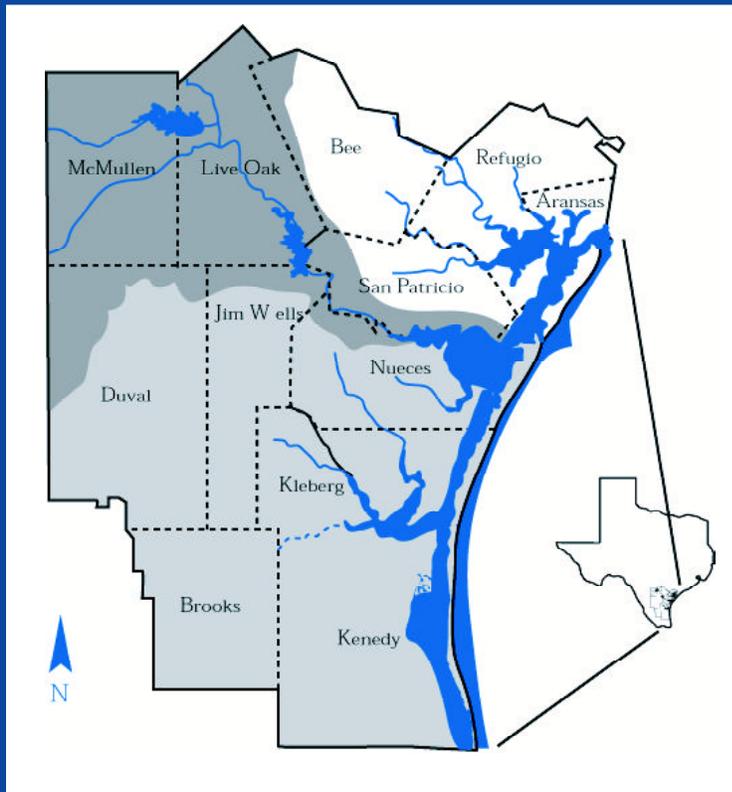


Economic Impacts on Regional and State Economies of Human Uses of the Coastal Resources of the Corpus Christi Bay National Estuary Program Study Area



Corpus Christi Bay National Estuary Program
CCBNEP-16 • August 1997



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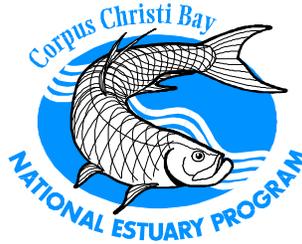
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of Human Uses of the Coastal Resources
of the Corpus Christi Bay
National Estuary Program Study Area

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CORPUS CHRISTI BAY NATIONAL ESTUARY PROGRAM

The Corpus Christi Bay National Estuary Program (CCBNEP) is a four-year, community based effort to identify the problems facing the bays and estuaries of the Coastal Bend, and to develop a long-range, Comprehensive Conservation and Management Plan. The Program's fundamental purpose is to protect, restore, or enhance the quality of water, sediments, and living resources found within the 600 square mile estuarine portion of the study area.

The Coastal Bend bay system is one of 28 estuaries that have been designated as an **Estuary of National Significance** under a program established by the United States Congress through the Water Quality Act of 1987. This bay system was so designated in 1992 because of its benefits to Texas and the nation. For example:

- Corpus Christi Bay is the gateway to the nation's sixth largest port, and home to the third largest refinery and petrochemical complex. The Port generates over \$1 billion of revenue for related businesses, more than \$60 million in state and local taxes, and more than 31,000 jobs for Coastal Bend residents.
- The bays and estuaries are famous for their recreational and commercial fisheries production. A study by Texas Agricultural Experiment Station in 1987 found that these industries, along with other recreational activities, contributed nearly \$760 million to the local economy, with a statewide impact of \$1.3 billion, that year.
- Of the approximately 100 estuaries around the nation, the Coastal Bend ranks fourth in agricultural acreage. Row crops -- cotton, sorghum, and corn -- and livestock generated \$480 million in 1994 with a statewide economic impact of \$1.6 billion.
- There are over 2600 documented species of plants and animals in the Coastal Bend, including several species that are classified as endangered or threatened. Over 400 bird species live in or pass through the region every year, making the Coastal Bend one of the premier bird watching spots in the world.

The CCBNEP is gathering new and historical data to understand environmental status and trends in the bay ecosystem, determine sources of pollution, causes of habitat declines and risks to human health, and to identify specific management actions to be implemented over the course of several years. The 'priority issues' under investigation include:

- altered freshwater inflow
- declines in living resources
- loss of wetlands and other habitats
- bay debris
- degradation of water quality
- altered estuarine circulation
- selected public health issues

The **COASTAL BEND BAYS PLAN** that will result from these efforts will be the beginning of a well-coordinated and goal-directed future for this regional resource.

STUDY AREA DESCRIPTION

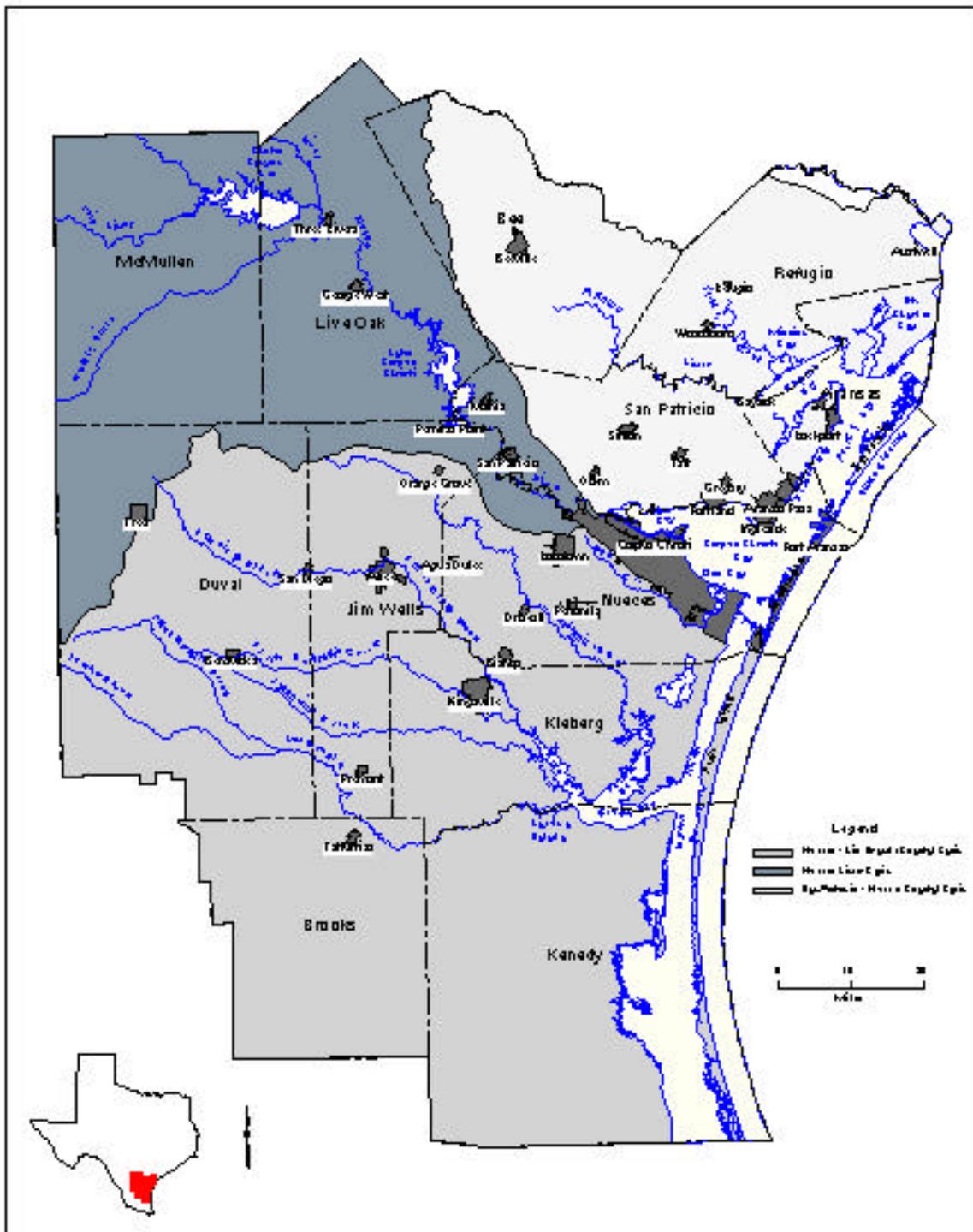
The CCBNEP study area includes three of the seven major estuary systems of the Texas Gulf Coast. These estuaries, the Aransas, Corpus Christi, and Upper Laguna Madre are shallow and biologically productive. Although connected, the estuaries are biogeographically distinct and increase in salinity from north to south. The Laguna Madre is unusual in being only one of three hypersaline lagoon systems in the world. The study area is bounded on its eastern edge by a series of barrier islands, including the world's longest -- Padre Island.

Recognizing that successful management of coastal waters requires an ecosystems approach and careful consideration of all sources of pollutants, the CCBNEP study area includes the 12 counties of the Coastal Bend: Refugio, Aransas, Nueces, San Patricio, Kleberg, Kenedy, Bee, Live Oak, McMullen, Duval, Jim Wells, and Brooks.

This region is part of the Gulf Coast and South Texas Plain, which are characterized by gently sloping plains. Soils are generally clay to sandy loams. There are three major rivers (Aransas, Mission, and Nueces), few natural lakes, and two reservoirs (Lake Corpus Christi and Choke Canyon Reservoir) in the region. The natural vegetation is a mixture of coastal prairie and mesquite chaparral savanna. Land use is largely devoted to rangeland (61%), with cropland and pastureland (27%) and other mixed uses (12%).

The region is semi-arid with a subtropical climate (average annual rainfall varies from 25 to 38 inches, and is highly variable from year to year). Summers are hot and humid, while winters are generally mild with occasional freezes. Hurricanes and tropical storms periodically affect the region.

On the following page is a regional map showing the three bay systems that comprise the CCBNEP study area.



Corpus Christi Bay National Estuary Program Study Area

TABLE OF CONTENTS

Section	Page
TABLE OF CONTENTS	ix
LIST OF TABLES	xi
LIST OF FIGURES	xii
LIST OF ACRONYMS	xiii
ACKNOWLEDGEMENTS	xiv
EXECUTIVE SUMMARY	1
I. INTRODUCTION	5
I.1 Purpose of the Study	5
I.2 Description of the CCBNEP Study Area	6
I.2.1 History and Economic Base	6
I.2.2 Physical Characteristics and Recreational Activities	7
II. ECONOMIC IMPACT ANALYSIS	8
II.1 Literature review	8
II.1.1 Literature on the CCBNEP Study Area	8
II.1.2 General Literature on Economic Impact Analysis	8
II.1.3 Economic Impact Literature on the CCBNEP and Other Estuary Programs	9
II.2 Export Base Theory: Export and Residentiary Industries	9
II.3 Input-output Analysis	11
II.4 Characterization of the Regional Economy	12
III. ESTIMATION OF DIRECT IMPACTS	13
III.1 Data Sources	14
III.2 Heavy Industry and Manufacturing	15
III.2.1 Petroleum Refining and Chemical Industries	15
III.2.2 Construction	16
III.2.3 Mining	16
III.2.4 Ship and Boat Building and Repairing	16
III.2.5 Seafood Manufacturing	16

III.2.6 Methodology for the Estimation of Direct Impacts for the Industry and Manufacturing Sectors	17
III.3 Commercial Fishing	18
III.3.1 Direct Impacts by Bay System	22
III.3.2 Direct Impacts of all CCBNEP study area landings from the Gulf and Bay systems	22
III.3.3 Direct Impacts by Area Caught	23
III.4 Recreation and Tourism	24
III.4.1 Estimation of direct impacts	25
III.4.2 Visitation patterns and trends	29
III.5 Agriculture	30
III.6 Military	31
III.7 Other Federal and State Government	32
IV. TOTAL ECONOMIC IMPACTS ON THE CCBNEP STUDY AREA	32
IV.1 Impacts on the Coastal Bend Regional Economy	33
IV.2 Tourism Related Industries	35
IV.3 Commercial Fishing	36
IV.4 Major Industrial Sectors	39
V. TOTAL ECONOMIC IMPACTS ON THE STATE OF TEXAS	40
VI. SUMMARY AND CONCLUSIONS	42
VII. REFERENCES	43

LIST OF TABLES

Table	Page
Table ES.1. Summary of estimated direct impacts of bay related economic sectors by category on the CCBNEP study area, 1995.	2
Table ES.2. Total economic impacts of bay related industries by category on the CCBNEP study area and Texas, 1995.	3
Table III.1. Direct impact measures for export sectors in the CCBNEP study area	14
Table III.2. Employment and wages for heavy industry and manufacturing sectors in the CCBNEP study area, 1995	15
Table III.3. Estimated final demands and their relative share for the heavy industry and manufacturing sectors for the CCBNEP study area, (1995)	18
Table III.4. Ex-Vessel Value (Direct Impacts, \$millions) for finfish, shrimp, and shellfish by bay system (1993-1995 average)	22
Table III.5. Ex-vessel values (\$ millions) of finfish, shellfish, and shrimp landed in CCBNEP counties from all bay systems and Gulf grid zones (1993-1995 average)	23
Table III.6. Ex-vessel value (\$) of shrimp caught in Gulf grid zone 20 by area landed	24
Table III.7. Travel expenditure, payroll, and employment for the CCBNEP area counties, 1995	25
Table III.8. Total and leisure travel expenditures estimates for the CCBNEP study area, 1995.	27
Table III.9. Distribution of leisure expenditures per person day, Corpus Christi DMA, 1995.	27
Table III.10. Direct impacts of tourism related sectors in the CCBNEP study area, 1995 (leisure only)	28
Table III.11. Direct impacts of tourism related sectors in the CCBNEP study area, 1995 (business only)	29
Table III.12. Visitation Patterns for Corpus Christi Area and Changes from 1987 to 1995	30
Table III.13. Direct impacts of agriculture on the CCBNEP study area, 1995.	31
Table III.14. Summary of estimated direct impacts of bay related economic sectors in the CCBNEP study area, 1995.	32
Table IV.1. Estimated impacts of bay related economic activities in the CCBNEP study area, 1995 (Base Scenario)	34
Table IV.2. Total impacts of tourism and related industries on the CCBNEP study area regional economy, 1995	36
Table IV.3. Summary of estimated impacts of commercial fishing on the CCBNEP study area regional economy under alternative scenarios, 1995	38
Table V.1. Estimated impacts of bay related industries in the CCBNEP study area on the Texas economy, 1995 (Base Scenario)	41

LIST OF FIGURES

Figure	Page
Figure III.1. Gulf Grid Zone 20	19
Figure III.2 Percentage share (in terms of ex-vessel values) of CCBNEP bay systems of the Total Texas Bay Landings (1993-1995 average)	20
Figure III.3 Average Texas and CCBNEP (Gulf+Bay) ex-vessel value of landings, by species, for 1993-1995 average	21
Figure III.4. Total value of finfish and shrimp landed by Bay System in the CCBNEP study area (1993-1995 average)	21

LIST OF ACRONYMS

CCBNEP	Corpus Christi Bay National Estuary Program
DMA	Designated Market Area
GCCBA	Greater Corpus Christi Business Alliance
GIWW	Gulf Intracoastal Waterway
MSA	Metropolitan Statistical Area
NMFS	National Marine Fisheries Service
SIC	Standard Industrial Classification
TDOC	Texas Department of Commerce
TPW	Texas Parks and Wildlife Department
TWC	Texas Workforce Commission
TAES	Texas Agricultural Extension Service
TWDB	Texas Water Development Board

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Chuck Jackson, of the Texas Department of Commerce provided the data on tourism for the Coastal Bend region and made himself available for all our questions. This data has been instrumental in documenting travel behavior for the region. Ms. Margot Heightower and Jim Nance, from National Marine and Wildlife Fisheries Service provided data for shrimp landings in extensive detail which helped the analysis greatly.

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Finally, the authors wish to thank the Corpus Christi National Estuary Program for the funding of the project.

**ECONOMIC IMPACTS ON REGIONAL AND STATE ECONOMIES
OF HUMAN USES OF THE COASTAL RESOURCES OF THE CORPUS
CHRISTI BAY NATIONAL ESTUARY PROGRAM STUDY AREA**

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Executive Summary

The Corpus Christi Bay National Estuary Program (CCBNEP) study area supports numerous activities that generate economic impacts, including navigation, transportation, extraction, and recreation. In addition to these uses, are activities that affect the bays and estuaries such as agriculture. All of these industries or activities have an economic impact on the local economy as well as impacts outside the region. The present study presents estimates of these economic impacts for the CCBNEP study area and the state of Texas.

Industries/activities identified as bay related either through their use of or their effects on the CCBNEP study area were classified into three categories:

Category I : Industries/activities that use the bay for navigation/transportation or industries not directly affected by the aesthetics and water quality of the bay. Because of locational advantage, convenience and other cost advantages, these industries are enhanced by their proximity to the bay. Industries in this category include petroleum refining industries, chemical industries, oil and gas extraction, sand, gravel, and other mining and quarrying, ship and boat building, water transportation and transportation services, and the military (marine-related).

Category II : Industries/activities whose volume of business is affected directly by the quality of water and/or aesthetic appearance of the bays. This category includes, prepared fish and seafood, tourism related industries, and commercial fishing.

Category III : Industries whose activities are largely unaffected by the bay but may affect the quality of the bay. These include agriculture (crops and livestock), state government, heavy construction and non-marine military activities.

To estimate these economic impacts of the bay related sectors, input-output models were developed for the Coastal Bend regional economy and Texas. These input-output models were used to estimate multipliers that show the impact of an increase in the sales to final demand of one sector on the value of output of other sectors of the economy (Appendix II). Total regional and state impacts were then estimated in terms of the total value of output, personal income, employment and value added.

As a first step in developing the input-output models and economic impacts, direct impacts of these industries have to be identified. Direct impacts (sales to final demand)

were estimated for each sector related to the bays as categorized above. A summary of direct impacts aggregated by category is shown in Table ES.1.

Table ES.1. Summary of estimated direct impacts of bay related economic sectors by category on the CCBNEP study area, 1995.

Category of Industries	Direct Impact (\$ millions)	Share of Total (%)
I	1,644.07	65.21
II	355.51	14.10
III	671.43	26.63
Total	2,521.01	100

Estimated direct impacts or sales to final demand shown in Table ES.1 provide the basis for estimating total economic impacts of bay related sectors in the CCBNEP study area. In estimating total impacts, alternative scenarios were considered for commercial fishing and tourism related industries. These were:

For tourism related industries;

1. Leisure travel only (base scenario)
2. Leisure plus business travel

For commercial fishing;

3. Bay and gulf fishing by all landings in the CCBNEP study area counties (irrespective of where caught)
4. Bay system catch only.
5. Bay system and Gulf grid zone 20 catch (base scenario)

It is estimated that, in total, bay related sectors' sales to final demand stimulated total regional business sales of over \$4 billion, personal income of \$1.2 billion, value added of \$2.3 billion and over 52 thousand jobs in the CCBNEP study area (Table ES.2).

These estimates indicate that bay related industries of the region are a significant part of the regional economic base. An estimate of the relative importance of the bay related industries can be made using employment. Estimated bay related employment for the base scenario (52,859) is about one third of the reported total employment in the Corpus Christi Metropolitan Statistical Area (MSA) and almost one fourth of that in the CCBNEP twelve county area (Texas Workforce Commission (TWC)).

Tourism and recreation related sectors ranked second in total employment generated within the region with an estimated 10,880 jobs, accounting for just over 20

Table ES.2. Total economic impacts of bay related industries by category on the CCBNEP study area and Texas, 1995.

Economic Impact Variable	Category I Sectors		Category II Sectors		Category III Sectors		Totals*	
	CCBNEP	Texas	CCBNEP	Texas	CCBNEP	Texas	CCBNEP	Texas
Output (\$mil)	2,432.91	2,646.54	589.74	647.98	1,081.96	1,178.82	4,105	4,473
Personal Income (\$mil)	605.33	691.19	206.57	240.42	435.1	507.33	1,247	1,439
Value Added (\$mil)	1,04.91	1,239.30	342.53	388	850.04	900.89	2,297	2,528
Employment (jobs)	18,776	22,096	12,556	12,753	21,527	26,437	52,859	61,286

* Totals are rounded to the nearest dollar value or whole number.

percent of all bay related employment impacts. As previously indicated, this sector is an aggregation of several service and retail businesses that provide services and goods to recreationists and tourists. This employment estimate includes direct employment in those businesses as well as jobs created in related businesses that provide them with supplies, materials, and goods.

From the results of this analysis, on average, each dollar of tourist and recreationist expenditures resulted in about \$1.75 in total value of output, \$0.67 of personal income, and \$1.06 of value added in the regional economy. In addition, an employment multiplier of about 40 jobs per million dollars of tourist and recreationist expenditures is indicated by the analysis.

Under the base scenario, a total of 900 jobs were generated by commercial fishing in the region. This accounted for about 2 percent of all bay related jobs. Commercial fishing generated \$45.28 million in value of output and \$31.52 million in value-added in the region. Total impacts on personal income were \$12.86 million. The relatively low estimated employment and income impacts from commercial fishing may be related to unique employment practices in this industry.

The magnitude of economic impacts of categories varied among impact variables. For example, Category II industries including tourism related industries, commercial fishing, and seafood manufacturing generated 12,556 jobs out of the total 45,509 jobs generated in the Coastal Bend by bay related industries, or about 28 percent. In terms of personal income impacts, the share of these industries is about 20 percent of the total personal income impacts for the region. This difference reflects varying average wage rates among the bay related industries. Highest employment and personal income impacts are generated by the tourism, agriculture, and petrochemical sectors.

Statewide impacts represent estimated impacts of CCBNEP bay related industries on the state economy. Jobs created elsewhere in the state were estimated to be 8,421 generating an additional \$192 million in personal income outside the regional economy. In terms of output, Category II industries generated an additional \$58.2 million, while Category I industries generated an additional \$214 million at the state level. Total incremental output at the state level was estimated to be \$368 million. In terms of value added, the CCBNEP bay related industries provide an estimated \$231 million in other areas of Texas.

Several areas of future research were identified. Perhaps the greatest limitation encountered was lack data on bay and estuary related tourism and recreation visitation and expenditures in the CCBNEP study area. Data used to estimate impacts of tourism and related industries was the most current and complete available. Nevertheless, none of the data sources found provided information oriented directly to the objectives of the study. The collection of primary data in this industry is recommended.

Introduction

I.1 Purpose of the Study

The purpose of this study is to estimate economic impacts of sectors related to the Corpus Christi Bay National Estuary Program (CCBNEP) study area either through use of, or effect on the bay and estuary resources. The study is intended to provide an analysis of the regional economy that may be used in the development of a management plan for the CCBNEP.

Assessing the economic impacts of industries and other economic activities is crucial in the valuation of local, regional, and state economies. An increase in the output of each economic activity generates direct economic impacts in terms of employment and income, has secondary impacts on sectors that supply inputs to these industries/activities, and results in consumption effects generated by increased incomes. Since the CCBNEP study area is an integral part of the larger state economy, these impacts are manifested not only at the local site of occurrence but extend into the state economy as well.

Bays and estuaries in the Coastal Bend region support a wide range of economic activity. Moreover, like any coastal region, human activities vary significantly in their nature and economic characteristics. These include industries that produce goods and services from the resources of the bays and estuaries to be sold in private markets. Other human uses do not extract or consume bay and estuary resources, but rather depend upon the quality and quantity of resources to attract non-consumptive activities such as boating, fishing, and other recreational activities. Generally, the benefits of these activities do not flow through private markets.

Important sectors producing goods for private markets include petroleum refining and natural gas industries, chemicals, agriculture, and commercial fishing. Each are examples of industries that contribute to the local economy by converting the region's resources into consumer goods and exporting them to other regions. Given sufficient data, the regional economic value of these industries may be calculated in a straightforward manner. Often this value is expressed in terms of regional sales or some economic variable reflecting its worth as determined by the private market.

Other uses of the bays that are equally important include non-consumptive and common property uses such as recreation and tourism. For these activities, there exists no organized market by which these uses may be marketed on a per-unit basis. Open access of bay and estuary waters, beaches, and general aesthetics of the coastal region are by their inherent nature public goods shared by users without exclusion. While there is no doubt about the value of these public goods, that value cannot be expressed through private market exchanges.

Given this lack of organized markets, economic values of public uses of bays and estuaries are generally unknown and economic impacts of these resource uses in their natural state are undervalued. To achieve a comprehensive analysis of human uses of bay and estuary resources, economic impacts of all uses are identified and estimated in this study.

This study first identifies the industries and activities that use the bay or estuary resources, including recreational activities, and then classifies these into categories according to the relationship of each to the area bays and estuaries. Estimates are made of direct impacts on the regional economy of each industry or activity in terms of regional sales or expenditures. Then, economic impacts are estimated using an input-output model, which provides results on the regional and state level impacts of these industries/activities.

Economic impacts estimated in this study are business values, such as income generated, employment, or sales. They are different from the results of a cost-benefit analysis where economic values estimated refer to the welfare value of a resource or its shadow price (opportunity cost) (Wellman and Noble, 1997). Results obtained in this study are, therefore, valuation of the bays and estuaries in terms of business impacts and do not imply a welfare value. These business values are useful in determining the effects of an increase or decrease in output of one of the bay related industries or activities on the output, employment, and income of the other sectors in the regional and state economies, including the effect of increased household incomes.

I.2 Description of the CCBNEP Study Area

I.2.1 History and Economic Base

The CCBNEP study area encompasses 11,500 square miles of land and water, with 75 miles of coastline and includes the Aransas, Corpus Christi, and upper Laguna Madre bay systems. The twelve counties within the CCBNEP study area represent a diverse economic base: Aransas, Bee, Brooks, Duval, Jim Wells, Kenedy, Kleberg, Live Oak, McMullen, Nueces, Refugio, and, San Patricio.

The population of the region was 543,367 in 1995, representing 2.9% of the Texas population. Area population grew by 12% from 1980 to 1995 with highest population growth in Nueces county where the population reached 312,708. Nueces county accounted for 57.5% of the CCBNEP study area population in 1995. (U.S. Bureau of Census). Although population has increased in the region as a whole, some counties have experienced out-migration.

The CCBNEP study area has been inhabited by Indians, Europeans, and Mexicans over the course of its history. Early economic history of the region was mainly in commerce, consisting of trading of hides, tallow, and canned fish by European settlers around 1747. After the civil war, the cattle industry flourished and several tanning and hide factories were built. Later, commercial fishing and oystering began and has remained an important economic activity. The area experienced rapid growth in the first half of the 20th century. At that time, Rockport was the commercial center and Corpus Christi was much smaller. After a hurricane destroyed Rockport in 1919, the Port of Corpus Christi was opened in 1926 which brought about rapid growth to the region (Jones et. al.). Corpus Christi's population was enhanced by building of the port and seawall. Natural gas was discovered in San Patricio County in 1913, and oil was discovered in 1930 (Greater Corpus

Christi Business Alliance, 1996). These developments helped Corpus Christi become a major Gulf Coast petrochemical center.

Until the mid-1980's, oil, gas, and agriculture remained the most important industries (Greater Corpus Christi Business Alliance, 1996). In the 1972-1983 period, the Corpus Christi Economy grew by 36% while the US growth rate was 25% (Bushell, 1992). Falling oil prices in the mid-1980's caused city leaders to focus on diversifying the economy and introducing tourist attractions as an economic development plan. These efforts have been quite successful, and today Corpus Christi has become an important regional metropolitan area with an economic base that includes electronics, agribusiness, steel fabrication, petrochemical industry, teleservices industry, health and service industry, retail and commercial trade, and the Department of Defense (Greater Corpus Christi Business Alliance, 1996).

Although traditional economic sectors such as agriculture, oil and gas extraction, and fishing remain important, services and retail trade serving tourism and coastal recreation has become increasingly important over the last two decades. Major economic generators in the area today are petrochemicals, tourism, agribusiness, and military.

Commercial fishing is an important activity in the CCBNEP study area. The majority of Texas finfish landings are from CCBNEP bays. The area also has a valuable shrimp fishery. However, the commercial fishing industry (and recreational fishing) in the CCBNEP study area is being threatened by several factors. One is loss of coastal marshlands, the other is lack of sufficient inflow of freshwater. Wetlands of the Corpus Christi area are the most varied in Texas. Ninety five percent of all commercial and recreational fish species in the region spend some portion of their lives in these estuarine ecosystems (Sea Grant, 1994).

I.2.2 Physical Characteristics and Recreational Activities

The CCBNEP bay system is composed of the Aransas, Corpus Christi, and the upper Laguna Madre estuaries. These estuaries support a wide range of fish and wildlife in eight habitats: Open bay, hard substrates, oyster reefs, seagrass meadows, coastal marshes, tidal flats, barrier Islands, and gulf beaches. Primary concerns for these estuarine habitats are:

- Open bay and seagrass meadow habitats have been impacted or altered by dredging, channelization, and anthropogenic activities.
- Oyster reef habitats have been eliminated due to mudshell dredging and reduced freshwater inflow
- Barrier island and Gulf beach habitats are affected by commercial development as related to recreation and tourism and oil spills (CCBNEP, 1996).

The CCBNEP study area has diverse wildlife including 494 species of birds (CCBNEP, 1996). These resources attract a large number of birdwatchers to the area. Birdwatching is important in the Rockport/Fulton area where tourists leave about \$5 million in the area each year (Sharp, 1996). The area supports a wide range of other recreational activities such as swimming, surfing, fishing, sailing, power boating, waterfowl hunting, camping, and canoeing. These activities provide nonmarket value to

the users and economic impacts to the local economy. Also, many nonusers of these bays and estuaries derive economic value from them because of their existence as estuaries of national significance (Wellman, 1996).

II. Economic Impact Analysis

II.1 Literature review

The literature survey conducted for the study focused on three different aspects:

1. Literature on CCBNEP study area
2. General literature on economic impact analysis
3. Economic impact literature on CCBNEP or other estuary programs

II.1.1 Literature on the CCBNEP Study Area

This part of the literature survey focused mainly on general information on the CCBNEP study area. The CCBNEP publishes “Around the Bend” which is a quarterly newsletter containing information on workshops, news relevant to the CCBNEP, educational material on the environmental aspects of the CCBNEP, and tips on conservation and resource protection. Several issues have been used in this study as background information and useful insights on the activities in which the CCBNEP is involved.

“Texas Shores” (Sea Grant, 1994) has an issue entitled “Recognizing Corpus Christi Bay” which provides background on and issues concerning the CCBNEP. Other literature used for background information includes: Jones et. al. study (Jones, et. al. 1996), Wellman (Wellman, 1996; Wellman and Noble 1997), Bushell (Bushell, 1992), The Greater Corpus Christi Business Alliance (GCCBA) Economic Overview Study (GCCBA, 1996), and personal communication with Marilyn Pierce and Gary Bushell from the GCCBA, Anthony Alejandro from the Port of Corpus Christi Authority; and Larry McEachron, Lee Green, Bill Fuls, and Page Campbell from Texas Parks and Wildlife (TPW). Several publications by the Texas Department of Commerce, Tourism Division were also used for travel related information. (TDOC, 1996: a,b)

II.1.2 General Literature on Economic Impact Analysis

Literature for general economic impact analysis was confined to input-output models, and only to the most recent literature. A comprehensive treatment of input-output analysis can be found in Leontief (1966). Midmore (1991), and Miller (Miller and Blair, 1985) give a good background on input-output models. Dewhurst et al. (1991) include some new developments in regional input-output modeling, and address issues in modeling and interpretation. Archer (1995) discusses some data issues in tourism and important considerations in survey design.

Input-output models are used in the analysis of economic impacts of tourism (Archer and Fletcher, 1990, 1996). A discussion of tourism multipliers can be found in Archer (1977).

II.1.3 Economic Impact Literature on the CCBNEP and Other Estuary Programs

Several national estuary programs were contacted for economic impact studies conducted by these programs. The Barrataria-Terrebonne National Estuary Program (BTNEP) published “Economic Value Assessment for the Barrataria-Terrebonne Estuarine Complex” (Industrial Economics, Inc., 1995). This study used an input-output model to estimate economic impacts of industry, commercial fishing and recreational activities in the BTNEP area. The study also calculated values associated with recreational activities using consumer surplus values per day of recreational activity from existing literature. Other studies conducted for the Albemarle-Pamlico (Industrial Economics, Inc., 1995) and Galveston Bay National Estuary Programs (Whittington, et al., 1994) use travel cost models or contingent evaluation methods to estimate recreational values.

For the CCBNEP study area, the Fesenmaier study (Fesenmaier, et al., 1987) estimated economic impacts of recreational and commercial fishing and other recreational activities. Jones, et al., 1996 gives background for the CCBNEP and lists direct impacts at the regional level for several industries. Where relevant, results obtained in the present study are compared with the studies by Fesenmaier (Fesenmaier, et al., 1987) and Jones (Jones, et al., 1996).

II.2 Export Base Theory: Export and Residentiary Industries

The purpose of the present study is to provide an economic impact analysis on the CCBNEP study area of the industries and activities related to area bays and estuaries. This section provides a brief description of the concepts from regional economic theory on which the analysis is based.

Economic impact analysis is based upon a regional economic development concept referred to as “economic base” or “export base” theory (Richardson, 1969). This theory states that growth of a region is initiated by and depends primarily on its ability to produce goods and services “exported” from the region. Hence, industries or sectors of a regional economy may be divided into two groups: (1) export sectors; and (2) residentiary sectors. Export sectors produce goods and services sold outside the region, thus stimulating inflow of new money into the region. It is this group of industries that provide the stimulus for growth when demand for their products is expanding, and also cause a decline in economic activity within a region when export demand slackens. Since the primary factor in placement within this group is that production and sales cause new money flows into the local region, “exports” may be defined quite broadly and typically include the following industries:

- Agriculture
- Mining
- Manufacturing

- Non-Residential Construction
- Tourism
- Federal Government
- State Government

Residential sectors produce goods and services primarily for local markets and consumers within the region. Whereas demand for goods and services of these sectors of the economy is viewed as dependent upon the success of export sectors, their role in economic growth of a region is no less important. The primary function of residential industries is to provide goods and services to export industries of the region and to employees and households. The group of residential industries typically consists of:

- Business Services
- Personal Services
- Wholesale Services
- Retail Services
- Financial Institutions
- Local Governments
- Residential Construction
- Transportation/Communications/Utilities

This classification implies a cause and effect relationship that flows throughout the local economy. That is, new income and employment derives from the sale of goods and services to parties outside the local region which, in turn, creates local business and personal demand for the goods and services provided by residential industries. Hence, total income and employment of the region is derived from export industries and expanded by residential industries. This expansion is called the “multiplier effect” which will be addressed in more detail later in this report.

As local export industries increase output and thereby generate more employment, income and demand for goods and services of local residential businesses, some economic impacts flow to other regions. Clearly, not all the demand for production inputs by export industries can be met by local residential businesses. Likewise, some goods and services demanded by employees and households are not available locally, or these consumers decide to make purchases outside the region. Imports into the local region to serve these needs means that some money flows out of the region, thereby creating economic impacts elsewhere. In this study, estimated economic impacts falling outside the CCBNEP area are limited to those occurring Texas.

One note of caution is in order relating to the classification of local businesses as either export or residential in a regional economic analysis. While this classification facilitates economic impact analysis, it is clear that in some cases a specific industry may be one or the other, or both. For example, consider the retail sector of a local economy. Retail stores exist primarily to serve local residents in a typical city. However, construction of a large shopping mall with retail stores of many varieties may cause shoppers to travel from remote areas whose purchases would constitute an export activity.

Numerous other examples could be given relating to medicine, construction, financial centers, etc. For this study, industries are classified based on their primary

function in the economy—either export or residentiary. Since this classification also relates to human use of bays and estuaries, misclassification does not appear to be a significant problem.

II.3 Input-output Analysis

Input-output models originated with the work of Wassily Leontief (Leontief, 1966) on a general theory of production based on economic interdependence among producing sectors of the economy. Input-output models follow a general equilibrium approach, and have been useful in analyzing the aggregate economy. These models show how a change in one sector will affect all other sectors of the economy. Input-output models have been used in forecasting, planning development, and analysis of technical change.

An input-output model calculates multipliers which show the impact of an increase in the output of one sector on other sectors. There are several multipliers, depending on the economic variable of interest:

1) The output multiplier which is an estimate of the change in total output (business sales) by all sectors within the regional economy that results from a change in sales to final demand by one particular sector in the economy.

2) The employment multiplier which estimates the change in total employment (all jobs) throughout the regional economy that results from a change in sales to final demand by a given sector.

3) The total income multiplier which is an estimate of the change in total household income from all sources (wages, salaries, profits and rents) resulting from a change in sales to final demand of a given sector.

4) The value added multiplier which is an estimate of the change in total, regional economic returns from the employment of all resources of production in the economy from a change in sales to final demand by a given sector. Value added is the same as the value of all goods and services produced within the CCBNEP study area. It is analogous to Gross Domestic Product as reported at the national level. Hence, value added within a region may be referred to as Gross Regional Product.

Multiplier estimates are expressed as the impact on a selected economic variable of a one dollar change in final demand. It is assumed that the functional relationship to final demand is linear so the multiplier may be used to estimate the impact of larger sales to final demand by any given sector in the economy.

The notion of multipliers rests on the difference between the initial effect of a change in final demand and total effects of that change. Total effects can be defined as the sum of direct and indirect effects (which does not include the effects generated by the increase in household incomes) or direct, indirect, and induced effects (which includes the effect of increased household incomes on the economy) (Miller and Blair, 1985). Impact estimates in this study include the effect of increased household incomes along with direct and indirect impacts.

II.4 Characterization of the Regional Economy

The first step in estimating direct economic impacts is the classification of regional industries into export and residentiary groups. The primary focus of impact analysis is on export industry groups and their direct economic impacts, defined as the annual amount of sales or other sources of income flows into the region. Of particular interest in this study was identifying those export industries related to the CCBNEP study area and understanding the nature of the relationship. To accomplish this, an “economic triage” was conducted by categorizing industries into one of three groups depending upon the extent and manner in which the industry is related to the bay. The three categories are:

Category I - Industries/activities that use the bays for navigation/transportation or industries not directly affected by the aesthetics and water quality of the bays. Because of locational advantage, convenience and other cost advantages, these industries are enhanced by their proximity to the bay. Industries in this category include:

- Petroleum refining industries
- Chemical industries
- Oil and gas extraction
- Sand, gravel, and other mining and quarrying
- Ship and boat building and repairing
- Water transportation and transportation services
- Military (marine related)

Category II - Industries/activities whose volume of business is affected directly by the quality of water and aesthetic appearance of the bays and estuaries. This category includes:

- Prepared fish and seafood
- Tourism, retail and related industries
- Commercial fishing

Category III- Industries whose activities are largely unaffected by the bays but may affect the quality of the bays. Export industries in this category include:

- Agriculture (crops and livestock)
- Food manufacturing(other than seafood)
- Heavy construction(except oil platforms)
- State government
- Military (non-marine related)

This triage or characterization provides a convenient means of understanding the various ways in which important export industries relate to the bay system and the regional economy. Clearly, the bays and estuaries provide significant amenities to a wide variety of economic activities ranging from recreation activities to heavy industry. All these activities contribute to the strength of the regional economy.

In addition to the private export industries previously listed, the bays are an important factor in the location of several government activities. These include: US Navy training and operational bases, federal and state marine research agencies, federal and state regulatory agencies, and other government functions. Many are located in the CCBNEP study area because their functions and duties relate to the bays and estuaries. Economic impact of these governmental activities is comparable to private business or individual activities previously listed. For purposes of this study, expenditures of those governmental agencies that focus primarily on marine activities or use the bays for their purposes (i.e. the military) are included as part of the regional export base.

There are other forces of growth in the region such as retirees from other states who live in the region for several months during the winter (Winter Texans), non-marine government, or other autonomous investments. These sectors are not identified separately in this study due to lack of complete information. Perhaps the most important category is Winter Texans. A recent survey documents valuable information on Winter Texans but does not include expenditure categories of this group or how many travel to the CCBNEP study area. (Vincent, et al., 1996)

Highlights of the survey show:

- An estimated 97,000 Winter Texans were in the Rio Grande Valley (excluding those living with family or in own housing)
- Retirees (typically from the Midwest) spend about \$700 to \$1000 per month on living expenses with an average income in the \$30,000 to \$34,000 range.
- Direct impacts of Winter Texan travel in 1994-1995 tourism season were estimated to be \$250 million to the Rio Grande Valley economy.

III. Estimation of Direct Impacts

Activities in the economic sectors previously listed provide economic benefits to the economies of the region where these activities occur as well as throughout Texas. These economic impacts can be classified into direct and secondary impacts. Impacts on a regional or state economy are measured by total output value, employment or total income paid by sector. However, not all sectors' direct value of output or sales can be measured directly due to lack of data. Direct impacts estimation for industries such as manufacturing and agriculture are more straightforward since output and employment figures are readily available in published form. Estimation of economic impacts for recreational activities is not so straightforward. Recreational sectors such as recreational fishing, birdwatching, and other recreational activities do not have immediately measurable economic values. However, contribution to local businesses is significant as participants in these activities generate income for local economies by spending generated through these activities. These direct impacts also have secondary impacts on regional and state economies. To estimate secondary impacts of these activities, direct expenditures have to be estimated, then allocated to sectors that exist in the Standard Industrial Classification (SIC) to match up with the input-output model. Hence, the choice of sectors is limited to ones listed under the SIC system.

In addition, care must be taken to ensure that direct impact estimates are accurate and comparable in terms of date, area covered, and industry contribution to the economy. Table III. 1 shows the variables used as direct impact estimates for the export sectors classified as bay related.

Table III.1. Direct impact measures for export sectors in the CCBNEP study area

Sectors	Direct Impact Measure
Heavy Industry and Manufacturing	Sales to final demand
Commercial Fishing	Total ex-vessel value of catch
Recreation and Tourism	Travel expenditures within the region
Agriculture	Cash receipts from sales
Government	Marine agencies total salaries
Military	Military and civilian payroll and contracts

III.1 Data Sources

For direct impacts, the following sources of data were utilized:

- Texas Workforce Commission (TWC) wage and employment data for all industry classifications by county, for 1993-1995
- IMPLAN data for 1990-1992-1994, which has output and employment data for each industry matched by industry classification numbers
- Texas Department of Commerce (TDOC), Tourism Division data which has travel expenditures by county 1993-1995, as well as expenditures on different spending categories. This data source is discussed in more detail in the section on direct impact estimation for recreation and tourism
- Texas Agricultural Extension Service (TAES), Estimates of Value of Agricultural Production by County, 1993-1995
- National Marine Fisheries Service (NMFS), which includes shrimp values by county and by area caught from 1993-1995
- Trends in Texas Commercial Fishery Landings, 1972-1995, by Robinson, Campbell, and Butler, published by the TPW, which includes data on fish species and ex-vessel values for each bay system and Gulf grid zone for the CCBNEP area
- D.K. Shifflett and Associates Ltd. (D.K.S.&A Ltd.) Directions® Performance/Index Survey made available by the Texas Department of Commerce, Tourism Division. These data have business and leisure travel expenditures per person day and other related travel data for the CCBNEP area

In what follows, estimation of direct impacts in previously identified sectors is explained in detail. These direct impacts are then used in the IMPLAN model to estimate secondary impacts.

III.2 Heavy Industry and Manufacturing

Measured in terms of value of production, sales or employment, heavy industry and manufacturing are the largest components of the CCBNEP study area economy. For the most part, business volume of these industries depends on use of bay transportation and navigation facilities, the ship channel to the Gulf of Mexico, and the Gulf Intracoastal Waterway (GIWW). The two exceptions to this generalization are the prepared seafood and fish industry, and the ship and boat building industries whose businesses either totally or partially depend upon water and habitat quality of the CCBNEP study area. Transportation of petrochemicals, including products ranging from imported oil to finished petroleum and chemical goods, is the single largest industrial use of the bays and estuaries.

Table III. 2 shows average quarterly employment and annual wages in the industry and manufacturing sectors in the CCBNEP study area in 1995.

Table III.2. Employment and wages for heavy industry and manufacturing sectors in the CCBNEP study area, 1995

Sectors	Employment	Wage (\$millions)
Natural gas & crude petroleum	1,671	21.49
Natural gas liquids	114	1.29
Maintenance and repair oil and gas wells	4,503	31.80
Stone, sand, gravel, chemical mining	95	0.63
New highways and streets	1,734	8.89
New mineral extraction facilities	4,133	29.50
Seafood	26*	N/A
Misc. food preparations except seafood	210*	N/A
Chemical products	3,641	48.03
Petroleum refining	3,311	43.80
Paving, coatings, etc.	57	0.57
Lubricating oils, coal products, etc.	64	0.03
Ship and boat building and repairing	846	6.29
Water transportation	529	3.80
Total	20,934	196.12

Source: Texas Workforce Commission, 1993-1995

*IMPLAN 1994

III.2.1 Petroleum Refining and Chemical Industries

Petroleum refining has been an important sector in the CCBNEP study area ever since oil was discovered in the Coastal Bend region. Although there has been a decline in oil production since the 1970's, petroleum refining and petrochemical production has continued to grow as processing has utilized imported oil from outside the region as a source of input. With continued dependence on imported oil, refining may be expected to increase.

Petroleum refining and chemical industries provided 6,952 jobs and accounted for 46.8 percent of wages of sales to final demand of all industrial and manufacturing sectors in 1995 (Table III.2).

In the present study, the Port and related businesses are included in the Water Transportation and Services sector, following the SIC convention. Estimated impacts of this sector are not directly comparable to those of Martin O'Connell and Associates, (1995). In 1995, the TWC reported water transportation businesses in the CCBNEP study area provided 529 direct jobs and paid \$3.8 million in wages (Table III.2).

III.2.2 Construction

Heavy construction is included in this study as a bay related industry because of the importance of offshore oil and gas extraction. Construction of platforms and drilling equipment to serve development of oil and gas wells in the bays and estuaries, as well as further offshore are a significant part of the heavy construction industry in the CCBNEP study area. Texas Workforce Commission data shows that the construction of new mineral extraction facilities accounted for 4,133 jobs and \$29 million in wages in the area in 1995 (Table III.2).

III.2.3 Mining

Mining activities include oil and gas extraction, and stone, gravel, and chemical mining. Extraction of natural gas and crude petroleum is the most important activity in the area. This sector includes both inland oil and gas production and production in the bays and estuaries. The petroleum extraction industry has a long history of significance in the regional economy even though, in recent years, volume of production and value of oil and gas has steadily declined.

Also included in the bay related mining activity is the Stone, Sand, Gravel and Chemical mining sector. While the size of this industry is not large compared to oil and gas extraction, it does use water transportation to move products, especially along the GIWW.

III.2.4 Ship and Boat Building and Repairing

The Ship and Boat building industry is directly bay related as it supports offshore petroleum extraction as well as commercial fishing industries. Moreover, sport fishermen and other boating recreationists depend upon this sector for repairs and other services.

III.2.5 Seafood Manufacturing

Classified as manufacturing is the preparation and processing of shrimp, fish, and other seafood. In the CCBNEP study area, this industry is made up primarily of frozen seafood. This manufacturing industry is closely linked to local commercial fishing.

III.2.6 Methodology for the Estimation of Direct Impacts for the Industry and Manufacturing Sectors

In this study, sales to final demand was used as an estimate of direct impact that generates economic activity. As previously indicated, sales to final demand include those activities that generate new money flows into the regional economy, namely exports, sales to consumers, sales to government, and expenditures of visitors to the region for recreation, tourism, or other purposes. There exists no available statistical series on sales to final demand by regional manufacturing firms. A survey of these firms was beyond the scope of this study.

As an alternative, manufacturing sales to final demand for 1995 were estimated using data series available on employment from the TWC and data on final demand contained within the IMPLAN models for 1990, 1992 and 1994.

The estimation procedure involved three steps:

1. Quarterly employment data made available by the TEC were compiled for each industry by SIC and county for the CCBNEP study area during 1990-1995. Three year averages for employment using each year's average quarterly employment were calculated for each industry and aggregated over counties to a regional total.
2. A productivity ratio (final demand to employment) was calculated for each industry using the CCBNEP study area IMPLAN estimates of final demand and aggregated TWC data for employment in 1990, 1992, and 1994. This ratio expresses sales to final demand per employee in each of the respective manufacturing industries. The magnitude is less than conventional output to employment ratios because not all manufacturing output is sold to final demand.
3. The industry productivity ratio was then multiplied by the industry 1995 average quarterly employment from the TWC to obtain an estimate of 1995 sales to final demand (direct impacts). This procedure provided an estimate of 1995 final sales to consumers, exports from the region, and sales to government for each of the manufacturing industries identified as being bay related.

An exception to the estimation procedure was the sector entitled "Maintenance and Repair, Oil and Gas Wells". Due to lack of reliable sales to final demand data for this sector, an approximation was made by assuming the same final demand to output ratio as the oil and gas production sectors, and applying this ratio to the 1995 total output for the "Maintenance and Repair Oil and Gas Wells" sector from the IMPLAN data. This gave an estimate of sales to final demand for this sector.

Estimated 1995 sales to final demand (direct impacts) for each bay related manufacturing industry are shown in Table III.3. Tables that show the estimation procedure, data and productivity ratios are shown in Appendix I.

Table III.3. Estimated final demands and their relative share for the heavy industry and manufacturing sectors for the CCBNEP study area, (1995)

Sectors	Final Demand (\$ millions)	Total Aggregate Sectors (\$millions)	Share of total (%)
Natural gas and crude petroleum	19.97		
Natural gas liquids	12.14		
Maintenance and repair, oil and gas wells	6.02		
Total Oil and gas extraction		38.12	2.5
Mining and quarrying of nonmetallic minerals (sand, gravel, chemical mining)	1.01	1.01	0.1
New highways and streets	64.10		
New mineral extraction facilities	90.32		
Total Heavy construction		154.22	10.1
Fresh and frozen seafood	7.53		
Miscellaneous food preparations except seafood	39.92		
Total Miscellaneous food		47.45	3.1
Aggregate chemical products	449.18	449.16	29.5
Petroleum refining	717.29		
Paving, coatings, etc.	0.20		
Lubricating oils, coal products, etc.	36.51		
Total Petroleum refining and related industries		754.00	49.4
Ship and boat building and repairing	26.21	26.21	1.7
Water transportation	32.03		
Transportation services	23.10		
Total Water transportation services		55.13	3.6
Total	1,525.3	1,525.3	100

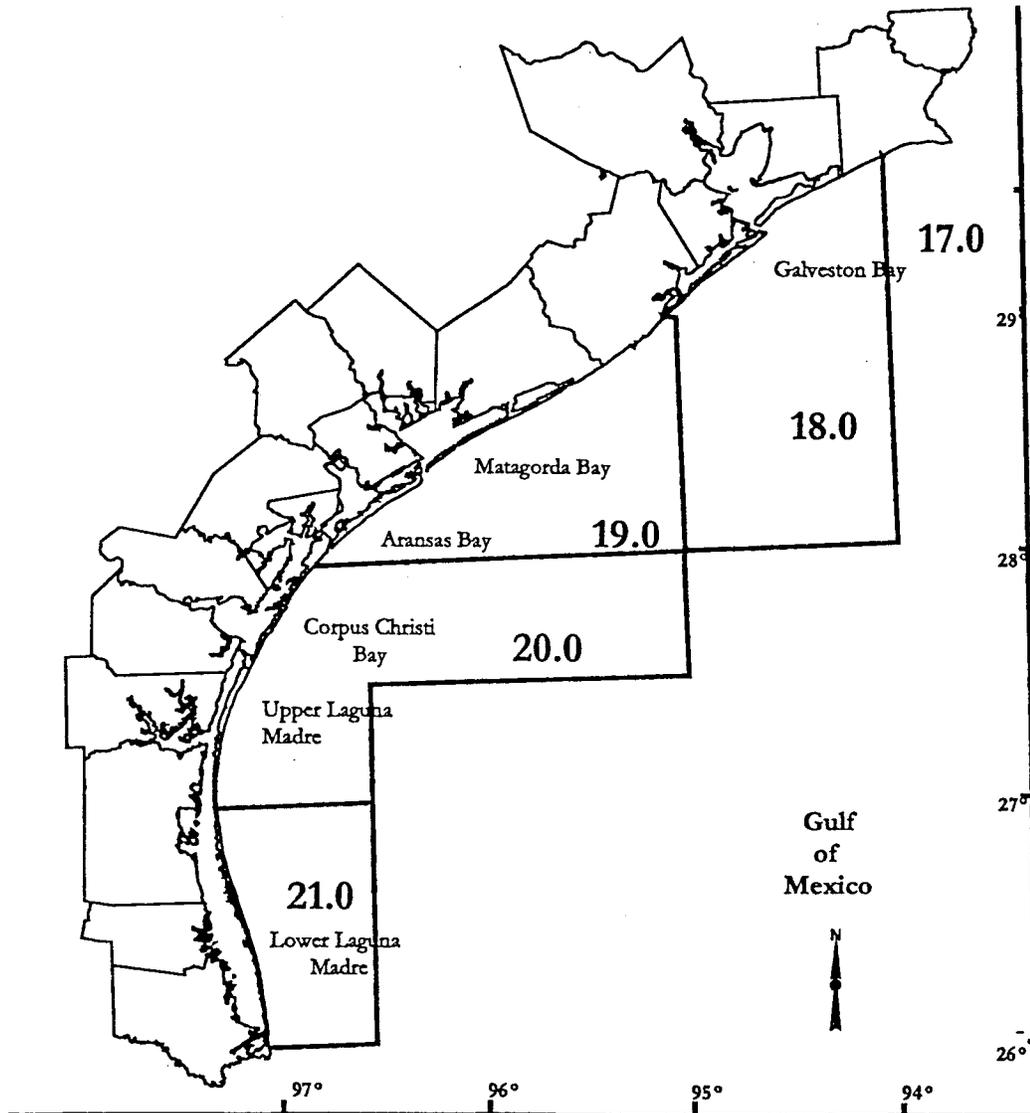
Source: IMPLAN and TWC, 1993-1995

III.3 Commercial Fishing

Figure III.1 shows the bay and Gulf grid zone specifications used by NMFS and TPW to document commercial landings. Commercial fishing in the CCBNEP study area is composed of two distinct activities: bay fishing and Gulf fishing. Bay fishing is done primarily with smaller boats that sell catches at points of landing in the local area. Gulf fishing uses larger commercial boats that may fish over a wide expanse of the Gulf of Mexico. Gulf boats fishing waters off the CCBNEP study area sell their catch locally or outside the region. Likewise, Gulf boats fishing in areas remote from the CCBNEP study area may land fish and shrimp in CCBNEP counties.

Figure III.1. Gulf Grid Zone 20

Texas bay system and Gulf of Mexico grid zones

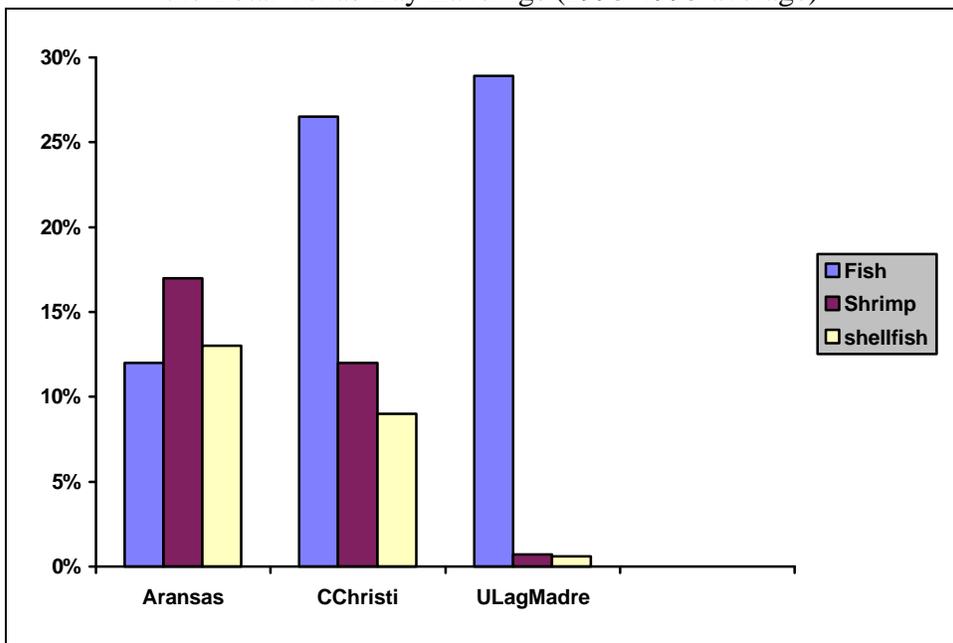


The Corpus Christi and Aransas bay systems together account for \$16 million in finfish and shrimp landings (estimated from Robinson, et al. 1996 and NMFS, 1993-1995). The Coastal Bend is ranked second in Texas in total seafood landings by weight and economic value. Annually, about eight million pounds of seafood are landed by commercial fishermen in the waters around the Coastal Bend. Half of the landings are shrimp, followed by blue crab, Eastern oysters, and finfish (CCBNEP, 1996).

Most finfish landings in Texas come from the Corpus Christi, upper and lower Laguna Madre Bay systems (Robinson, et al. 1996). Total finfish landings in these three bay systems account for about 75% of all finfish landings in Texas (Figure III.2). Aransas and Corpus Christi bay systems together account for about 30% of total shrimp landings by bay system in Texas.

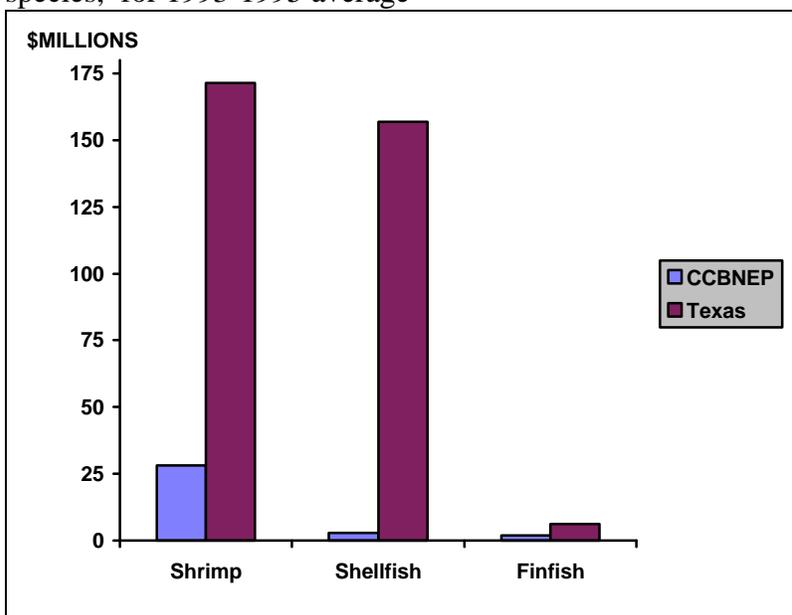
Figure III.2 shows value of ex-vessel landings both from bay systems and Gulf grid zone 20 compared to Texas totals for bay and gulf during 1993-1995. The value of shrimp and shellfish far outweigh the value of finfish in both the region and Texas. Brown shrimp is the most valuable of all species, and Aransas and Corpus Christi bay systems account for about 42% of all brown shrimp landed in Texas bay systems. Average value of each species for the CCBNEP area is shown in Figure III.3.

Figure III.2 Percentage share (in terms of ex-vessel values) of CCBNEP bay systems of the Total Texas Bay Landings (1993-1995 average)



Source: Robinson, et al., 1996

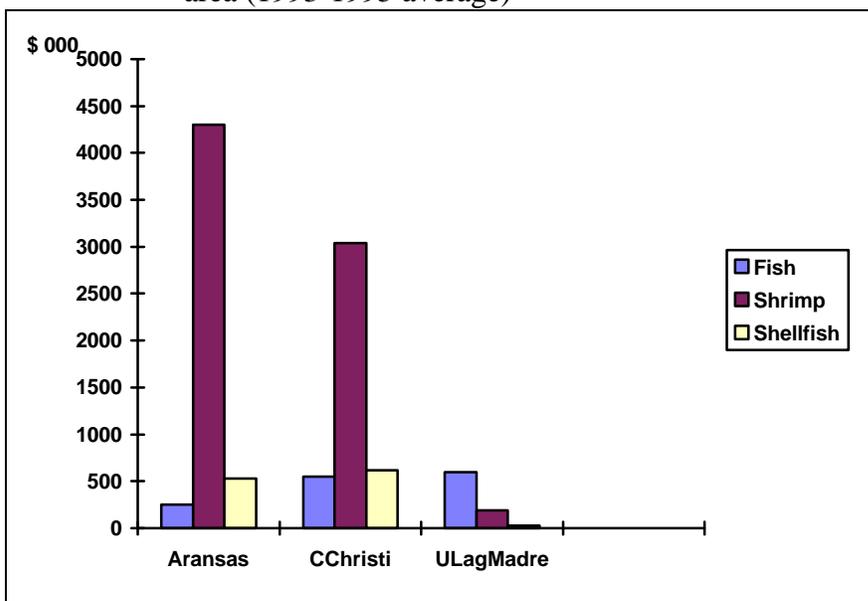
Figure III.3 Average Texas and CCBNEP (Gulf+Bay) ex-vessel value of landings, by species, for 1993-1995 average



Source: Robinson, et al., 1996

As seen in Figure IV.4 , shrimp accounts for the highest value of all species in the CCBNEP study area. Of the three bay systems, upper Laguna Madre has the highest finfish landings in terms of value and weight. The Aransas bay system accounts for the highest value in shrimp landings.

Figure III.4. Total value of finfish and shrimp landed by Bay System in the CCBNEP study area (1993-1995 average)



Source: Robinson, et al., 1996

Direct impacts for the commercial fishing industry were estimated by total ex-vessel value of finfish, shellfish, and heads-off shrimp landed in the three bay systems and the Gulf grid zone 20. Total value of commercial fishing in the area was estimated using data from Robinson, et al., 1996 and NMFS. Commercial fishing data compiled by TPW has finfish landings by bay system and Gulf grid zone (by area caught). TPW data were used to estimate total value of finfish and shellfish. For commercial shrimp, data from NMFS was used. These data include shrimp landings by bay system and by Gulf grid zone and is reported by both area caught and county landed. Shrimp data by NMFS is heads-off so it is not directly comparable with the TPW data. Unless otherwise noted, shrimp data in this study are for heads-off shrimp.

In estimating direct impacts, three distinct cases were considered. Direct impacts were estimated by bay system only, Gulf grid zone 20 catch, and by total value of Gulf and bay landings in CCBNEP counties, regardless of where caught.

III.3.1 Direct Impacts by Bay System

For the commercial fishing industry, ex-vessel values of finfish, shrimp, and shellfish were used as an estimate of direct impacts. Ex-vessel values from 1993-1995 were compiled from the two data sources for each species, then three year averages were calculated. Using a three year average accounts for annual variations in landings and prices and gives a more accurate estimate of direct impacts. Table III.4 shows the average annual value for each species by bay system.

Table III.4. Ex-Vessel Value (Direct Impacts, \$millions) for finfish, shrimp, and shellfish by bay system (1993-1995 average)

	Aransas	Corpus Christi	UpperLagunaMadre	Total
Finfish	249,381	548,731	597,814	1,395,926
Shrimp	4,299,547	3,040,416	186,671	7,526,634
Shellfish	528,374	616,764	28,018	1,173,156
Total	4,567,679	6,924,924	1,004,670	10,095,666

Source: Robinson et al., 1996

III.3.2 Direct Impacts of all CCBNEP study area landings from the Gulf and Bay systems

As previously mentioned, shrimp landings are reported both by area caught and county landed. It is important to have the two sets of direct impacts to make a distinction between value by area caught and value by county landed. Estimated values of shrimp and fish by county landed in the region may be of more immediate significance in terms of current, direct impact to the regional economy within the time frame of this study. This estimate includes value of shrimp and fish landed within the region during the period studied irrespective of the Gulf grid zone or bay system caught. As previously mentioned, for shrimp, these data were readily available.

To estimate finfish landings, percent shares of total shrimp landings from all bay systems and Gulf grid zones for Aransas and Nueces counties were estimated and applied to total bay and Gulf finfish and shellfish landings for the Gulf of Mexico. Table III.5 shows estimated finfish and shrimp landed in Aransas and Nueces counties from any bay system or gulf grid zone in the Gulf of Mexico.

Table III.5. Ex-vessel values (\$ millions) of finfish, shellfish, and shrimp landed in CCBNEP counties from all bay systems and Gulf grid zones (1993-1995 average)

Year	<u>Aransas</u>		<u>Nueces</u>		Total
	Fish+Shellfish	Shrimp	Fish+Shellfish	Shrimp	
1993	660,914	23,226,431	58,374	2,051,435	25,997,154
1994	1,417,769	28,802,138	127,329	2,586,697	32,933,933
1995	1,498,176	24,129,655	85,625	1,379,081	27,092,537
3-year average	1,922,286	25,386,075	90,443	2,005,737	28,674,541

Source: Robinson et al., 1996

III.3.3 Direct Impacts by Area Caught

A third case exists, which is based on total fish and shrimp caught in the Corpus Christi and upper Laguna Madre Bay Systems and Gulf grid zone 20 regardless of whether it is landed inside or outside the region. Table III.6 shows ex-vessel values for shrimp caught in Gulf grid zone 20 but landed in counties outside the CCBNEP study area. From a perspective of the economic potential of the CCBNEP study area waters, the estimate for total catch from the Gulf grid zone 20 and CCBNEP bay systems may be the best, even though some immediate impacts on coastal economies will fall outside the CCBNEP study area. This alternative was considered as the base scenario for direct impacts of commercial fishing for the region.

Table III.6. Ex-vessel value (\$) of shrimp caught in Gulf grid zone 20 by area landed

	1993	1994	1995	Total	3 yr Average
CCBNEP	4,089,116	4,969,274	8,626,468	17,684,858	5,894,953
FL-Escambia	3,532	nr	nr	3,532	1,177
FL-Gulf	1,997	nr	nr	1,997	666
AL-Baldwin	495,371	nr	nr	495,371	165,124
LA-Iberia	65,442	nr	nr	65,442	21,814
LA-StMary	10,502	nr	nr	10,502	3,501
LA-LaFourche	nr	nr	67,165	67,165	22,388
LA-Vermilion	139,816	nr	159,884	299,700	99,900
TX-Brazoria	109,062	56,953	45,022	211,037	70,346
TX-Calhoun	79,765	527,729	nr	607,494	202,498
TX-Cameron	11,595,131	13,902,672	15,635,861	41,133,664	13,711,221
TX-Jefferson	100,681	839,140	47,699	987,520	339,840
Total	16,690,415	20,295,768	24,582,099	61,568,282	20,522,761

nr = none reported

The 1993-1995 average of ex-vessel values of total Gulf grid zone 20 harvest of finfish, shrimp, and shellfish (including all counties outside the CCBNEP study area) was estimated to be \$21.01 million, partitioned as follows:

Shrimp \$20,522,761
 Finfish \$489,494
 Shellfish \$366

The three scenarios considered in the model are:

- I. CCBNEP bay systems catch: \$10.1 million
- II. CCBNEP bay systems catch and Gulf grid zone 20 catch: \$31.1million
- III. Gulf and bay landings in the CCBNEP study area from all other bays and the Gulf: \$28.7 million (base scenario).

The 1987 Fesenmaier study (Fesenmaier et al., 1987) estimated a higher direct impact for gulf fishing. This is due partly to the method used to estimate direct impacts for gulf shrimp landings. The 1987 study used total heads-on shrimp landings for all gulf grid zones and allocated these landings to the different bay systems using a weighting scheme developed for previous fisheries resource studies conducted by the Texas Water Development Board (TWDB) (Fesenmaier et al., N-M-A Estuary report, p.17, 1987). In the present study, data for the Gulf grid zone 20 were available in sufficient detail so landings value could be estimated more precisely.

III.4 Recreation and Tourism

Recreational tourism is an important economic stimulus to the CCBNEP study area. Leisure travelers partake in a number of different recreational activities. Important among these are recreational fishing, birdwatching, windsurfing, and camping. Leisure travelers also engage in different activities such as visiting a cultural site or museum, or shopping and entertainment. Economic impacts of recreation on the regional economy occurs when any of these visitors

spend money for these various activities. In the aggregate, the economic impact of recreation and tourism is dependent upon the number of visitors to the area and the amount of money that spent while in the area.

III.4.1 Estimation of direct impacts

For the CCBNEP study area, three sources of data were available for estimating direct economic impacts of recreational tourism. These were:

- Fesenmaier study of recreational visitation and expenditures along the Texas Coast in 1987. (Fesenmaier, et al., 1987)
- D.K.Shifflett and Associates Ltd. survey results supplied by the TDOC (D.K.S.&A Ltd., 1996).
- Texas Department of Commerce and U.S. Travel Data Center, Travel Spending for Texas Counties, 1987-1995. (TDOC, 1996)
- Wellman and Noble study. The results of on-site user survey for a sample of recreationists in the CCBNEP study area.(Wellman and Noble, 1997)

The D.K.S.&A Ltd., 1996 survey data contacts an average of 25,000 households/ month nationwide. Survey results contain data on time spent on recreational activities and expenditures for the Corpus Christi Designated Market Area (DMA). The Corpus Christi DMA includes 10 of the 12 counties in the CCBNEP study area (excluding Live Oak and McMullen). This data source was used to estimate expenditures in the region for the tourism and recreation sectors since it was the most comprehensive data set for the purposes of this study. D.K.S.&A Ltd. data on total travel spending by county were obtained from the TDOC. The total (business+leisure) travel expenditures, travel related employment, and payroll for 1995 as reported by the TDOC are shown in Table III.7.

Table III.7. Travel expenditure, payroll, and employment for the CCBNEP area counties, 1995

County	Travel Expenditure (\$millions)	Travel Payroll (\$millions)	Travel Employment (Thousands)
Aransas	44.30	8.81	0.68
Bee	9.94	1.96	0.15
Brooks	4.87	0.81	0.06
Duval	5.18	0.83	0.06
Jim Wells	18.25	3.56	0.28
Kenedy	0.37	0.07	0.00
Kleberg	24.04	5.41	0.45
Live Oak	18.64	3.02	0.22
McMullen	6.92	0.98	0.06
Nueces	472.36	130.61	8.44
Refugio	4.50	0.75	0.06
San Patricio	23.21	4.22	0.32
Total	632.58	161.03	10.78

Source: TDOC, 1996

To account for annual fluctuations in visitation and expenditures, a three year average of 1993-1995 travel expenditures were calculated from the TDOC data for the 12 counties. This is total travel expenditures and includes business travel. Total expenditures were then separated into business and leisure travel expenditures by using the D.K.S.&A Ltd. survey breakdown of travel expenditures for the Corpus Christi DMA. Expenditures on leisure travel as a percent of the total were calculated for 1993 through 1995, then averaged. This provides a three year weighted average with the years in which leisure travel accounted for a higher percentage of the total receiving more weight in the average. Travel expenditures and the percent share of leisure travel are shown in Table III.8.

Table III.8. Total and leisure travel expenditures estimates for the CCBNEP study area, 1995.

	Total expenditures (business+leisure) (\$ millions)	Leisure travel as a percent of total (%)	Leisure Travel Expenditures (\$ millions)
1993	577.75	39.24	226.71
1994	622.18	46.32	306.72
1995	632.58	47.00	297.31
3-yr Average	610.84	45.33	276.91

Source: Estimated from TDOC and D.K.S.&A. Ltd., 1996

The TDOC data do not include travel within 100 miles. Therefore, an adjustment was made to include an estimate of leisure travel within the CCBNEP study area as follows:

Fesenmaier et al. 1987, estimated a total of 2,601,690 visits to the Nueces-Mission-Aransas area in 1986. Of these, 11.2% or 291,389 visits were from Nueces county. Total population of Nueces county for 1986 was 294,650. This means that, on average, 99% of the population made a recreational visit to the area. This percentage was used to estimate local recreational visits in 1995. This was done by taking the 3-year average of the population of the 12 county CCBNEP study area (537,059) and multiplying by 0.99 to get an estimated 531,688 local visits for recreational purposes.

To estimate expenditures by the tourist related industry, average daily expenditures from D.K.S.&A Ltd. were used. These expenditures were then allocated to the corresponding sector in the input-output model. Distribution of expenditures are given in Table III.9.

Table III.9. Distribution of leisure expenditures per person day, Corpus Christi DMA, 1995.

Expenditure Category	Travel Expenditures	
	\$/ person day	% of total
Transport	17.3	27.12
Lodging	10.6	16.61
Food	15.5	24.29
Shopping	10.3	16.14
Entertainment	7.1	11.13
Other	3.0	4.70
Total	63.8	100%

Source: D.K.S.&A Ltd., 1996

For people traveling within the CCBNEP study area, it was assumed that each person spent \$10 per day on transportation instead of \$17.3. Other expenditures were

assumed to be the same. Thus, total expenditures per day by local visitors equaled \$56.5 which resulted in a total direct impact of \$30.04 million. Estimated total direct impacts on all tourist related sectors are shown in Table III.10.

Table III.10. Direct impacts of tourism related sectors in the CCBNEP study area,1995 (leisure only)

Expenditure category	>100miles	<100 miles (\$ millions)	Total	Corresponding Sector
Transport	37.55	5.31	42.86	Gas Service Stations
Lodging	45.99	5.64	51.63	Hotels and Lodging
Food	67.28	8.24	75.50	Eating Est.+ Food Stores
Shopping	44.69	5.48	50.17	Miscellaneous Retail
Entertainment	30.82	3.77	34.59	Amusement, Theaters.etc
Other	13.02	1.59	14.60	Miscellaneous Retail
TOTAL	239.35	30.40	269.75	

Source: Estimated from D.K.S.&A Ltd. and TDOC.

Business travel expenditures account for about 60% of total travel expenditures in the CCBNEP study area. Classification of business travelers as in the D.K.S.& A Ltd. survey, suggests the respondent did not indicate leisure activities as the primary purpose of the trip. Nevertheless, availability of a wide range of bay related recreational activities, bay related attractions, and the general coastal ambience of the area probably attracts a number of conferences, association meetings, and other organized business activities. An effort was made in this study to discern what proportion of all such business activities could be attributed to the attraction of the bay. Unfortunately, no information could be obtained. As a second best solution, a second scenario for tourism impact was developed that included both business and leisure travel expenditures for visitors from more than 100 miles away from the CCBNEP area. These scenarios should be considered to be lower (leisure only) and upper (leisure+business) limits on direct impacts of recreational travel to the CCBNEP area.

In the second scenario, direct impacts for business travel were estimated and allocated to the tourism related sectors in the same way as the original scenario. Total expenditures for business travelers were \$340.10 million (1993-1995 average). Estimation of business travel impacts are shown in Table III.11. Combining expenditures by leisure (Table III.10) and business (Table III.11) travelers yielded an estimated total for this scenario of \$541.83 million in 1995.

Table III.11. Direct impacts of tourism related sectors in the CCBNEP study area, 1995
(business only)

Expenditure Category	Breakdown of expenditure (%)	Total expenditures by sector (\$ millions)	Corresponding Sector
Transportation	40	68.02	Gas Service Stations
Lodging	24	81.62	Hotels and Lodging
Food	18	61.22	Eating Est.+ Food Stores
Shopping	11	37.40	Miscellaneous retail
Entertainment	4	13.60	Amusement, theaters
Other	3	11.22	Miscellaneous retail
Total	100	272.08	

Source: Estimated from D.K.S.&A Ltd. and TDOC

III.4.2 Visitation patterns and trends

Total number of leisure visitor days to the CCBNEP area from locations 100 miles or more away were estimated from the D.K.S.&A Ltd. and TDOC using estimates for total expenditures and expenditures per day by leisure travelers. Total leisure travel expenditures for the CCBNEP study area (1993-1995 average) were \$276.91 million; travelers spent \$63.8/person/day on average. Dividing total expenditures by per-person expenditures yields an estimated average of 4,340,282 annual visits during 1993-1995 from 100 miles or more away. Adding to this the estimated 537,059 visits within the CCBNEP area yields an estimate of 4,766,996 visits. This represents a 19% increase compared to 3,878,963 visits estimated in 1987 by Fesenmaier et al. 1987.

Activities that visitors spend time on appear to have changed from 1987 to 1995. Fesenmaier et al. (1987) developed visitation and percentage of time spent on each recreational pursuit for the Nueces-Mission-Aransas (N-M-A) and Laguna Madre estuary systems. Results of the 1987 survey show that 38 percent of all recreational travel visits to the Texas coast were to the N-M-A and Laguna Madre Estuaries. The most popular activities were fishing, camping, and swimming.

The D.K.S.&A Ltd. survey (1996) has a slightly different classification of recreational activities, but, some categories can be compared. In some cases, classifications were dissimilar between the two surveys but enough detail was provided

Table III.12. Visitation Patterns for Corpus Christi Area and Changes from 1987 to 1995

Fesenmaier study 1987		D.K.S & A Ltd. Survey 1993-1996		% Change 1987 to 1995
Activity	Time (%)	Activity	Time (%)	
Boating	3.7	Boat/sail	5.6	51
Fishing+Hunting	22.6	Hunt/fish	18.4	-19
Swimming	19.9	Beach/waterfront	62.2	} 36
Picnicking	11.4	Parks/	13.7	
Camping	26.9	Camping	3.5	
Sightseeing	15.5	Visit Historic Site	18.8	21

Source: D.K S.& A. Ltd. and Fesenmaier, et. al.

so aggregations of categories enabled a relative comparison. For example, aggregation of swimming, picnicking, and camping from the Fesenmaier survey was compared to the sum of parks, camping, and beach/waterfront in the D.K.S.&A survey. The N-M-A estuary was chosen to be more representative of the CCBNEP study area, so activity breakdowns of N-M-A from Fesenmaier were compared to the D.K.S.& A Ltd. survey (Table III.12).

Yearly data from the D.K.S.&A survey shows that cultural, museum, entertainment and historic site visits have increased. These changes might be attributed to the availability of other attractions in the Corpus Christi area such as the Aquarium, the Lexington and other attractions not available in 1987.

III.5 Agriculture

Agriculture is traditionally an important economic activity in the Coastal Bend region. Nueces county led Texas in grain sorghum production in nine of the past ten years and is among the top 25 cotton producing counties in Texas (GCCBA). Corpus Christi and Robstown serve as regional agriservice centers for the Coastal Bend.

Total value of agricultural production was compiled from the Texas Agricultural Extension Service and Texas Crop and Agricultural Statistics. Three year averages (1993-1995) for all 12 counties were used to obtain final demand for agricultural activities. Table III.13 shows the direct impacts for agricultural sectors in the CCBNEP study area. For purposes of this study, it is assumed all agricultural products are either exported from the region or sold directly to consumers.

Table III.13. Direct impacts of agriculture on the CCBNEP study area, 1995.

Sectors	Sales to Final Demand (\$millions)
Dairy and farm products	5.16
Poultry and eggs	0.19
Beef	124.38
Other meat animals and livestock products (goats, hogs, sheep, honey, mohair, wool)	1.33
Cotton	111.01
Feed crops(barley, corn, ensilage, hay, oats, sorghum)	1.05
Food grains(rice, wheat, rye)	103.00
Fruits	0.00
Vegetables(melons, vegetables, watermelon, food corn)	8.19
Sugar and miscellaneous products (alfalfa, castors, cloverseed, cowpeas, guar, nursery, other crops)	3.51
Total	358.931

Source: TAES, 1993-1995

III.6 Military¹

The military in the CCBNEP study area consists of Naval Station Ingleside, Naval Air Station Corpus Christi, and Corpus Christi Army Depot. Most of the military activities maker use of the bay and therefore are included as bay dependent industries in this study. The Corpus Christi Army Depot is excluded from this study as its activities do not relate to the bay.

Naval Station Ingleside opened in 1992 as a base for mine warfare vessels. With the acquisition of three small mine countermeasure vessels, total employment at the base will reach 4,000.

Naval Station Corpus Christi is a major flight training facility. Employment in 1996 (both military and civilian) was around 7,000.

Military expenditures and employment data were obtained from The Greater Corpus Christi Business Alliance. Local expenditures by the military installations are the appropriate measure of final demand for this sector. Bay area military complex payroll expenditures for 1995 was \$166 million (excluding Corpus Christi Army Depot). This value was used as a proxy for 1995 military expenditures.

¹ This section was drawn mainly from the Greater Corpus Christi Business Alliance.

III.7 Other Federal and State Government

For the non-military government sector, only marine related federal and state funding was considered. Federal and state agencies engaged in marine research regulation and other activities were contacted by telephone survey. The best approximation of final demand was total salaries paid, because for most agencies, total budgets could not be broken down to identify specific expenditures for the CCBNEP study area. Direct impacts for this sector were estimated as \$12.5 million. This is undoubtedly an underestimate.

A summary of direct impacts of all sectors included on this study is shown in Table III.14. Each sector's share of total impacts are also shown. The petrochemical sector accounts for 47.8% of total direct impacts, with agriculture, military and tourism following with 14.2, 12.5 and 10.7 %.

Table III.14. Summary of estimated direct impacts of bay related economic sectors in the CCBNEP study area, 1995.

Sectors	Direct Impact (\$millions)	Share of Total (%)
Agriculture	358.93	15.13
Commercial fishing (bay and gulf)	38.31	1.62
Oil and gas extraction	38.12	1.61
Mining and quarrying of nonmetallic miner.	1.01	0.04
Heavy construction	154.42	6.51
Seafood and miscellaneous food	47.45	2.00
Chemical and allied products	449.16	18.94
Petroleum refining and related industries	754.00	31.80
Ship and boat building and repairing	26.21	1.11
Water transportation and services	55.13	2.33
Tourism related industries (leisure)	269.75	11.38
Federal government-Military	166.00	7.00
State government-education and non-education	12.5	0.53
Total	2,370.99	100

IV. Total Economic Impacts on the CCBNEP Study Area

Estimated direct impacts or sales to final demand shown in Table III.14 provide the basis for estimating total economic impacts of bay related sectors in the CCBNEP study area. Sales to final demand by these export industries constitute initial impacts that stimulate demand for goods and services from other sectors of the economy through secondary and tertiary rounds of market exchanges. This "ripple effect" in the regional economy leads to a total impact larger than original sales transactions. The input output

model used in this study provides a methodology by which these successive rounds of impacts are aggregated into a total for regional and state economies.

IV.1 Impacts on the Coastal Bend Regional Economy

Estimated impacts of bay related economic activities in the CCBNEP study area are presented in Table IV.1. Estimates of total impacts are given for total regional output, personal income, value added and employment for each of the 13 bay related economic sectors. These are calculated using economic impact multipliers for the CCBNEP study area shown in Appendix II. It is estimated in total, that bay related sectors' sales to final demand stimulated total regional business sales of over \$4 billion, personal income of \$1.2 billion, value added of \$2.3 billion and over 52,000 jobs in the CCBNEP study area.

These estimates indicate bay related industries of the region are a significant part of the area's economic base. An estimate of relative importance of bay related industries can be made using employment. The bay related employment estimate for this scenario (52,859) is about 1/3 of reported total employment in the Corpus Christi Metropolitan Statistical Area (MSA), and almost 1/4 of total employment in the CCBNEP twelve county study area (TWC).

Employment, personal income, and value added are the best economic variables to use in comparing the relative contribution of bay related sectors. Output or total regional business sales is a less desirable variable because it includes double counting of sales as products as they move through the production, processing and marketing system.

Table IV.1. Estimated impacts of bay related economic activities in the CCBNEP study area, 1995 (Base Scenario)

Category	Aggregated Sector	Economic Impact Variable			
		Output	Personal Income (\$ millions)	Value Added	Employment (jobs)
1	Oil and gas extraction	57.40	15.66	40.68	542
1	Mining and quarrying of non-metallic minerals	1.54	0.49	1.05	18
1	Chemical and allied products	818.90	190.29	389.76	4,709
1	Petroleum refining and related industries	1,098.47	139.26	357.10	3,836
1	Ship and boat building and repairing	42.73	17.20	23.72	514
1	Water transportation and services	104.36	28.97	42.77	1,023
1	Military (marine-related)	309.51	213.46	249.83	8,134
2	Commercial fishing(bay systems and gulf by area caught)	45.28	12.86	31.52	900
2	Seafood and miscellaneous food preparations	73.70	13.26	25.44	776
2	Tourism related industries (leisure)	470.76	180.45	285.57	10,880
3	Agriculture	520.99	107.26	430.37	9,273
3	Heavy construction	257.98	118.88	175.11	4263
3	Military (non-marine related)	279.68	192.89	225.75	7,350
3	State government - education and non-education	23.31	16.07	18.81	641
Total		4,104.60	1,246.98	2,297.48	52,589

IV.2 Tourism Related Industries

The Tourism Related Industries sector, including leisure travel only, had the largest total employment generated within the region with an estimated 10,880 jobs, accounting for about 21% of all bay related employment impacts. This sector is an aggregation of several service and retail businesses that provide services and goods to recreationists and tourists. This employment estimate includes direct employment in those businesses as well as jobs created in related businesses that provide them with supplies, materials and goods.

Total impact estimates for this sector are presented in Table IV.2 are from direct impacts of leisure travelers only. An alternative scenario was run for Tourism Related Industries that included all business and leisure travel (\$541.83 total expenditures) which resulted in a total output impact of over \$950 million, \$365 million in personal income, nearly \$581 million of value added, and 21,358 jobs. This scenario increased estimated bay related total employment to 55,987 with tourism and related industries accounting for more than 1/3 of the total. Using this scenario, tourism and recreation moves to the top of all bay related industries in terms of employment and value-added impacts. Unfortunately, no estimate could be made of what proportion of business travel to the study area could be attributed to the presence of amenities and activities offered by bays and estuaries. Assuming that some part of business conventions and meetings are attracted to the area by these amenities, scenarios 1 and 2 may be interpreted as lower and upper limits on the impacts of this industry, respectively.

In constructing the model to estimate total impacts, it was not possible to develop a multiplier for tourism and recreation because expenditures from these activities are spread among several sectors. However, after the analysis, “psuedo-multipliers” may be constructed. Total impacts presented in Table IV.2 are based on an estimated \$269.75 million annual expenditure by tourists and recreationists in the regional economy (Table III.10) . Therefore, it may be stated on average, each dollar of tourist and recreationist expenditures resulted in about \$1.75 in total output, \$0.67 of personal income, and \$1.06 of value added in the Coastal Bend regional economy. In addition, an employment multiplier of about 40 jobs per million dollars of tourist and recreationist expenditures is indicated by the analysis.

Table IV.2. Total impacts of tourism and related industries on the CCBNEP study area regional economy, 1995

Scenarios for tourism related industries				
Economic Impact Variable	Leisure Only		Business and Leisure	
	Tourism and related Industries	CCBNEP Total	Tourism and related Industries	CCBNEP Total
Direct Impact (\$ mil)	269.75		541.83	
Output (\$ mil)	470.76	3,824.93	950.66	4,304.83
Personal Income(\$ mil)	180.45	1,054.11	365.71	1,239.37
Value-Added (\$ mil)	285.57	2,071.74	580.92	2,367.09
Employment (jobs)	10,880	45,509	21,358	55,987

It is interesting to note the tourism sector ranks lower than second in terms of total personal income and value added. This is expected because this sector is dominated by retail stores and personal services which have lower-than-average wage rates and returns to other resources than that of capital intensive sectors. For example, employment impacts of Tourism Related Industries is more than twice those of the Chemical and Allied Products sector. However, value added impacts estimated for Chemical and Allied Products exceed Tourism Related Industries (Table IV.1).

IV.3 Commercial Fishing

Commercial fishing is of particular interest because of the history in the economic base of the region and its obvious direct dependence on sustained productivity of CCBNEP bays and estuaries. As indicated, three scenarios were developed for commercial fishing to identify independent impacts of (1) bay catch, (2) bay and gulf catch that is landed in CCBNEP counties, and (3) bay and gulf catch in CCBNEP study area waters (Gulf Grid Zone 20 + CCBNEP bay systems), some of which may be landed in other areas. Scenario (3) was chosen as the base scenario. These alternative scenarios are summarized in Table IV.3.

In the base scenario, impacts are related to fish and shrimp caught in the CCBNEP study area. In this scenario, an estimated 900 jobs were generated by commercial fishing in the region in 1995. This accounts for about 2% of all jobs. Commercial fishing generated \$45.28 million in output and \$31.52 million in value-added to the region. Total impacts on personal income were \$12.86 million (Table IV.3).

Estimated impacts of commercial fishing on employment and regional income are likely lower than actually supported by this activity. Commercial fishing boats' employment practices differ from those of most other industries in that workers on the

boat are generally not paid wages and salaries. Rather, boat employees typically share variable expenses of each day's boat activities and "returns" from the daily catch. This arrangement suggests the number of employees and employee income in this industry is likely to be underreported in statistics. This may result in lower total employee and income estimates from the input-output model used in this study.

Total impacts from bay fishing only were about \$14.70 million in output, accounting for 292 jobs in the region in 1995. Scenario (2) considers finfish and shrimp landing in CCBNEP counties, regardless of where caught. This scenario generated \$41.77 million in output and \$29.08 million in personal income. It generated a total of 830 jobs and a personal income of \$11.86 million.

Table IV.3. Summary of estimated impacts of commercial fishing on the CCBNEP study area regional economy under alternative scenarios, 1995

Economic Impact Variable	Scenarios for Commercial Fishing					
	CBNEP Bay Systems		CCBNEP Bay Systems plus Landings from All Other Areas		CCBNEP Bay Systems Plus Gulf Grid Zone 20 (Base Scenario)	
	Commercial Fishing	CCBNEP All Bay Related Sectors	Commercial Fishing	CCBNEP All Bay Related Sectors	Commercial Fishing	CCBNEP All Bay Related Sectors
Direct Impact (\$mil)	10.10		21.01		28.70	
Output (\$mil)	14.70	4,074.02	41.77	4,101.09	45.28	4,104.60
Personal Income (\$mil)	4.17	1,238.29	11.86	1,245.98	12.86	1,246.98
Value-Added (\$mil)	10.23	2,276.19	29.08	2,295.04	31.52	2,297.48
Employment (jobs)	292	52,251	830	52,789	900	52,859

IV.4 Major Industrial Sectors

Other major job generating bay related sectors of the economy included Agriculture, Chemical and Allied Products, Heavy Construction, Petroleum Refining and Water Transportation and Services (Table IV.1). Agriculture is estimated to be a major employment generator in the region accounting for about 9,273 jobs either directly or indirectly, primarily in related agribusiness firms that supply production inputs, provide services and process agricultural commodities.

Petrochemical industries are clearly a major component of the economic base of the CCBNEP region. Chemicals and Allied Products generated an estimated 4,709 jobs and \$190.29 million in personal income. Personal income generated by these industries was second only to the Military in total amount of income paid to regional households. Petroleum Refining supported, directly or indirectly, an estimated 3,836 jobs and was also significant in the total amount of regional income and value added.

The Heavy Construction sector was responsible for 4,263 jobs, \$118.88 million in personal income, and \$175.11 million in value added in the regional economy in 1995. Construction of new mineral extraction facilities, primarily offshore drilling platforms and rigs, was the dominant activity in this sector. Since operation of these offshore rigs may be by non-local companies, this is an export activity like any other export industry.

In general, the wide variety of economic enterprises and activities that comprise bay related sectors of the CCBNEP regional economy are responsible for significant impacts as they export goods and services to parties outside the region and generate new regional money flows.

V. Total Economic Impacts on the State of Texas

Economic impacts of bay related economic sectors in the CCBNEP study area on the Texas economy as a whole are presented in Table V.1. Interpretation of impact variables are the same as presented for the CCBNEP study area regional impacts shown in Table IV.1 but in general, impacts are larger since they are distributed to businesses and individuals throughout the state including the CCBNEP study area.

In the estimation of total state wide impacts, multipliers for some sectors were smaller than the CCBNEP study area regional multipliers. Conceptually, this should not occur. This problem was encountered only in a few sectors where most activities are local and service oriented, and only for employment multipliers. This phenomenon might, therefore, be attributed to the fact employment impacts of these industries are largely confined to the regional economy. Whenever a smaller multiplier was encountered at the state level, multipliers for the region and state level were assumed to be the same. This is why, for example, tourism sector employment impacts are the same for the CCBNEP study area and state.

Statewide impacts are estimates as total direct, indirect and induced effects of bay related enterprises and activities on all sectors of the Texas economy. In aggregate, bay related sectors of the CCBNEP study area economy had the following impacts on the Texas economy; \$4,473 million of total business sales (output), \$1,439 million of personal income, \$2,528 million of value added, and 61,280 jobs (Table V.1). These estimates use leisure travel only in the Tourism Related Industries sector. For the most part, there was little change in the relative magnitude among sectors as the estimation moved from the regional to the state level (Table V.1).

Table V.1. Estimated impacts of bay related industries in the CCBNEP study area on the Texas economy, 1995 (Base Scenario)

Category	Aggregated Sector	Economic Impact Variable			
		Output	Personal Income (\$ millions)	Value Added	Employment (Jobs)
1	Oil and Gas Extraction	58.70	15.99	41.38	5,42
1	Mining and Quarrying of Non-Metallic Minerals	1.79	0.59	1.09	18
1	Chemical and Allied Products	912.44	227.55	439.72	5,547
1	Petroleum Refining and Related Industries	1,172.73	167.61	412.16	4,211
1	Ship and Boat Building and Repairing	46.38	18.11	25.49	5,39
1	Water Transportation and Services	115.96	35.12	51.49	1,113
1	Federal government - military	338.54	226.22	267.97	10,126
2	Commercial fishing(bay systems and gulf by area caught)	49.24	15.22	33.96	1,097
2	Seafood and Miscellaneous Food Preparations	78.28	16.88	33.99	7,76
2	Tourism related industries (leisure)	520.46	208.32	320.05	10,880
3	Agriculture	565.45	155.99	447.90	12,367
3	Military (non-marine related)	305.91	204.42	242.12	9,150
3	Heavy construction	281.97	129.97	190.69	4,279
3	State government - education and non-education	25.49	17.04	20.18	6,41
Total		4,473.37	1,439.03	2,528.23	61,280

Statewide impacts represent estimated impacts of bay related industries in the CCBNEP study area on the state economy. Jobs created elsewhere in Texas are about 8,421 generating an additional \$192 million in personal income outside the CCBNEP economy. In terms of output, Category II industries generated an additional \$58.2 million, while Category I industries generated an additional \$214 million at the state level. Total incremental output at the state level is \$368 million. In terms of value added, bay related industries generate an additional \$230 million in areas of Texas outside the regional economy.

VI. Summary and Conclusions

The present study estimates economic impacts of industries or activities related to the CCBNEP bays and estuaries through their use of these bays and estuaries for transportation, navigation, recreation, extraction, and other activities.

As a first step, bay related industries and activities were identified and were then classified into three groups according to use of or impact on CCBNEP study area waters. The second step involved estimation of direct impacts. These impacts are measured by sales to final demand for each industry or activity. Sales to final demand data are not readily available for all sectors. Furthermore, some sectors such as recreation and tourism sectors are not just one activity or industry. Therefore, expenditures of leisure travelers are taken as a proxy for direct impacts of tourism and related industries.

Estimated direct impacts were then used to calculate multipliers for the CCBNEP study area and state level impacts of bay related industries. Using indirect and induced multipliers, total output, personal income, value added, and employment impacts of each industry at the regional and state levels were estimated.

Results reveal CCBNEP bay related industries and activities have a total impact of \$4.1 billion in total output in the CCBNEP region accounting for 52,859 jobs, and generating a personal income of \$1.4 billion. At the state level, an additional 8,421 jobs and \$368 million in output were estimated to be generated by the CCBNEP bay related industries. Largest output impacts were generated by the petroleum and chemical industries at both regional and state levels. However, in terms of employment impacts, tourism and related sectors had the highest total impact. Detailed conclusions and implications from this study are presented in the Executive Summary.

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Appendix I. Employment and Output Data and Estimation of Productivity Ratios for Industry and Manufacturing Sectors

Activity	Code	Sector	*Average Final Demand	**Average Employment	***Ratio	****Employment in 1995	*****Final Demand
			\$MM	Jobs	MMS/Job	Jobs	\$MM
Activity 3		<i>Oil and Gas Extraction</i>					
Event 1	38	Natural Gas & Crude Petroleum	25.93	2169.25	0.0120	1670.5	19.969
Event 2	39	Natural Gas Liquids	13.01	121.92	0.1067	113.75	12.138
Event 3	57	Maintenance And Repair Oil And Gas Wells	278.03	5162.58	0.0539	4503	6.016
Activity 4		<i>Mining and Quarrying of NonMetallic Minerals</i>					
Event 1	40--47	Stone, Sand, Gravel, Chemical Mining	0.90	84.25	0.0107	95	1.012
Activity 5		<i>Heavy Construction</i>					
Event 1	51	New Highways And Streets	74.10	2004.42	0.0370	1734	64.100
Event 2	53	New Mineral Extraction Faciliti	92.07	4213.33	0.0219	4133.25	90.322
Activity 6		<i>Misc. Food</i>					
Event 1	97,98	Sea Food	7.53	N/A	N/A	N/A	7.532
Event 2	99--103	Misc. Food Preparations Except Seafood	39.92	N/A	N/A	N/A	39.92
Activity 7		<i>Chemicals and Allied Products</i>					
Event 1	186--209	Chemical Products	431.01	3493.67	0.1234	3640.75	449.157
Activity 8		<i>Petroleum Refining and Related Industries</i>					
Event 1	210	Petroleum Refining	671.52	3099.50	0.2167	3310.75	717.289
Event 2	211,212	Paving, Coating, Etc.	0.17	49.33	0.0034	57.25	0.195
Event 3	213,214	Lubricating Oils, Coal Products, Etc.	3.34	5.83	0.5727	63.75	36.508
Activity9		<i>Ship and Boat Building and Repairing</i>					
Event 1	392,393	Ship and Boat Building and Repairing	17.53	565.75	0.0310	845.75	26.211
Activity 10		<i>Water Transportation and Transportation Services</i>					
Event 1	436	Water Transportation	36.15	597.00	0.0605	529	32.031

*Average Final Demand is from 1990, 1992 and 1994 IMPLAN database;

*Average Employment is from Texas Workforce Commission (TWC);

***Ratio = (Average Final Demand/Average Employment);

****Employment in 1995 is from TWC;

*****Final Demand = Employment in 1995*Ratio

Appendix II. Multipliers for the CCBNEP Region and Texas

Table II.1 Output Multipliers for CCBNEP Area, 1994

Events	Sector	Direct	Indirect	Induced	Total
1	Dairy farm products	1.0000	0.0209	0.6270	1.6479
2	Poultry and eggs	1.0000	0.0292	0.3240	1.3532
3	Beef	1.0000	0.0193	0.4766	1.4959
4	Other meat animals and livestock products	1.0000	0.0256	0.4046	1.4302
5	Cotton	1.0000	0.0462	0.5013	1.5476
6	Food grains	1.0000	0.0674	0.2748	1.3421
7	Feed crops	1.0000	0.0656	0.2883	1.3539
8	Fruits and tree nuts	1.0000	0.0521	0.4311	1.4833
9	Vegetables	1.0000	0.0798	0.3331	1.4129
10	Sugar and misc. crops	1.0000	0.0417	0.5296	1.5712
11	Commercial fishing	1.0000	0.1777	0.2778	1.4555
12	Natural gas and crude petroleum	1.0000	0.3636	0.2983	1.6619
13	Natural gas liquids	1.0000	0.0723	0.0597	1.1320
14	Stone, sand, gravel and chemical mining	1.0000	0.1944	0.3286	1.5231
15	New highways and streets	1.0000	0.3220	0.3631	1.6852
16	New mineral extraction facilities	1.0000	0.0331	0.6272	1.6603
17	Maintenance and repair oil and gas wells	1.0000	0.1000	0.6400	1.7400
18	Seafood	1.0000	0.5734	0.2325	1.8059
19	Misc. food preparations except seafood	1.0000	0.3259	0.1794	1.5053
20	Chemical products	1.0000	0.5384	0.2848	1.8232
21	Petroleum refining	1.0000	0.3120	0.1197	1.4317
22	Paving, coatings, etc..	1.0000	0.6034	0.2417	1.8451
23	Lubricating oils, coal products, etc	1.0000	0.7383	0.2114	1.9497
24	Ship and boat building and repairing	1.0000	0.1888	0.4412	1.6300
25	Water transportation	1.0000	0.6546	0.2605	1.9150
26	Transportation services	1.0000	0.3804	0.4819	1.8623
27	Food, eating and drinking	1.0000	0.3157	0.4364	1.7521
28	Automotive dealers and service stations	1.0000	0.2582	0.4869	1.7452
29	General retail	1.0000	0.2009	0.4957	1.6966
30	Hotels and lodging places	1.0000	0.3649	0.4325	1.7974
31	Amusement and recreation services, NEC	1.0000	0.4157	0.3895	1.8052
32	Federal government - Military	1.0000	0.0000	0.8645	1.8645
33	State government-education and noneducation	1.0000	0.0000	0.8645	1.8645

Table II.2 Personal Income Multipliers for CCBNEP Area, 1994

Events	Sector	Direct	Indirect	Induced	Total
1	Dairy farm products	0.0267	0.0845	0.1588	0.2700
2	Poultry and eggs	0.0376	0.0762	0.1814	0.2953
3	Beef	0.0612	0.0593	0.1832	0.3036
4	Other meat animals and livestock products	0.0454	0.0558	0.1800	0.2813
5	Cotton	0.0361	0.1039	0.2253	0.3653
6	Food grains	0.0329	0.0746	0.1512	0.2586
7	Feed crops	0.0382	0.0451	0.1309	0.2143
8	Fruits and tree nuts	0.0096	0.1170	0.1924	0.3190
9	Vegetables	0.0114	0.0820	0.1455	0.2389
10	Sugar and misc. crops	0.1349	0.0113	0.6579	0.8041
11	Commercial fishing	0.2791	0.0423	0.0919	0.4132
12	Natural gas and crude petroleum	0.1886	0.1564	0.0986	0.4437
13	Natural gas liquids	0.0422	0.0269	0.0197	0.0888
14	Stone, sand, gravel and chemical mining	0.3248	0.0553	0.1087	0.4888
15	New highways and streets	0.3122	0.1078	0.1201	0.5401
16	New mineral extraction facilities	0.7164	0.0091	0.2074	0.9329
17	Maintenance and repair oil and gas wells	0.7200	0.0200	0.2100	0.9500
18	Seafood	0.0986	0.1704	0.0769	0.3458
19	Misc. food preparations except seafood	0.1173	0.0902	0.0593	0.2669
20	Chemical products	0.1969	0.1325	0.0942	0.4236
21	Petroleum refining	0.0660	0.0725	0.0396	0.1780
22	Paving, coatings, etc..	0.1394	0.1402	0.0799	0.3595
23	Lubricating oils, coal products, etc	0.0819	0.1627	0.0699	0.3145
24	Ship and boat building and repairing	0.4576	0.0528	0.1459	0.6563
25	Water transportation	0.1156	0.1857	0.0861	0.3874
26	Transportation services	0.4361	0.1214	0.1594	0.7168
27	Food, eating and drinking	0.4135	0.0913	0.1443	0.6491
28	Automotive dealers and service stations	0.4786	0.0846	0.1610	0.7243
29	General retail	0.5083	0.0651	0.1639	0.7373
30	Hotels and lodging places	0.3715	0.1287	0.1430	0.6432
31	Amusement and recreation services, NEC	0.3231	0.1275	0.1288	0.5793
32	Federal government - Military	1.0000	0.0000	0.2859	1.2859
33	State government-education and noneducation	1.0000	0.0000	0.2859	1.2859

Note: Multipliers from event 1 to event 10 are from IMPLAN database in 1992

Table II.3 Value Added Multipliers for CCBNEP Area, 1994

Events	Sector	Direct	Indirect	Induced	Total
1	Dairy farm products	0.9095	0.0137	0.3662	1.2894
2	Poultry and eggs	0.9111	0.0171	0.1893	1.1175
3	Beef	0.9225	0.0123	0.2784	1.2132
4	Other meat animals and livestock products	0.8798	0.0160	0.2363	1.1322
5	Cotton	0.9524	0.0272	0.2928	1.2724
6	Food grains	0.9139	0.0349	0.1605	1.1093
7	Feed crops	0.9112	0.0347	0.1684	1.1143
8	Fruits and tree nuts	0.9410	0.0293	0.2518	1.2222
9	Vegetables	0.9101	0.0459	0.1945	1.1506
10	Sugar and misc. crops	0.9471	0.0225	0.3093	1.2789
11	Commercial fishing	0.7746	0.0764	0.1623	1.0133
12	Natural gas and crude petroleum	0.6152	0.2524	0.1742	1.0418
13	Natural gas liquids	0.9219	0.0529	0.0349	1.0097
14	Stone, sand, gravel and chemical mining	0.7505	0.0984	0.1920	1.0409
15	New highways and streets	0.4950	0.1618	0.2121	0.8689
16	New mineral extraction facilities	0.9382	0.0175	0.3663	1.3220
17	Maintenance and repair oil and gas wells	0.8483	0.0452	0.3737	1.2672
18	Seafood	0.1365	0.3589	0.1358	0.6312
19	Misc. food preparations except seafood	0.2602	0.1531	0.1048	0.5182
20	Chemical products	0.4485	0.2529	0.1664	0.8678
21	Petroleum refining	0.2060	0.1907	0.0699	0.4666
22	Paving, coatings, etc..	0.2639	0.2626	0.1412	0.6677
23	Lubricating oils, coal products, etc	0.1642	0.3221	0.1235	0.6097
24	Ship and boat building and repairing	0.5561	0.0911	0.2577	0.9049
25	Water transportation	0.1802	0.2884	0.1521	0.6207
26	Transportation services	0.5135	0.1961	0.2815	0.9910
27	Food, eating and drinking	0.5739	0.1637	0.2549	0.9925
28	Automotive dealers and service stations	0.7335	0.1490	0.2844	1.1669
29	General retail	0.7906	0.1151	0.2895	1.1953
30	Hotels and lodging places	0.5937	0.1971	0.2526	1.0434
31	Amusement and recreation services, NEC	0.4342	0.2141	0.2275	0.8757
32	Federal government - Military	1.0000	0.0000	0.5050	1.5050
33	State government-education and noneducation	1.0000	0.0000	0.5050	1.5050

Table II.4 Employment Multipliers for CCBNEP Area, 1994

Events	Sector	Direct	Indirect	Induced	Total
1	Dairy farm products	10	5	7	23
2	Poultry and eggs	12	6	9	26
3	Beef	15	3	9	27
4	Other meat animals and livestock products	15	3	8	26
5	Cotton	13	9	11	33
6	Food grains	11	4	7	22
7	Feed crops	11	2	6	19
8	Fruits and tree nuts	9	10	9	28
9	Vegetables	7	7	7	21
10	Sugar and misc. crops	63	1	31	95
11	Commercial fishing	23	2	4	29
12	Natural gas and crude petroleum	4	6	5	14
13	Natural gas liquids	1	1	1	3
14	Stone, sand, gravel and chemical mining	11	2	5	18
15	New highways and streets	11	4	6	21
16	New mineral extraction facilities	22	0	10	32
17	Maintenance and repair oil and gas wells	26	1	10	36
18	Seafood	8	10	4	21
19	Misc. food preparations except seafood	9	4	3	15
20	Chemical products	2	4	4	10
21	Petroleum refining	1	2	2	5
22	Paving, coatings, etc..	3	5	4	12
23	Lubricating oils, coal products, etc	2	5	3	10
24	Ship and boat building and repairing	11	2	7	20
25	Water transportation	5	7	4	16
26	Transportation services	10	4	7	22
27	Food, eating and drinking	30	4	7	41
28	Automotive dealers and service stations	19	3	7	30
29	General retail	44	2	8	54
30	Hotels and lodging places	23	6	7	35
31	Amusement and recreation services, NEC	22	6	6	34
32	Federal government - Military	36	0	13	50
33	State government-education and noneducation	38	0	13	51

Note: Multipliers from event 1 to event 10 are from IMPLAN database in 1992

Table II.5 Output Multipliers for Texas State, 1994

Events	Sector	Direct	Indirect	Induced	Total
1	Dairy farm products	1.0000	0.0310	0.7572	1.7882
2	Poultry and eggs	1.0000	0.0418	0.3628	1.4046
3	Beef	1.0000	0.0319	0.5761	1.6080
4	Other meat animals and livestock products	1.0000	0.0299	0.5262	1.5561
5	Cotton	1.0000	0.0938	0.6030	1.6968
6	Food grains	1.0000	0.0808	0.3596	1.4404
7	Feed crops	1.0000	0.0784	0.3365	1.4149
8	Fruits and tree nuts	1.0000	0.0619	0.5716	1.6335
9	Vegetables	1.0000	0.0903	0.4358	1.5261
10	Sugar and misc. crops	1.0000	0.0502	0.5887	1.6389
11	Commercial fishing	1.0000	0.2097	0.3731	1.5828
12	Natural gas and crude petroleum	1.0000	0.3405	0.3338	1.6743
13	Natural gas liquids	1.0000	0.0683	0.0681	1.1364
14	Stone, sand, gravel and chemical mining	1.0000	0.3297	0.4426	1.7723
15	New highways and streets	1.0000	0.3827	0.4729	1.8557
16	New mineral extraction facilities	1.0000	0.0430	0.7619	1.8049
17	Maintenance and repair oil and gas wells	1.0000	0.1301	0.7765	1.9066
18	Seafood	1.0000	0.4001	0.2763	1.6764
19	Misc. food preparations except seafood	1.0000	0.3742	0.2704	1.6446
20	Chemical products	1.0000	0.6451	0.3864	2.0314
21	Petroleum refining	1.0000	0.3659	0.1621	1.5280
22	Paving, coatings, etc..	1.0000	0.6960	0.3676	2.0636
23	Lubricating oils, coal products, etc	1.0000	0.7759	0.3153	2.0913
24	Ship and boat building and repairing	1.0000	0.2427	0.5268	1.7695
25	Water transportation	1.0000	0.7214	0.3869	2.1083
26	Transportation services	1.0000	0.4735	0.6231	2.0966
27	Food, eating and drinking	1.0000	0.3782	0.5604	1.9386
28	Automotive dealers and service stations	1.0000	0.2792	0.6166	1.8958
29	General retail	1.0000	0.2183	0.6169	1.8352
30	Hotels and lodging places	1.0000	0.3964	0.5687	1.9651
31	Amusement and recreation services, NEC	1.0000	0.5251	0.6169	2.1421
32	Federal government - Military	1.0000	0.0000	1.0394	2.0394
33	State government-education and noneducation	1.0000	0.0000	1.0394	2.0394

Table II.6 Personal Income Multipliers for Texas State, 1994

Events	Sector	Direct	Indirect	Induced	Total
1	Dairy farm products	0.0263	0.1185	0.2273	0.3721
2	Poultry and eggs	0.0408	0.1073	0.2504	0.3985
3	Beef	0.0578	0.1081	0.2965	0.4623
4	Other meat animals and livestock products	0.0659	0.0732	0.3802	0.5194
5	Cotton	0.0367	0.1512	0.3303	0.5182
6	Food grains	0.0340	0.1157	0.2131	0.3628
7	Feed crops	0.0357	0.0797	0.1892	0.3046
8	Fruits and tree nuts	0.0106	0.1770	0.2893	0.4769
9	Vegetables	0.0113	0.1244	0.2231	0.3589
10	Sugar and misc. crops	0.1285	0.0267	0.8659	1.0211
11	Commercial fishing	0.3026	0.0564	0.1302	0.4892
12	Natural gas and crude petroleum	0.1828	0.1384	0.1165	0.4376
13	Natural gas liquids	0.0417	0.0238	0.0238	0.0893
14	Stone, sand, gravel and chemical mining	0.3230	0.1028	0.1545	0.5803
15	New highways and streets	0.3220	0.1330	0.1651	0.6200
16	New mineral extraction facilities	0.7196	0.0134	0.2660	0.9990
17	Maintenance and repair oil and gas wells	0.7112	0.0359	0.2711	1.0181
18	Seafood	0.1320	0.1338	0.0965	0.3623
19	Misc. food preparations except seafood	0.1523	0.1079	0.0944	0.3545
20	Chemical products	0.1956	0.1761	0.1349	0.5066
21	Petroleum refining	0.0716	0.0843	0.0566	0.2125
22	Paving, coatings, etc..	0.1695	0.1841	0.1283	0.4820
23	Lubricating oils, coal products, etc	0.1126	0.1908	0.1101	0.4134
24	Ship and boat building and repairing	0.4339	0.0730	0.1839	0.6907
25	Water transportation	0.1364	0.2358	0.1350	0.5073
26	Transportation services	0.4305	0.1690	0.2175	0.8170
27	Food, eating and drinking	0.4209	0.1183	0.1956	0.7348
28	Automotive dealers and service stations	0.4939	0.0993	0.2152	0.8084
29	General retail	0.5165	0.0770	0.2153	0.8089
30	Hotels and lodging places	0.3923	0.1548	0.1985	0.7456
31	Amusement and recreation services, NEC	0.4049	0.1887	0.2153	0.8089
32	Federal government - Military	1.0000	0.0000	0.3628	1.3628
33	State government-education and noneducation	1.0000	0.0000	0.3628	1.3628

Note: Multipliers from event 1 to event 10 are from IMPLAN database in 1992

Table II.7 Value Added Multipliers for Texas State, 1994

Events	Sector	Direct	Indirect	Induced	Total
1	Dairy farm products	0.9091	0.0208	0.4475	1.3773
2	Poultry and eggs	0.9091	0.0208	0.2144	1.1444
3	Beef	0.9091	0.0209	0.3405	1.2705
4	Other meat animals and livestock products	0.9091	0.0196	0.3110	1.2396
5	Cotton	0.9091	0.0541	0.3564	1.3196
6	Food grains	0.9091	0.0432	0.2125	1.1648
7	Feed crops	0.9091	0.0431	0.1989	1.1511
8	Fruits and tree nuts	0.9407	0.0340	0.3378	1.3125
9	Vegetables	0.9091	0.0507	0.2576	1.2173
10	Sugar and misc. crops	0.9465	0.0284	0.3479	1.3229
11	Commercial fishing	0.7746	0.0966	0.2205	1.0917
12	Natural gas and crude petroleum	0.6152	0.2320	0.1973	1.0445
13	Natural gas liquids	0.9219	0.0494	0.0402	1.0116
14	Stone, sand, gravel and chemical mining	0.6417	0.1735	0.2616	1.0768
15	New highways and streets	0.5069	0.1991	0.2795	0.9854
16	New mineral extraction facilities	0.9382	0.0234	0.4503	1.4118
17	Maintenance and repair oil and gas wells	0.8483	0.0618	0.4589	1.3690
18	Seafood	0.1833	0.2187	0.1633	0.5653
19	Misc. food preparations except seafood	0.4029	0.1822	0.1598	0.7449
20	Chemical products	0.4359	0.3147	0.2284	0.9790
21	Petroleum refining	0.2138	0.2242	0.0958	0.5338
22	Paving, coatings, etc..	0.3249	0.3278	0.2173	0.8700
23	Lubricating oils, coal products, etc	0.2527	0.3585	0.1864	0.7975
24	Ship and boat building and repairing	0.5400	0.1213	0.3114	0.9726
25	Water transportation	0.2070	0.3489	0.2287	0.7845
26	Transportation services	0.5151	0.2577	0.3683	1.1411
27	Food, eating and drinking	0.5809	0.2002	0.3312	1.1123
28	Automotive dealers and service stations	0.7335	0.1680	0.3644	1.2660
29	General retail	0.7906	0.1309	0.3646	1.2861
30	Hotels and lodging places	0.6104	0.2262	0.3361	1.1727
31	Amusement and recreation services, NEC	0.4774	0.2859	0.3646	1.1280
32	Federal government - Military	1.0000	0.0000	0.6143	1.6143
33	State government-education and noneducation	1.0000	0.0000	0.6143	1.6143

Table II.8 Employment Multipliers for Texas State, 1994

Events	Sector	Direct	Indirect	Induced	Total
1	Dairy farm products	10	7	11	28
2	Poultry and eggs	11	8	12	31
3	Beef	15	8	14	37
4	Other meat animals and livestock products	24	4	18	47
5	Cotton	13	12	16	41
6	Food grains	11	6	10	27
7	Feed crops	11	4	9	24
8	Fruits and tree nuts	8	14	14	36
9	Vegetables	7	10	11	28
10	Sugar and misc. crops	61	3	42	107
11	Commercial fishing	28	2	5	35
12	Natural gas and crude petroleum	3	5	5	12
13	Natural gas liquids	1	1	1	3
14	Stone, sand, gravel and chemical mining	8	3	6	17
15	New highways and streets	11	4	7	22
16	New mineral extraction facilities	21	0	11	32
17	Maintenance and repair oil and gas wells	22	1	11	34
18	Seafood	7	6	4	17
19	Misc. food preparations except seafood	4	4	4	12
20	Chemical products	2	4	5	12
21	Petroleum refining	1	2	2	5
22	Paving, coatings, etc..	3	5	5	14
23	Lubricating oils, coal products, etc	2	5	4	11
24	Ship and boat building and repairing	11	2	7	21
25	Water transportation	5	7	5	18
26	Transportation services	10	5	9	24
27	Food, eating and drinking	29	4	8	42
28	Automotive dealers and service stations	17	3	9	28
29	General retail	41	2	9	52
30	Hotels and lodging places	20	6	8	34
31	Amusement and recreation services, NEC	20	8	9	37
32	Federal government - Military	46	0	15	60
33	State government-education and noneducation	36	0	15	51

Note: Multipliers from event 1 to event 10 are from IMPLAN database in 1992

Appendix III. Detailed Total Impacts on the CCBNEP Region and Texas, 1995

Table III.1 Estimated Output Impact of Bay Related Economic Activities of the CCBNEP Study Area, 1995

Number	Sectors	Direct	Indirect	Induced	Total
		\$MM	\$MM	\$MM	\$MM
1	Dairy farm products	5.16	0.11	3.23	8.50
2	Poultry and eggs	0.19	0.01	0.06	0.26
3	Beef	124.38	2.40	59.28	186.07
4	Other meat animals and livestock products	1.33	0.03	0.54	1.91
5	Cotton	111.01	5.13	55.65	171.79
6	Food grains	1.05	0.07	0.29	1.41
7	Feed crops	103.00	6.76	29.70	139.46
8	Fruits and tree nuts	0.00	0.00	0.00	0.01
9	Vegetables	8.19	0.65	2.73	11.58
10	Sugar and miscellaneous crops	3.51	0.15	1.86	5.51
11- Case 1	Commercial fishing (bay systems)	10.10	1.79	2.81	14.70
11 - Case2	Commercial fishing (bay systems and gulf by county)	28.70	5.10	7.97	41.77
11- Case 3	Commercial fishing(bay systems and gulf zone 20)	31.11	5.52	8.64	45.28
12	Natural gas & crude petroleum	19.97	7.26	5.96	33.19
13	Natural gas liquids	12.14	0.88	0.72	13.74
14	Stone, sand, gravel, chemical mining	1.01	0.20	0.33	1.54
15	New highways and streets	64.10	20.64	23.28	108.02
16	New mineral extraction facilities	90.32	2.99	56.65	149.97
17	Maintenance and repair oil and gas wells	6.02	0.60	3.85	10.47
18	Seafood	7.53	4.32	1.75	13.60
19	Miscellaneous food preparations except seafood	39.92	13.01	7.16	60.09
20	Chemical products	449.16	241.81	127.93	818.90
21	Petroleum refining	717.29	223.79	85.86	1026.93
22	Paving, coatings, etc..	0.20	0.12	0.05	0.36
23	Lubricating oils, coal products, etc..	36.51	26.95	7.72	71.18
24	Ship and boat building and repairing	26.21	4.95	11.57	42.73
25	Water transportation	32.03	20.97	8.34	61.34
26	Transportation services	23.10	8.79	11.13	43.02
27-Case 1	Food and eating & drinking	75.50	23.84	32.94	132.28
28- Case 1	Automotive dealers and service stations	42.03	10.85	20.47	73.35
29 - Case 1	Miscellaneous retail	64.77	13.01	32.10	109.89
30 - Case 1	Hotels and lodging places	51.63	18.84	22.33	92.80
31- Case 1	Amusement and recreation services	34.59	14.38	13.47	62.44
27 - Case 2	Food and eating & drinking	136.75	43.17	59.67	239.60
28- Case 2	Automotive dealers and service stations	110.36	28.50	53.73	192.59
29 - Case 2	Miscellaneous retail	113.10	22.72	56.06	191.88
30 - Case 2	Hotels and lodging places	133.25	48.63	57.62	239.50
31- Case 2	Amusement and recreation services	48.19	20.03	18.77	86.99
32	Federal government - military (marine related)	166.00	0.00	143.51	309.51
33	Federal government - military (non-marine related)	150.00	0.00	129.68	279.68
34	State government - education and non-education	12.50	0.00	10.81	23.31

Table III.2 Estimated Personal Income Impact of Bay Related Economic Activities of the CCBNEP Study Area, 1995

Number	Sectors	Direct	Indirect	Induced	Total
		\$MM	\$MM	\$MM	\$MM
1	Dairy farm products	0.14	0.44	0.82	1.39
2	Poultry and eggs	0.01	0.01	0.03	0.06
3	Beef	7.61	7.38	22.79	37.76
4	Other meat animals and livestock products	0.06	0.07	0.24	0.37
5	Cotton	4.01	11.53	25.01	40.55
6	Food grains	0.03	0.08	0.16	0.27
7	Feed crops	3.93	4.65	13.48	22.07
8	Fruits and tree nuts	0.00	0.00	0.00	0.00
9	Vegetables	0.09	0.67	1.19	1.96
10	Sugar and miscellaneous crops	0.47	0.04	2.31	2.82
11- Case 1	Commercial fishing (bay systems)	2.82	0.43	0.93	4.17
11 - Case2	Commercial fishing (bay systems and gulf by county)	8.01	1.21	2.64	11.86
11- Case 3	Commercial fishing(bay systems and gulf zone 20)	8.68	1.32	2.86	12.86
12	Natural gas & crude petroleum	3.77	3.12	1.97	8.86
13	Natural gas liquids	0.51	0.33	0.24	1.08
14	Stone, sand, gravel, chemical mining	0.33	0.06	0.11	0.49
15	New highways and streets	20.01	6.91	7.70	34.62
16	New mineral extraction facilities	64.70	0.82	18.73	84.26
17	Maintenance and repair oil and gas wells	4.33	0.12	1.26	5.72
18	Seafood	0.74	1.28	0.58	2.60
19	Miscellaneous food preparations except seafood	4.68	3.60	2.37	10.65
20	Chemical products	88.45	59.53	42.30	190.29
21	Petroleum refining	47.32	52.00	28.39	127.71
22	Paving, coatings, etc..	0.03	0.03	0.02	0.07
23	Lubricating oils, coal products, etc..	2.99	5.94	2.55	11.48
24	Ship and boat building and repairing	11.99	1.38	3.82	17.20
25	Water transportation	3.70	5.95	2.76	12.41
26	Transportation services	10.07	2.80	3.68	16.56
27-Case 1	Food and eating & drinking	31.22	6.89	10.90	49.01
28- Case 1	Automotive dealers and service stations	20.12	3.56	6.77	30.44
29 - Case 1	Miscellaneous retail	32.92	4.21	10.62	47.75
30 - Case 1	Hotels and lodging places	19.18	6.65	7.38	33.21
31- Case 1	Amusement and recreation services	11.18	4.41	4.45	20.04
27 - Case 2	Food and eating & drinking	56.55	12.48	19.73	88.76
28- Case 2	Automotive dealers and service stations	52.83	9.34	17.77	79.94
29 - Case 2	Miscellaneous retail	57.49	7.36	18.54	83.39
30 - Case 2	Hotels and lodging places	49.50	17.15	19.05	85.71
31- Case 2	Amusement and recreation services	15.57	6.14	6.21	27.92
32	Federal government - military (marine related)	166.00	0.00	47.46	213.46
33	Federal government - military (non-marine related)	150.00	0.00	42.89	192.89
34	State government - education and non-education	12.50	0.00	3.57	16.07

Table III.3 Estimated Value Added Impact of Bay Related Economic Activities of the CCBNEP Study Area, 1995

Number	Sectors	Direct	Indirect	Induced	Total
		\$MM	\$MM	\$MM	\$MM
1	Dairy farm products	4.69	0.07	1.89	6.65
2	Poultry and eggs	0.17	0.00	0.04	0.21
3	Beef	114.74	1.54	34.63	150.90
4	Other meat animals and livestock products	1.17	0.02	0.31	1.51
5	Cotton	105.72	3.02	32.51	141.24
6	Food grains	0.96	0.04	0.17	1.16
7	Feed crops	93.86	3.57	17.35	114.78
8	Fruits and tree nuts	0.00	0.00	0.00	0.00
9	Vegetables	7.46	0.38	1.59	9.43
10	Sugar and miscellaneous crops	3.32	0.08	1.08	4.48
11- Case 1	Commercial fishing (bay systems)	7.82	0.77	1.64	10.23
11 - Case2	Commercial fishing (bay systems and gulf by county)	22.23	2.19	4.66	29.08
11- Case 3	Commercial fishing(bay systems and gulf zone 20)	24.10	2.38	5.05	31.52
12	Natural gas & crude petroleum	12.28	5.04	3.48	20.80
13	Natural gas liquids	11.19	0.64	0.42	12.26
14	Stone, sand, gravel, chemical mining	0.76	0.10	0.19	1.05
15	New highways and streets	31.73	10.37	13.60	55.70
16	New mineral extraction facilities	84.74	1.58	33.09	119.41
17	Maintenance and repair oil and gas wells	5.10	0.27	2.25	7.62
18	Seafood	1.03	2.70	1.02	4.75
19	Miscellaneous food preparations except seafood	10.39	6.11	4.18	20.69
20	Chemical products	201.45	113.59	74.72	389.76
21	Petroleum refining	147.79	136.78	50.15	334.71
22	Paving, coatings, etc..	0.05	0.05	0.03	0.13
23	Lubricating oils, coal products, etc..	5.99	11.76	4.51	22.26
24	Ship and boat building and repairing	14.58	2.39	6.76	23.72
25	Water transportation	5.77	9.24	4.87	19.88
26	Transportation services	11.86	4.53	6.50	22.89
27-Case 1	Food and eating & drinking	43.33	12.36	19.24	74.94
28- Case 1	Automotive dealers and service stations	30.83	6.26	11.95	49.05
29 - Case 1	Miscellaneous retail	51.21	7.46	18.75	77.42
30 - Case 1	Hotels and lodging places	30.65	10.17	13.04	53.87
31- Case 1	Amusement and recreation services	15.02	7.40	7.87	30.29
27 - Case 2	Food and eating & drinking	78.48	22.39	34.86	135.73
28- Case 2	Automotive dealers and service stations	80.95	16.44	31.39	128.78
29 - Case 2	Miscellaneous retail	89.42	13.02	32.75	135.18
30 - Case 2	Hotels and lodging places	79.12	26.26	33.66	139.03
31- Case 2	Amusement and recreation services	20.92	10.32	10.96	42.20
32	Federal government - military (marine related)	166.00	0.00	83.83	249.83
33	Federal government - military (non-marine related)	155.00	0.00	75.75	225.75
34	State government - education and non-education	12.50	0.00	6.31	18.81

Table III.4 Estimated Employment Impact of Bay Related Economic Activities of the CCBNEP Study Area, 1995

Number	Sectors	Direct	Indirect	Induced	Total
		\$MM	\$MM	\$MM	Jobs
1	Dairy farm products	52	28	39	119
2	Poultry and eggs	2	1	2	5
3	Beef	1814	417	1073	3304
4	Other meat animals and livestock products	19	4	11	35
5	Cotton	1438	1010	1178	3626
6	Food grains	11	4	7	23
7	Feed crops	1111	242	635	1988
8	Fruits and tree nuts	0	0	0	0
9	Vegetables	59	57	56	173
10	Sugar and miscellaneous crops	222	2	109	333
11- Case 1	Commercial fishing (bay systems)	233	16	43	292
11 - Case2	Commercial fishing (bay systems and gulf by county)	661	46	123	830
11- Case 3	Commercial fishing(bay systems and gulf zone 20)	716	50	133	900
12	Natural gas & crude petroleum	74	120	92	286
13	Natural gas liquids	13	12	11	37
14	Stone, sand, gravel, chemical mining	11	2	5	18
15	New highways and streets	712	264	358	1334
16	New mineral extraction facilities	2028	30	872	2930
17	Maintenance and repair oil and gas wells	155	4	59	219
18	Seafood	57	74	27	158
19	Miscellaneous food preparations except seafood	356	152	110	618
20	Chemical products	1115	1625	1969	4709
21	Petroleum refining	585	1560	1321	3467
22	Paving, coatings, etc..	1	1	1	2
23	Lubricating oils, coal products, etc..	74	173	119	366
24	Ship and boat building and repairing	289	46	178	514
25	Water transportation	171	224	128	524
26	Transportation services	225	102	171	499
27- Case 1	Food and eating & drinking	2280	286	507	3073
28 - Case 1	Automotive dealers and service stations	812	135	321	1269
29 - Case 1	Miscellaneous retail	2867	160	494	3521
30- Case 1	Hotels and lodging places	1190	295	344	1829
31 - Case 1	Amusement and recreation services	761	220	207	1188
27- Case 2	Food and eating & drinking	4130	518	918	5566
28 - Case 2	Automotive dealers and service stations	2091	349	827	3268
29 - Case 2	Miscellaneous retail	5019	280	865	6164
30- Case 2	Hotels and lodging places	3071	763	887	4720
31 - Case 2	Amusement and recreation services	1061	306	289	1656
32	Federal government - military (marine related)	5976	0	2158	8134
33	Federal government - military (non-marine related)	5400	0	1950	7350
34	State government - education and non-education	474	0	166	641

Table III.5 Estimated Output Impact of CCBNEP Bay Related Economic Activities on Texas Economy, 1995

Number	Sectors	Direct	Indirect	Induced	Total
		\$MM	\$MM	\$MM	\$MM
1	Dairy farm products	5.16	0.16	3.91	9.22
2	Poultry and eggs	0.19	0.01	0.07	0.27
3	Beef	124.38	3.97	71.66	200.01
4	Other meat animals and livestock products	1.33	0.04	0.70	2.07
5	Cotton	111.01	10.41	66.94	188.36
6	Food grains	1.05	0.08	0.38	1.51
7	Feed crops	103.00	8.07	34.66	145.74
8	Fruits and tree nuts	0.00	0.00	0.00	0.01
9	Vegetables	8.19	0.74	3.57	12.51
10	Sugar and miscellaneous crops	3.51	0.18	2.06	5.75
11- Case 1	Commercial fishing (bay systems)	10.10	2.12	3.77	15.99
11 - Case2	Commercial fishing (bay systems and gulf by county)	28.70	6.02	10.71	45.43
11- Case 3	Commercial fishing(bay systems and gulf zone 20)	31.11	6.52	11.61	49.24
12	Natural gas & crude petroleum	19.97	6.80	6.67	33.44
13	Natural gas liquids	12.14	0.83	0.83	13.79
14	Stone, sand, gravel, chemical mining	1.01	0.33	0.45	1.79
15	New highways and streets	64.10	24.53	30.31	118.95
16	New mineral extraction facilities	90.32	3.88	68.82	163.02
17	Maintenance and repair oil and gas wells	6.02	0.78	4.67	11.47
18	Seafood	7.53	3.01	2.08	12.63
19	Miscellaneous food preparations except seafood	39.92	14.94	10.79	65.65
20	Chemical products	449.16	289.73	173.55	912.44
21	Petroleum refining	717.29	262.44	116.25	1095.98
22	Paving, coatings, etc..	0.20	0.14	0.07	0.40
23	Lubricating oils, coal products, etc..	36.51	28.33	11.51	76.35
24	Ship and boat building and repairing	26.21	6.36	13.81	46.38
25	Water transportation	32.03	23.11	12.39	67.53
26	Transportation services	23.10	10.94	14.39	48.43
27- Case 1	Food and eating & drinking	75.50	28.55	42.31	146.36
28 - Case 1	Automotive dealers and service stations	42.03	11.74	25.92	79.68
29 - Case 1	Miscellaneous retail	64.77	14.14	39.96	118.87
30- Case 1	Hotels and lodging places	51.63	20.47	29.36	101.46
31 - Case 1	Amusement and recreation services	34.59	18.16	21.34	74.09
27- Case 2	Food and eating & drinking	136.75	51.72	76.64	265.10
28 - Case 2	Automotive dealers and service stations	110.36	30.81	68.05	209.22
29 - Case 2	Miscellaneous retail	113.10	24.69	69.77	207.56
30- Case 2	Hotels and lodging places	133.25	52.83	75.77	261.85
31 - Case 2	Amusement and recreation services	48.19	25.31	29.73	103.23
32	Federal government - military (marine related)	166.00	0.00	172.54	338.54
33	Federal government - military (non-marine related)	150.00	0.00	155.91	305.91
34	State government - education and non-education	12.50	0.00	12.99	25.49

Table III.6 Estimated Personal Income Impact of CCBNEP Bay Related Economic Activities on Texas Economy, 1995

Number	Sectors	Direct	Indirect	Induced	Total
		\$MM	\$MM	\$MM	\$MM
1	Dairy farm products	0.14	0.61	1.17	1.92
2	Poultry and eggs	0.01	0.02	0.05	0.08
3	Beef	7.19	13.45	36.88	57.50
4	Other meat animals and livestock products	0.09	0.10	0.51	0.69
5	Cotton	4.07	16.78	36.66	57.52
6	Food grains	0.04	0.12	0.22	0.38
7	Feed crops	3.68	8.21	19.49	31.37
8	Fruits and tree nuts	0.00	0.00	0.00	0.00
9	Vegetables	0.09	1.02	1.83	2.94
10	Sugar and miscellaneous crops	0.45	0.09	3.04	3.58
11- Case 1	Commercial fishing (bay systems)	3.06	0.57	1.32	4.94
11 - Case2	Commercial fishing (bay systems and gulf by county)	8.68	1.62	3.74	14.04
11- Case 3	Commercial fishing(bay systems and gulf zone 20)	9.41	1.76	4.05	15.22
12	Natural gas & crude petroleum	0.83	0.47	0.47	1.78
13	Natural gas liquids	2.22	1.68	1.41	5.31
14	Stone, sand, gravel, chemical mining	0.33	0.10	0.16	0.59
15	New highways and streets	20.64	8.53	10.58	39.74
16	New mineral extraction facilities	64.99	1.21	24.02	90.23
17	Maintenance and repair oil and gas wells	4.28	0.22	1.63	6.13
18	Seafood	0.99	1.01	0.73	2.73
19	Miscellaneous food preparations except seafood	6.08	4.31	3.77	14.15
20	Chemical products	87.85	79.12	60.58	227.55
21	Petroleum refining	51.38	60.47	40.58	152.42
22	Paving, coatings, etc..	0.03	0.04	0.03	0.09
23	Lubricating oils, coal products, etc..	4.11	6.97	4.02	15.09
24	Ship and boat building and repairing	11.37	1.91	4.82	18.11
25	Water transportation	4.37	7.55	4.33	16.25
26	Transportation services	9.94	3.90	5.02	18.87
27- Case 1	Food and eating & drinking	31.77	8.93	14.76	55.47
28 - Case 1	Automotive dealers and service stations	20.76	4.17	9.05	33.98
29 - Case 1	Miscellaneous retail	33.45	4.99	13.95	52.39
30- Case 1	Hotels and lodging places	20.25	7.99	10.25	38.49
31 - Case 1	Amusement and recreation services	14.00	6.53	7.45	27.98
27- Case 2	Food and eating & drinking	57.56	16.17	26.75	100.48
28 - Case 2	Automotive dealers and service stations	54.51	10.96	23.76	89.22
29 - Case 2	Miscellaneous retail	58.42	8.71	24.36	91.48
30- Case 2	Hotels and lodging places	52.27	20.62	26.45	99.35
31 - Case 2	Amusement and recreation services	19.51	9.09	10.38	38.98
32	Federal government - military (marine related)	166.00	0.00	60.22	226.22
33	Federal government - military (non-marine related)	150.00	0.00	54.42	204.42
34	State government - education and non-education	12.50	0.00	4.54	17.04

Table III.7 Estimated Value Added Impact of CCBNEP Bay Related Economic Activities on Texas Economy, 1995

Number	Sectors	Direct	Indirect	Induced	Total
		\$MM	\$MM	\$MM	\$MM
1	Dairy farm products	4.69	0.11	2.31	7.11
2	Poultry and eggs	0.17	0.00	0.04	0.22
3	Beef	113.08	2.60	42.35	158.03
4	Other meat animals and livestock products	1.21	0.03	0.41	1.65
5	Cotton	100.91	6.00	39.56	146.48
6	Food grains	0.95	0.05	0.22	1.22
7	Feed crops	93.64	4.44	20.48	118.56
8	Fruits and tree nuts	0.00	0.00	0.00	0.01
9	Vegetables	7.45	0.42	2.11	9.98
10	Sugar and miscellaneous crops	3.32	0.10	1.22	4.64
11- Case 1	Commercial fishing (bay systems)	7.82	0.98	2.23	11.03
11 - Case2	Commercial fishing (bay systems and gulf by county)	22.23	2.77	6.33	31.33
11- Case 3	Commercial fishing(bay systems and gulf zone 20)	24.10	3.01	6.86	33.96
12	Natural gas & crude petroleum	12.28	4.63	3.94	20.86
13	Natural gas liquids	11.19	0.60	0.49	12.28
14	Stone, sand, gravel, chemical mining	0.65	0.18	0.26	1.09
15	New highways and streets	32.49	12.76	17.92	63.17
16	New mineral extraction facilities	84.74	2.11	40.67	127.52
17	Maintenance and repair oil and gas wells	5.10	0.37	2.76	8.24
18	Seafood	1.38	1.65	1.23	4.26
19	Miscellaneous food preparations except seafood	16.08	7.27	6.38	29.73
20	Chemical products	195.80	141.35	102.57	439.72
21	Petroleum refining	153.37	160.80	68.71	382.87
22	Paving, coatings, etc..	0.06	0.06	0.04	0.17
23	Lubricating oils, coal products, etc..	9.22	13.09	6.80	29.12
24	Ship and boat building and repairing	14.15	3.18	8.16	25.49
25	Water transportation	6.63	11.17	7.32	25.13
26	Transportation services	11.90	5.95	8.51	26.36
27- Case 1	Food and eating & drinking	43.85	15.11	25.01	83.97
28 - Case 1	Automotive dealers and service stations	30.83	7.06	15.32	53.21
29 - Case 1	Miscellaneous retail	51.21	8.48	23.62	83.30
30- Case 1	Hotels and lodging places	31.52	11.68	17.35	60.55
31 - Case 1	Amusement and recreation services	16.51	9.89	12.61	39.02
27- Case 2	Food and eating & drinking	79.44	27.37	45.29	152.10
28 - Case 2	Automotive dealers and service stations	80.94	18.55	40.22	139.71
29 - Case 2	Miscellaneous retail	89.42	14.80	41.24	145.45
30- Case 2	Hotels and lodging places	81.34	30.15	44.78	156.27
31 - Case 2	Amusement and recreation services	23.01	13.78	17.57	54.36
32	Federal government - military (marine related)	166.00	0.00	101.97	267.97
33	Federal government - military (non-marine related)	150.00	0.00	92.12	242.12
34	State government - education and non-education	12.50	0.00	7.68	20.18

Table III.8 Estimated Employment Impact of CCBNEP Bay Related Economic Activities on Texas Economy, 1995

Number	Sectors	Direct	Indirect	Induced	Total
		\$MM	\$MM	\$MM	Jobs
1	Dairy farm products	52	37	57	146
2	Poultry and eggs	2	1	2	6
3	Beef	1811	965	1782	4558
4	Other meat animals and livestock products	32	6	24	63
5	Cotton	1438	1323	1771	4532
6	Food grains	11	6	11	28
7	Feed crops	1084	405	942	2431
8	Fruits and tree nuts	0	0	0	0
9	Vegetables	59	81	88	228
10	Sugar and miscellaneous crops	215	12	147	374
11- Case 1	Commercial fishing (bay systems)	285	18	53	356
11 - Case2	Commercial fishing (bay systems and gulf by county)	810	50	151	1012
11- Case 3	Commercial fishing(bay systems and gulf zone 20)	878	55	164	1097
12	Natural gas & crude petroleum	74	120	92	286
13	Natural gas liquids	13	12	11	37
14	Stone, sand, gravel, chemical mining	8	3	6	18
15	New highways and streets	680	279	428	1387
16	New mineral extraction facilities	1885	36	971	2892
17	Maintenance and repair oil and gas wells	155	4	59	219
18	Seafood	57	74	27	158
19	Miscellaneous food preparations except seafood	356	152	110	618
20	Chemical products	1110	1987	2450	5547
21	Petroleum refining	578	1573	1641	3792
22	Paving, coatings, etc..	1	1	1	3
23	Lubricating oils, coal products, etc..	73	181	163	416
24	Ship and boat building and repairing	287	57	195	539
25	Water transportation	165	229	175	569
26	Transportation services	224	117	203	544
27- Case 1	Food and eating & drinking	2280	286	507	3073
28 - Case 1	Automotive dealers and service stations	812	135	321	1269
29 - Case 1	Miscellaneous retail	2867	160	494	3521
30- Case 1	Hotels and lodging places	1190	295	344	1829
31 - Case 1	Amusement and recreation services	761	220	207	1188
27- Case 2	Food and eating & drinking	4130	518	918	5566
28 - Case 2	Automotive dealers and service stations	2091	349	827	3268
29 - Case 2	Miscellaneous retail	5019	280	865	6164
30- Case 2	Hotels and lodging places	3071	763	887	4720
31 - Case 2	Amusement and recreation services	1061	306	289	1656
32	Federal government - military (marine related)	7636	0	2490	10126
33	Federal government - military (non-marine related)	6900	0	2250	9150
34	State government - education and non-education	474	0	166	641