the existing expenditure data, but not the extent of participation with available participation data. It should not be assumed that these activities are unimportant, because participants are likely to make other expenditures in the local economy. If the impacts of oil spills on specific recreation activities and their participants are to be understood, information will be required on the intensity, location, and patterns of outdoor recreation activities that might be impacted. Without such a data base and information system, impacts on recreation are likely to be understated since only activities where a market transaction has taken place can be observed.

APPENDIX I

MEDIA COVERAGE TABLES

I

Table I-1

BLM MEDIA DATA SUMMARY BY TYPE OF MEDIA, CATEGORY AND DATE OF PUBLICATION

Media	Date of Publication	Category	Media	Date of Publication	Category
Dallas T H	05 Feb 80	Capping	People Mag	27 Aug 79	Information
Austin A S	24 Feb 80	Capping	Oil Gas Jour	17 Dec 79	Information
Dallas News	06 Feb 80	Capping	Wall Str Jour	20 Sep 79	Information
Houston Post	05 Jan 80	Capping	Wall Str Jour	04 Sep 79	Capping
Houston Chron	26 Sep 79	Capping	Science News	25 Oct 79	Information
Jour of Commer	16 Sep 79	Capping	N Y Times	13 Aug 79	Tourism
Jour of Commer	17 Sep 79	Capping	N Y Times	19 Aug 79	Information
Dallas News	23 Sep 79	Capping	N Y Times	18 Aug 79	Information
Austin A S	26 Sep 79	Cost	Nat Geo		Information
Austin A S	21 Sep 79	Burmah Agate	N Y Times	24 Aug 79	Legal/Political
Corpus Christi T	23 Sep 79	Capping	L A Times	15 Aug 79	Information
Houston Chron	27 Sep 79	Legal/Political	L A Times	14 Aug 79	Information
San Ant Exp	15 Aug 79	Capping	L A Times	10 Aug 79	Tourism
Dallas News	24 Jan 80	Information	L A Times	17 Aug 79	Cost
Austin A S	24 Jan 80	Information	L A Times	19 Aug 79	Environment
Corpus Christi C	06 Mar 80	Information	L A Times	18 Aug 79	Information
Dallas T H	24 Sep 79	Capping	L A Times	10 Jun 79	Fishing
Dallas T H	25 Jan 80	Information	L A Times	20 Aug 79	Tourism
Lufkin News	10 Mar 80	Information	Newsweek	10 Sep 79	Information
Houston Post	04 Oct 79	Capping	Newsweek	20 Aug 79	Information
Austin A S	17 Oct 79	Capping	Newsweek	15 Aug 79	Information
Houston Post	15 Mar 80	Information	Newsweek	25 Jun 79	Capping
Houston Chron	13 Jan 80	Capping	Time	16 Jul 79	Information
Corpus Christi C	07 Feb 80	Capping	Time	20 Aug 79	Information
Houston Chron	05 Jan 80	Capping	USNWR	20 Aug 79	Information
Dallas News	08 Feb 80	Legal/Political	N Y Times	14 Jun 79	Legal/Political
Dallas T H	08 Feb 80	Legal/Political	N Y Times	12 Jun 79	Capping
Audobon	06 Nov 79	Information	N Y Times	10 Jun 79	Capping

Table I-1

BLM MEDIA DATA SUMMARY BY TYPE OF MEDIA, CATEGORY AND DATE OF PUBLICATION (CONTINUED)

Media	Date of Publication	Category
N Y Times	09 Jun 79	Capping
N Y Times	17 Jun 79	Capping
N Y Times	26 Jun 79	Capping
N Y Times	15 Jun 79	Information
Science News	02 May 81	Information
USNWR	07 Apr 80	Information
Newsweek	04 Aug 80	Cost
The Nation	19 Jul 80	Information
L A Times	24 Oct 79	Legal/Political
L A Times	24 Aug 79	Legal/Political
L A Times	27 Aug 79	Information
L A Times	29 Aug 79	Legal/Political
L A Times	23 Sep 79	Capping
L A Times	26 Aug 79	Legal/Political
L A Times	02 Sep 79	Legal/Political
L A Times	03 Sep 79	Tourism
L A Times	02 Nov 79	Burmah Agate
L A Times	02 Oct 79	Legal/Political
L A Times	28 Aug 79	Information
N Y Times	17 Feb 80	Capping
N Y Times	26 Feb 80	Information
N Y Times	24 Oct 79	Legal/Political
N Y Times		Capping
N Y Times	17 Oct 79	Capping
N Y Times	03 Oct 79	Capping
N Y Times	26 Nov 79	Burmah Agate
N Y Times	23 Nov 79	Burmah Agate
N Y Times	31 Oct 79	Capping
N Y Times	07 Nov 79	Burmah Agate
N Y Times	08 Nov 79	Burmah Agate
N Y Times	10 Nov 79	Burmah Agate
N Y Times	11 Nov 79	Burmah Agate
N Y Times	12 Nov 79	Burmah Agate
N Y Times	13 Nov 79	Burmah Agate
N Y Times	13 Nov 79	Capping
N Y Time	19 Nov 79	Burmah Agate
N Y Times	06 Dec 79	Legal/Political
N Y Times	13 Dec 79	Information
N Y Times	09 Dec 79	Burmah Agate
Wall Str Jour	26 Jul 79	Information
N Y Times	25 Mar 80	Capping
N Y Times	06 Apr 80	Environment
N Y Times	12 Apr 80	Information
N Y Times	17 Jun 80	Legal/Political
N Y Times	23 May 80	Information
Wall Str Jour	24 Oct 79	Legal/Political
Wall Str Jour	19 Dec 79	Legal/Political
Wall Str Jour	18 Oct 79	Capping
Wall Str Jour	14 Sep 79	Legal/Political
Wall Str Jour	09 Aug 79	Fishing
Wall Str Jour	12 Jul 79	Fishing
Wall Str Jour	12 Jun 79	Capping
Wall Str Jour	26 Jun 79	Capping

Table I-1

BLM MEDIA DATA SUMMARY BY TYPE OF MEDIA, CATEGORY AND DATE OF PUBLICATION (CONTINUED)

Media	Date of Publication	Category	Media	Date of Publication	Category
Wall Str Jour	11 Jun 79	Cost	Aviator Week	08 Oct 79	Information
Wall Str Jour	06 Jun 79	Capping	Business Week	10 Oct 79	Legal/Political
Wall Str Jour	25 Mar 80	Capping	L A Times	08 Aug 79	Fishing
N.Y Times	08 Oct 79	Information	N Y Times	31 Aug 79	Information
N Y Times	05 Oct 79	Information	L A Times	05 Aug 79	Information
N Y Times	03 Oct 79	Legal/Political	Wall Str Jour	04 Sep 79	Legal/Political
N Y Times	14 Oct 79	Capping	Dallas News	19 Oct 79	Legal/Political
L A Times	31 Jul 79	Environment	Ft Worth S T	19 Oct 79	Legal/Political
L A Times	10 Aug 79	Information	Dallas T H	19 Oct 79	Legal/Political
L A Times	09 Aug 79	Information	Dallas T H	19 Oct 79	Legal/Political
L A Times	06 Aug 79	Information	Houston Post	24 Oct 79	Legal/Political
Outdoor Life	03 Mar 80	Environment	Austin A S	12 Mar 80	Legal/Political
L A Times	16 Jul 79	Information	Austin A S	12 Mar 80	Legal/Political
N Y Times	06 Sep 79	Information	Corpus Christi C	17 Aug 79	Legal/Political
N Y Times	08 Sep 79	Information	Dallas T H	24 Oct 79	Legal/Political
N Y Times	09 Sep 79	Legal/Political	San Ant Exp	11 Aug 79	Legal/Political
N Y Times	10 Sep 79	Legal/Political	San Ant Exp	11 Aug 79	Legal/Political
N Y Times	14 Sep 79	Information	Dallas T H	13 Aug 79	Legal/Political
N Y Times	15 Sep 79	Environment	Austin A S	21 Aug 79	Legal/Political
N Y Times	18 Sep 79	Information	Austin A S	24 Aug 79	Legal/Political
N Y Times	30 Sep 79	Legal/Political	N Y Times	17 Aug 79	Information
N Y Times	23 Sep 79	Legal/Political	L A Times	31 Oct 79	Capping
N Y Times	22 Sep 79	Legal/Political	N Y Times	15 Aug 79	Information
N Y Times	26 Aug 79	Environment	N Y Times	15 Aug 79	Information
N Y Times	23 Aug 79	Environment	N Y Times	13 Aug 79	Information
N Y Times	26 Aug 79	Legal/Political	N Y Times	12 Aug 79	Information
N Y Times	04 Sep 79	Tourism	N Y Times	12 Aug 79	Legal/Political
			N Y Times	10 Aug 79	Information
			N Y Times	09 Aug 79	Information

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BLM MEDIA DATA SUMMARY BY TYPE OF MEDIA, CATEGORY AND DATE OF PUBLICATION (CONTINUED)

Media	Date of Publication	Category	Media	Date of Publication	Category
N Y Times	08 AUG 79	Tourism	Austin A S	23 Sep 79	Capping
N Y Times	07 Aug 79	Information	Austin A S	24 Sep 79	Capping
N Y Times	06 Aug 79	Information	Houston Post	25 Aug 79	Capping
N Y Times	05 Aug 79	Information	Austin A S	20 Mar 80	Capping
N Y Times	17 Jul 79	Information	Dallas News	22 Feb 80	Capping
N Y Times	22 Jul 79	Information	Dallas T H	03 Aug 79	Capping
N Y Times	22 Jul 79	Information	Dallas T H	03 Aug 79	Capping
N Y Times	25 Jul 79	Information	Austin A S	28 Feb 80	Capping
N Y Times	29 Jul 79	Information	Austin A S	24 Feb 80	Capping
N Y Times	29 Jul 79	Information	Houston Post	11 Jan 80	Capping
N Y Times	30 Aug 79	Information	Austin A S	05 Jan 80	Capping
N Y Times	28 Aug 79	Environment	Houston Chron	23 Feb 80	Capping
N Y Times	28 Aug 79	Information	Dallas News	16 Mar 80	Legal/Political
N Y Times	20 Aug 79	Environment	Corpus Christi C	18 Dec 79	Legal/Political
N Y Times	09 Sep 79	Legal/Political	Dallas T H	17 Feb 80	Legal/Political
N Y Times	04 Oct 79	Legal/Political	Houston Post		Legal/Political
San Ant Exp	27 Dec 79	Capping	San Ant Exp	13 Mar 80	Legal/Political
San Ant News	28 Dec 79	Capping	Austin A S	13 Mar 80	Legal/Political
Houston Post	10 Nov 79	Capping	San Ant Exp	13 Mar 80	Legal/Political
Corpus Christi C	05 Dec 80	Capping	Austin A S	05 Mar 80	Legal/Political
Dallas T H	23 Feb 80	Capping	Wichita Falls	05 Mar 80	Legal/Political
Austin A S	20 Oct 79	Capping	Dallas News	24 Oct 79	Legal/Political
Austin A S	17 Oct 79	Capping	Austin A S	23 Oct 79	Legal/Political
Austin A S	15 Oct 79	Capping	Austin A S	09 Jun 79	Legal/Political
Austin A S	13 Oct 79	Capping	Corpus Christi C	13 Mar 80	Information
Port Arthur News	09 Oct 79	Capping	Corpus Christi C	13 Mar 80	Legal/Political
Austin A S	04 Oct 79	Capping	Dallas T H	13 Mar 80	Legal/Political
Austin A S	24 Sep 79	Capping	Dallas T H	15 Mar 80	Legal/Political

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BLM MEDIA DATA SUMMARY BY TYPE OF MEDIA, CATEGORY AND DATE OF PUBLICATION (CONTINUED)

Media	Date of Publication	Category	Media	Date of Publication	Category
Austin A S	15 Mar 80	Legal/Political	Houston Post	18 Aug 79	Legal/Political
Dallas T H	16 Mar 80	Legal/Political	Houston Post	09 Aug 79	Legal/Political
Houston Post	16 Mar 80	Legal/Political	Dallas News	08 Aug 79	Legal/Political
Austin A S	15 Mar 80	Legal/Political	Houston Post	08 Oct 79	Legal/Political
San Ant Light	27 Mar 80	Legal/Political	Dallas News	10 Oct 79	Legal/Political
Houston Post	27 Mar 80	Legal/Political	Dallas T H	10 Aug 79	Legal/Political
Dallas News		Legal/Political	Corpus Christi C	29 Jul 79	Legal/Political
San Ant Light	02 Apr 80	Legal/Political	Daily Texan	17 Aug 79	Environment
Austin A S	21 Nov 79	Legal/Political	Austin A S	10 Jan 80	Information
Houston Post	19 Mar 80	Legal/Political	Dallas T H	17 Oct 79	Legal/Political
Houston Post	25 Oct 79	Legal/Political	Houston Post	17 Oct 79	Legal/Political
Daily Texan	13 Aug 79	Legal/Political	Houston Post	26 Sep 79	Information
Houston Post	13 Aug 79	Legal/Political	Houston Post	17 Oct 79	Environment
Dallas News	22 Aug 79	Legal/Political	Dallas News	13 Mar 80	Legal/Political
Ft Worth S T	22 Aug 79	Legal/Political	Austin A S	08 Mar 80	Legal/Political
Houston Post	21 Aug 79	Legal/Political	Houston Post	08 Mar 80	Legal/Political
Dallas News	18 Aug 79	Legal/Political	Dallas T H	08 Mar 80	Legal/Political
Austin A S	18 Aug 79	Legal/Political	Austin A S	29 Dec 79	Information
Austin A S	18 Aug 79	Legal/Political	Austin A S	01 Mar 80	Capping
Houston Post	20 Sep 79	Legal/Political	Austin A S	01 Mar 80	Capping
Houston Chron	17 Oct 79	Legal/Political	Austin A S	05 Feb 80	Capping
Houston Post	19 Oct 79	Legal/Political	Austin A S	06 Dec 79	Legal/Political
Dallas News	19 Oct 79	Legal/Political	Dallas News	13 Mar 80	Information
Dallas T H	15 Aug 79	Legal/Political	Corpus Christi C	25 Mar 80	Capping
Austin A S	19 Oct 79	Legal/Political	Corpus Christi C	26 Feb 80	Information
Austin Citi	18 Oct 79	Legal/Political	Wall Str Jour	26 Jul 79	Information
San Ant Exp	19 Oct 79	Legal/Political	Houston Post	04 Nov 79	Capping
Corpus Christi C	15 Aug 79	Legal/Political	Dallas News	20 Mar 80	Information

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BLM MEDIA DATA SUMMARY BY TYPE OF MEDIA, CATEGORY AND DATE OF PUBLICATION (CONTINUED)

Media	Date of Publication	Category	Media	Date of Publication	Category
Austin A S	09 Aug 79	Capping	Houston Post	17 Aug 79	Tourism
Houston Post	06 Aug 79	Information	Dallas News	17 Aug 79	Information
Austin A S	10 Aug 79	Information	Corpus Christi C	28 Dec 79	Information
Houston Post	23 Dec 79	Information	Austin A S	21 Nov 79	Fishing
Houston Post	30 Dec 79	Burmah Agate	Austin A S	06 Dec 79	Legal/Political
Houston Chron	29 Dec 79	Information	Houston Post	08 Aug 79	Environment
Dallas T H	09 Aug 79	Cost	Austin A S	16 Aug 79	Information
Houston Chron	29 Aug 79	Information	Austin A S	26 Mar 80	Capping
Dallas T H	26 Aug 79	Capping	Wash Post	20 Aug 79	Tourism
San Ant Exp	23 Aug 79	Environment	Ft Worth S T	19 Aug 79	Tourism
San Ant Exp	23 Aug 79	Information	Houston Post	01 Nov 79	Fishing
Austin A S	09 Aug 79	Capping	Dallas News	08 Aug 79	Information
Austin A S	11 Aug 79	Information	Houston Post	20 Aug 79	Environment
Houston Post	11 Aug 79	Cost	Houston Post	18 Aug 79	Environment
Dallas T H	12 Aug 79	Legal/Political	Houston Post	08 Aug 79	Information
Houston Post	04 Aug 79	Information	London Times	02 Aug 79	Environment
Dallas T H	31 Jul 79	Capping	Austin A S	08 Aug 79	Information
Houston Post	07 Aug 79	Information	Austin A S	12 Aug 79	Tourism
Corpus Christi C	06 Apr 80	Information	San Ant Exp	03 Aug 79	Information
Houston Post	16 Mar 80	Legal/Political	Houston Post	10 Aug 79	Information
Corpus Christi C	03 Oct 79	Capping	Wall Str Jour	09 Aug 79	Fishing
Houston Post	07 Oct 79	Environment	Houston Post	10 Aug 79	Environment
San Ant Light	17 Sep 79	Cost	Houston Post	12 Aug 79	Information
Houston Post	19 Sep 79	Information	Houston Post	12 Aug 79	Information
Houston Post	22 Aug 80	Environment	Houston Post	08 Aug 79	Tourism
Dallas News	19 Aug 79	Information	Houston Post	07 Aug 79	Environment
Dallas News	20 Aug 79	Tourism	Austin A S	07 Aug 79	Environment
Austin A S	17 Aug 79	Tourism	Dallas News	07 Aug 79	Information

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BLM MEDIA DATA SUMMARY BY TYPE OF MEDIA, CATEGORY AND DATE OF PUBLICATION (CONTINUED)

Media	Date of Publication	Category	Media	Date of Publication	Category
Houston Post	05 Aug 79	Information	Austin A S	14 Aug 79	Information
Houston Post	09 Aug 79	Information	Austin A S	14 Aug 79	Information
Dallas News	03 Aug 79	Information	Dallas T H	09 Mar 80	Environment
Dallas News	03 Aug 79	Fishing	San Ant Light	02 Dec 79	Tourism
Dallas News	21 Aug 79	Tourism	Daily Texan	24 Jan 80	Information
Houston Post	15 Aug 79	Information	Lufkin News	25 Mar 80	Information
Austin A S	15 May 80	Information	Dallas News	29 Apr 80	Environment
Austin A S	16 Aug 79	Tourism	Austin A S	18 Nov 79	Environment
Austin A S	09 Aug 79	Environment	Dallas T H	09 Mar 80	Environment
Austin A S	13 Aug 79	Cost	Wall Str Jour	12 Jul 79	Fishing
Austin A S	13 Aug 79	Fishing	Austin A S	10 May 80	Environment
Ft Worth S T	13 Aug 79	Information	Houston Break		Information
Austin A S	01 Aug 79	Information	Dallas T H	07 Mar 80	Capping
Ft Worth S T	01 Aug 79	Information	Corpus Christi C	08 Mar 80	Environment
Houston Chron	19 Aug 79	Environment	L A Times	28 Feb 80	Capping
San Ant Exp	16 Aug 79	Information	L A Times	31 Oct 79	Capping
Austin A S	16 Aug 79	Environment	L A Times	13 Jan 80	Information
Houston Post	19 Aug 79	Environment	L A Times	30 Jan 80	Information
Houston Post	19 Aug 79	Information	L A Times	21 Apr 80	Information
Houston Post	19 Aug 79	Information	L A Times	28 Jul 80	Capping
Dallas News	22 Aug 79	Information	Chicago Trib	24 Sep 79	Capping
Dallas News	22 Aug 79	Fishing	Chicago Trib	09 Mar 80	Capping
Houston Post	22 Aug 79	Information	Chicago Trib	23 Sep 79	Legal/Political
Houston Post	21 Aug 79	Information	Chicago Trib	23 Aug 79	Information
Houston Post	21 Aug 79	Information	Chicago Trib	18 Aug 79	Environment
San Ant Light	19 Aug 79	Information	Chicago Trib	10 Jun 79	Information
Houston Post	16 Aug 79	Information	Chicago Trib	07 Aug 79	Information
Dallas News	17 Aug 79	Cost	Chicago Trib	10 Jun 79	Information

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BLM MEDIA DATA SUMMARY BY TYPE OF MEDIA, CATEGORY AND DATE OF PUBLICATION (CONTINUED)

Media	Date of Publication	Category	Media	Date of Publication	Category
Chicago Trib	11 Nov 79	Burmah Agate	London Times		Environment
Chicago Trib	03 Oct 79	Legal/Political	London Times		Information
Chicago Trib		Information	London Times		Legal/Political
Chicago Trib	25 Mar 80	Capping	Christ Sci	10 Aug 79	Information
Chicago Trib	01 Mar 80	Capping	Christ Sci	27 Jul 79	Environment
Chicago Trib	02 Nov 79	Burmah Agate	Christ Sci	04 Sep 79	Legal/Political
Chicago Trib	06 Aug 79	Legal/Political	Christ Sci	24 Oct 79	Legal/Political
Chicago Trib	30 Aug 79	Environment	Christ Sci	15 Jan 80	Capping
Chicago Trib	24 Aug 79	Environment	Christ Sci	25 Mar 80	Legal/Political
Chicago Trib	21 Aug 79	Information	Christ Sci	17 Jul 79	Information
Chicago Trib	20 Aug 79	Information	Christ Sci	27 Jul 79	Information
Chicago Trib	19 Aug 79	Information	Christ Sci	01 Aug 79	Information
Chicago Trib	05 Jul 79	Capping	Christ Sci	06 Aug 79	Information
Chicago Trib	08 Aug 79	Capping	Christ Sci	09 Aug 79	Legal/Political
Chicago Trib	15 Aug 79	Information	Christ Sci	21 Aug 79	Information
Chicago Trib	09 Aug 79	Legal/Political	Christ Sci	21 Aug 79	Information
Chicago Trib	14 Aug 79	Information	Christ Sci	22 Aug 79	Tourism
Chicago Trib	06 Aug 79	Information	Christ Sci	27 Aug 79	Legal/Political
London Times	25 Mar 80	Capping	Christ Sci	29 Aug 79	Information
London Times	20 Aug 79	Information	Christ Sci	06 Sep 79	Information
London Times	14 Aug 79	Information	Christ Sci	27 Sep 79	Environment
London Times	09 Sep 79	Information	Christ Sci	22 Oct 79	Capping
London Times		Information	Christ Sci	23 Oct 79	Information
London Times		Information	Christ Sci	02 Nov 79	Burmah Agate
London Times		Information	Christ Sci	06 Nov 79	Burmah Agate
London Times		Information	Christ Sci	21 Feb 80	Capping
London Times		Information	Christ Sci	26 Mar 80	Capping
London Times		Information	Christ Sci	25 Nov 79	Legal/Political
London Times		Information			

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BLM MEDIA DATA SUMMARY BY TYPE OF MEDIA, CATEGORY AND DATE OF PUBLICATION (CONTINUED)

Media	Date of Publication	Category	Media	Date of Publication	Category
Wash Post	25 Jun 79	Environment	New Orleans T P	06 Nov 79	Burmah Agate
Wash Post	16 Jul 79	Information	New Orleans T P	01 Nov 79	Legal/Political
Wash Post	19 Aug 79	Information	New Orleans T P	24 Oct 79	Legal/Political
Wash Post	26 Aug 79	Legal/Political	New Orleans T P	15 Aug 79	Information
Wash Post	19 Oct 79	Capping	New Orleans T P	29 Aug 79	Information
Wash Post	26 Dec 79	Capping	New Orleans T P	21 Aug 79	Cost
Wash Post	02 Nov 79	Galveston Oil	New Orleans T P	11 Aug 79	Legal/Political
Wash Post	08 Nov 79	Galveston Oil	New Orleans T P	11 Aug 79	Fishing
Wash Post	06 Nov 79	Legal/Political	New Orleans T P	13 Jun 79	Information
Wash Post	10 Jun 79	Environment	New Orleans T P	11 Jun 79	Fishing
Wash Post	28 Jul 79	Information	New Orleans T P	12 Jun 79	Information
Wash Post	06 Aug 79	Information	New Orleans T P	06 Jul 79	Capping
Wash Post	07 Aug 79	Environment	New Orleans T P	16 Jul 79	Information
Wash Post	08 Aug 79	Information	New Orleans T P	19 Jul 79	Environment
Wash Post	10 Aug 79	Information	New Orleans T P	31 Jul 79	Capping
Wash Post	11 Aug 79	Information	New Orleans T P	02 Aug 79	Information
Wash Post	14 Aug 79	Information	New Orleans T P	04 Aug 79	Information
Wash Post	14 Feb 80	Legal/Political	New Orleans T P	05 Aug 79	Information
Wash Post	29 Aug 79	Legal/Political	New Orleans T P	05 Aug 79	Information
Wash Post	07 Oct 79	Legal/Political	New Orleans T P	06 Aug 79	Information
New Orleans T P	26 Aug 79	Information	New Orleans T P	07 Aug 79	Information
New Orleans T P	29 Aug 79	Information	New Orleans T P	08 Aug 79	Information
New Orleans T P	16 Aug 79	Information	New Orleans T P	08 Aug 79	Information
New Orleans T P	12 Jul 79	Information	New Orleans T P	09 Aug 79	Information
New Orleans T P	27 Dec 79	Information	New Orleans T P	09 Aug 79	Information
New Orleans T P	27 Dec 79	Capping	New Orleans T P	10 Aug 79	Information
New Orleans T P	22 Nov 79	Information	New Orleans T P	12 Aug 79	Information
New Orleans T P	19 Nov 79	Burmah Agate	New Orleans T P	14 Aug 79	Information

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BLM MEDIA DATA SUMMARY BY TYPE OF MEDIA, CATEGORY AND DATE OF PUBLICATION (CONTINUED)

Media	Date of Publication	Category	Media	Date of Publication	Category
New Orleans T P	14 Aug 79	Capping	New Orleans T P	05 Nov 79	Burmah Agate
New Orleans T P	17 Aug 79	Information	New Orleans T P	17 Nov 79	Burmah Agate
New Orleans T P	17 Aug 79	Information	New Orleans T P	09 Nov 79	Information
New Orleans T P	18 Aug 79	Legal/Political	New Orleans T P	10 Nov 79	Information
New Orleans T P	18 Aug 79	Information	New Orleans T P	10 Nov 79	Burmah Agate
New Orleans T P	18 Aug 79	Information	New Orleans T P	12 Nov 79	Capping
New Orleans T P	19 Aug 79	Information	New Orleans T P	13 Nov 79	Burmah Agate
New Orleans T P	20 Aug 79	Information	New Orleans T P	23 Nov 79	Burmah Agate
New Orleans T P	24 Aug 79	Information	New Orleans T P	24 Nov 79	Burmah Agate
New Orleans T P	25 Aug 79	Information	New Orleans T P	27 Nov 79	Burmah Agate
New Orleans T P	26 Aug 79	Information	New Orleans T P	30 Nov 79	Burmah Agate
New Orleans T P	27 Aug 79	Environment	Houston Post	04 Jan 80	Legal/Political
New Orleans T P	28 Aug 79	Information	Houston Post		Legal/Political
New Orleans T P	30 Aug 79	Information	Audobon	04 Jan 80	Capping
New Orleans T P	31 Aug 79	Information	Houston Post	10 Jan 80	Information
New Orleans T P	02 Sep 79	Capping	Dallas T H	26 Mar 80	Capping
New Orleans T P	04 Sep 79	Tourism	Corpus Christi C	18 Mar 80	Information
New Orleans T P	08 Sep 79	Legal/Political	Corpus Christi C	07 Apr 80	Information
New Orleans T P	10 Sep 79	Legal/Political	Houston Chron	23 Aug 79	Environment
New Orleans T P	11 Sep 79	Legal/Political	Houston Chron	07 Mar 80	Capping
New Orleans T P	24 Sep 79	Capping	Dallas T H	11 Mar 80	Information
New Orleans T P	25 Sep 79	Capping	Dallas T H	14 Aug 79	Information
New Orleans T P	30 Sep 79	Legal/Political	Austin A S		Environment
New Orleans T P	02 Oct 79	Legal/Political	Austin A S		Legal/Political
New Orleans T P	07 Oct 79	Legal/Political	Corpus Christi C	07 Aug 79	Tourism
New Orleans T P	16 Oct 79	Capping	Corpus Christi C	07 aug 79	Legal/Political
New Orleans T P	02 Nov 79	Burmah Agate	Corpus Christi C		Information
New Orleans T P	03 Nov 79	Burmah Agate	Corpus Christi C		Tourism

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BLM MEDIA DATA SUMMARY BY TYPE OF MEDIA, CATEGORY AND DATE OF PUBLICATION (CONTINUED)

Media	Date of Publication	Category	Media	Date of Publication	Category
KTRK TV	08 Aug 79	Legal/Political	Houston Post	13 Aug 79	Fishing
KPRC TV	08 Aug 79	Tourism	Austin A S		Information
KHOU TV	08 Aug 79	Information	Austin A S		Environment
KTRK TV	08 Aug 79	Environment	Austin A S		Environment
KHOU TV	08 Aug 79	Legal/Political	Austin A S	10 Aug 79	Environment
KTRK TV	08 Aug 79	Tourism	KPRC TV	03 Aug 79	Environment
KHOU TV	08 Aug 79	Tourism	KTRK TV	06 Aug 79	Information
KPRC TV	09 Aug 79	Information	KPRC TV	06 Aug 79	Information
KTRK TV	09 Aug 79	Tourism	KTRK TV	06 Aug 79	Tourism
KHOU TV	09 Aug 79	Fishing	KHOU TV	06 Aug 79	Environment
KHOU TV	09 Aug 79	Environment	KPRC TV	06 Aug 79	Information
KPRC TV	09 Aug 79	Tourism	KHOU TV	06 Aug 79	Environment
KTRK TV	10 Aug 79	Tourism	KHOU TV	06 Aug 79	Information
KTRK TV	10 Aug 79	Environment	KHOU TV	07 Aug 79	Information
KHOU TV	10 Aug 79	Legal/Political	KPRC TV	07 Aug 79	Fishing
KTRK TV	10 Aug 79	Legal/Political	KPRC TV	07 Aug 79	Tourism
KPRC TV	15 Aug 79	Information			

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BLM MAGAZINE DATA SUMMARY BY MAGAZINE CATEGORY AND DATE OF PUBLICATION

Media	Date of Publication	Category
Audobon	06 Nov 79	Information
People Mag	27 Aug 79	Information
Oil Gas Jour	17 Dec 79	Information
Wall Str Jour	20 Sep 79	Information
Wall Str Jour	04 Sep 79	Capping
Science News	25 Oct 79	Information
Nat Geo		Information
Newsweek	10 Sep 79	Information
Newsweek	20 Aug 79	Information
Newsweek	15 Aug 79	Information
Newsweek	25 Jun 79	Capping
Time	16 Jul 79	Information
Time	20 Aug 79	Information
USNWR	20 Aug 79	Information
Science News	02 May 81	Information
USNWR	07 Apr 80	Information
Newsweek	04 Aug 80	Cost
The Nation	19 Jul 80	Information
Wall Str Jour	26 Jul 79	Information
Wall Str Jour	24 Oct 79	Legal/Political
Wall Str Jour	19 Oct 79	Legal/Political
Wall Str Jour	18 Oct 79	Capping
Wall Str Jour	14 Sep 79	Legal/Political
Wall Str Jour	09 Aug 79	Fishing
Wall Str Jour	12 Jul 79	Fishing
Wall Str Jour	12 Jun 79	Capping
Wall Str Jour	26 Jun 79	Capping
Wall Str Jour	11 Jun 79	Cost
Wall Str Jour	06 Jun 79	Capping
Wall Str Jour	25 Mar 80	Capping
Outdoor Life	03 Mar 80	Environment
Aviation Week	08 Oct 79	Information
Business Week	10 Oct 79	Legal/Political
Wall Str Jour	04 Sep 79	Legal/Political
Wall Str Jour	26 Jul 79	Information
Wall Str Jour	09 Aug 79	Fishing
Wall Str Jour	12 Jul 79	Fishing
Audobon	04 Jan 80	Capping

N=38

Table I-3

BLM T.V. DATA SUMMARY
(BY DATE OF AIRING AND CATEGORY)

MEDIA	TIME	CATEGORY
KPRC TV	03 Aug 79	Environment
KTRK TV	06 Aug 79	Information
KPRC TV	06 Aug 79	Information
KTRK TV	06 Aug 79	Tourism
KHOU TV	06 Aug 79	Environment
KPRC TV	06 Aug 79	Information
KHOU TV	06 Aug 79	Environment
KHOU TV	06 Aug 79	Information
KHOU TV	07 Aug 79	Information
KPRC TV	07 Aug 79	Fishing
KPRC TV	07 Aug 79	Tourism
KTRK TV	08 Aug 79	Legal/Political
KPRC TV	08 Aug 79	Tourism
KHOU TV	08 Aug 79	Information
KTRK TV	08 Aug 79	Environment
KHOU TV	08 Aug 79	Legal/Political
KTRK TV	08 Aug 79	Tourism
KHOU TV	08 Aug 79	Tourism
KPRC TV	09 Aug 79	Information
KTRK TV	09 Aug 79	Tourism
KHOU TV	09 Aug 79	Fishing
KHOU TV	09 Aug 79	Environment
KPRC TV	09 Aug 79	Tourism
KTRK TV	10 Aug 79	Tourism
KTRK TV	10 Aug 79	Environment
KHOU TV	10 Aug 79	Legal/Political
KTRK TV	10 Aug 79	Legal/Political
KPRC TV	15 Aug 79	Information

The Department of the Interior Mission

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The Department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

The Minerals Management Service Mission

As a bureau of the Department of the Interior, the Minerals Management Service's (MMS) primary responsibilities are to manage the mineral resources located on the Nation's Outer Continental Shelf (OCS), collect revenue from the Federal OCS and onshore Federal and Indian lands, and distribute those revenues.

Moreover, in working to meet its responsibilities, the **Offshore Minerals Management Program** administers the OCS competitive leasing program and oversees the safe and environmentally sound exploration and production of our Nation's offshore natural gas, oil and other mineral resources. The MMS **Minerals Revenue Management** meets its responsibilities by ensuring the efficient, timely and accurate collection and disbursement of revenue from mineral leasing and production due to Indian tribes and allottees, States and the U.S. Treasury.

The MMS strives to fulfill its responsibilities through the general guiding principles of: (1) being responsive to the public's concerns and interests by maintaining a dialogue with all potentially affected parties and (2) carrying out its programs with an emphasis on working to enhance the quality of life for all Americans by lending MMS assistance and expertise to economic development and environmental protection.