Acknowledgements

This project's success was directly attributed to the assistance and support from all of those individuals involved in this twelve-month effort. Initially, funding for the project was obtained through the Florida Department of Environmental Protection's Division of Marine Fisheries Management. Mr. Jon Dodrill, Environmental Administrator, is thus recognized for his assistance with the project funding.

A special thank you is extended to all of our field researchers who assisted with the on-site data collection process in the five county study area. From May, 1998 through August, 1998 five Florida State University College of Business students majoring in Hospitality Administration, personally interviewed over 1,000 non-county residents during their visits to Bay, Walton, Okaloosa, Santa Rosa, and Escambia counties. Jack Asher, the field research manager, is recognized for coordinating those many tasks involved with site selection, training and interviewing. Additionally, Adam Dansby, Joshua Bailin, Lance Hart and Tim Pritchard are recognized for their efforts.

Our telephone survey team should be recognized for the many hours they dedicated to calling and interviewing 400 boat owners in the study area during evenings from September, 1998 through November, 1998. Tim Pritchard , Joey Baker and Denver Mullins are appropriately acknowledged.

The data editing, coding and entry process would not have been possible without the assistance of Sara Christenson and Kevin Adams. Brian Cronin is also recognized for his participation with data entry tasks.

Ms. Betty Brown, Florida State University's Academic Computing and Network Services Specialist in Computer Applications, is recognized for her assistance with the development of all analysis programs used for this project. In particular, her guidance with applications regarding the Statistical Packages for the Social Sciences (SPSS) software is appreciated.

Dr. Joseph West, Chairman of Florida State University's Department of Hospitality Administration, is recognized for providing the physical space and equipment necessary to complete this project. In particular, computer access, long distance telephone service and research lab space were vital in the project's success.

Ms. Fran Loeb, Administrative Assistant, Department of Economics, Florida State University, deserves special recognition for her assistance with all administrative project tasks. She coordinated all accounting tasks related to management of the project's budget including payroll, employment, purchasing, and travel. Karen Wells, Department of Economics, also deserves recognition for her assistance with manuscript preparation.

Also, Shael Wolfson, graduate assistant in Economics, is recognized for his assistance with draft report development tasks. Dagang Wang, doctoral student in the Department of Statistics, deserve recognition because of his assistance with preparing master lists of registered boat owners residing in the study area.

Finally, we would like to recognize our friends, families and loved ones for patiently supporting us throughout this endeavor. Their understanding provided us with the necessary willingness to succeed.

Sincerely,

Mark A. Bonn, Ph.D.
Associate Professor
College of Business
Department of Hospitality Admin.
Florida State University

Frederick W. Bell, Ph.D.
Professor
College of Social Sciences
Department of Economics
Florida State University

Vernon R. Leeworthy, Ph.D.
Chief Economist
Special Projects Office
National Ocean Service
National Oceanic and Atmospheric Admin.
U.S. Department of Commerce

TABLE OF CONTENTS

Chapter 1: Economic Impact and Importance of Artificial Reefs In Bay County, Florida 1

Introduction 1

Background 1

Part 1: Visitors To Bay County 2
Methodology
Sample Survey 4
Number of Visitors; Visitor Spending and Wage and Employment Impact of Visitors 4
Generated Wages and Employment 8

Boating Visitors 11
Methodology
Sample Survey
Number of Visitors: Visitor Spending and Wage and Employment Impact of Boating Visitors

Visitors Using Artificial Reefs 17
Methodology
Number of Visitors; Visitor Spending and Wage and Employment Impact Associated With Artificial Reefs 19

Evaluation of Artificial Reefs By Users 23
Methodology

Visitor Use Value of Artificial Reefs 25
Methodology
Measurement of Use of Value 28
Empirical Implementation 29

Part 2: Residents of Bay County 47

Introduction 47
Residents Engaged in Boating 47
Methodology
Sample Survey 51
Estimation of Spending, Employment, Wages and Days on Saltwater Recreational Fishing 52
Residents Using Artificial Reefs 55
Evaluation of Artificial Reefs by Resident Users 59
Methodology and Empirical Results
Resident Use Value of Artificial Reefs 61
Application of the Turnbull Distribution to

Residents 63
Dichotomous Choice Application 64
Demographic and Boating Characteristics of Resident Fishers and Divers 70
Summary And Conclusions 72
Economic Impact of Artificial Reef Visitors 72
Use Value (Willingness To Pay) of Artificial Reef Visitors 74
Economic Impact of Artificial Reef Residents 74
Use Value of Residents 75
Combined Economic Impact of Visitors and Residents 76
Combined Use Value of Visitors and Residents 76

Chapter 2: Economic Impact and Importance of Artificial Reefs In Walton County, Florida 79

Introduction 79

Background 79

Part 1: Visitors To Walton County 80
Methodology
Sample Survey
Visitor and Visitor Spending Estimation 82
Generated Wages and Employment 85

Boating Visitors 87
Methodology
Sample Survey 88
Number of Visitors: Visitor Spending and Wage and Employment Impact of Boating Visitors 88

Visitors Using Artificial Reefs 94
Methodology
Number of Visitors; Visitor Spending and Wage and Employment Impact Associated With Artificial Reefs 96

Evaluation of Artificial Reefs By Users 100
Methodology

Visitor Use Value of Artificial Reefs 102
Methodology
Measurement of Use of Value 105
Empirical Implementation 106

Part 2: Residents of Walton County 124

Introduction 124

Residents Engaged in Boating 125
Methodology
Sample Survey 128
Estimation of Spending, Employment, Wages and Days on Saltwater Recreational Fishing 129
Residents Using Artificial Reefs 132
Evaluation of Artificial Reefs by Resident Users Methodology and Empirical Results 135
Resident Use Value of Artificial Reefs 138
Application of the Turnbull Distribution to Residents 139
Dichotomous Choice Application 141

Demographic and Boating Characteristics of Resident Fishers and Divers 147

Summary And Conclusions 149
Economic Impact of Artificial Reef Visitors 149
Use Value (Willingness To Pay) of Artificial Reef Visitors 150
Economic Impact of Artificial Reef Residents 151
Use Value of Residents 152
Combined Economic Impact of Visitors and Residents 153
Combined Use Value of Visitors and Residents 153

Chapter 3: Economic Impact and Importance of Artificial Reefs In Okaloosa County, Florida 156
Introduction 156

Background 156

Part 1: Visitors To Okaloosa County 157
Methodology
Sample Survey 159
Number of Visitors and Spending Estimation 159
Generated Wages and Employment 162

Boating Visitors 164
Methodology
Sample Survey 164
Number of Visitors: Visitor Spending and Wage and Employment Impact of Boating Visitors 164

Visitors Using Artificial Reefs 170
Methodology
Number of Visitors; Visitor Spending and Wage and Employment Impact Associated With Artificial Reefs 172

Evaluation of Artificial Reefs By Users
Methodology 176

Visitor Use Value of Artificial Reefs 178
Methodology
Measurement of Use of Value 181
Empirical Implementation 182

Part 2: Residents of Okaloosa County 199

Introduction 199
Residents Engaged in Boating 200
Methodology
Sample Survey 203
Estimation of Spending, Employment, Wages and Days on Saltwater Recreational Fishing 204
Residents Using Artificial Reefs 207
Evaluation of Artificial Reefs by Resident Users 210
Methodology and Empirical Results
Resident Use Value of Artificial Reefs 213
Application of the Turnbull Distribution to Residents 215
Dichotomous Choice Application 216
Demographic and Boating Characteristics of Resident Fishers and Divers 222

Summary And Conclusions 224
Economic Impact of Artificial Reef Visitors 224
Use Value (Willingness To Pay) of Artificial Reef Visitors 226
Economic Impact of Artificial Reef Residents 226
Use Value of Residents 227
Combined Economic Impact of Visitors and Residents 228
Combined Use Value of Visitors and Residents 228

Chapter 4: Economic Impact and Importance of Artificial Reefs In Santa Rosa County, Florida 231

Introduction 231

Background 231

Part 1: Visitors To Santa Rosa County 232
Methodology
Sample Survey 234
Generated Wages and Employment 237

Boating Visitors 239
Methodology

Sample Survey
Number of Visitors: Visitor Spending and Wage and Employment Impact of Boating Visitors

Visitors Using Artificial Reefs 245
Methodology
Number of Visitors; Visitor Spending and Wage and Employment Impact Associated With Artificial Reefs 247

Evaluation of Artificial Reefs By Users
Methodology 251

Visitor Use Value of Artificial Reefs 253
Methodology
Measurement of Use of Value 256
Empirical Implementation 257

Part 2: Residents of Santa Rosa County 274

Introduction 274
Residents Engaged in Boating 275
Methodology
Sample Survey 278
Estimation of Spending, Employment, Wages and Days on Saltwater Recreational Fishing 279
Residents Using Artificial Reefs 283
Evaluation of Artificial Reefs by Resident Users 286
Methodology and Empirical Results
Resident Use Value Of Artificial Reefs 288
Application of the Turnbull Distribution to Residents 289
Dichotomous Choice Application 291
Demographic and Boating Characteristics of Resident Fishers and Divers 296

Summary And Conclusions 299
Economic Impact of Artificial Reef Visitors 299
Use Value (Willingness To Pay) of Artificial Reef Visitors 300
Economic Impact of Artificial Reef Residents 301
Use Value of Residents 302
Combined Economic Impact of Visitors and Residents 302
Combined Use Value of Visitors and Residents 303

Chapter 5: Economic Impact and Importance of Artificial Reefs In Escambia County, Florida 306

Introduction 306

Background 306

Part 1: Visitors To Escambia County 307
Methodology
Sample Survey
Number of Visitors and Spending Estimation 309
Generated Wages and Employment 312

Boating Visitors 314
Methodology
Sample Survey
Number of Visitors: Visitor Spending and Wage and Employment Impact of Boating Visitors

Visitors Using Artificial Reefs 320
Methodology
Number of Visitors; Visitor Spending and Wage and Employment Impact Associated With Artificial Reefs 322

Evaluation of Artificial Reefs By Users
Methodology 326

Visitor Use Value of Artificial Reefs 328
Methodology
Measurement of Use of Value 331
Empirical Implementation 332

Part 2: Residents of Escambia County 349

Introduction 349
Residents Engaged in Boating 350
Methodology
Sample Survey 353
Estimation of Spending, Employment, Wages and Days on Saltwater Recreational Fishing 354
Residents Using Artificial Reefs 355
Evaluation of Artificial Reefs by Resident Users 360
Methodology and Empirical Results
Resident Use Value of Artificial Reefs 362
Application of the Turnbull Distribution to Residents 364
Dichotomous Choice Application 365
Demographic and Boating Characteristics of Resident Fishers and Divers 370

Summary And Conclusions 373
Economic Impact of Artificial Reef Visitors 373
Use Value (Willingness To Pay) of Artificial Reef

Visitors 375
Economic Impact of Artificial Reef Residents 375
Use Value of Residents 376
Combined Economic Impact of Visitors and Residents 377
Combined Use Value of Visitors and Residents 377

Chapter 6: A Summary of the Economic Impact and Recreational Value of Artificial Reefs On Selected Coastal Counties in Northwest Florida 380

Introduction 380

Economic Impact Associated With Artificial Reefs 381

Recreational Value Associated With Artificial Reefs 385
Turnbull Distribution
Dichotomous Choice 389
Travel Cost Method 391

Demographic and Boater Profile of Reef Users 393
Visitors
Residents

Visitor and Resident Evaluation of Artificial Reefs 394

References 395

Appendix: Definitions and Formulas for Economic Impact Calculations 397

Appendix A: Spreadsheets for Visitors and Residents in Bay County 400

Appendix B: Spreadsheets for Visitors and Residents in Walton County 410

Appendix C: Spreadsheets for Visitors and Residents in Okaloosa County 420

Appendix D: Spreadsheets for Visitors and Residents in Santa Rosa County 431

Appendix E: Spreadsheets for Visitors and Residents in Escambia County 441

Appendix F: Survey Instruments for Visitors and Residents 451

ECONOMIC IMPACT AND IMPORTANCE

OF ARITIFICAL REEFS IN NORTHWEST FLORIDA

by

Dr. Frederick W. Bell
Professor
Department of Economics
Florida State University

Dr. Mark A. Bonn
Associate Professor
Department of Hospitality Administration
Florida State University

Dr. Vernon R. Leeworthy
Chief Economist
Special Projects Office
National Ocean Service
National Oceanic and Atmospheric
Administration
U.S. Department of Commerce

for

Office of Fisheries Management and Assistance Service
Florida Department of Environmental Protection

under Contract Number MR235

December, l998

CHAPTER 1

ECONOMIC IMPACT AND IMPORTANCE OF ARTIFICIAL REEFS IN BAY COUNTY, FLORIDA

INTRODUCTION

The purpose of this chapter is to show how we estimated both the market economic impact (e.g., sales, income, employment) and the non-market economic use value (i.e. consumer's surplus or the amount visitors or residents are willing to pay over and above the amount they actually spend) of visitors and residents of Bay County, Florida. We estimate the market economic impacts for all visitors, boating visitors and residents, and, most importantly, for visitors and residents that used artificial reefs for fishing and diving. Also, we estimate the non-market economic use value of boating visitors and residents that fished and dived and the portion of this value attributable to artificial reefs. These values are used later in the report to conduct a rough benefit-cost analysis of the artificial reef program in northwest Florida.

In this chapter, we will first address the visitor population, then we will address the resident population of Bay, County. We explain the economic concepts and our methods of estimation.

BACKGROUND

But, first some facts about Bay County, Florida. Bay County is located in eastern section of the Northwest Florida study area. It contains 764 square miles of land ranking it 29th among the 67 counties in Florida. In 1996, Bay County had a resident population of 142,200. This county has a relatively low median age of about 33 years compared to 36 years for all of Florida.

According to Bell(l996), Bay County depends heavily upon tourism; retirement; some manufacturing; fishing and the military for its economic survival or what we shall call export income. Quantification of these "basic industries" is generally not difficult except for the tourism or visitation sector. The main reason for this is that the sector cuts across the two broad categories of retailing and services. That is, visitors spend money on a great variety of products and services. Such items are not designated as specific industries in the collection of data

by the Federal and State governments. So, specific studies are necessary to quantify the economic importance of the visitor sector which is a collection of industries.

PART 1

VISITORS TO BAY COUNTY

METHODOLOGY

The model that was used to estimate visitation to a local area is called the "**CAPACITY UTILIZATION MODEL**". This model has been widely used throughout Florida in such counties as Monroe; Orange; Osceola; Seminole; Hillsborough and Leon. In the latter two counties, two of the authors of this report (Dr. Bell and Dr. Bonn) are currently engaged in continuing work on the quarterly and annual estimation of the number of visitors; spending; wages and employment generated and developing indices of how visitors view the amenities of these counties.

Although rather simple in concept, the "**CAPACITY UTILIZATION MODEL**" is complex to implement because of the number of variables to consider. This model is based upon where visitors to an area stay and that is the hotel and motel industry in the region. We call this an accommodation mode. Certainly, visitors may spend their nights with friends and relatives; in campgrounds; in condominiums or just come for the day (i.e., day visitors). The simplified "CAPACITY UTILIZATION MODEL" divides the visitor sector into those staying in hotels and motels and those staying in all other modes. If required, the residual sector can be broken down into its components, but this is at additional expense and is usually requested by special interests(e.g., condominium owners want to know how many visitors use condominiums, etc.). Thus, the capacity of the hotel/motel industry in the local area gives us the ability to extrapolate the sample to the population. That is, if we know the number of rooms occupied per night, we can derive the number of individuals using hotels and motels merely by multiplying by the size of the party using a room. Data on the number of rooms and occupancy rates are obtained from Smith Travel, Inc. on a subscription basis. As demand for visitations to the local area increases, the number of hotel rooms should expand and with it our estimate of the number of visitors. The residual or all other accommodation modes sector is linked to the hotel/motel sector by the percent of the randomly sampled number of visitors that stayed in something other than a motel/hotel. This description will become clearer once we show the results for each of the counties discussed above. To show how we obtain the number of visitors

using hotels and models, the following expression may be helpful:

HMV = k*R*p*SP/LS where

HMV= number of person-visits using hotel/motel accommodations;
k = hotel/motel occupancy rate;
R = number of hotel and motel rooms in the county;
p = period of estimation in days (e.g., l month=30 days);
SP = size of party staying in hotel/motel room;
LS = length of stay in hotel/motel room (e.g., number of nights).

The right hand side of the above expression can be broken-down into quite meaningful concepts. First, we must multiply the occupancy rate (k) times the number of available rooms (R) in the area. The available rooms are obtained by an inventory of all hotels and motels in the area. This yields the number of rooms actually used by visitors per night. Next, the length of the period is important since it specifies how many rooms nights were used in a month; quarter or yearly. In practice, p=90 since we are dealing with quarter-by-quarter analyses. As mentioned above, we must multiply by (SP) or the size of the party to count all visitors occupying the hotel/motel room per night. This will, of course, vary from night to night, but we use an average over the period of analysis. Finally, the first four terms in the above expression will yield the number of hotel/motel occupants (person-days of occupancy) for any period of time, but to obtain HMV we must divide by the length of stay or (LS). This is not obvious, but can be explained by an example.

Assume one person attends a research seminar lasting 30 days and occupies one motel room each night. Then, we would have one person-visit per month. But, if we run two 15-day research seminars where there is a different class every 15 days, then the motel room turns over once a month. Now, two person-visits would accrue to the motel room since two individuals would occupy the room in the thirty day period. Thus, as the (LS) decreases (e.g., from 30 to 15 days in the above example), the number of person-visits increases. This is the rationale for the length of stay in the above expression.

In all the counties in the Florida Panhandle mentioned above, there is both a seasonality and trend in visitation. This is expressed by the occupancy rate. As occupancy rates decline (i.e., off-season), the number of hotel/motel rooms being used declines, thus illustrating the fall in demand via person-visits

or HMV. This can be studied over the four quarters of the year as to its impact on visitor spending; generation of wages and employment and how the local economy adjusts to this pattern.

This is but a brief illustration of the principal sector of the CAPACITY UTILIZATION MODEL. The other or residual sector is obtained by ascertaining what percent of total visitor use is accounted for by the hotels/motel accommodation mode. This percentage is obtained by a random sample of visitors to the area.

SAMPLE SURVEY

During the spring and early summer of l998, face-to-face interviews were conducted at hotels, beaches and other places frequented by visitors. A total of 125 visitors were interviewed during this period. The survey instrument was designed to obtain spending amounts and other economic profile data. In addition, respondents were asked about the extent of boating while in Bay County. This is the data base upon which the next two sections depend for the estimation of the CAPACITY UTILIZATION MODEL discussed above.

NUMBER OF VISITORS; VISITOR SPENDING AND WAGE AND EMPLOYMENT IMPACT OF VISITORS

Using rather crude estimates from traditional sectors, Bell(l996), estimated that the "tourist sector" was the most important sector among those designated as in the economic base (i.e., those industries deriving income from outside the region). The visitor sector is very diverse ranging from night clubs; marinas for boating; beaches for swimming and sunbathing to the Panama City Campus of Florida State University. We hope to capture the direct economic impact of this visitor sector by the implementation of the CAPACITY UTILIZATION MODEL discussed above. The results of estimating total visitors for the last 12 months is shown in Table 1.1.

TABLE 1.1

BAY COUNTY VISITOR ESTIMATES
1997-98
(12 MONTHS)

ESTIMATION OF HOTEL/MOTEL VISITORS TO AREA(HMV)

(1) HMV = (k*R*p*SP)/LS = (.613*7,830*365*3.8)/4.07

= 1,874,558

where,

HMV = estimated number of visitors using hotels/motels;
k = occupancy rate over year;
R = average number of rooms during year;
p = number of days in year = 365
SP = average size of party for those using H/M yearly;
LS = average length of stay for those using H/M yearly.

ESTIMATION OF TOTAL VISITORS TO AREA(TV)

(2) HMV = g*TV

where,

g= percent of total visitors to area using H/M;
TV= total visitors to the area or those staying in hotels and motels plus those staying elsewhere or day visitors.

expressing (2) to solve for total visitors(TV), we have

(3) TV = HMV/g = 1,874,558 / .368

= 5,093,908

SUMMARY:

VISITORS USING HOTELS AND MOTELS(HMV):	1,874,558
OTHER VISITORS(FRIENDS/RELATIVES; CAMPING; CONDOS; DAY VISITORS OR 5,093,908 LESS 1,874,558) (OV)	3,219,350
TOTAL VISITORS	5,093,908

It is estimated that over the last 12 months or from approximately June 1997 through May l998, there were over 5 million person-visits to Bay County of which nearly 37 percent used hotels and motels for their accommodations. Notice that we have designated the over 3.2 million visitors that used other accommodations during 1997-98 as OV to identify the residual. Of course, in the normal course of analyses, we would recommend that the year be a calendar one and that estimates of visitors be made quarterly to catch the seasonality of this sector. Estimation of visitation is simply the first step in the analysis of the economic impact of the visitor sector on Bay County. The reader should again recognize that published statistics do not give these kinds of figures, so they must be estimated using individualized studies such as the one conducted here.

To obtain the raw data from which to calculated the estimated visitors, the rooms(R) and occupancy rate(k) can be obtained from Smith Travel, Inc. via subscription. However, the other data such as (SP), (LS), and percent of visitors staying in hotels and motels (g) must be obtained by a random sample of visitors to the county. The latter sampling was done over a two-month period as an approximation to annual sampling. This was necessary because of time and budget constraints.

Now, we can turn to Table 1.2 to see how total spending of visitors to Bay County was estimated as the next step in this process. Total visitor spending in Bay County is broken-down into those staying in hotel/motel accommodations and all other as discussed above. The interpretation of the first equation in Table 1.2 dealing with those staying in just hotels and motels is as follows: The number of person-visits or HMV is multiplied by the average length of stay (LS) to get the total number of person-days. This is then multiplied by the average expenditures per day per individual in the traveling party or $EPPD/SP. This yields the total expenditures in the Bay County area spent by those visitors that used the hotel/motel accommodation mode. Such individuals spent over $477 million dollars in the local

economy over the last twelve months. It should be noticed that expenditures are not merely dependent upon the number of person-visits, but party spending; number in party and the length of stay in the area. The influence of all these factors will become apparent when one compares different counties. For example, fewer visitors who spend larger amounts per day could easily offset total spending of a greater number of visitors who spend comparatively little per day. A person-visit for one day will not, in general, have the same spending impact as one of two weeks.

TABLE 1.2

ESTIMATION OF TOTAL SPENDING BY

VISITORS TO BAY COUNTY, FLORIDA

1997-98
(12 Months)

ESTIMATION OF TOTAL HOTEL/MOTEL VISITOR SPENDING(TVSHM)

(1) $TVSHM=(HMV*LS)*($EPPD/SP)=(1,874,558*3.8)*($272.67/4.07)

= $477,227,600

where,

$TVSHM = total visitor spending staying in H/M;
HMV = number of H/M visitors from Table 14;
LS = length of stay for H/M visitors.
$EPPD = expenditures per party/day for H/M visitors;
SP = size of party for H/M visitors;

ESTIMATION OF TOTAL ALL OTHER VISITOR SPENDING(TVSOV)

(2) $TVSOV=(OV*LS)*($EPPD/SP)=(3,219,350*4.87)*($291.80/4.73)

= $967,211,400

TOTAL VISITOR SPENDING IN AREA (TVS)

(3) $TVS = $TVSHM + $TVSOV

= $477,227,600 + $967,211,100

= $1,445,439,000

SUMMARY:

TOTAL VISITOR SPENDING BY H/M USERS:	$477,227,600
TOTAL VISITOR SPENDING BY OTHER USERS:	$967,211,400
GRAND TOTAL OF VISITOR SPENDING	$1,444,439,000

To estimate the spending of all other visitors to the Bay County area, we used the same expression as employed for the H/M group in Table 1.2. Notice that the per party spending per day is higher at $291.80 for the other compared to $272.67 for those staying in hotels and motels. The reasons behind this are rooted in the categories of spending which will be discussed later in this illustration. The Other Visitors(OV) spent over $967 million in Bay County and when combined with those staying at hotels and motels amount to annual spending of $1.445 billion dollars. This the estimated direct injection of money into the Bay County economy by visitors as part of the county's export base so important to it economic survival.

GENERATED WAGES AND EMPLOYMENT

The visitors' spending of somewhat less than 1.5 billion dollars has two impacts on Bay County. First, this spending generates wages and employment for those employed directly in industries catering to visitors such as motels and eating and drinking places. Second, there is an important multiplier effect associated with the creation of direct jobs in the local area. That is, employees serving visitors turn around and spend their wages on what are called local industries ranging from banking to auto repair services. This is called the "***multiplier effect***" as money keeps circulating throughout the community. As this happens, money does leak out of the area as products such as auto parts are not made locally, but must be bought from such distant points as Detroit.

Let us consider an estimate of the total direct wages and employment generated by visitors to the Bay County area. Beneath the total category of expenditures by visitors, we have ten separate purchase categories ranging from lodging to local shopping. Each category can be matched to published data on sales; wages and employment. The most detailed breakdown of these categories can be obtained from the l992 Censuses of Retail Trade and Service Industries and updated to l997-98. Two important statistics emerge. They are the sales-to-employment ratio and the percent wages are of sales. These can be designed as S/E and %W respectively. They will vary by category since some industries are more labor intensive than others. For example, a gasoline station has a high S/E since it is not very labor intensive(i.e., fully automated if just selling gas with credit cards) while a restaurant has a lower S/E ratio since each party needs the attention of a waitress. To obtain the estimated employment and wages, the following procedure was followed with the total spending broken into 10 categories or industries:

Employment = Spending in i'th industry /(S/E for i'th industry)

For example, if $150 million were spent on lodging and the sales-to-employment ratio for lodging was $50,000, we would estimate that 3,000 jobs would be sustained in this industry (i.e.,$150 million divided by $50,000). Further, assume that of the $150 million spent, 25% is required for wages or $37.5 million. Although all these calculations are not shown here, they are available from the authors upon request.

For Bay County, the direct wages and employment generated by visitor spending from the above analyses are compared with total wages and employment in the area for the l997-98 period under consideration in Table 1.3. Direct wages and salaries generated by visitors were nearly 15 percent of all wages paid in Bay County. Of great significance, visitor spending account for nearly 40 percent of all full and part-time jobs in this county. Thus, the visitor sector provides employment to almost four out of ten employees in the area. Wages per year in the tourist sector average about $10,000 compared to $23,571 in all industries in Bay County. Restaurants; bars; motels and amusement establishments employ a disproportionate share of part-time workers. In addition, most of these jobs are unskilled

or entrance kinds of employment that do not normally pay relatively high wages when compared to all industries in Bay County. Still, such jobs aid those wishing only part-time work and/or those seeking their first job to get established. The results are not surprising and are in line with those found in the visitor sector in other counties in Florida.

The estimates in Table 1.3 do not include the multiplier impacts of visitor spending in Bay County. This will enhance the economic magnitude of the visitor sector. The usual wage multiplier is between 1.2 and 1.5 for such small and open economies as Bay County. If we take the mid-point of these estimates of 1.4, then wages created by visitors may amount to a direct impact of about $322 million and an additional $129 million(.4*$322 million) or about $451 million. This would amount to nearly 24 percent of the Bay County economy as measured by wages. The indirect employment impact would be less since those making $10,000 per year would spend this money in industries employing workers in the $24,000 per year category using the overall county average. Thus, indirect employment would not rise by a 1.4 multiplier. The best estimate is that the employment multiplier is closer to 1.1 because the wage level difference between those working in the visitor sector and the overall Bay County economy. Indirect employment would be about 3,200 jobs for a total of over 35,000 jobs. Thus, we can see that the wage and employment impact of the visitor sector in Bay County is both complex, but also very revealing as to the nature of this economy.

TABLE 1.3

ESTIMATED DIRECT WAGES AND EMPLOYMENT

GENERATED BY VISITORS TO BAY COUNTY

COMPARED TO TOTAL WAGES AND EMPLOYMENT

OVER THE LAST 12 MONTHS

(1997-98)

	VISITOR GENERATED AMOUNT (MIL$)	TOTAL FOR AREA (MIL$)	VISITOR % OF TOTAL
WAGES AND SALARIES	$321.98	$1,900.49*	14.94 %
FULL AND PART-TIME EMPLOYMENT	31,986	80,832**	39.57 %

* 1995 salaries and wages taken from the U.S. Bureau of Economic Research and adjusted upward for projected employment growth of 1.4% annually or 4.2% plus a rise in inflation of 6.7 percent over the l995-l998 period or 10.9% from University of Florida, Bureau of Economic and Business Research and the Presidents Economic Report, 1998.

**l995 employment from U.S. Bureau of Economic Research adjusted for job growth of 1.4% taken from University of Florida, Bureau of Economic and Business Research for a total percent increase of 4.2.

BOATING VISITORS

METHODOLOGY

As part of the sample survey of all visitors, we asked respondents about their participation in recreational boating during the last 12 months. The total visitors are an umbrella under which many activities are included including boating. Therefore, to go from general visitor days to days spent boating the following expression was employed:

N*LS*TPY = TVD

where, N= sample size;
LS= length of stay per trip;
TPY= trips per year to the area;
TVD= total visitor days.

From the data obtained in the sample survey of all visitors, we calculated the following:

125*4*1.5 = 750 visitor days from the sample.

The respondents in the sample spend approximately 750 days per year in Bay County. They also told us that they spend 72 boater days over the last 12 months. Therefore, we estimated that 9.6% or nearly 10% of all visitor days were spent boating annually. As an approximation, we shall use 10% as the way to go from general visitation to boater visitation measured in terms of days.

SAMPLE SURVEY

In the summer of l998,a second sample survey was conducted of just boating visitors to Bay County. This survey linked the first survey of all visitors to just those engaged in some kind of boating. 115 boating visitors were interviewed to gather information regarding their mode of boating, expenditures in Bay County while boating, and most importantly their use and evaluation of artificial reefs. The sample survey instrument is shown in Appendix 2. The survey was taken

at such boating sites as boat ramps and marinas. Thus, the following analysis is based upon the second critical survey made in this study.

NUMBER OF VISITORS; VISITOR SPENDING AND WAGES AND EMPLOYMENT IMPACT OF BOATING VISITORS

Using the information from Tables 1.1 and 1.2, we calculated the total number of visitor days spent by all visitors using the following expression:

TVD = HMV*LSHM + OV*LSOV

where, TVD = total days for visitors to Bay County;
HMV = person-visits using hotel/motel;
LSHM = average length of stay for those using H/M;
OV = all other person-visits;
LSOV = average length of stay for all other modes of accommodations.

Inserting the necessary information from Tables l.1 and 1.2, we have the following:

22.801 Million = 1.8746 Million*4.07 + 3.219 Million*4.87

Therefore, we have estimated that all visitors to Bay County spent almost 23 million days over the last 12 months. About 10% of these days were devoted to boating. Thus, aggregate boating days are 2.2801 million over the last 12 months.

Using the sample distribution of days by mode of fishing, we have the following distribution:

Boating Mode	Estimated Number of Days in Last 12 Months
1.Own Boat	1.5824 Million Days (69.4%)
2.Charter Boat	.6179 Million Days (27.1%)
3.Partyboat	.0616 Million Days (2.7%)

4.Private Rental/No Guide .0182 Million Days (.7%)

From the above, it can be concluded that boating visitors to Bay County prefer to either trailor their boats or store them in marinas. Only about 30% of the boating visitors prefer to rent a boat of some kind. This pattern, as we shall see, will vary from county to county depending on cost, distance, and the socioeconomic characteristics of the boating visitors.

As discussed above, each boating mode will involve somewhat different kinds of expenditures (e.g., no rental fee for own boat trailored to Bay County) and the magnitude of the expenditures per party per day. This is one reason for breaking the boating modes down into four classifications. Therefore, we can compute the total expenditures on each mode by boating visitors using the following expression and "own boat" as an illustration:

$$TEO = TBDO * (\$EPPDO/SPO)$$

where, TEO = total expenditures in Bay County by those those using their own boat;

TBDO = total boating days by those using their own boat;
$EPPDO = total expenditures per party/day for those using their own boat;
SPO = size of party

The rationale for the above expression is fairly straight forward. The second term is total party expenditures per day divided by the size of the party. This yields expenditures per day per person. When multiplied by total person-days, this yields an estimate of total expenditures for those visitors using their own boat. This expression can be used for the other three boating modes to derive total spending in each mode. The spending is on many goods and services in Bay County that either directly or indirectly facilitate the use of a boating mode. For example, those that come for a charter boat experience, spend money on hotels, eating and drinking places, and, of course, the charter boat rental, for example. All are charter boat related since this is the main purpose of the visit to Bay County. Table 1.4 shows the average spending per party per day (EPPD) and party size (SP) by both boating mode and type of activity.

TABLE 1.4

ESTIMATED AVARAGE SPENDING PER PARTY
PER DAY AND PARTY SIZE FOR BOATERS
BY BOATING MODE AND ACTIVITY
BAY COUNTY, FLORIDA

BOATING MODE	AVERAGE SPENDING PER PARTY PER DAY EPPD($)	AVERAGE PARTY SIZE
OWN BOAT		
FISHING	$352.51	4.37
DIVING	$301.25	3.40
CHARTER BOAT		
FISHING	$630.48	4.38
DIVING[1]	$309.53	4.75
PARTY BOAT		
FISHING	$351.54	3.24
PRIVATE RENTAL		
FISHING	$529.19	3.67

1. For Diving, expenditures are for all rental (e.g. Charter, Party, and Private Rental).

Table 1.5 shows the results of our expenditure calculations. Boating visitors to Bay County spend a little over $218 million on the four boating modes. Of course, the own boat mode is the largest total expenditures of over $128 million. As with all visitor spending, we also calculated the related wages and employment. This was done in the same way as described in the section on all visitors discussed above. Visitor boating-related expenditures generated a total of nearly $39 million in wages which supports 4,255 employees.

TABLE 1.5

ESTIMATION OF SPENDING BY BOATING VISITORS

CLASSIFIED BY BOATING MODE IN BAY COUNTY, FLORIDA

BOATING MODE	TOTAL EXPENDITURES (MILLION$)[1]	RELATED WAGES (MILLION$)[2]	RELATED EMPLOYMENT (FULL and PARTIME)[3]
1. OWN BOAT	$128.32	$18.40	1,995
2. CHARTER BOAT	$ 81.00	$18.35	2,045
3. PARTYBOAT	$ 6.68	$ 1.50	168
4. PRIVATE RENTAL	$ 2.37	$ .43	47
TOTAL	$218.37	$38.68	4,255

1. See Table 1.6 for TBD by boating mode and Table 1.4 for the average expenditures and party size by mode.

2. Wages are obtained by multiplying percent wages by each expenditure items contained in the boating survey instrument. Percent wages were obtained from the U.S. Census of Retailing and Services and updated to l998. See Appendix 2 for boating survey instrument.

3. Employment was derived by dividing total spending by the sales to employment ration(S/E) for each spending category in the boating survey instrument. The S/E ratio was obtained as the same source as given in footnote 2. See Appendix 2 for the boating survey instrument.

In addition to spending, wages, and employment, it is important to know how many person-visits were made to Bay County for the purpose of boating. This figure can be estimated

by the following expression:

$$V = TBD/LS$$

where, V= person visits;
TBD= total boating days;
SP= size of the party.

The logic of the expression is that TBD are generated by all visitors to the county. Each visitor may stay for a particular number of days. To get the person-visits, this expression must be divided by the average length of stay. This yields an estimate of the total person-visits. We can apply this formula to each boating mode and thereby breakdown the person-visits by visitation by kind of boating. This is shown in Table 1.6

TABLE 1.6

ESTIMATION OF PERSON-VISITS
BY BOATING MODE FOR BAY COUNTY

BOATING MODE	BOATING DAYS (MILLIONS)	LENGTH OF STAY (DAYS)	PERSON-VISITS (MILLIONS)
1. Own Boat	1.5824	3.87	.4089
2. Charter Boat	.6179	4.85	.1274
3. Party boat	.0616	5.00	.0123
4. Private Rental	.0182	3.00	.0061
Total	2.2801		.5543

From Table 1.1, there were over 5 million person-visits to Bay County. Of these visitors, it is estimated that 554,300 were boating visitors over the last 12 months or about 10.9 percent of the total visitors. Notice that this percent corresponds to our

approximately 10% estimate of the number of boating days as a percent of total days spent by the sample of visitors discussed above.

Table 1.7 shows the demographic and boating characteristics of boating visitors surveyed in our second and most extensive survey. Boating visitors were relatively young and affluent. They were overwhelmingly white males. Bottom fish were caught along with some pelagic fish. About one-third of the visitors said they used artificial reefs. However, this is not the same thing as the percent of total boating days that were spent on artificial reefs. This leads us to the central thrust of this study and that is visitors(and residents) using artificial reefs.

TABLE 1.7

DEMOGRAPHIC AND BOATING CHARACTERISTICS OF

BOATING VISITORS IN BAY COUNTY

DEMOGRAPHICS	AVERAGE/OTHER
1. Age	36 years
2. % Males	81.4%
3. % White	97.5
4. Family Income	$65,000
5. Education	Some College
BOATING PROFILE	
1. Average Length of Boat(If owned)	27 feet
2. Years Boating in Florida Panhandle	5.3 years
3. Percent Owned Boat	24.6%
4. Percent Member of Boating Club	4.2%
5. Targeted Species	1.Red Snapper
	2.King Mackerel
	3.Red Fish
	4.Grouper
	5.Spanish Mackerel
6. Catch/Party/Day: Targeted Species	7.35 Fish
7. Species That Just Came Along	1.Bonita

	2.Catfish
	3.Grouper
	4.Triggerfish
	5.Redfish
8.Catch/Party/Day:Non-Targeted Species	6.71 Fish
9.Percent of Visitors Using Artificial Reefs	33.%
10. Number of Different Artificial Reefs Used Per Year by Those Using Them	3.43
ll. Principal Artificial Reef Used in a Year Is Off Bay County	46.6%
12. Average Distance of Artificial Reef Used from Shore	11 Miles
13. Principal Fishing Method Used on Artificial Reefs	Bottom Fishing

Source: Sample Survey of Boating Visitors to Bay County

VISITORS USING ARTIFICIAL REEFS

METHODOLOGY

Up to this point, two sample surveys were utilized in this study. The first concentrated on the general visitor to Bay County and also the extent to which the respondent engaged in boating over the last 12 months. A recreational boating experience embraces many activities such as cruising; water skiing; rafting-up; racing; wildlife observation and, of course, fishing and diving. The latter activities are done from a boat and may or may not involve an artificial reef. Therefore, we can illustrate in the following manner:

Days Boating = {Fishing + Other Activities} + {Diving + Other Activities}

In the second survey of boating visitors, we focused on just fishing and diving which may or may not be performed in conjunction with an artificial reef. In Bay County, we found that of the total days spent either fishing and/or diving, that 90% were spent fishing and the balance were spent diving over the last 12 months according to the visiting boaters using their own boat. These proportions vary with fishing and diving modes. Since our estimate of total boating days includes Other Activities, we must make some adjustment to our findings for Bay County. In retrospect, we should have asked about these other activities so we could put fishing and diving in better perspective. This should be done in further studies of artificial reefs. However, we did make some adjustment for Other Activities by using probabilities from Bell(1995). We used the following expressions:

Days Fishing = Pr(DF)* Days Allocated to Fishing

Days Diving = Pr(DD)* Days Allocated to Diving

We first allocated total days on the basis of the fishing and diving proportions. Then, we asked the question as to the probability that the days allocated to fishing will, in effect,

be used for fishing. Thus, Pr(DF)= probability that a day allocated to fishing will be used for fishing where "DF" is days fished. Similarly, Pr(DD) is the probability that a day allocated to diving will actually be used for diving where "DD" is days diving. Bell(l995) has indicated the following values for these two probabilities:

$$Pr(DF) = .80 \text{ and } Pr(DD) = .25$$

Therefore, if there are 100 general boating days, 90 will be allocated to potential fishing and 10 to potential diving based upon our second survey or the boating visitor survey. Of the 90 days allocated to potential fishing, we estimate that 72(.8*90) will actually be used for fishing. In the case of diving, the 10 days will be deflated on the basis of the probability to 2.5(.25*10). Therefore, our best estimate is that the 100 generic boating days are spent in the following manner: Fishing: 72 days; Diving: 2.5 days; Other Activities: 25.5 days. This methodology was used to allocate the total days among the three categories. Thus, those that think that fishing and diving occupy most or all of the time of the total boating days of visitors to Bay County will feel that we have underestimated the economic impact of artificial reefs. Alternatively, we can say that our estimates that follow are conservative or at least made an allowance for the "Other Activities Effect". Finally, the total fishing and diving days proportion vary by fishing mode as shown in Table 1.8.

TABLE 1.8

ALLOCATION OF BOATING DAYS BY MODE AND ACTIVITY FOR BAY COUNTY,FLORIDA

Boating Mode	Fishing %F(%T)	Diving %D(%T)
Own Boat	90%(80%)	10%(25%)

Charter	83%(100%)	17%(25%)
Party Boat	100%(100%)	0%(0%)
Private Rental	90%(80%)	10%(25%)

As expected, most of the boating days that were fishing and/or diving were found to be used for recreational fishing.

This leads us to the estimated percentage of total days that are obtained from the sample survey for just fishing and diving that are spent on artificial reefs. We asked responds to allocate days boating by fishing and diving on or about artificial reefs. These proportions are shown in Table 1.9.

TABLE 1.9

PERCENT OF FISHING AND DIVING ON ARTIFICIAL REEFS

Fishing		Diving	
l. Own Boat:	62.3%	l. Own Boat:	95.6%
2. Charter Boat:	85.0%	2. Rentals:	50.0%
3. Party Boat:	90.9%		
4. Private Rental	31.6%		

The majority of boating days spent fishing was done on or about artificial reefs according to our findings. This was even more true for diving. Over 64 percent of all diving days were

spent on artificial reefs. The estimates for diving, however, are based on a relatively small sample size (N=57).

NUMBER OF VISITORS; VISITOR SPENDING AND WAGES AND EMPLOYMENT ASSOCIATED WITH ARTIFICIAL REEFS

With the information developed above from the second sample survey of visitors, we are able to obtain an estimate of the economic impact of visitors to Bay County who use artificial reefs. We shall call these economic impacts artificial reef related. Also, we make no distinction between public and private artificial reefs. The following expression was used to obtain artificial reef related spending by boating mode for fishing:

TEOARF = (TBDO/SPO)$EPPDO * %F * %T * %AR

where, TEOARF = total artificial reef related expenditures by visitors engaged in fishing(Own Boat);
TBDO = total boating days by visitors using own boat;
SPO = average size of party(Own Boat);
$EPPDO = Expenditures per party/day by visitors using their own boat;
%F = percent of all boating days spent fishing;
%T = probability(Pr)or percent of a fishing day that will be spent fishing;
%AR = percent of days spent on artificial reefs.

The above equation is the generalized expression to determine artificial reef related spending in Bay County where we are using Own Boat as an illustration. The equation may seem difficult to understand; however, it is really quite simple. We have seen the first two terms of the expression in the discussion above. That is, (TBDO/SPO)$EPPDO is the total spending on boating by visitors using their own boat in Bay County. This is shown as $128.32 million in Table 1.5. These terms are followed by %F which is what percent the spending was related to fishing. Next, %T is an adjustment of %F to account for Other Activities as discussed above. Finally, we multiply by the %AR or the percent of the days spent on the artificial reef to arrive at TEOARF or total expenditures by visitor using their own boat

while using an artificial reef off Bay County, Florida. Since this is the "bottom line" of our presentation, it might be helpful to give a numerical illustration.

$57.28 million = (1.5824 Million/4.37)$352.51 *.9 *.8 * .623

Notice that all the numbers on the right hand side of the expression have been developed and explained in the above discussion(the $345.06 is in Table 1.4). Thus, our conservative estimate is that of the total boating visitors using their own boat, $57.28 million were spent while fishing on an artificial reef. Thus, about 44.6% of total boating visitor spending using their own boat was artificial reef related ($57.28/$128.32). This does not include diving on an artificial reefs or the other boat modes. It serves to illustrate how we went about deriving artificial reef related spending. Table 1.10 shows the application of this procedure for fishing and diving, including all modes of boating. It also shows the estimated wages and employment related to the artificial reef related spending.

The grand total of all spending that is artificial reef related is $130.96 million which supports $24.69 million in related wages and 2,727 employees. This money is injected by boating visitors into the Bay County economy. As this injection is multiplied throughout the economy, there is a direct impact of increasing sales, wages, and employment as discussed earlier in this chapter. Let us concentrate on direct wages injected. This will probably have a multiplier of 1.4. Therefore, the total wage impact is $34.57 million. Also, employment will increase by some multiplier, but probably less than the wage multiplier because the visitor sector is composed of relative low paid jobs. Assuming a multiplier of 1.2 for employment, we would have 3,272 direct and indirect jobs created by boating visitors using artificial reefs. These are economically significant numbers, but must be placed in the same perspective that the entire visitors sector was in Table 1.3. Wages generated by visitor boating on artificial reef would be about 1.82% of all wages in the Bay County economy ($34.57/$1,900.49) and 4.05% of all employment(3,272/80,832). This is not to minimize the economic importance of artificial reefs. Any sector that is related to nearly 3,300 jobs is not inconsequential to the local area.

TABLE 1.10

ESTIMATED ARTIFICIAL REEF RELATED SPENDING;

WAGES AND EMPLOYMENT GENERATED IN BAY COUNTY, FLORIDA

ACTIVITY/MODE	VISITOR SPENDING (MILLION$)	WAGES GENERATED (MILLION$)	EMPLOYMENT
OWN BOAT	**$60.49**	**$8.69**	**943**
FISHING	$57.28	$8.25	895
DIVING	$3.21	$0.44	48
CHARTER BOAT	**$63.80**	**$14.53**	**1,619**
FISHING	$62.93	$14.35	1,598
DIVING[1]	$0.87	$0.18	21
PARTY BOAT	**$6.08**	**$1.37**	**153**
FISHING	$6.08	$1.37	153
DIVING	$0.00	$0.00	0
PRIVATE RENTAL	**$0.59**	**$0.10**	**12**
FISHING	$0.59	$0.10	12
DIVING	$0.00	$0.00	0
TOTAL	**$130.96**	**$24.69**	**2,727**
FISHING	$126.88	$24.07	2,658
DIVING	$4.08	$0.62	69

1. For Diving, Charter, Party and Private Rental were combined.

We have not yet presented the total days and person-visits that are related to artificial reefs in Bay County. The former is important in developing recreational values in the section below while the latter is important in its relation to all visitors to the Bay County area. Let us consider total days spent on artificial reefs. The following expression can be used to estimate such days:

TBDARF = TBDO * %F * %T * %AR

where, TBDARF = total boating days on artificial reefs while fishing
%F, %T, and %AR were defined above.

The same general equation can be used for diving except %F is changed to %D and the numerical values of the other variables may change depending on boating mode since we have used "Own Boat" as an illustration. The artificial reef related boating days were estimated along with person-visits as shown in Table 1.11.

TABLE 1.11

RECREATIONAL DAYS AND PERSON-VISITS ASSOCIATED WITH ARTIFICIAL REEF USE FOR BAY COUNTY, FLORIDA

Mode/Activity	Number of Person-days (Millions)	Length of Stay (Days)	Person-visits (Millions)
1. **Own Boat**	**0.7478**		**0.1933**
Fishing	0.7100	3.87	0.1835
Diving	0.0378	3.87	0.0098
2. **Charter Boat**	**0.4506**		**0.0928**
Fishing	0.4372	4.85	0.0901
Diving	0.0134	4.85	0.0027
3. **Party Boat**	**0.0560**		**0.0112**
Fishing	0.0560	5.00	0.0112
Diving	0.0000	5.00	0.0000
4. **Private Rental**	**0.0041**		**0.0014**
Fishing	0.0041	3.00	0.0014
Diving	0.0000	3.00	0.0000
Total	**1.2585**		**0.2987**
Fishing	1.2073		0.2862
Diving	0.0512		0.0125

About 1.26 million days were spent over the last 12 months on artificial reefs in Bay County. The use value of a recreational days will be discussed below. This will add more meaning to the measurement of recreational days.

Finally, we would like to know how many person-visits to Bay County are related to artificial reefs. Using "Own Boat" as an illustration, this may be measured by the following expression:

$$VOAR = TBDOAR/LSOAR$$

where, VOAR = person-visits for those using their own boat on artificial reefs;

TBDOAR = total boating days for those using own boat on artificial reefs;

LSOAR = length of stay for those using own boat on artificial reefs.

Therefore, to obtain person-visits, we only have to divide days on artificial reefs by the length of stay. This makes good intuitive sense since if one individual spent 10 days in Bay County and each stay was 5 days, then we would have two person-visits. In the right hand column of Table 1.11, we show the person-visits by fishing and diving and by boating mode that are related to artificial reefs. Over a 12 month period, Bay County attracted 298,700 person-visits for the sole purpose of fishing and/ or diving on an artificial reef. About 5.9% of all visitors to Bay County, as measured by person-visits, are attracted to fishing and/or diving on artificial reefs. Remember there are a little over 5 million person-visits made to Bay County annually (See Table 1.1).

EVALUATION OF ARTIFICIAL REEFS BY USERS

METHODOLOGY

As part of survey of boating visitors to Bay County, we asked the respondents to evaluate the artificial reefs that they used. Questions about the artificial reefs were restricted

to those that actually used artificial reefs. The evaluation of artificial reefs took place in two steps. First, we asked respondents the reasons that might be important in their decision to use an artificial reef as a recreational aid in fishing or diving. Respondents rated each statement from Very Important to Not Important at All. The results were obtained with the percent that answered either Very Important or just Important as our measure of importance (see Table 1.12).

TABLE 1.12

REASONS BEHIND THE CHOICE OF AN ARTIFICIAL REEF FOR ARTIFICIAL REEF USERS IN BAY COUNTY

Reason	Percent Very Import or Important
1. Better Catch Rate	79.5%
2. Previous Experience at Site	55.9%
3. Site Is Close to Shore	27.3%
4. Want to Fish Near Others	1.1%
5. Other Fishermen Recommended Site	55.6%
6. Site Is Easy to Locate	62.5%
7. Better Fishing than Natural Reefs	44.3%

It would appear that the choice to use an artificial reef is based upon better fishing and ease of location. Respondents did not mind going 10-15 miles from shore to fish(See Table 1.7, Item 12), appeared to want the entire reef to themselves in that they did not appear to want company. It would appear that artificial reefs offer an improved recreational experience for the fishermen and even divers.

We attempted to get respondents to evaluate the present status of artificial reefs of Northwest Florida in the Gulf of Mexico. This goes to the placement of reefs and how crowed they are. Table 1.13 shows the results for fishers and divers. The existing pattern of artificial reefs seems to win the approval of fishers and divers using them. Users would like the reefs deployed some distance from shore to maximize fishing success, but placed in no more than 150

feet of water. They strongly believe that artificial reefs increase the overall abundance of fish. This is a perception which could be debated. It is true that artificial reefs add to the fishery habitat, but no scientific study is known to the authors that definitely establishes that the fish population is actually increased with artificial reefs. Users could be confusing an aggregation of fish that are attracted by new reefs from places with no reefs. This would be a redistribution with no actual increase in the population. Finally, the evaluation seems to be in favor of the expansion of the artificial reef program since only 1.7 % felt there were too many artificial reefs.

TABLE 1.13

EVALUATION OF EXISITING ARTIFICIAL REEFS

OFF BAY COUNTY, FLORIDA

CRITERIA FOR EVALUATION	PERCENT STRONGLY AGREE OR AGREE
1. Reefs Placed Too Far From Shore	21.7
2. Artificial Reef Too Crowded	45.0
3. Too Many Artificial Reefs Placed in Gulf of Mexico	1.7
4. Artificial Reefs Should Be in 150 Feet or Less of Water	69.0
5. Artificial Reefs More Productive Than Natural Reefs	38.3
6. Artificial Reefs Increase Abundance of Fish	79.6

Source: FSU Survey of Boating Visitors to Bay County.

VISITOR USE VALUE OF ARTIFICIAL REEFS

METHODOLOGY

Up to this point in the report, we have stressed the economic impact of visitors using artificial reefs on the local economy. In a later section of this chapter, we shall consider resident spending on boating that is related to artificial reefs. However, in this section we shall look at a new concept entitled "use or user value" of the recreational experience.

If we look at the natural resources used in creating a fishing or diving day, they are obviously fish and water. These resources are common property in nature. This means that there is no organized market to sell and buy these resources. In effect, fish are free to those wishing to fish for this resource. Except for a small amount paid for a fishing license, there is no substantial fee paid for the use of the fishery resource or even the waters of the Gulf of Mexico. Although a recreational day is a service rendered by nature, there is no overt price to be paid. We call this a nonmarket activity. This does not mean that recreation is worthless. In fact, various laws have been passed to protect natural resources so society as a whole can derive value from their use. In general, this is what we mean by use value. But how can it be measured?

For market goods, economists have a demand curve to measure the value of a good. Oranges, wheat, and steel have a demand curve where as price drops, more is consumed. Recreational fishing and diving are services rendered to recreationalists that should have a demand curve as well. The fact is that we cannot measure this demand curve directly because there is no price-quantity relationship to be observed. However, economists have developed techniques to indirectly measure the value obtained from the use of a natural resource that is common property.

Consider Figure 1. DD is the recreational demand curve for fishing. If there were a price, the quantity demanded would fall as the "price" increases. Thus, the demand curve is downward sloping. Since the price is zero for recreational fishing, anglers "consume" D(1) days fishing. The measure of consumption or production is usually measured in either days or trips for recreation. Trips can be longer than one day in length and correspond to the person-visit concept we discussed earlier.

Consider the area under the DD or demand curve. What we see is that recreational fishermen would be willing to pay P(l) or even P(2) or higher for the right to fish the resource, but because of the common property nature of market, the price is

actually zero. Thus, the difference between what recreationalist would be willing to pay and the actual price(i.e., zero) is called ***consumer's surplus***. Such a concept exists with market goods such as oranges, but there is a price above zero. But, there are those that would be willing to pay an even higher price. This difference is conceptually the same and is called consumer's surplus. As we shall see, consumer's surplus derived by recreationalists is actually use value. But, let us consider the market for recreation just a little bit more.

FIGURE 1

THE DEMAND CURVE AND SHIFTS IN THE DEMAND

FOR RECREATIONAL FISHING

PRICE

D(1) D(2) RECREATIONAL DAYS FISHING

We have established that there is a demand curve for recreation indicated by DD in Figure 1. Now, let us introduce the artificial reef as a "recreational aid" in fishing(and diving too). How does the artificial reef influence this market. Remember that our survey respondents in the last section generally felt that artificial reefs increase fishery catch rate or generally improve the recreational experience. The impact of introducing an artificial reef is to shift the demand curve for recreational fishing in Figure 1 upward and to the right. This means that at every level of recreation as measured by days or trips the angler is willing to pay more for the recreational experience. In a market sense, this shows how the favorable attitude of recreational fishermen manifests itself by an upward shift in the demand curve. Notice that something else happens and that is an increase in consumer’s surplus or use value. The area between the two demand curves is the increase in use value as a result of deploying the artificial reef. In contrast to the discussion in the economic impact sections above, the increase in use value means that by investing in an artificial reef we have increased output in the entire economy. While artificial reefs impact a region, they, in theory, increase national output as well. The distinction between an economic impact and use value is that the former is distributional, while the latter is a rise in national output. By distributional, we mean that if visitors do not spend their money in Bay County, they will spend it elsewhere-- maybe in the Florida Keys.

An indirect way of measuring consumer’s surplus or use value is to ask users a question designed to measure the shift in the recreational demand curve by deploying artificial reef. The following questions was asked respondents in our boating visitor survey:

> "The artificial reef program cost money. Suppose that the government proposed that all newly constructed reefs would be paid for by requiring that the reef user with their own boat either pay for a stamp as part of their fishing license or pay for a decal as part of their boat registration. If you used a rental of any kind, you would probably pay for the operator's stamp or decal in the form of higher fees to cover

> costs. The money would go into a trust fund that could only be used for the construction of artificial reefs. Would you be willing to pay $_____per year when you renew your fishing or boating license and/or use a rental boat of any kind to fund this construction program?

In this question, we have phrased it so it conforms to some generally accepted standard. First, there is a statement as background on the question. Second, there is a payment vehicle that is well articulated. Third, there is an assurance that the moneys collected will go into a trust fund designed for the sole purpose of adding new artificial reefs. The respondent is presented with a figure which he or she accepts or rejects. Therefore, we close the question to a potential open-ended ones where respondents are asked what they would pay with no constraints. This kind of a question leads to numerous biases. To implement the methodology described in this section, there are three general approaches:

MEASUREMENT OF USE VALUE

1. The Turnbull Distribution

From our question discussed above, we relate the YES and NO answers to the payments requested. The payments ran from $1 to $50 per year. As the payments rise, the probability of the respondent answering YES is decreased. The area under the Turnbull distribution gives an approximation of use value of adding additional artificial reefs. This techniques will be further explained in the implementation section.

2. Dichotomous Choice Model

In the question above, the respondent is presented with and either or situation much like a consumer faces in the market where you are presented with a price and you either take it or leave it. This is a dichotomous choice. If we let "l" stand for YES to the payment amount and "0" stand for NO to the payment amount, we can form an equation of the following form:

Pr(l,0)= f {Payment Presented; Socioeconomic Vector; Other

Shifters }

The dependent variable or Pr is called a binary variable where only one of two values can appear(i.e., YES and NO). The respondents base their choice on the payment presented. The socioeconomic vector includes income; sex; race; etc. while other shifters contain variables such as boat length; etc. to hold them constant while looking at how the probability of saying YES changes as the payment presented increases. As with the Turnbull distribution, we are look at the area under the J-shaped curve showing the relation between the probability of saying YES and the increasingly higher payment demanded. This will be another estimate of use value.

3. Travel Cost Techniques

This techniques is not based upon the willingness to pay question posed above. It is based upon the distance traveled by the boating visitors. We would expect that as the cost of travel rises, that fewer trips(and days) will be made to Bay County by visitors. The cost of these trips can be estimated and are also given as a response to a question on expenditures in the boating visitor survey. The following equation can be used to formulate the travel cost techniques:

Trips to Bay County = f {Travel Cost; Socioeconomic Vector; Other Shifters}

Travel cost is used as a proxy for price since as it rises, trips taken should fall according to travel cost hypothesis. Once this expression is estimated, we may hold the other variables constant and estimate the area under the travel cost demand curve. This will yield another estimate of consumer’s surplus or use value.

EMPIRICAL IMPLEMENTATION

The Turnbull Approach

The Turnbull(1976) distribution is non-parametric,

maximum likelihood(ML) estimator for interval-censored data which is what we have when presenting payments to respondents and asking whether they would be willing to pay such an amount or not. The Turnbull estimator uses respondents' choices to construct an interval estimate for the latent willingness to pay implied by each respondent's choice. The individual's answer to a single question will distinguish either a lower or an upper bound for his or her WTP. By combining respondents', we obtain estimates for the relative frequency of responses at different WTP levels. The intervals start at zero and end at infinity. In doing our study, we established seven intervals as follows: (1) $0 to $1; (2) $1 to $5; (3) $5 to $10; (4) $10 to $20; (5) $20 to $30; (6) $30 to $50 and (7) $50 to infinity. The interval has an upper and lower bound. It is assumed that the fraction of the sample estimated to be in each interval has a willingness to pay(WTP) value equal to the lower end point of the interval. This is referred to as the lower-bound estimate of willingness to pay and is considered to be a conservative estimate of use value.

Using the WTP question regarding artificial reef discussed above, we asked for a response from only those using artificial reefs. A prior analysis of the data indicated that the Turnbull distribution technique could not be implemented by county, but was in conformity to a priori theory for fishers from the five counties combined. The theory assumes that as the WTP amount is increased, the percent answering **"YES"** will decline. That is, the more costly the artificial reef program, the smaller the percent of the users willing to pay for the program. The sample for fishers was 264 responses while those for divers was just 37 responses with many intervals with no answers. Therefore, we were restricted to applying the Turnbull distribution to only those engaged in fishing. Of course, this is the principal use of artificial reefs by visitors to each county. Also, using the whole sample assumes that the WTP does not vary from county to county. Given the geographical proximity of the counties involved, this is not an unreasonable assumption. Furthermore, other techniques employed below will give us the ability to test the influence of each county on the WTP. Table 1.14 shows the results of the application of the Turnbull estimator to our data on the willingness to pay(WTP) for the artificial reef program.

Consider the first interval in Table 1.14(i.e., from $0 to $l). 54 respondents were asked whether they would be willing to pay at least $1.00 as part of their fishing license/ or cost of boat rental over a 12 month period for funding the artificial reef program. 49 respondents or 90.7 percent answered **"YES".** This gives us one point on the Turnbull Distribution. We cannot calculate the WTP unless we observe a change from one point on the distribution to another. This is called the change in density. The second interval when compared to the first interval shows how the willingness to pay responds to a progressive rise in the **"payment price".** Therefore, we multiply the lower bound of the interval by the change in density to get the incremental willingness to pay. When this is done for all the intervals in Table 1.14, we get the cumulative willingness to pay of $22.17 per year. Respondents responding to the highest interval are assumed to have a maximum willingness to pay of $50. This is not unreasonable when one looks at how rapidly the probability of saying **"YES"** to the payment drops off as the payment rises in Table 1.14. Since the willingness to pay question was asked of an individual(i.e., not a fishing party), we interpret the $22.17 to be the WTP by one visitor fisher over a 12 month period for the artificial reef program as contained in the willingness to pay question. Since the data are an aggregation for all counties in the study, this WTP will apply to any fisher in anyone of the five counties. In Bay County, the typical visitor spends 4 days per trip and visits the county about 1.5 times per year. Therefore, we interpret the $22.17 as the WTP for 6 days of boating adjusted for percent fishing and the percent engaged in other boating activities. We estimated above that 52.95 percent of all general boating days are spent fishing on or about artificial reefs. Thus, of the 6 days in total fishing, 52.95 percent or 3.18 days are spent per individual on artificial reefs. Taking the annual WTP of $22.17 per fisher, and dividing it by days spent on artificial reefs in Bay County, we have a **WTP/Day of $6.97**. What is this value? It is the interpreted as the incremental recreational value afforded to the average fisher by artificial reefs as a recreational aid on a fishing day. Why is this important? The basic reason is that the expenditures on artificial reefs not only has an economic impact which we have quantified, but increases output in the general economy. That is, since the market does not measure the value of recreational output by many natural resources such as the fishery as discussed above, we have an indirect measure of this value. The **total annual use value of artificial reefs for fishing in Bay County is equal to about $8.41 million** ($6.97*1.2073 million days spent fishing on artificial reefs in Bay County). We shall

discuss this further after we gave reviewed the two other procedures used to estimate the WTP as discussed above.

TABLE 1.14

APPLICATION OF THE TURNBULL ESTIMATOR TO THE WILLINGNESS TO PAY(WTP) FOR ARTIFICIAL REEFS

(1) Lower Bound for Interval	(2) Upper Bound for Interval	(3) Probability of Paying at at Upper Bound	(4) Change In Density	(6) WTP (1)*(4)	(7) N
$0	$1	.907	.093	0	54
$1	$5	.796	.111	$ .110	49
$5	$10	.804	-.008	-$ .008	46
$10	$20	.600	.204	$2.040	35
$20	$30	.411	.189	$3.780	34
$30	$50	.197	.215	$6.450	46
$50	Infinity	.000	.196	$9.800	N/A

Total Willingness to Pay(Total of Column 6): $22.172

Dichotomous Choice Application

The modeling approach followed here is one originally developed by Bishop and Heberlein (1979). There have been many applications using slightly different specifications of the model and Hanemann (1984) further developed the underlying economic theory behind various model specifications and the formulas for calculating consumer’s surplus or compensating variation. Compensating variation is consumer’s surplus adjusted for the

income effects of price changes that would keep the consumer at the same level of total economic well-being as before the change in price. The answers to questions like the ones used in this study to measure the value of artificial reefs are assumed to yield estimates directly of compensating variation. The general form of the dichotomous choice is as follows:

$$Pr\ (YES) = \alpha - \beta_{BID} * BID + \beta_{SE} * SE + \mu$$

where, Pr (YES)= the probability that the user will be willing to pay the randomly assigned dollar amount (BID).

BID = randomly assigned dollar amounts.

β_{BID} = estimated coefficient on BID.

SE = vector of other socioeconomic variables and/or natural resource attributes.

β_{SE} = estimated coefficients for SE vector.

μ = error term following logistic distribution for logit model and normal distribution for the probit model.

The above model was estimated using both the logistic and normal distribution assumption about μ. The BID variable was included in its linear and logarithmic form (natural logarithm of BID called LBID here). In the SE vector, we include a variety of socioeconomic factors including household income, age, years of experience boating in northwest Florida, race, and sex. Also, included were variables for differentiating charter and party boat mode use from use of the own boat and private rental boat modes. A variable was also entered to indicate artificial reef use and, when fishermen and divers were combined, a variable was entered to differentiate divers from fishermen. However, none of the variables in the SE vector were significant in any model specification. Some have argued that this finding calls into question the validity of the estimated values. We present eight model specifications that include only the bid amount as an explanatory variable (Table 1.15). The models differ by sample of users (e.g. all users versus fishermen only), by assumption about the distribution of the errors (e.g. the logit of probit model), and by specification of the bid amount (e.g. linear BID or log linear or natural logarithm of bid or LBID). The estimated values derived from these models range from $23.92 to $29.83 per user per year. The average of these eight values is

$27.02.

The average value derived from the dichotomous choice models is slightly higher than that obtained using the same information and employing the Turnbull method $27.02 versus $22.17 or about 22 percent higher. The lowest value obtained from the dichotomous choice model is only 7.89 percent higher than that obtained using the Turnbull method ($23.92 versus $22.17). To derive an estimate of the willingness to pay per day, as with the Turnbull estimate above we divide the annual value per person by 3.18 days yielding an estimate of **WTP/day of $8.50** ($27.02/3.18). And, our estimate of total annual value of artificial reef use in Bay County using the dichotomous choice method is **$10.26 million** ($8.50 * 1.2073 million days of use).

TABLE 1.15

DICHOTOMOUS CHOICE MODELS

FOR ARTIFICIAL REEF USERS

IN NORTHWEST FLORIDA

Model Number	α	β_{BID} or β_{LBID}	BID or LBID	Users	Type of Model	N	WTP for Artificial Reef ($)[1]
1	2.2308 (9.455)*	-.07486 (-8.159)	BID	All	Logit	302	29.80
2	1.3392 (10.309)	-.04490 (-8.778)	BID	All	Probit	302	29.83
3	3.6048 (7.948)	-1.1233 (-7.299)	LBID	All	Logit	302	24.76
4	1.9752 (8.980)	-.6134 (-7.877)	LBID	All	Probit	302	25.03
5	2.1086 (8.448)	-.07167 (-7.551)	BID	Fish	Logit	260	29.42

6	1.2692	-.04305	BID	Fish	Probit	260	29.48
	(9.145)	(-8.104)					
7	3.3250	-1.0473	LBID	Fish	Logit	260	23.92
	(7.187)	(-6.713)					
8	1.8367	-.5783	LBID	Fish	Probit	260	23.95
	(8.124)	(-7.282)					
1-8 Average							27.02

* t-values in parentheses.

1. For linear model, annual willingness to pay (WTP) is equal to α/β_{BID}, while for the log linear model, WTP is equal to $\exp(\alpha/\beta_{LBID})$.

Travel Cost Demand Model Application

The modeling approach employed here is one that has recently been applied to visitors to the Florida Keys (See Leeworthy and Bowker 1997, and Bowker and Leeworthy 1998). The choice of this modeling approach is based on the similarity of the type of sample data collected that present problems of biased estimation of consumer's surplus. A major source of possible bias in estimating consumer's surplus is when the sample does not include those that do not consume the good or service, here fishing or diving in northwest Florida. Not including people that do not engage in fishing or diving in estimating the demand function can lead to what is called truncation bias. It is called truncation bias because the sample is truncated at one visit to the area or only includes people that made at least one trip to northwest Florida. Samples that are conducted on-site of visitors by definition only include people that have visited the area. This is done because obtaining a random sample of all people (visitors and non-visitors) is too expensive for practical purposes. However, statisticians and economists have developed methods to correct demand estimation with truncated samples and thus avoid the truncation bias.

Another aspect about trips is that one cannot take a fraction of a trip. Trips take on integer values (e.g., 1, 2, 3,…365). Statisticians and economists have also developed methods for estimating models where the dependent variable, like

trips, have integer values. The methods are called count data models and include the Poisson model and the negative binomial model. The model we employ here is a special version of the count data models that uses a maximum likelihood method of estimation that also adjusts for truncation bias and are therefore called the truncated Poisson and truncated negative binomial models.

The travel cost model estimated here takes on the following general form:

$$Ln(TRIPS_i)=\beta_0 + \beta_{tc}TC_i + \beta_{se}\ SE_i + \mu_i$$

where, for the ith individual Ln(TRIPS) is the natural logarithm of the quantity of recreation trips, TC is the travel cost per trip, SE represents the vector including other relevant socioeconomic variables and site attributes, the βs' are regression parameters estimated by the model that quantify the relationship between the right-hand side variables to TRIPS, and μ is an error term that is assumed to follow a gamma distribution with mean 1.0 and variance α (Greene, 1995).

Table 1.16 provides definitions of all the variables used in estimating the final model presented here. Several of the variables in Table 1.16 require further explanation. We followed Bowker, English & Donovan (1996), Leeworthy and Bowker (1997) and Bowker and Leeworthy (1998)and defined the dependent variable as a person-trip (NTRIPS). Hence a family of four visiting northwest Florida once per year would account for four person-trips as would an individual visiting northwest Florida four times in one year. However, given the same origins and travel modes, the price per person-trip would differ as the single visit cost for the family of four would be apportioned to four person-trips. While intuitively appealing, this construction of the dependent variable is practical for situations were group travel by car is common. In the boating visitors sample used here, all visitors came by automobile. In addition, the construction of the dependent variable used here helps to avoid the empirical malady of low dispersion of the dependent variable i.e., a clustering around one trip annually.

Travel costs per person-trip (TCOSTPP) is equal to round-trip road mileage times a cost per mile then divided by the number of people in the traveling party. Distance was calculated from the center of the zip code of the person's home to the center of the zip code of the site in northwest Florida where the person was interviewed. We used a computer program called Prophesy Plus and chose the route that was the fastest (would take the least time). Mileage cost was calculated using $0.14

per mile. This estimate is based on a recent study of travel costs by auto visitors to the Florida Keys (Leeworthy and Bowker 1997). This cost is less than what the Federal government uses to reimburse Federal employees for travel when using their private vehicles (currently $0.31 per mile). The reason is that the Federal government rate includes overhead costs such as insurance and maintenance as well as the depreciation of the vehicle. The costs used here only include trip related costs such as gasoline, oil, parking fees, and tolls. As discussed above, round-trip travel costs were divided by the number in the traveling party to put costs on a person-trip basis to be consistent with our definition of TRIPS (NTRIPS) or person-trips.

The inclusion of time costs, both in-transit and on-site is subject to considerable debate. Theoretically, Freeman (1993) demonstrates that both kinds of time costs should be included. However, he points out a number of problems which continue to plague applied researchers. One is the inability of a large portion of the population to easily substitute between working increased hours at their normal (or overtime) wage rate and leisure time. Another is the possibility of utility or disutility resulting from work, travel, or on-site time, hence rendering the full wage rate a potentially poor measure of the shadow cost of time. He points out that while most surveys elicit a pretax income measure, a more realistic wage rate would be derived from after tax income.

Many other researchers have used a percentage of the wage rate, some based on travel studies of the cost of travel congestion, while most use some arbitrary percent of the wage rate. We felt that resolving this issue was beyond the scope of this study and we used a more conservative approach and have not included the value of time.

It is important in travel cost modeling, especially when visitors come from origins of great distance, to control for the length of trip. The variable (STAY) is the length of the interview trip measured in number of days. Length of trip was used extensively in the beginning of the report to estimate the total number of person-trips. It is assumed that all trips over the year are the same length.

We included a host of standard socioeconomic variables including age (AGEH), household income (INCTTH), race/ethnicity (WHITE), years of experience visiting northwest Florida (EXPER), sex (MALE)and whether the person was a member of a fishing or diving club (CLUB). AGEH was scaled in hundreds of years and was used in estimation with it's squared value (AGESQH). This specification tests if there is a parabolic relationship between the number of person-trips (NTRIPS) and age (AGEH). We will discuss this in more detail below when discussing the results of the estimation. Household income (INCTTH) was scaled to $10,000. Thus a value of one means a household income of $10,000. Household income was actually obtained in intervals (e.g. less than $10,000, $10,000-$19,999, $20,000-$29,999, etc.). We converted this to a continuous variable by setting the value of household income to the mid-point of the interval given by the person interviewed.

The variable (EXPER) is the number of years the person interviewed had been boating in the panhandle of Florida. For race/ethnicity, we created a dummy variable (WHITE) which takes on a value of one (1) if the person interviewed was White, not Hispanic and zero (0) otherwise. There were not enough Black or African American or Hispanic persons in the boating sample to construct separate variables for these groups. The variable (CLUB) is also a dummy variable that takes on a value of one (1) if the person was a member of a fishing or diving club and zero (0) otherwise. In addition, sex was represented as a dummy variable that takes on a value of one (1) if the person interviewed was a male and zero (0) otherwise.

We also constructed a set of intercept and slope dummy variables to test whether those that dive (DIVE), or used the charter boat mode (CHARTER), or used the party boat mode (PARTY), and, most importantly for this study, used an artificial reef (REEF) have different demands. That is, instead of estimating

separate demand equations for each group (we don't have enough people in the boating sample to do this), we can employ statistical techniques that allow us to estimate different demands while pooling the data. DIVE, CHARTER, PARTY and REEF are intercept dummies that take on values of one (1)or zero (0) just like variable WHITE, MALE, and CLUB discussed above. Intercept dummies let us test if, on average, different groups take more or less trips (NTRIPS). For example, do divers take more or less trips to northwest Florida for boating activities, holding all other factors constant, than fishermen.

Slope dummies test whether the slope of the demand function is different for different groups. As we will show below, this is important for two reasons. Slope dummies allow us to test whether different groups will respond differently to price. That is, for a given percentage change in price, what will be the percentage change in number of trips to northwest Florida for boating activities by different groups. Economists call this price elasticity. Price inelasticity means for a given percentage change in price their will be a smaller percentage change in number of trips. This has practical importance to local businesses because inelastic demands means that, for a price increase, total revenue will increase. The opposite is true if demand is elastic.

Another important use of slope dummies is in estimating consumer's surplus or use value per trip. As we will show when we discuss later the formula for calculating consumer's surplus or the use value per trip, the calculation depends on the slope of the demand function. So groups with different demand slopes will have different use values per trip. Groups with demands with steeper slopes will have higher use values per trip and vice versa.

We constructed slope dummies for divers (DCOST1), for those that used charter boat mode (CHCOST1), for those that used the party boat mode (PARCOST1), and those that used an artificial reef (REFCOST1). The variables are created by simply multiplying the intercept dummy variable for each group by the travel cost variable (TCOSTPP). An estimated positive coefficient on a slope dummy means that the slope of the demand for boating trips is steeper for that group meaning that groups demand will be more inelastic and will mean that group has a higher use value per trip than the base group. For example, if the coefficient on DCOST1 is positive, it will mean that divers have more inelastic demands than fishermen, holding all other factors constant. It will also mean that divers have a higher use value per trip than fishermen.

TABLE 1.16

DEFINITIONS OF THE TRAVEL COST MODEL VARIABLES

Variable	Definition
NTRIPS	Annual number of person-trips to northwest Florida for boating activities.
TCOSTPP	Travel cost per person-trip. Round-trip mileage from home to the interview site times $0.14/mile.
STAY	Length of trip measured in number of days.
INCTTH	Household income (in 10,000 of $).
AGEH	Age of the person interviewed (in hundreds of years).
AGESQH	AGEH squared.
EXPER	Number of years have been boating in northwest Florida.
DIVE	Dummy variable (1=participated in diving).
CHARTER	Dummy variable (1=used charter boat mode).
PARTY	Dummy variable (1=used party boat mode).
CLUB	Dummy variable (1=member of a fishing or diving club).
REEF	Dummy variable (1=used artificial reef).
DCOST1	Slope dummy for diving (DIVE*TCOSTPP).
REFCOST1	Slope dummy for use of artificial reef(REEF*TCOSTPP).
CHCOST1	Slope dummy for charter boat mode use.

(CHARTER*TCOSTPP).

PARCOST1 Slope dummy for party boat mode use (PARTY*TCOSTPP).

α Overdispersion parameter. A significant parameter indicates the presence of overdispersion and that the Poisson model is rejected in favor or the negative binomial model.

Results of the Travel Cost Demand Model

Truncated Poisson and negative binomial (TNB) models were estimated using LIMDEP Version 7.0 (Greene 1995). Only the TNB model is presented here because the hypothesis of no over dispersion was rejected based on a Wald test equivalent to the asymptotic t-ratio on the estimated dispersion parameter, α (Yen & Adamowicz, 1993). Table 1.17 summarizes the results of the TNB model.

Several variables included in Table 1.16 were dropped from the model because they were not statistically significant. The variables dropped were STAY, DCOST1, and REFCOST1. Length of trip (STAY) was negative but not significant. The slope dummy for diving (DCOST1) was positive but not significant meaning that the price elasticity and consumer's surplus or use value per trip was not different between fishermen and divers. And, most important here, the slope dummy for artificial reef use was positive but not significant meaning that the price elasticity and use value per trip was not different between users and nonusers of artificial reefs.

All the variables included in the final model presented in Table 1.17 are statistically significant, except household income (INCTTH). Because of incomes economic importance we kept it in the model despite it's insignificance. Dropping income from the equation did not significantly change any other estimated model coefficients in our tests of alternative model specifications. All the other variables included in the model were statistically significant with high levels of confidence as expressed in the column labeled, $P[\ |z| \geq z]$. This column contains the significance level for the test of whether the estimated coefficient is significantly different from zero. A value of 0.05 would indicate significance at the 5 percent level or that we are confident at the 95 percent level. Generally, the model variables were all significant at the 0.05 or below meaning these

are fairly strong results.

Price Elasticities

The coefficient on TCOSTPP is negative indicating a downward sloping demand curve as presented in Figure 1. As discussed above, price elasticity of demand measures how the demand for trips (NTRIPS) changes with changes in prices (TCOSTPP), holding all other factors constant. Specifically, price elasticities measure the percentage change in the number of trips (NTRIPS) for a percentage change in price (TCOSTPP).

TABLE 1.17

TRAVEL COST MODEL RESULTS

FOR BOATING VISITORS

TO NORTHWEST FLORIDA

Variable	Coefficient	Standard Error	b/St.Er.	P[|Z|>z]	Mean of X
Constant	4.132307282	.60192811	6.865	.0000	1.00000
TCOSTPP	-.03937839110	.0024047564	-16.375	.0000	36.832241
CHCOST1	.02606125483	.0030188745	8.633	.0000	22.724031
PARCOST1	.01365062332	.0059164162	2.307	.0210	10.808520
INCTTH	.01485993937	.012251925	1.213	.2252	8.0092308
AGEH	-7.413161512	2.9668408	-2.499	.0125	.38021538
AGESQH	10.02846709	3.2960961	3.043	.0023	.15524892
MALE	.2889243810	.15285344	1.890	.0587	.85846154
CLUB	.6819655766	.14803140	4.607	.0000	.067692308
CHARTER	-1.346883501	.11960963	-11.261	.0000	.60923077
PARTY	-1.255882128	.23010332	-5.458	.0000	.20923077
REEF	.2897223689	.10902141	2.657	.0079	.53230769
	Overdispersion parameter for negative binomial model				
Alpha	.5272315531	.67047941E-01	7.864	.0000	

NTRIPS (mean) 9.19

Log likelihood function	-877.5674
Restricted log likelihood	-1607.626
Chi-squared	1460.118

```
Degrees of freedom                    1
Significance level             .0000000
LEFT  Truncated data, at NTRIPS =  0.
N=325
```

In our particular specification of the demand model, price elasticity for those that used the own boat and private rental boat modes is equal to the estimated coefficient on TCOSTPP times TCOSTPP. That is, price elasticity varies with the level of price. At the mean or average travel cost, the price elasticity for the demand by those that used own boat or private rental boat for both fishing and diving was equal to -1.45 (-.0394*36.83 from Table 1.17). Thus the demand for own boat and private rental boat trips for fishing and diving in northwest Florida is considered elastic. That is, for a 10 percent increase in price, demand for trips will decrease by 14.5 percent. This means that price increases for this group would result in decreases in total revenue to local businesses. And, price decreases will result in increases in total revenue.

For fishers and divers that used party and charter boating modes, price elasticities are calculated using the slope dummies we discussed above. For the party boat mode, the price elasticity at the overall sample mean travel cost is equal to -0.9484 [(-.0394+.01365)*36.83]. For a 10 percent increase in the price, party boat mode trips would decrease 9.48 percent. Since this price elasticity is less than -1.0 we say that the demand for party boat mode trips is inelastic. Meaning that for a price increase, total revenues would increase. And, price decreases will result in decreases in total revenue.

For fishers and divers that used the charter boat mode, the price elasticity at the sample mean travel cost is equal to -0.4898 [(-0.0394+.0261)*36.83]. For a ten percent increase in price, charter boat trips would decrease about 4.9 percent. Thus, for the charter boat mode, demand is price inelastic.

Relationship Between Trips and Age

As discussed above, the relationship between NTRIPS and the age of the person interviewed (AGEH) was expected to be parabolic. This was tested by including age squared (AGESQH) in the estimated travel cost demand model. The coefficient on AGEH is negative and the coefficient on AGESQH is positive meaning that as age increases, from age 16, the number of trips (NTRIPS) decreases, reaches a minimum, and then starts increasing with age (a u-shaped parabola). Below is the estimated relationship using our estimated travel cost model. Note that trips reach a minimum at age 35.

NTRIPS	AGE
2.0	16
1.7	25
1.5	35
1.6	45
1.9	55
2.3	65
2.6	70
3.4	80

Relationship Between Trips and Other Factors

For all other factors and trips, the marginal effects are reported here. The marginal effects are the changes in the number of trips for a one unit change in the factor. For intercept dummies, discussed earlier, the calculation shows how many trips, on average, a group makes more than the reference group. Marginal effects are calculated as the mean number of NTRIPS times the estimated coefficient on the factor.

Household income has a relatively small effect on trip taking. An increase of $10,000 in household income would result in only a 0.14 increase in the number of trips (NTRIPS). Males, on average, make 2.65 more trips than females. Members of fishing and diving clubs (CLUB) make, on average, 6.27 more trips than non club members. Charter boat mode users make, on average, 12.38 fewer trips than those that use the own boat and private rental boat modes. Party boat users make, on average, 11.54 fewer trips than those that use the own boat and private rental boat modes. And finally, those that used artificial reefs (REEF) make, on average, 2.66 more trips than non reef users.

User Value of Artificial Reefs

As discussed above, we can use our estimated travel cost model to estimate consumer's surplus or use or user value for artificial reefs. We estimate these values per person-trip, per person-day, and the total annual value for Bay County. The estimates are presented by boat mode and for fishermen and divers.

For those that used the own boat or private rental boat mode (fishermen and divers), the following formula is used to calculate consumer's surplus per person-trip:

$$CSPT_{own} = (-1/\beta_{TCOSTPP}) * [1/1+(t_{TCOSTPP})^{-2}]$$

where, $CSPT_{own}$ = Consumer's surplus (use value) per person-trip for those that used the own boat or private rental boat modes, including both fishermen and divers.

$\beta_{TCOSTPP}$ = Estimated coefficient on the travel cost variable (TCOSTPP).

$t_{TCOSTPP}$ = Estimated t-value (from column labeled b/st.er. in Table 1.17) for the travel cost variable coefficient.

By substituting the values for the above variables from Table 1.17, we calculate $CSPT_{own} = [-1/-.0394] * [1/1+(16.375)^{-2}] = [25.38] * [.9963] =$ **$25.29**. The above formula has two components. The first is the formula for calculating the area under the estimated travel cost demand model as shown in Figure 1 earlier in the chapter. The second component is an adjustment for bias in consumer's surplus estimates from demand functions. Even though the estimated demand function is unbiased, consumer's surplus estimates are biased (Zellner and Park, 1979). The correction factor is a simple function of the estimated t-value on the travel cost coefficient (Bockstael and Strand, 1987). When the estimated t-value is large, the correction factor for bias will be small.

An important finding from our travel cost demand modeling was that those that used the charter and party boat modes (fishermen and divers) had different price elasticities and different consumer's surpluses per person-trip. The formula for charter boat mode fishermen and divers is as follows:

$$CSPT_{CHARTER} = [-1/(\beta_{TCOSTPP} + \beta_{CHCOST1})] * [1/1+(t_{TCOSTPP})^{-2}] * [1/1+(t_{CHCOST1})^{-2}]$$

where, $CSPT_{CHARTER}$ = Consumer's surplus per person-trip for fishermen and divers that used the charter boat mode.

$\beta_{TCOSTPP}$ = Estimated coefficient on the travel cost variable.

$\beta_{CHCOST1}$ = Estimated coefficient on the slope dummy variable (CHCOST1).

$t_{TCOSTPP}$ = Estimated t-value (from column labeled b/st.er. in Table 1.17) for the travel cost variable coefficient.

$t_{CHCOST1}$= Estimated t-value (from column labeled b/st.er. in Table 1.17) for the slope dummy variable (CHCOST1) coefficient.

By substituting the values for each variable in the above formula from Table 1.17, we calculate $CSPT_{CHARTER}$ = [-1/(-.0394+.0261)] * $[1/1+(16.375)^{-2}]$ * $[1/1+(8.633)^{-2}]$ = [75.19] * [.9963] * [.9868] = **$73.92**. The above calculation is similar to the one for own boat and private rental boat modes except that there are three components to the calculation. The first component adjusts for the change in slope of the demand function for charter boat mode users. The second and third components adjust for the bias in consumer's surplus and account for the bias from both the travel cost coefficient and the slope dummy for charter boat users.

The formula for party boat mode users is as follows:

$$CSPT_{PARTY} = [-1/(\beta_{TCOSTPP} + \beta_{PARCOST1})] * [1/1+(t_{TCOSTPP})^{-2}] * [1/1+(t_{PARCOST1})^{-2}]$$

where, $CSPT_{PARTY}$ = Consumer's surplus per person-trip for fishermen and divers that used the party boat mode.

$\beta_{TCOSTPP}$ = Estimated coefficient on the travel cost variable.

$\beta_{PARCOST1}$ = Estimated coefficient on the slope dummy variable (PARCOST1).

$t_{TCOSTPP}$ = Estimated t-value (from column labeled b/st.er. in Table 1.17) for the travel cost variable coefficient.

$T_{PARCOST1}$= Estimated t-value (from column labeled b/st.er. in Table 1.17) for the slope dummy variable (PARCOST1) coefficient.

By substituting the values for each variable in the above formula from Table 1.17, we calculate $CSPT_{PARTY}$ = [-1/(-.0394+.01365)] * [1/1+$(16.375)^{-2}$] * [1/1+$(2.307)^{-2}$] = [38.83] * [.9963] * [.8418] = **$32.57**. The above calculation is similar to the one for the charter boat mode.

Using the above estimates of consumer's surplus per person-trip, we can estimate the total annual value of artificial reefs and we can estimate the value on a per person-day value. We do this by referring back to our estimates of person-trips and person-days by boat mode and activity (see Table 1.11). We reproduce those estimates along with our estimates of total annual consumer's surplus and consumer's surplus per person-day in Table 1.18.

Table 1.18 shows the impacts of a variety of factors on total value for artificial reefs. Even though our estimate of consumer's surplus per person-trip was higher for party boat mode users than own boat mode users ($32.57 vs. $25.29), there is no significant difference on a per person-day basis ($6.54 vs. $6.51). And, even though the own boat mode and private rental mode users had the same value per person-trip ($25.29), private rental boat mode users had a higher value per person-day ($8.63 vs. 6.54). The reason for this difference is the difference in length of trip. Private rental boat mode users had, on average, shorter trips than those that used their own boats (3.0 vs.3.87).

Even though charter boat mode users made significantly less person-trips and spent less person-days in Bay county than the own boat mode users, total annual value for charter boat users was significantly higher than that of own boat mode users ($6.86 million vs. $4.89 million). The higher value per person-trip and per person-day, for charter boat users, more than offset the number of person-trips and person-days by own boat users.

Overall, for year 1997-1998, artificial reefs for Bay County visitors were worth over **$12 million**. Fishermen accounted for 96.3 percent of the total value, while divers accounted for 3.7 percent. Visitors that used charter boat fishing services accounted for 54.8 percent of the total value, while fishermen using their own boats accounted for 38.2 percent of the total value.

Comparison of User Values Across Methods

The Turnbull method resulted in an estimate of the value per

person-day for artificial reef use (fishing only) of $6.97 compared to $8.50 for the dichotomous choice models, and $9.69 using the travel cost model. Total annual value for the artificial reefs (fishing only) in Bay County was estimated at $8.41 million using the Turnbull method, $10.26 million using the dichotomous choice models, and $11.70 million using the travel cost model. Because the willingness to pay questions resulted in estimated values that were not explained by differences in any socioeconomic factors, **we conclude that the travel cost model results are the 'best' results for Bay County. Including fishermen and divers, we estimate the total annual value of artificial reef use in Bay County was $12.15 million.**

TABLE 1.18

ANNUAL AND PER PERSON-DAY USE VALUES

FOR ARTIFICIAL REEFS IN BAY COUNTY, FLORIDA

Boat Mode/ Activity	Person-Visits on Artificial Reefs (millions)[1]	Total Annual Use Value of Artificial Reefs (millions $)[2]	Person-days on Artificial Reefs (millions)[3]	User Value Per Person-day ($)[4]
Own Boat	**0.1933**	**4.8886**	**0.7478**	**6.54**
Fishing	0.1835	4.6408	0.7100	6.54
Diving	0.0098	0.2478	0.0378	6.56
Charter	**0.0928**	**6.8598**	**0.4506**	**15.22**
Fishing	0.0901	6.6602	0.4372	15.23
Diving	0.0027	0.1996	0.0134	14.90
Party	**0.0112**	**0.3648**	**0.0560**	**6.51**
Fishing	0.0112	0.3648	0.0560	6.51
Private Rental	**0.0014**	**0.0354**	**0.0041**	**8.63**
Fishing	0.0014	0.0354	0.0041	8.63
Total	**0.2987**	**12.1486**	**1.2586**	**9.65**
Fishing	0.2862	11.7012	1.2073	9.69
Diving	0.0125	0.4474	0.0512	8.74

1. See Table 1.11.
2. Total annual consumer's surplus for artificial reefs is equal to the estimated consumer's surplus per person-trip (CSPT) for each boating mode times the number of person-trips on artificial reefs. CSPT for own boat and private rental mode is $25.29, $73.92 for charter boat mode, and $32.57 for the party boat mode.
3. See Table 1.11.
4. Consumer's surplus per person-day for artificial reef use is

calculated as total annual consumer’s surplus for artificial reef use divided by total person-days on artificial reefs.

PART 2

RESIDENTS OF BAY COUNTY

INTRODUCTION

When we consider artificial reefs, we must look at two well defined user groups. These are the visitors to Bay county which we have extensively analyzed above and the residents of that county. Such coastal residents engage in all forms of boating and also use artificial reefs as a recreational aid. In 1996, the population of Bay County, Florida was estimated at 142,159 individuals. These individuals took advantage of the coastal environment by registering 15,587 pleasure craft or a little over 9 persons per boat. In the State of Florida, there are over 19 persons per registered boat indicating that Bay County has more than double the per capita ownership of pleasure craft. A coastal county requires a relatively large infrastructure for boating including piers, boat ramps, and marinas. In addition, we can add artificial reefs as part of this infrastructure.

A inventory taken by the Florida Department of Environmental Protection(1996) in l995 indicated that Bay County had the following boating infrastructure:

1. Piers: 24 with a length of 12,236 linear feet;

2. Boat Ramps: 40 with a total of 55 boating lanes;

3. Marinas: 28 with 1,431 slips and 885 dry racks.

It is estimated by the DEP, that there are 48 artificial reefs off Bay County. All of these facilities are available to both visitors and residents for boating use in the Gulf of Mexico.

We shall focus on the registered boats in Bay County as the universe for resident use of artificial reefs. Of course, residents, as was true of the visitor sector, may avail themselves of party, charter, and other rental boats operating from the county. This will also be treated in our economic analyses. However, we shall start with the registered pleasure boats. For purpose of analyses, these pleasure craft were broken down into three categories based on the length of the vessel as follows:

Class 1: Under 16 Feet	9,182
Class 2: 16 Feet to 39 Feet, 11 inches	6,284
Class 3: Over 40 Feet	121
Total	15,587

The boat registration data were obtained from the Florida Department of Highway Safety and Motor Vehicles. Even though finer class distinctions are available by length, we felt that dealing with the above classes made our study more manageable and targets the Class 2 pleasure crafts as those capable of reaching an artificial reef which we saw in the visitor study above is, on average, over 10 miles from shore. Thus, the decision was made to target those intermediate size pleasure craft that are more likely to use artificial reefs. The third class is relatively small and was included to assure we treated, in some way, all the pleasure craft registered in Bay County.

RESIDENTS ENGAGED IN BOATING

METHODOLOGY

Residents engaged in boating from Bay County were divided into two classes: those using their own boats and those using some kind of rental boat such as a party, charter, or other kind of rental boat. Let us consider the “own boat category” first. As discussed above, the universe for this category includes all the registered boats in the county. It is possible that a resident of Bay County may register his or her boat in another county. If this is the case, we made the assumption that the boating activity of that resident took place mainly in the county in which the pleasure craft was registered. This is what is called a simplifying assumption to limit the scope of this study. However, of more concern in a coastal county is those individuals that registered their craft there, but live elsewhere. Such individuals would not be defined as residents of the coastal county. For example, a resident of Tallahassee may berth his craft in one of the 28 marinas in Bay County. It would not be unreasonable for such an individual to have registered his boat in Bay County as a matter of convenience. Therefore, some adjustment must be made to the registered pleasure craft numbers to account for, delete, nonresidents. For each of the Classes established above, the following expression was employed:

RESBT = REGBT * % RES

where,

RESBT = Registered resident boats(pleasure craft);
REGBT = Registered boats (pleasure craft) in the county under study;
%RES = Percent of registered boats registered to individuals with homes in the county under study.

Just how %RES(percent local residents) was determined will be discussed under sampling procedure below. Next, registered pleasure craft owned by local residents is merely a stock of boats which may or may not be used for boating or some element of boating such as fishing or diving. In our sampling procedures discussed below, we ascertained, from those owning registered boats, the number of days per year they were used predominately for saltwater fishing. For purposes of this study, we are only interested in fishing and diving since these activities are the primary recreational use of artificial reefs. The following expression may be useful in looking at a fishers use of a pleasure craft:

FPDYO = RESBT* FDPBPYO

where,
FPDYO = Fishing(saltwater) party days per year using own boat;
RESBT = Resident boats(pleasure craft);
FDPBPYO = Fishing(saltwater) days per own boat per year.

This is a rather simple expression which indicated that saltwater fishing days per year is the result of multiplying the number of boats by the average number of fishing days. This turns the stock of boats into a flow of days per year. Each day represents the action of a group of people or party. So, each day can be regarded as a "party day". Such "days" refer to the use of the pleasure craft or boat by a residents of the county under study.

Next, we wish to translate fishing days into expenditures by residents using their boats in Bay County. To do this, we can use the following expression:

$EXPENDFO = FPDYO * $EPPDO

where,
$EXPENDFO = Total expenditures on saltwater fishing per year using own boat;
FPDYO = Fishing (saltwater) party days per year using own boat;

$EPPDO = Expenditures per party per day using own boat.

Notice that $EPPDO is expenditures by the entire party using a boat or pleasure craft on any given day for saltwater fishing. Such expenditures run from bait and fuel to slip rentals in a marina. Thus, we were able to obtain how much was spent by those residents using their own boat on bait, for example. This will be discussed in some detail below.

$EXPENDFO must be converted into how many job such expenditures support in Bay County and wages related to such jobs. This can be accomplished by the following expressions:

EMPLOYFO = $EXPENDFO / {($S/E)}

$WAGESO = %WAGES*$EXPENDFO

where,

EMPLOYFO = Number of full and part-time jobs generated by recreational saltwater fishers using own boat in the county;

$S/E = The ratio of sales to employment for those industries in which spending for good and services are made for saltwater fishing;

$WAGESO = Wages and salaries generated by own boat spending in industries related to saltwater fishing;

%WAGES = Percent wages are of total sales/expenditures in industries related to saltwater fishing.

The first expression above is used to derive employment by dividing expenditures which are sales by the published ratio of sales-to-employment in those industries related to saltwater fishing. Each of these industries generates wages as a cost of doing business. Therefore, we multiply this published ratio of wages-to-sales or %WAGES by $EXPENDFO to obtain the wages and salaries generated by these expenditures. In both expressions, we need published data that are taken from the U.S. Censuses of Retailing and Services for the county in question. In the case of this chapter, we have published data for Bay County on all major industries serving the county. Published data are not always available for all the parameter needed for the above expression. In this case, we must turn to sampling which is discussed below in a separate section.

It should be recognized that not all residents use their own boat for saltwater fishing in Bay County. Rentals such as party

and charter boats are readily available and are the choice of many visitors to the county as discussed in Part 1 in this chapter. How do we obtain the total expenditures by residents on this part of the saltwater fishing sector?

Consider the following expression:

$EXPENDFR = ($EXPENDVISITOR/ %VIS) * %RES

where,

$EXPENDFR = Expenditures by county residents on charter, party and other rental boats for saltwater fishing;

$EXPENDVISITOR = Expenditures by all visitors on charter, party and other rental boats for saltwater fishing;

%VIS = Percent visitors are of the total demand for charter, part and other rentals;

%RES = Percent residents are of the total demand for charter, party and other rental boats.

The right hand side of the above expression has two terms. The first term merely “blows-up” visitor expenditures on all rental boats to total expenditures including, of course, those expenditures made by non-visitors or residents. The second term is merely what percent total expenditures are made by residents of the county in question. The “percents” are based on the number of days that visitors and residents make in connection with the boat rental industry in the county. This is the best measure of demand available from the boat rental industry. This will be discussed below in some detail.

Finally, we would like to estimate the number of person fishing days spent by all residents of Bay County. The reason we say “person” fishing days is that we wish to derive the total number of fishing days by all persons engaged in saltwater fishing. These days will be used later to estimate the total use value of the recreational experience that was extensively discussed under the visitor’s section above. The following expression can be used to estimate total saltwater person-days:

PDAYSFO = FPDYO * SPO

where,

PDAYSFO = Person days saltwater fishing using own boat;

FPDYO = Fishing(saltwater) party days per year using own boat;

SPO = Size of party engaged in saltwater fishing using own

boat.

Now, we shall turn to the survey techniques used with the residents to obtain some of the parameters of the expressions discussed above.

SAMPLE SURVEY

The researchers obtained a magnetic tape from the Florida Department of Highway Safety and Motor Vehicles (FDHSMV) containing all registered boat owners in the State of Florida. The computer tape was processed to yield only those registered boaters in the five West Florida Counties under study. These five counties contained 60,599 registered boat owners. This defined our universe of resident boaters. The purpose of obtaining the tape was to form the universe for telephone sampling of registered boat owners in each of the five counties. Unfortunately, the FDHSMV does not obtain the phone number of the registered boat owner. To overcome this problem, we obtained a CD-ROM of all listed phone numbers in the United States including Florida. The CD-ROM was interfaced with the magnetic tape of registered both owners to match as many owners with listed phone numbers. For the counties under study, we were able to “match” about 85 percent of the registered boat owns on the tape with phone numbers available on the CD-ROM. The “matched set” of registered boat owners in each county was randomized so they could be sampled. This was a substantial undertaking for the research team plus a graduate student in the Florida State University Statistics Department. But, it did form the basis for the telephone survey.

The random sample size was determined by the county under study and the budget for the project. That is, Bay; Okaloosa and Escambia Counties contain about 80 percent of the registered boat owners so this is where our sampling was concentrated. Further, the budget for this project limited the size of the sampling even for the larger counties. After the survey instrument was developed for residents, the randomized boat owners were called by telephone in Bay County during the summer and early fall of 1998. The degree of cooperation by the boat owners called was exceedingly low with only 1 in 10 agreeing to be surveyed. This make the process even more expensive. We have no idea as to why the response rate was so low. In any event, 95 boat owners were completely surveyed in Bay County by the end of the allotted time for the resident survey. It was our intention to get a least 100 boat owners for the larger counties and this was generally obtained. The survey instrument used for the residents is contained in Appendix 3 for the readers inspection.

ESTIMATION OF SPENDING;EMPLOYMENT; WAGES AND DAYS ON SALTWATER RECREATOINAL FISHING:

Table 1.20 contains the necessary parameters to estimate the economic impact model formulated above. For the reader's insight into this process, let us work through an example. Consider size class 1 or own boats under 16 feet as discussed above and included in Table 1.20. Inserting the estimated values from Table 1.20 into the expressions explained above, we have the following:

(1) RESBT = RESBT*%RES = 9,182*.93 = 8,540 (locally owned boats)

(2) FDPYO = RESBT*FDPBPYO = 8,500*15.25 = .130235(Millions party days)

(3) $EXPENDFO = FPDYO *$EPPDO = .130235(Millions) * $67.00
= $8.726 (Million)

(4) EMPLOY = $EXPENDFO/{($S/E)} = $8.726/ ($.1344)= 65 Employees

(5) $WAGESO = %WAGES * $EXPENDFO = .0868 * $8.726 (Million)
= $.7573 (Million)

(6) PDAYSFO = FPDYO * SPO = .1330235(million) * 2.6
=.338611(Million person days)

(7) $EXPENDFR = ($EXPENDVISITORS/%VIS) * %RES
= {$56.95(Million)/.9}*.1
= $6.33 (Million)

Summarizing the above analyses, we can state that the individuals in Bay County owning pleasure craft under 16 feet spent over $8.7 million on saltwater recreational fishing which in turn generated over $.75 million in wages which supported 65 jobs in Bay County. In addition, the local individuals owning the pleasure craft provided over one-third of a million person-days of saltwater recreational fishing. Notice that these conclusions were reached using expressions (l) through (6) above. Expression (7) relates to an estimate of total spending of all Bay County residents on party, charter, and other rentals combined. These individuals either do not own boats or, if they do, choose to kick back and let someone else do the boating while they concentrate on fishing. Table 1.21 summarizes all the analyses for the three classes and rentals.

Residents of Bay County, Florida spent nearly $33.5 million on saltwater recreational fishing over the last 12 months (primarily l998). According to summary Table 1.21, this generated about $3.1 million in wages and salaries that supported about 295 full and part-time employees located in Bay County. In addition to the visitor spending discussed in the first part of this chapter, the residents of Bay County place considerable pressure on the boating infrastructure of the area. Of great importance, these conclusions only applying to saltwater fishing using a boat mode and does not include fishing from the shore. In addition, fishers spent 851,621 person-days over the last 12 months in the pursuit of recreational saltwater fishing. As explained under our discussion of visitors above, the number of person-days is a significant factor in computing the use value of the fishery resource and even recreational aids such as artificial reefs. This brings us to a direct consideration of that segment of the resident anglers using artificial reefs.

TABLE 1.20

PARAMETERS ESTIMATED FROM THE SAMPLE
OR TAKEN FROM PUBLISHED DATA TO IMPLEMENT
THE BAY RESIDENT ECONOMIC IMPACT MODEL
OF SALTWATER RECREATIONAL FISHING

	OWN BOAT			RENTAL
Parameter	Class 1	Class 2	Class 3	All other
RESBT (Registered boats)	9,182	6,284	121	N/A
%RES (Percent live in county)	93	88	66	N/A
FDPBPYO (Days per year/boat)	15.25	25.82	100	N/A
$EPPDO (Expenditures/party/ day)	$67.00	$150.28	$91.17	N/A
$S/E (Millions) (Sales-to-Employ- ment ratio)	$.1344	$.1360	$.1572	$.040
%WAGES (Percent wages of sales)	.0868	.0797	.0742	.230
SPO (Size of party)	2.60	3.26	3.5	N/A
%VIS (Percent visitors)	N/A	N/A	N/A	90
%RES (Percent residents)	N/A	N/A	N/A	10
$EXPENDVISITORS ($ Spent by visitors using party, charter and other rentals in millions)	N/A	N/A	N/A	$56.95

Source: Florida State University Sample Survey; U.S. Censuses of Retailing and Services, Bay County, Florida.

TABLE 1.21

ESTIMATED ECONOMIC IMPACT OF RESIDENT SALTWATER FISHING ON BAY COUNTY, FLORIDA

ECONOMIC VARIABLE/ INDICATOR	CLASS 1	CLASS 2	CLASS 3	RENTAL	TOTAL
EXPENDITURES (Millions)	$ 8.73	$21.43	$.60	$2.74	$33.49
WAGES (Millions)	$ .76	$ 1.71	$.044	$ .616	$ 3.12
EMPLOYMENT	65	158	4	69	295
PERSON DAYS (Millions)	.3386	.4648	.0280	.020	.8516

Source: Florida State University

RESIDENTS USING ARTIFICIAL REEFS

As we mentioned above, our telephone survey covered 95 resident boaters in Bay County, Florida. Much of the information contained in Table 20 came from this survey. In addition to this information, we asked resident boaters about their use of artificial reefs for saltwater recreational fishing. We measured participation in terms of days spent fishing. In fact, the days spent fishing are the driving force behind all our economic impact conclusions discussed above.

In total, the 95 resident boaters sampled spent 2,694 party days per year engaged in saltwater recreational fishing. This was the aggregate fishing effort by all of the three boat length classes discussed above. Respondents were asked to break down their saltwater fishing days into those days spent on or about artificial reefs off Bay County. Of the total party days, 1,341 party days were spent fishing on artificial reefs. Thus, about 50 percent of all party days spent on saltwater recreational fishing

targeted artificial reefs as the place to engage in fishing. An independent survey of charter boat operators by the authors indicated that artificial reefs are fished over 47 percent of the fishing days. Therefore, whether one used his own boat or a rental, it would appear that artificial reefs are used about 50 percent of the time devoted to saltwater recreational fishing. Since days fishing is a multiplier to get all the economic impact information, then it follows that 50 percent of the total economic impact is artificial reef related. This is shown in Table 1.22.

For fishers only, they spent nearly $17 million on goods and services in Bay County, Florida that is artificial reef-related. This expenditure supports 148 full and part-time employees with wages of $1.56 million. These anglers spent 425,812 person days on artificial reefs over the last 12 months(primarily l998). Lastly, we shall consider divers as a recreational group that uses artificial reefs.

TABLE 1.22

ESTIMATED ECONOMIC IMPACT OF RESIDENTIAL

SALTWATER RECREATIONAL FISHING ON OR ABOUT

ARTIFICIAL REEFS, BAY COUNTY, FLORIDA

ECONOMIC VARIABLE / INDICATOR	VALUE
TOTAL EXPENDITURES	$16.74 MILLION
TOTAL WAGES	$ 1.56 MILLION
TOTAL EMPLOYMENT	147 EMPLOYEES
TOTAL PERSON DAYS	.4258 MILLION

* 50 percent of total economic impact of saltwater recreational fishing by residents attributable to the existence of artificial reefs. See text for a further discussion. Figures in this table are 50 percent of the figures in Table 1.21.

Source: Florida State University

Up to this point, we have not mentioned diving as a recreational use of an artificial reef. From our sample, diving constitutes about 10 percent of all the days devoted to fishing and diving by the residents of Bay County, Florida. For the other counties we shall be reviewing, diving is even less important. To estimate the economic impact of diving, we performed the following procedure:

ADJFACTOR = DAYSDIV/ DAYSFISH

where,

ADJFACTOR = Adjustment factor to economic variables associated with recreational saltwater fishing to derive estimates of economic variables associated with diving;
DAYSDIV = Days spent diving by residents;
DAYSFISH = Days spent fishing by residents.

The ADJFACTOR is merely multiplied by the economic variables associated with recreational saltwater fishing on artificial reefs to derive an estimate of the economic importance of diving. The implicit assumption is that spending by divers per party per day is about the same as that for fishers. Unfortunately, the sample for divers in Bay County that use artificial reefs was only 3 responses. When diver expenditures per days for the 3 responses were compared to those for fishers, it indicated about the same expenditures per party per day. Thus, we shall make no further adjustments.

The fishers spent 2,694 days per year from the sample while the divers spent only 289. Therefore, the ADJFACTOR would be .107 (289/2,694). Applying this factor to the results in Table 1.22 yields a rough estimate of the economic extent of diving. All of this is summarized in Table 1.23. The combined economic impact of fishers and divers using artificial reefs in Bay County is reflected in spending of over $18.5 million, supporting 164 jobs and generating $1.73 million in wages and salaries. These two groups spent 471,374 person-days on the artificial reefs over the last 12 months.

Next, we shall consider, as we did with visitors, the responses by fishers and divers to questions concerning their evaluation of artificial reefs as a recreational aid.

TABLE 1.23

ESTIMATED ECONOMIC IMPACT OF RESIDENTIAL

SALTWATER FISHING AND DIVING ON ARTIFICIAL

REEFS IN BAY COUNTY, FLORIDA

ECONOMIC VARIABLE/ INDICATOR	FISHERS	DIVERS*	TOTAL
TOTAL EXPENDITUES (MILLIONS)	$16.74	$1.8	$18.53
TOTAL WAGES (MILLIONS)	$ 1.56	$0.17	$ 1.73
TOTAL EMPLOYMENT	148	16	163
TOTAL PERSON-DAYS (MILLIONS)	.4258	.0456	.4714

* Divers derived by multiplying fishers by the adjustment factor(ADJFACTOR) of .107 explained in the text.

Source: Florida State University

EVALUATION OF ARTIFICIAL REEFS BY RESIDENT USERS

METHODOLOGY AND EMPIRICAL RESULTS

As part of the telephone survey of resident boat owners in Bay County, we asked respondents to evaluate the artificial reefs that they used. Such questions were restricted to those that have actually used one or more artificial reefs. We asked respondents the reasons that might be important in their decision to use an artificial reef as a recreational aid in either fishing or diving. Respondents rated each statement from Very Important to Not Important at All. The following results were obtained with the percent that answered either Very or just Important as their evaluation.

TABLE 1.24
Reasons Behind the Choice of an Artificial Reef by Fishers

Reason	Percent Very Important or Important
1. Better Catch Rate	92.3
2. Previous Experience at Site	75.0
3. Site Is Close to Shore	52.6
4. Want to Fish Near Others	9.5
5. Other Fishers Recommended Site	36.2
6. Site Is Easy to Locate	54.5
7. Better Fishing than Natural Reefs	36.4

Source: Florida State University

It would appear that fishing catch rate on artificial reefs was of paramount importance in the decision by fishers to use an artificial reef for a recreational aid. Apparently, artificial reefs raise use value as discussed in Part 1 dealing with visitors. In fact, we found that the travel cost model applied to visitors verified the hypotheses that recreational value is increased when an artificial reef is introduced into the recreational activity of saltwater fishing. A particular artificial reef was rated very important when the individual had previous experience with it. Respondents were evenly divided over the existing distribution of artificial reefs. About fifty percent of the respondents felt that artificial reefs where not too close to shore. Respondents definitely felt that they wanted

to be alone on artificial reefs as less than 10 percent wanted to fish near others. A little over one-third of the artificial reef users felt that the recommendations of other fishers regarding a "good" artificial reef was either very or just important. Users were evenly divided among those feeling the artificial reef was easily to locate indicating that location of the existing distribution of reefs may be somewhat of a problem. Finally, artificial reefs are a good man-made recreational aid; however; only one-third of the users felt that man was better than nature-that is two thirds felt natural reefs yielded "better fishing".

We asked both fishers and divers to evaluate artificial reefs from somewhat of a different perspective. In the above analyses, the respondents were restricted to fishers only. Table 25 shows the results from both users combined. With regard to placement of artificial reefs too far from shore, all users were as the just fishers result evenly divided about this issue. Such strategic placement of artificial reefs is beyond the scope of this inquiry, but important enough to warrant further investigation. At present, most of the users of artificial reefs do not think that they are too crowded (i.e., only 30%). However, with the rapid expansion in boating in the Florida Panhandle, it would appear that this may be a problem in the immediate future. All users are not convinced that artificial reefs are more productive than natural reefs. This is consistent with the feelings of just fishers. Although crowding on artificial reefs does not appear to be a problem, only 10% of all the users felt that there were too many artificial reefs. There will be two issues arise from this result. First, should the investment in artificial reefs be expanded in the future since crowding may become critical problem. Second, some regard the expansion in artificial reefs will hasten overfishing of bottom dwelling fish such as red snapper and various groupers. The hypotheses advanced is that artificial reefs do not increase the size of the fishery population, but merely aggregate an existing population on reefs where they can be easily overfished. This view regards artificial reefs as devices to increase the "efficiency" of recreational fishers in catching fish. This debate has been covered lately in Grossman et al and Bohnsack et al (l997).

The consensus of users feel that artificial reefs should be placed in water less than 150 feet deep. This is understandable since bottom dwelling fish are seldom found no deeper than 150 feet. Finally, to add information to the debate over whether artificial reefs increase fishery population or actually diminish such populations, users perceive that artificial reefs "increase abundance". An argument can be made that artificial reefs are man-made habitats that increase fishery stocks and hence abundance. This is an item for further study and is certainly beyond the scope of this report.

TABLE 1.25

EVALUATION OF EXISTING ARTIFICIAL REEFS

BY DIVERS AND FISHERS OFF BAY COUNTY, FLORIDA

CRITERIA FOR EVALUATION	PERCENT STRONGLY AGREE OR AGREE
1. Reefs Placed Too Far From Shore	50%
2. Artificial Reefs Too Crowded	30%
3. Artificial Reefs More Productive Than Natural Reefs	30%
4. Too Many Artificial Reefs	10%
5. Artificial Reefs Should Be In Water Less Than 150 Feet	70%
6. Artificial Reefs Increase Abundance of Fish	80%

Source: Florida State University

RESIDENT USE VALUE OF ARTIFICIAL REEFS

METHODOLOGY

We shall not go through an extensive discussion of the analytics of use value as we did for the visitors in Part 1. The reader is referred to the section discussing use value in the visitor analyses above. As the reader will remember, use value is the recreational value placed upon a common property resource such as a fishery which does not trade in an organize market. Quite simply, until recently there was no saltwater fishing license required by Florida for fishing in its

territorial waters; therefore, the fish were free to anglers for their recreational use. Despite the expenditures of these anglers which is the economic impact, there is an additional value called "use value" that is derived from this natural resource. We have argued and the survey results would seem to support the hypotheses that the artificial reef is a recreational aid that increases the use value of the fishery or the waters above the artificial reef for divers. Thus, we have basic use value and the incremental use value created by the artificial reef. It is well known that an increase in catch rates will increase use value. See Green(1984) and Leeworthy(1990) for examples. Artificial reef fishers contend that catch rates are indeed better there. Thus, those fishing on an artificial reef should experience increase use value from the saltwater recreational fishing experience. This was confirmed for visitors in Part 1 and has profound implications for a benefit/cost analyses of the artificial reef program. As with the visitors, we asked the residents to respond to the following question, which we shall repeat again for the reader:

> "The artificial reef program cost money. Suppose that the government proposed that all newly constructed reefs would be paid for by requiring that reef users with their own boat either pay for a stamp as part of their fishing license and/or if they used a rental boat probably pay higher fees for the operator's stamp. The money would go into a trust fund that could only be used for the construction of artificial reefs. Would you be willing to pay $_____ per year when you renew your fishing license/and or use a rental boat of any kind to fund this construction program?"

Notice that this question is directed at fishers only. The reason is that there were too few divers in the sample from all five counties to implement the estimation of use value procedure. To enlarge the sample, we combined all counties where telephone interviews of fishers were completed. A total of 339 responses were obtained among the five counties. On a random basis, the respondents were asked this question which we called "dichotomous choice". That is, the respondent answers YES or NO to the amount or payment presented. The amounts presented were $1; $5; $10; $15;$20;$30 and $50. Remember, a respondent is presented with only one of these "payment vehicles" in the single interview. In this way, we get a segment of the sample answering to each of the assigned values for the payment vehicle.

In the case of the visitors discussed above, we used three procedures to estimate use value. For residents, the travel cost

method could not be used because of the short distance traveled to the boat launching site. Therefore, we are restricted to the Turnbull Distribution and the Dichotomous Choice Equation for the estimation of the use value for saltwater recreational fishing on artificial reefs. We interpret the question stated above to be the incremental use value of expanding the artificial reef program to satisfy the users. In Table 25, only 10 percent of the present reef users felt that there were enough artificial reefs off Bay County. Therefore, we would expect incremental use value from providing more artificial reefs. Just how many additional reefs was not directly addressed because we would have to get into placement; size and depth of additional reefs. This kind of detail was beyond the scope of this investigation.

APPLICATION OF THE TURNBULL DISTRIBUTION TO RESIDENTS

We shall not get into an extensive discussion of the Turnbull Distribution since this was covered in Part 1 dealing with visitors. We would expect that as the payment amount increased, that fewer and fewer respondents would be willing to pay for the expansion of the artificial reef program. This means that the percentage of respondents for each dollar amount should decline as the dollar amount presented to the fisher increased. Table 26 shows the computations using the Turnbull Distribution procedure.

As expected, the percent of fisher respondents willing to pay increasingly higher dollar values declines as the dollar value is raised from $1 to $50. Even at the $50 level, 39.4 percent of that group of fishers said YES that they would be willing to pay that amount. This shows a strong support for the expansion of the artificial reef program even when faced with a higher cost of fishing licenses and/or rental boat fees by residents of all five counties. From the analyses in Table 26, it would indicate that the typical fisher using an artificial reef would pay an additional $25.45 per year to support the expansion of the program. Notice that use value and willingness to pay is used interchangeably. In general, they are the same concept. The answer to our dichotomous choice question was given by one individual so the $25.45 refers to the annual individual willingness to pay or the incremental use value of the artificial reef as a recreational aid. This use value is usually expressed on a daily basis. The reason for this is that we have estimated the number of person days connected with the artificial reef usage above. For Bay County, Florida, the typical boat owner fishes 28.35 days per year. This figures combines classes 1-3 discussed above. Of course, only 50 percent or 14.18 days are spent on artificial reefs as discussed above. Therefore, the resident use value is about $1.80 per day($25.45/14.18 days). The

residents use value is substantially less than that found for visitors($6.97/day) using the Turnbull technique. Since residents fish 5-6 times the days fished by visitors, one might expect diminishing marginal returns as one fishes more. This form of diminishing marginal utility might be responsible for the disparity between visitors and residents.

If we assume that the marginal willingness to pay is equal to the average willingness to pay, then we can compute total user value per year. Using the number of fishing days on artificial reefs by Bay County residents over the last 12 months, we can estimate the annual total flow of use value to Bay County fishers and divers assuming that the diver's use value is about the same as that of fishers. There were 471,400 days spent on artificial reefs by fishers and divers who are residents of Bay County, Florida. This is shown in Table 1.23. This allows us to make the following statement: Fisher and diver residents of Bay County derive $848,520 in recreational use value from the use of artificial reefs per year. This is a considerable flow of use value when it is compared to the cost of funding the artificial reef program. This will be considered in some detail when we finish all five of the counties under study.

TABLE 1.26

ESTIMATION OF RECREATIONAL SALTWATER

FISHING USE VALUE FOR ARTIFICIAL REEFS OF NORTHWEST FLORIDA

USING THE TURNBULL DISTRIBUTION

(1) Lower Bound for Interval	(2) Upper Bound For Interval	(3) Probability of Payment at Upper Bound	(4) Change in Density of Distribution	(5) Willingness To Pay (Use Value) (1)*(4) $	(6) Sample Size
$0	$1	.771	.229	0	70
$1	$5	.657	.115	$0.115	64
$5	$10	.586	.070	$0.350	58

$10	$15	.545	.041	$0.410	11
$15	$20	.547	-.002	-$0.040	64
$20	$30	.410	.137	$4.110	39
$30	$50	.394	.016	$0.800	33
$50	Infinity	0	.394	$19.700	N/A
	Total Use Value(Sum Column 5)			$25.445	

Source: Florida State University

Dichotomous Choice Application

The modeling approach followed here is one originally developed by Bishop and Heberlein (1979). There have been many applications using slightly different specifications of the model and Hanemann (1984) further developed the underlying economic theory behind various model specifications and the formulas for calculating consumer's surplus or compensating variation. Compensating variation is consumer's surplus adjusted for the income effects of price changes that would keep the consumer at the same level of total economic well-being as before the change in price. The answers to questions like the ones used in this study to measure the value of artificial reefs are assumed to yield estimates directly of compensating variation. The general form of the dichotomous choice is as follows:

$$Pr\ (YES) = \alpha - \beta_{BID} * BID + \beta_{SE} * SE + \mu$$

where, Pr (YES)= the probability that the user will be willing to pay the randomly assigned dollar amount (BID).

BID = randomly assigned dollar amounts.

β_{BID} = estimated coefficient on BID.

SE = vector of other socioeconomic variables and/or natural resource attributes.

β_{SE} = estimated coefficients for SE vector.

μ = error term following logistic distribution for logit model and normal distribution for the probit model.

The above model was estimated using both the logistic and normal distribution assumption about μ. The BID variable was included in its linear and logarithmic form (natural logarithm of BID called LBID here). In the SE vector, we include a variety of socioeconomic factors including household income, education level, age, years of experience boating in northwest Florida, race, and sex. Also, included were variables for differentiating charter, party, and private rental boat mode use from use of the own boat. Boat length was also entered as possible explanatory variable. A variable was also entered to indicate artificial reef use and, when fishermen and divers were combined, a variable was entered to differentiate divers from fishermen. Dummy variables were also entered for the counties to test for differences in values by county, holding all other factors constant. Table 1.27 includes the definitions of all the variables used in estimating the dichotomous choice models.

A total of eight models were estimated. The models differ by sample of users (e.g. all users versus fishermen only), by assumption about the distribution of the errors (e.g. the logit of probit model), and by specification of the bid amount (e.g. linear BID or log linear or natural logarithm of bid or LBID). We only present the results of the model we considered the “best” model. Other results are available from the authors on request. Of the variables in Table 1.27, MALE, WHITE, EXPER, AGE, AGESQ, DIVE, and all the county dummy variables were not statistically significant in any model specification. Unlike the results from the visitor model, several variables were significant in explaining the willingness to pay for artificial reefs. Household income (INC) was positive and significant meaning that higher income households were willing to pay more for artificial reefs. All the education dummy variable were positive and significant meaning that those with an education level of high school graduate and above were willing to pay more for artificial reefs than those who had not graduated high school. The coefficients first increase then decline with higher levels of education suggesting a parabolic relationship between education and willingness to pay for artificial reefs. College graduates and those with graduate degrees would be willing to pay slightly less than those that either graduated from high school or had some college or vocational training. Those that own larger boats are willing to pay more as are those that used artificial reefs. Those that belonged to fishing and diving clubs and those that used some form of rental boating were willing to pay less.

The results across the eight models were not significantly different and ranged from $29.23 to $31.57 with an average across the eight models of $30.74. The results presented in Table 1.28 are representative of the eight models and produces a value of $30.58 which is not significantly different from the average across all eight models.

The value derived from the dichotomous choice model is slightly higher than that obtained using the same information and employing the Turnbull method $25.45 versus $30.58 or about 20 percent higher. The lowest value obtained from the dichotomous choice model is about 15 percent higher than that obtained using the Turnbull method ($29.23 versus $25.45). To derive an estimate of the willingness to pay per day, as with the Turnbull estimate above we divide the annual value per person by 14.18 days yielding an estimate of **WTP/day of $2.16** ($30.58/14.18). And, our estimate of total annual value of artificial reef use in Bay County using the dichotomous choice method is **$1.018 million** ($2.16 * 471,400 days of use).

TABLE 1.27

DEFINITIONS OF VARIABLES

USED IN DICHOTOMOUS CHOICE MODELS

FOR RESIDENTS OF NORTHWEST FLORIDA

Variable	Definition
FWP	Dependent Variable, 1=YES 0=NO, for willingness to pay randomly assigned dollar amount. Fishermen only.
WPALL	Dependent Variable, 1=YES 0=NO, for willingness to pay randomly assigned dollar amount. Fishermen and divers combined.
FBID	Randomly assigned dollar amount or bid for fishermen only. Dollar amounts $1, $5, $10, $15, $20, $30, and $50.
LFBID	Natural logarithm of FBID.
BIDALL	Randomly assigned dollar amount or bid for fishermen and divers combined. Dollar amounts $1, $5, $10, $15, $20, $30, and $50.
LBIDALL	Natural logarithm of BIDALL.
AGE	Age of respondent in years.
AGESQ	Age of respondent squared.
INC	Household Income of respondent in thousands of dollars.
EXPER	Years of boating experience in northwest Florida.
BOATLEN	Length of boat owned measured in feet.

SHS	Dummy variable for education level. Some High School.
HSGRAD	Dummy variable for education level. High School Graduate.

TABLE 1.27 (CONTINUED)

Variable	Definition
SCOLLEGE	Dummy variable for education level. Some College or vocational training.
COLLGRAD	Dummy variable for education level. College Graduate.
GRADPROF	Dummy variable for education level. Graduate degree of Professional degree.
RENTAL	Dummy variable for use of charter, party or rental boat services.
REEF	Dummy variable for use of artificial reefs.
CLUB	Dummy variable for membership in fishing or diving club.
DIVE	Dummy variable for diving in northwest Florida.
MALE	Dummy variable for gender of respondent. 1=Male 0=female.
WHITE	Dummy variable for race/ethnicity. 1=White 0=all others.
BAY	Dummy variable for county of residence. 1=Bay County.

WALTON	Dummy variable for county of residence. 1=Walton County.
OKA	Dummy variable for county of residence. 1=Okaloosa County.
ESCAM	Dummy variable for county of residence. 1=Escambia County.
SANTA	Dummy variable for county of residence. 1=Santa Rosa County.

TABLE 2.28

RESULTS OF ESTIMATION OF DICHOTOMOUS CHOICE MODEL

Variable (X)	Coefficient(β)	Standard Error (β)	T-value (β)	Prob. T-value	Mean of X
Constant	-1.734013395	.80216741	-2.162	.0306	
LBIDALL	-.2934505106	.06741002	-4.353	.0000	2.1360793
INC	.0105656069	.00392190	2.694	.0071	59.409722
BOATLEN	.0287826639	.01629651	1.766	.0774	21.736111
HSGRAD	1.295912551	.65786491	1.970	.0489	.17708333
SCOLLEGE	1.333626579	.63790874	2.091	.0366	.41666667
COLLGRAD	1.306813660	.64188700	2.036	.0418	.28125000
GRADPROF	1.268269984	.67117464	1.890	.0588	.10763889
RENTAL	-.8063524979	.32159810	-2.507	.0122	.06597222
REEF	.4114559423	.18719732	2.198	.0280	.73611111
CLUB	-.5066315361	.26390973	-1.920	.0549	.10763889

N=288
Chi-Squared 51.816
Degrees of freedom 10
Chi-squared Significance .0000
Percent Correct Predictions 71.18
Mean of Dependent Variable WPALL=.6284
Estimated Consumer's Surplus=$30.58* (Annual per person)

* Of the eight models estimated, the range of estimated consumer's surpluses was from $29.23 to $31.57 with a mean across all eight models of $30.74.

DEMOGRAPHIC AND BOATING CHARACTERISTICS

OF RESIDENT FISHERS AND DIVERS

Table 1.29 shows the demographic and boating characteristics of resident fishers and divers from the Bay County sample of boat owners. The typical respondent was a 53 year old white male with some college as an educational level and having a family income of about $55,000 per year. The demographic profile for all boaters was almost identical to the sub-sample of artificial reef users. There was no statistical difference between the demographic characteristics of general boaters and those using artificial reefs. A comparison of residents to visitors reveals somewhat of a contrast. Visitors tend to be much younger with a higher family income. See Table 1.7. Thus, the two markets for the two products-fishing and diving - is segmented into residents who are older and most probably living on pensions in comparison to visitors that a much younger and more affluent. This pattern is not unusual for many coastal communities. It does give us a contrast in terms of the constituency for artificial reefs. That is, when visitors are combined with residents, it would appear that artificial reefs are used by a broad spectrum of socioeconomic groups.

With respect to boater profile, the average pleasure craft size in the sample was 23 feet which is slightly larger than the average for the population of registered boats in Bay County which was a little over 18 feet. Boaters in the Florida Panhandle have been boating, on average, for 24 years. This is attributable to their age and, of course, their living in a coastal community. Only a little over 6% of the boat owners were members of some kind of boater’s club. The targeted species for fishers were very similar as that for visitors to Bay County in the snappers, groupers, and mackerels are well represented. As expected, if one fished for those species that “just come along”, then the kind of species is much more diverse ranging from trigger fish to shark. The daily party catch rates were 8 and 8.76 fishing for targeted and non-targeted species respectively. The catch rates were somewhat higher for residents than visitors which is to be expected based upon the difference in experience in fishing of Bay County (24 vs. 5 years). About 77% of the residents said they used artificial reefs over the last twelve months; however, the fishing days spent on artificial reefs was about 50% of total days as indicated in our discussion above. Residents choose to use over 4 different artificial reefs in a 12 month period and, apparently, they are all off Bay County indicating a “stay at home preference”. Residents fished on artificial reefs that are about 6-7 miles from shore. Visitors using charter boats were

apparently taken further offshore for fishing on artificial reefs (i.e., 11 miles).

TABLE 1.29

DEMOGRAPHIC AND BOATING CHARACTERISTICS OF

OF RESIDENT BOATERS IN BAY COUNTY, FLORIDA

DEMOGRAPHICS:	AVERAGE/OTHER
1. Age	53 Years
2. %Male	93.9%
3. %White	91.8%
4. Family Income	$55,000
5. Education	Some College
BOATING PROFILE:	
1. Average Length of Boat Owned	23 Feet
2. Years Boating in Florida Panhandle	24 Years
3. Percent Members of Boating Club	6.2%
4. Targeted Species:	1. Grouper
	2. Kingfish
	3. Red Snapper
	4. Mackerels
	5. Sea Trout
5. Catch/Party/Day: Targeted Species	8.00 Fish
6. Species That Just Come Along	1. Grouper
	2. Amberjack
	3. Triggerfish
	4. Angel Fish
	5. Shark
7. Catch/Party/Day: Non-Targeted Species	8.78 fish
8. Percent of Sampled Resident Boater Using Artificial Reefs	77%
9. Number of Different Artificial Reefs Used Per Year by Those Using Them	4.2
10. Principal Artificial Reef Used During Year is Off Bay County(% of Users)	96%
11. Average Distance of Artificial Reef Used from Shore	6.46 Miles
12. Principal Fishing Method Used on Artificial Reef	Bottom Fishing

Source: Florida State University

SUMMARY AND CONCLUSIONS

ECONOMIC IMPACT OF ARTIFICIAL REEF VISITORS:

1. Over the last 12 months(l997-98), it was estimated that slightly over 5 million person-visits were made to Bay County for various forms of recreation and business;

2. The visitors to Bay County pumped nearly $1.45 billion dollars in spending directly into the local economy supporting nearly 32,000 full and part-time employees and generating nearly $322 million dollars in wages. Visitors were directly responsible for nearly 15% of all wages paid in Bay County and a whopping 40 percent of full and part-time employment in this county;

3. All visitors to Bay County over the last 12 months(l997-98) spent about 23 million days in this county. The need for lodging; eating and shopping establishments while these visitor days were being spent generated the aggregate economic impact estimated above;

4. Of significance to this study, it was estimated that 10% of all visitor days or 2.3 million days were spent by visitors engaged in saltwater recreational boating off the Gulf Coast of Bay County. The principal modes of boating chosen by visitors were the use of one’s own boat or the rental of a charter boat which accounted 96% of all boating days. Party or head boats or other kinds of non-captain rentals accounted for the other 4%;

5. Visitor boating accounted for over $218 million in spending which supported 4,255 full and part-time employees who received over $38.68 million in wages. Because boating visitors spend

money on fishing supplies and charter rental fees in addition to motels and restaurants as a general visitor would, they tend to spend more money per party than the average visitor. Thus, even though boating visitors account for 10% of visitor days, they account for over 15% of all visitor spending in Bay County. It also follows that boating visitors generated proportionately more direct employment and wages than the “average visitor” to this county;

6. One of the central thrusts of this study is to identify the economic impact of that segment of boating identified with fishing and diving so we could estimate the amount of visitor spending that is related to the existence of artificial reefs off Bay County. After adjusting for all other uses of boats(e.g., cruising; water skiing), we estimated that 72% and 2.5% of all saltwater boating days were spent for saltwater fishing and diving respectively. Of the total days estimated to be devoted to fishing and diving, about 53% were spent on artificial reefs principally off Bay County. This led us to an estimate of the economic impact-related importance of artificial reefs for fishing and diving;

7. Over the last 12 month(l997-98), fishing and diving visitors using their own boat or some kind of rental boat(e.g., charter), spent over $130.96 million in Bay County on those days they engaged in saltwater fishing and diving on or about artificial reef. This supports 2,727 employees who receive an estimated $24.69 million in wages. This is an artificial reef-related economic impact. The reader should not infer that if artificial reefs did not exist, that Bay County would loose this economic impact. However, our further inquiry of artificial reef users would tend to support the hypothesis that this “recreational aid” is important to the recreational fishing and diving experience. This is discussed under “use value” below;

8. Boating visitors that use artificial reefs have a demographic profile of that of a white male who is about 36 years of age and has some college as an educational background with an annual family income of $65,000. The typical visitor has a relatively large pleasure craft(27 feet) and has been boating in the Florida Panhandle for a little over 5 years. Only one-third of the visitors say they use artificial reef, but those that do use them very intensively. Only about 50% of the artificial reef users that use Bay County as a base use such reefs directly off the this county. On average, the visitor artificial reef users travel 11 miles out into the Gulf of Mexico to use the public and private artificial reefs for saltwater fishing and diving;

9. Finally, we asked visitors to evaluate the existing artificial reefs off Bay County. About 50% of the visitors felt that

artificial reefs were too crowded while less than 2% felt there were too many artificial reefs, indicating a possible need for additional artificial reefs. Only one in five artificial reef visitors felt that they are too far from shore. Since a large segment of the visitor demand comes via charter boats, this may be, in part, a function of places the charter boat captains take them to optimize catch rates for fishers. Although less than 40% of the visitors felt that artificial reefs were superior to natural reefs, these users did feel that artificial reefs increase the abundance of fish. As argued in the literature, artificial reefs may just redistribute or "collect" fish in one concentrated area rather than increase the fish population. If this is true, it is charged by some that artificial reefs hasten overfishing. This is an area for important future research. Also, visitors felt that artificial reefs should be placed in less than 150 feet of water. In summary, it would appear that present visitors that use artificial reef view them as a definite recreational aid as shown by both their evaluation and their willingness to pay for an expansion in this program which is discussed under "use value" below.

USE VALUE(WILLINGNESS TO PAY) OF ARTIFICIAL REEFS VISITORS:

1. Use value or the willingness to pay is defined as the nonmarket value of a resource that is not openly traded in an organized market. Quite simply, units or day usage of the resource such as a recreational fishery do not have a price for their use or daily rental. Public goods such as artificial reefs fall in the same category since all can use this recreational aid, but government does not place a direct charge on the usage of this resource. The reason the use value or what users would be willing to pay for use of the resource is important is that it is the true value of additional output in the economy that is not counted in Gross Domestic Product or simply the well known GDP. In this study, we used three indirect methods to measure the use value of the artificial reef in conjunction with fishing and diving: (l) the Turnbull Distribution; (2) the Dichotomous Choice Model and finally (3) the Travel Cost Approach. Each approach has general acceptance among economist as a reasonable approach to estimating use value;

2. Using the Turnbull Distribution, it was found that visitors were willing to pay $6.97 per day for recreational saltwater fishing on artificial reefs. On the other hand, the dichotomous choice method yielded $8.50 per day while the travel cost procedure produced a willingness to pay per day of $9.69 for visitors to Bay County, Florida.

ECONOMIC IMPACT OF ARTIFICIAL REEF RESIDENTS:

1. We studied three classes of pleasure craft own by residents of Bay County. These classes were boats under 16 feet; those between 16 and 39 feet and those over 39 feet. Overall, there were 15,587 registered pleasure craft in the county in l998. In addition to those owning their on pleasure craft, it was estimated that 4% of the demand for charter, party, and other kinds of rental boats in Bay County was accounted for by local residents. Using owned and rental boats used by residents, it was estimated that that resident saltwater recreational fishermen spent $33.49 million which supported 295 full and part-time employees, earning $3.12 million in wages and salaries;

2. Although residents predominately use their own boat for saltwater recreational fishing, visitors have a high use of all kinds of rentals(e.g., charter). Even so, we found that residents used about 50 percent of all party days spent on saltwater fishing off Bay County and targeted artificial reefs as a place to engage in fishing which is slightly lower than the 52.95% founds for visitors. It could be inferred that artificial reefs are a slightly greater attraction for visitors than local residents. Thus, artificial reefs may be view as an attractant for visitors to Bay County;

3. Diving days accounts for about 10% of the days spent saltwater fishing off Bay County. When the expenditures on saltwater recreational fishing are increased by 10% and divided by one-half or those days spent fishing and diving on artificial reefs, we found that $16.74 million was spent by residents that were related to artificial reefs. This expenditures by divers and fishers generated $1.56 million in wages and salaries and supported 147 full and part-time employees;

4. Compared to visitors, the resident demographic profile was that of an older individual (53 years old) who has been fishing off the Florida Panhandle for 24 years compared to only a little over 5 years for the visitors to Bay County. The resident boater is a white male with some college as an educational level and having a family income of $55,000 per year;

5. About one-half of the Bay County residents felt that artificial reefs were too far from shore while only 1 in 5 visitors held this opinion in their evaluation of artificial reefs. About one third of the residents felt the artificial reefs were too crowded. The perception was much higher for visitors(45%). As with the visitors, only 1 in 10 felt there were too many artificial reefs. Residents and visitors share the same opinion about whether artificial reefs are more productive than natural reefs and that artificial reefs increase abundance of

fish. That is, 30% of the residents supported the first proposition while 80% supported the second.

USE VALUE OF RESIDENTS:

1. The definition and explanation of use value was explained above under the visitor section;

2. Using the Turnbull Distribution, it was determined that resident willingness to pay or use value was $1.80 per day for fishers and divers using artificial reefs. This amounts to an annual total flow of recreational value for the residents of Bay County from the use of artificial reefs in conjunction with fishing and diving of $848,520. The Dichotomous Choice Model yielded a use value per day of $2.16 and this translates into a total annual value of $1.018 million.

3. In the only other study of artificial reefs, Milon(1988) found that resident users of artificial reefs off the coast of Miami, Florida were willing to pay $23.81; $26.07; and $35.07 using the contribution; referendum and bidding methods respectively expressed in l998 dollars. These values were all on an annual basis. Using the Turnbull Distribution, we found a willingness to pay per annum of $25.45 for artificial reef use off the Florida Panhandle, while the dichotomous choice method generated an estimated value of $30.58. These values would appear to be comparable to the values found by Milon in his earlier study.

COMBINED ECONOMIC IMPACT OF VISITORS AND RESIDENTS:

1. Table 1.30 shows the combined economic impact of visitors and residents that use artificial reefs off Bay County, Florida. Ignoring indirect or multiplier effects by the visitors, those fishers and divers that used artificial reefs off this county, spent $149.49 million over the last 12 month. This spending generated 2,727 full and part-time jobs in Bay County with a payroll of $26.42 million. By far, visitors played a greater role in the economic impact of artificial reef-related spending. That is, visitors accounted for 87.6% of the total spending impact, indicating how important boating visitors and especially fishers and divers that use artificial reefs are to the Bay County economy. Visitors are economically more important because of two reasons: (l) there are more fishing and diving days made by visitors than local residents and (2) when visitors come to the county, they spend several time what residents spend per party day.

2. Relative to the entire economic activity in the county,

those visitors and residents using artificial reefs account for 1.39% of all wages and salaries in the county and 3.62% of all full and part-time employment in this county. This may not seem overwhelming; however, no one firm in Bay County would account for such an impact such as this. It certainly gives the reader some perspective on the targeted artificial reefs for recreational enjoyment by both visitors and residents alike. Again, we cannot say that if artificial reefs were removed or never were placed in the Gulf of Mexico that this economic impact would not have occurred. However, there is strong feeling among the users that artificial reefs are important recreational aids.

COMBINED USE VALUE OF VISITORS AND RESIDENTS:

1. Visitors and residents spent over 1.68 million recreational days on or about artificial reefs off Bay County Florida. Using the Turnbull Distribution to estimate use value of artificial reefs as a recreational aid, we found that on a daily basis visitors were willing to pay $6.97, while residents were willing to pay only $1.80. One reason for this difference may be that the residents spend 4-5 times more days per person per year than visitors which may produce the law of diminishing marginal utility. Weighted by days, the combined use value of visitors and residents was estimated at $5.66 per day. This produces an annual flow of about $9.54 million of use value from the usage of artificial reefs off Bay County. The dichotomous choice approach yielded an estimate for visitors of $8.50 per person per day, and a value of $2.18 for residents with a weighted average of $6.96 per person per day. The dichotomous choice approach yielded estimated total annual values for all users of $11.72 million. In the last Chapter of this report, we shall look into the asset value of the artificial reef system using the use value flow from each county relative to the cost of deploying the artificial reefs to get an idea of the benefit/cost ratio related to the artificial reef program managed by the State of Florida.

TABLE 1.30

COMBINED ECONOMIC IMPACT ON BAY COUNTY,

FLORIDA OF THOSE FISHERS AND DIVERS USING ARTIFICIAL REEFS

ECONOMIC VARIABLE	VISITORS[1]	RESIDENTS[2]	TOTAL
EXPENDITURES (MILLIONS)	$130.96	$18.53	$149.49
WAGES GENERATED (MILLIONS)	$24.69	$ 1.73	$26.42
FULL AND PART-TIME EMPLOYMENT	2,727	163	2,930
TOTAL COUNTY WAGES (MILLIONS)			1,900.49
TOTAL COUNTY EMPLOYMENT			80,832
% ARTIFICIAL REEF RELATED DIRECT WAGES OF TOTAL WAGES IN THE COUNTY			1.39%
% ARTIFICIAL REEF RELATED DIRECT EMPLOYMET OF TOTAL EMPLOYMENT IN THE COUNTY			3.62%

1. Table 1.10.
2. Table 1.23.

TABLE 1.31

COMBINED RECREATONAL USE VALUE OF

VISITORS AND RESIDENTS FROM ARTIFICIAL REEFS

IN BAY COUNTY, FLORIDA

ECONOMIC MEASURE	VISITORS	RESIDENTS	TOTAL
1. TOTAL USER DAYS ON ARTIFICIAL REEFS	1,258,600	425,800	1,684,400
2. ANNUAL VALUE PER PERSON			
a. Turnbull	$22.14	$25.45	$23.80*
b. Dichotomous Choice	$27.02	$30.58	$28.80*
c. Travel cost	$30.65	N/A	N/A
3. VALUE PER PERSON/ RECREATIONAL DAY			
a. Turnbull	$6.97	$1.80	$5.66**
b. Dichotomous Choice	$8.50	$2.16	$6.96**
c. Travel Cost	$9.65	N/A	N/A
4. TOTAL ANNUAL USER VALUE FOR ALL USERS ($MIL)			
a. Turnbull	$8.77	$0.77	$9.54
b. Dichotomous Choice	$10.70	$1.02	$11.72
c. Travel Cost	$12.15	N/A	N/A

*Simple arithmetic average of visitors and residents;
** Weighted arithmetic average of visitors and residents.

CHAPTER 2

ECONOMIC IMPACT AND IMPORTANCE OF ARTIFICIAL REEFS IN WALTON COUNTY, FLORIDA

INTRODUCTION

The purpose of this chapter is to show how we estimated both the market economic impact (e.g., sales, income, employment) and the non-market economic use value (i.e. consumer’s surplus or the amount visitors or residents are willing to pay over and above the amount they actually spend) of visitors and residents of Walton County, Florida. We estimate the market economic impacts for all visitors, boating visitors and residents, and, most importantly, for visitors and residents that used artificial reefs for fishing and diving. Also, we estimate the non-market economic use value of boating visitors and residents that fished and dived and the portion of this value attributable to artificial reefs. These values are used later in the report to conduct a rough benefit-cost analysis of the artificial reef program in northwest Florida.

In this chapter, we will first address the visitor population, then we will address the resident population of Walton, County. We explain the economic concepts and our methods of estimation.

BACKGROUND

Walton County is located to the west of Bay County in Florida. Measured by land, it contains 1,058 square miles ranking it 11th month the 67 counties in Florida. However, in l996, there were a little over 34,000 people living in the county. The population density or persons per square mile ranked it 53rd in Florida's counties. This sparsely populated county does have a shoreline on the Gulf of Mexico that attracts visitors to the area.

Using rather crude estimates from traditional economic sectors, Bell(l996) estimated that the "tourist sector" was one of the largest sectors in the economic base or export industries in Walton County. The manufacturing of lumber, transportation equipment, and apparel also help form the

elements of the economic base and are referred to as “basic industries”. Quantification of these "basic industries" is generally not difficult except for the tourism or visitation sector. The main reason for this is that the sector cuts across the two broad categories of retailing and services. That is, visitors spend money on a great variety of products and services. Such items are not designated as specific industries in the collection of data by the Federal and State governments. So, specific studies are necessary to quantify the economic importance of the visitor sector which is a collection of industries.

PART 1

VISITORS TO WALTON COUNTY

METHODOLOGY

The model that was used to estimate visitation to a local area is called the "CAPACITY UTILIZATION MODEL". This model has been widely used throughout Florida in such counties as Monroe; Orange; Osceola; Seminole; Hillsborough and Leon. In the latter two counties, two of the authors of this report (Dr. Bell and Dr. Bonn) are currently engaged in continuing work on the quarterly and annual estimation of the number of visitors; spending; wages and employment generated and developing indices of how visitors view the amenities of these counties.

Although rather simple in concept, the "CAPACITY UTILIZATION MODEL" is complex to implement because of the number of variables to consider. This model is based upon where visitors to an area stay and that is the hotel and motel industry in the region. We call this an accommodation mode. Certainly, visitors may spend their nights with friends and relatives; in campgrounds; in condominiums or just come for the day (i.e., day visitors). The simplified "CAPACITY UTILIZATION MODEL" divides the visitor sector into those staying in hotels and motels and those staying in all other modes. If required, the residual sector can be broken down into its components, but this is at additional expense and is usually requested by special interests(e.g., condominium owners want to know how many visitors use condominiums, etc.). Thus, the capacity of the hotel/motel industry in the local area gives us the ability to extrapolate the sample to the population. That is, if we know the number of rooms occupied per night, we can derive the number of individuals using hotels and motels merely by multiplying by

the size of the party using a room. Data on the number of rooms and occupancy rates are obtained from Smith Travel, Inc. on a subscription basis. As demand for visitations to the local area increases, the number of hotel rooms should expand and with it our estimate of the number of visitors. The residual or all other accommodation modes sector is linked to the hotel/motel sector by the percent of the randomly sampled number of visitors that stayed in something other than a motel/hotel. This description will become clearer once we show the results for each of the counties discussed above. To show how we obtain the number of visitors using hotels and models, the following expression may be helpful:

$HMV = k*R*p*SP/LS$ where

HMV= number of person-visits using hotel/motel accommodations;
k = hotel/motel occupancy rate;
R = number of hotel and motel rooms in the county;
p = period of estimation in days (e.g., l month=30 days);
SP = size of party staying in hotel/motel room;
LS = length of stay in hotel/motel room (e.g., number of nights).

The right hand side of the above expression can be broken-down into quite meaningful concepts. First, we must multiply the occupancy rate (k) times the number of available rooms (R) in the area. The available rooms are obtained by an inventory of all hotels and motels in the area. This yields the number of rooms actually used by visitors per night. Next, the length of the period is important since it specifies how many rooms nights were used in a month; quarter or yearly. In practice, p=90 since we are dealing with quarter-by-quarter analyses. As mentioned above, we must multiply by (SP) or the size of the party to count all visitors occupying the hotel/motel room per night. This will, of course, vary from night to night, but we use an average over the period of analysis. Finally, the first four terms in the above expression will yield the number of hotel/motel occupants (person-days of occupancy) for any period of time, but to obtain HMV we must divide by the length of stay or (LS). This is not obvious, but can be explained by an example.

Assume one person attends a research seminar lasting 30 days and occupies one motel room each night. Then, we would have one person-visit per month. But, if we run two 15-day research seminars where there is a different class every 15 days, then the motel room turns over once a month. Now, two person-visits

would accrue to the motel room since two individuals would occupy the room in the thirty day period. Thus, as the (LS) decreases (e.g., from 30 to 15 days in the above example), the number of person-visits increases. This is the rationale for the length of stay in the above expression.

In all the counties in the Florida Panhandle mentioned above, there is both a seasonality and trend in visitation. This is expressed by the occupancy rate. As occupancy rates decline (i.e., off-season), the number of hotel/motel rooms being used declines, thus illustrating the fall in demand via person-visits or HMV. This can be studied over the four quarters of the year as to its impact on visitor spending; generation of wages and employment and how the local economy adjusts to this pattern.

This is but a brief illustration of the principal sector of the CAPACITY UTILIZATION MODEL. The other or residual sector is obtained by ascertaining what percent of total visitor use is accounted for by the hotels/motel accommodation mode. This percentage is obtained by a random sample of visitors to the area.

SAMPLE SURVEY

During the spring and early summer of l998, face-to-face interviews were conducted at hotels, beaches and other places frequented by visitors. A total of 125 visitors were interviewed during this period. The survey instrument was designed to obtain spending amounts and other economic profile data. In addition, respondents were asked about the extent of boating while in Bay County. This is the data base upon which the next two sections depend for the estimation of the CAPACITY UTILIZATION MODEL discussed above.

VISITOR AND VISITOR SPENDING ESTIMATION

In 1995, the U.S. Bureau of Economic Analysis estimated that Walton County had only 12,278 full and part-time jobs in the community. While being a rather small county as measured by population or employment, Walton County has two large beach resorts including two marinas that attract visitors for beach and boating activities as well as meeting and shopping in this coastal community. By using the CAPACITY UTILIZATION MODEL, discussed above, we were able to determine the total visitors for the last twelve months which are shown in Table 2.1.

It is estimated that over the last 12 months or approximately June l997 through May l998, there were 587,390 person-visits to Walton County of which nearly 29 percent used hotels and motels for their accommodations. Most visitors used condominiums for overnight stays as revealed by our survey. The other visitors have been designated as OV and number 419,984 in Table 2.1. There are only 870 hotel and motel rooms in Walton County so this sector does not accommodate most of the visitors to this county. Our survey also included data on visitor spending; therefore, we can estimate total visitor spending as shown in Table 2.2.

TABLE 2.1

WALTON COUNTY VISITOR ESTIMATES
1997-98
(12 MONTHS)

ESTIMATION OF HOTEL/MOTEL VISITORS TO AREA(HMV)

(1) HMV = (k*R*p*SP)/LS = (.613*870*365*3.27)/3.8

= 167,406

where,

HMV = estimated number of visitors using hotels/motels;
k = occupancy rate over year;
R = average number of rooms during year;
p = number of days in year = 365;
SP = average size of party for those using H/M yearly;
LS = average length of stay for those using H/M yearly.

ESTIMATION OF TOTAL VISITORS TO AREA(TV)

(2) HMV = g*TV

where,

g = percent of total visitors to area using H/M;
TV = total visitors to the area or those staying in hotel and motels plus those staying elsewhere or day visitors.

Expressing (2) to solve for total visitors(TV), we have

(3) TV = HMV/g = 167,406 / .285

= 587,390

SUMMARY:

VISITORS USING HOTELS AND MOTELS(HMV):	167,406
OTHER VISITORS(FRIENDS/RELATIVES; CAMPING; CONDOS; DAY VISITORS OR 587,390 LESS 167,406 (OV)	419,984

TOTAL VISITORS:	587,390

TABLE 2.2

ESTIMATION OF TOTAL SPENDING BY

VISITORS TO WALTON COUNTY, FLORIDA

1997-98
(12 Months)

ESTIMATION OF TOTAL HOTEL AND MOTEL VISITOR SPENDING(TVSHM)

(1) $TVSHM = (HMV*LS)*($EPPD/SP) =
(167,406*3.8)*($292.85/3.27)

= $56,970,780

where,

$TVSHM = total visitor spending staying in H/M;
HMV = number of H/M visitors from Table 3;
$EPPD = expenditures per party/day for H/M visitors;
SP = size of party for H/M visitors;
LS = length of stay for H/M visitors.

ESTIMATION OF TOTAL ALL OTHER VISITOR SPENDING(TVSOV)

(2) $TVSOV = (OV*LS)*($EPPD/SP) = (419,984*4.00)*($356.03/4.00)

= $149,526,900

TOTAL VISITOR SPENDING IN AREA(TVS)

(3) $TVS = $TVSHM + $TVSOV

= $56,970,780 + $149,526,900

= $206,497,700

SUMMARY:

TOTAL VISITOR SPENDING BY H/M USERS:	$ 56,970,780
TOTAL VISITOR SPENDING BY OTHER USERS:	$149,526,900

GRAND TOTAL OF VISITOR SPENDING: $206,497,700

The nearly 600,000 visitors to Walton County over the last 12 months injected approximately $207 million into the relatively small Walton County economy. This is a substantial injection and may be expected to grow as the county's natural resources on the coasts become well known. These visitors are an important part of the export base for Walton County.

GENERATED WAGES AND EMPLOYMENT

The visitors' spending of somewhat less than $207 million has two impacts on Bay County. First, this spending generates wages and employment for those employed directly in industries catering to visitors such as motels and eating and drinking places. Second, there is an important multiplier effect associated with the creation of direct jobs in the local area. That is, employees serving visitors turn around and spend their wages on what are called local industries ranging from banking to auto repair services. This is called the "*multiplier effect*" as money keeps circulating throughout the community. As this happens, money does leak out of the area as products such as auto parts are not made locally, but must be bought from such distant points as Detroit.

Let us consider an estimate of the total direct wages and employment generated by visitors to the Walton County area. Beneath the total category of expenditures by visitors, we have ten separate purchase categories ranging from lodging to local shopping. Each category can be matched to published data on sales; wages and employment. The most detailed breakdown of these categories can be obtained from the l992 Censuses of Retail Trade and Service Industries and updated to l997-98. Two important statistics emerge. They are the sales-to-employment ratio and the percent wages are of sales. These can be designed as S/E and %W respectively. They will vary by category since some industries are more labor intensive than others. For example, a gasoline station has a high S/E since it is not very labor intensive(i.e., fully automated if just selling gas with credit cards) while a restaurant has a lower S/E ratio since each party needs the attention of a waitress. To obtain the estimated employment and wages, the following procedure was followed with the total spending broken into 10 categories or industries:

Employment = Spending in i'th industry /(S/E for i'th industry)

For example, if $150 million were spent on lodging and the sales-to-employment ratio for lodging was $50,000, we would

estimate that 3,000 jobs would be sustained in this industry (i.e.,$150 million divided by $50,000). Further, assume that of the $150 million spent, 25% is required for wages or $37.5 million. Although all these calculations are not shown here, they are available from the authors upon request.

For Walton County, the direct wages and employment generated by visitor spending compared with total wages and employment in the area for the 1997-98 period is given in Table 2.3. Of the $262.5 million in wages and salaries generated in Walton County over the last 12 months, visitor spending accounted for 16.8% or $44.13 million. This is a considerable contribution to the economic base of this local economy. In percentage terms, it is comparable to Bay County. This is not unexpected since Walton County is the next coastal county to the West of Bay County, although considerably smaller.

Of the 12,794 full and part-time employees in Walton County, it was estimated that about *one-third or 4,445 jobs were directly related to visitor spending* as shown in Table 2.3. We would expect that the employees serving the visitor sector would be lower paid and have a larger percent of part-time jobs than the overall economy. This, in fact, has been documented for Walton County and is available from the authors should the reader be interested.

We have not included the multiplier impacts of visitor spending in Walton County in Table 2.3. This will enhance the economic magnitude of the visitor sector. The usual wage multiplier is between 1.2 and 1.5 for such small and open economies as Walton County. Because of this county's size, the authors selected 1.2 as an approximation and illustration. Therefore, indirect wages would be about $8.8 million dollars (.2 times $44.13) for total impact(direct and indirect) of nearly *$53 million* or about *one-fifth of the Walton County economy*. The indirect employment impact would be less since those making considerably less per year in the visitor sector would be spending their money on other local sectors where wages are much higher. This spending would add about 222 indirect jobs using a multiplier l.05 (.05 times 4,445).

TABLE 2.3

ESTIMATED DIRECT WAGES AND EMPLOYMENT GENERATED BY VISITORS TO WALTON COUNTY COMPARED TO TOTAL WAGES AND EMPLOYMENT OVER THE LAST 12 MONTHS (1997-98)

	VISITOR GENERATED AMOUNT (MIL$)	TOTAL FOR AREA (MIL$)	VISITOR PERCENT OF TOTAL
WAGES AND SALARIES	$44.13	$262.5*	16.8%
FULL AND PART-TIME EMPLOYMENT	4,445	12,794**	34.7%

* 1995 salaries and wages taken from the U.S. Bureau of Economic Research and adjusted upward for projected employment growth of 1.4% annually or 4.2% plus a rise in inflation of 6.7 percent over the l995-l998 period or 10.9% from University of Florida, Bureau of Economic and Business Research and the Presidents Economic Report, 1998.

**l995 employment from U.S. Bureau of Economic Research adjusted for job growth of 1.4% taken from University of Florida, Bureau of Economic and Business Research for a total percent increase of 4.2.

BOATING VISITORS

METHODOLOGY

As part of the sample survey of all visitors, we asked respondents about their participation in recreational boating during the last 12 months. The total visitors are an umbrella under which many activities are included including boating. Therefore, to go from general visitor days to days spent boating the following expression was employed:

$$(N*LS*TPY)/YRS = TVD$$

where, N= sample size;
LS= length of stay per trip;
TPY= trips per year to the area;
YRS= years (data was collected for two-year period)
TVD= total visitor days.

From the data obtained in the sample survey of all visitors, we calculated the following:

$$(134*4*2.2)/2 = 590 \text{ visitor days from the sample.}$$

The respondents in the sample spend approximately 590 days per year in Walton County. They also told us that they spend 89 boater days over the last 12 months. Therefore, we estimated that 14.95% or nearly 15% of all visitor days were spent boating annually. As an approximation, we shall use 15% as the way to go from general visitation to boater visitation measured in terms of days.

SAMPLE SURVEY

In the summer of l998,a second sample survey was conducted of just boating visitors to Bay and Walton Counties. This survey linked the first survey of all visitors to just those engaged in some kind of boating. 134 boating visitors were interviewed to gather information regarding their mode of boating, expenditures in Bay and Walton Counties while boating, and most importantly their use and evaluation of artificial reefs. The sample survey instrument is shown in Appendix 2. The survey was taken at such boating sites as boat ramps and marinas. Thus, the following analysis is based upon the second critical survey made in this study.

NUMBER OF VISITORS; VISITOR SPENDING AND WAGES AND EMPLOYMENT IMPACT OF BOATING VISITORS

Using the information from Tables 1.1 and 1.2, we calculated the total number of visitor days spent by all visitors using the following expression:

$$TVD = HMV*LSHM + OV*LSOV$$

where, TVD = total days for visitors to Walton County;
HMV = person-visits using hotel/motel;
LSHM = average length of stay for those using H/M;

OV = all other person-visits;
LSOV = average length of stay for all other modes of accommodations.

Inserting the necessary information from Tables l.1 and 1.2, we have the following:

2.316 Million = 167.4 thousand*3.8 + 420 thousand*4.0

Therefore, we have estimated that all visitors to Walton County spent over 2.3 million days over the last 12 months. About 15% of these days were devoted to boating. Thus, aggregate boating days are 0.3474 million over the last 12 months.

Using the sample distribution of days by mode of fishing, we have the following distribution:

Boating Mode	Estimated Number of Days in Last 12 Months
1.Own Boat	.2397 Million Days (69.0%)
2.Charter Boat	.0802 Million Days (23.1%)
3.Partyboat	.0080 Million Days (2.3%)
4.Private Rental/No Guide	.0195 Million Days (5.6%)

From the above, it can be concluded that boating visitors to Walton County prefer to either trailer their boats or store them in marinas. About 31% of the boating visitors prefer to rent a boat of some kind. This pattern, as we shall see, will vary from county to county depending on cost, distance, and the socioeconomic characteristics of the boating visitors.

As discussed above, each boating mode will involve somewhat different kinds of expenditures (e.g., no rental fee for own boat trailered to Bay County) and the magnitude of the expenditures per party per day. This is one reason for breaking the boating modes down into four classifications. Therefore, we can compute the total expenditures on each mode by boating visitors using the following expression and "own boat" as an illustration:

TEO = TBDO * ($EPPDO/SPO)

where, TEO = total expenditures in Bay County by those those using their own boat;

TBDO = total boating days by those using their own boat;
$EPPDO = total expenditures per party/day for those using their own boat;
SPO = size of party

The rationale for the above expression is fairly straight forward. The second term is total party expenditures per day divided by the size of the party. This yields expenditures per day per person. When multiplied by total person-days, this yields an estimate of total expenditures for those visitors using their own boat. This expression can be used for the other three boating modes to derive total spending in each mode. The spending is on many goods and services in Bay County that either directly or indirectly facilitate the use of a boating mode. For example, those that come for a charter boat experience, spend money on hotels, eating and drinking places, and, of course, the charter boat rental, for example. All are charter boat related since this is the main purpose of the visit to Walton County. Table 2.4 shows the average spending per party per day (EPPD) and party size (SP) by both boating mode and type of activity.

TABLE 2.4

ESTIMATED AVARAGE SPENDING PER PARTY PER DAY AND PARTY SIZE FOR BOATERS BY BOATING MODE AND ACTIVITY WALTON COUNTY, FLORIDA

BOATING MODE	AVERAGE SPENDING PER PARTY PER DAY EPPD($)	AVERAGE PARTY SIZE
OWN BOAT	$305.70	4.17
FISHING	$321.97	4.26
DIVING	$301.25	3.40
CHARTER BOAT	$603.93	4.73

FISHING	$756.48	4.72
DIVING[1]	$309.53	4.75
PARTY BOAT		
FISHING	$351.54	3.24
PRIVATE RENTAL		
FISHING	$529.19	3.67

1. For Diving, expenditures are for all rental (e.g. Charter, Party, and Private Rental).

Table 2.5 shows the results of our expenditure calculations.
Boating visitors to Walton County spend a little almost $32 million on the four boating modes. Of course, the own boat mode is the largest total expenditures of over $17 million. As with all visitor spending, we also calculated the related wages and employment. This was done in the same way as described in the section on all visitors discussed above. Visitor boating-related expenditures generated a total of about $5.6 million in wages which supports 611 employees.

TABLE 2.5

ESTIMATION OF SPENDING BY BOATING VISITORS

CLASSIFIED BY BOATING MODE IN WALTON COUNTY, FLORIDA

BOATING MODE	TOTAL EXPENDITURES (MILLION$)[1]	RELATED WAGES (MILLION$)[2]	RELATED EMPLOYMENT (FULL and PARTIME)[3]
1. OWN BOAT	$17.56	$2.53	273
2. CHARTER BOAT	$10.24	$2.34	261
3. PARTY BOAT	$0.87	$0.20	22
4. PRIVATE RENTAL	$2.81	$.51	55
TOTAL	$31.48	$5.58	611

1. See Table 2.6 for TBD by boating mode and Table 2.4 for the average expenditures and party size by mode.

2. Wages are obtained by multiplying percent wages by each expenditure items contained in the boating survey instrument. Percent wages were obtained from the U.S. Census of Retailing and Services and updated to l998. See Appendix 2 for boating survey instrument.

3. Employment was derived by dividing total spending by the sales to employment ration(S/E) for each spending category in the boating survey instrument. The S/E ratio was obtained as the same source as given in footnote 2. See Appendix 2 for the boating survey instrument.

In addition to spending, wages, and employment, it is important to know how many person-visits were made to Walton County for the purpose of boating. This figure can be estimated by the following expression:

$$V = TBD/LS$$

where, V= person visits;
TBD= total boating days;
SP= size of the party.

The logic of the expression is that TBD are generated by all visitors to the county. Each visitor may stay for a particular number of days. To get the person-visits, this expression must be divided by the average length of stay. This yields an estimate of the total person-visits. We can apply this formula to each boating mode and thereby breakdown the person-visits by visitation by kind of boating. This is shown in Table 2.6

TABLE 2.6

ESTIMATION OF PERSON-VISITS
BY BOATING MODE FOR WALTON COUNTY

BOATING MODE	BOATING DAYS (MILLIONS)	LENGTH OF STAY (DAYS)	PERSON-VISITS (MILLIONS)
1. Own Boat	.2397	4.17	.0575
2. Charter Boat	.0802	4.73	.0170
3. Party boat	.0080	3.24	.0025
4. Private Rental	.0195	3.67	.0053
Total	.3474		.0823

From Table 2.1, there were over 587 thousand person-visits to Walton County. Of these visitors, it is estimated that 823 thousand were boating visitors over the last 12 months or about 14 percent of the total visitors. Notice that this percent corresponds to our approximately 15% estimate of the number of boating days as a percent of total days spent by the sample of visitors discussed above.

Table 2.7 shows the demographic and boating characteristics

of boating visitors surveyed in our second and most extensive survey. Boating visitors were relatively young and affluent. They were overwhelmingly white males. Bottom fish were caught along with some pelagic fish. About one-third of the visitors said they used artificial reefs. However, this is not the same thing as the percent of total boating days that were spent on artificial reefs. This leads us to the central thrust of this study and that is visitors(and residents) using artificial reefs.

TABLE 2.7

DEMOGRAPHIC AND BOATING CHARACTERISTICS OF

BOATING VISITORS IN WALTON COUNTY

DEMOGRAPHICS	AVERAGE/OTHER
1. Age	37 years
2. % Males	81.5%
3. % White	97.7
4. Family Income	$72,000
5. Education	College Graduate
BOATING PROFILE	
1. Average Length of Boat(If owned)	28.57 feet
2. Years Boating in Florida Panhandle	5.8 years
3. Percent Owned Boat	28.5%
4. Percent Member of Boating Club	3.8%
5. Targeted Species	1.Grouper 2.King Mackerel 3.Red Fish 4.Red Snapper 5.Dolphin Fish
6. Catch/Party/Day: Targeted Species	7.35 Fish
7. Species That Just Came Along	1.Cobia 2.Spanish Mackerel 3.Dolphin fish
8.Catch/Party/Day:Non-Targeted Species	6.57 Fish
9.Percent of Visitors Using Artificial Reefs	66.2%
10. Number of Different Artificial Reefs Used Per Year by Those Using Them	3.45
ll. Principal Artificial Reef Used in a Year Is Off Walton County	93.4%
12. Average Distance of Artificial Reef Used from Shore	11.3 Miles
13. Principal Fishing Method Used on Artificial Reefs	Bottom Fishing

Source: Sample Survey of Boating Visitors to Walton County

VISITORS USING ARTIFICIAL REEFS

METHODOLOGY

Up to this point, two sample surveys were utilized in this study. The first concentrated on the general visitor to Bay County and also the extent to which the respondent engaged in boating over the last 12 months. A recreational boating experience embraces many activities such as cruising; water skiing; rafting-up; racing; wildlife observation and, of course, fishing and diving. The latter activities are done from a boat and may or may not involve an artificial reef. Therefore, we can illustrate in the following manner:

Days Boating = {Fishing + Other Activities} + {Diving + Other Activities}

In the second survey of boating visitors, we focused on just fishing and diving which may or may not be performed in conjunction with an artificial reef. In Bay County, we found that of the total days spent either fishing and/or diving, that 90% were spent fishing and the balance were spent diving over the last 12 months according to the visiting boaters using their own boat. These proportions vary with fishing
and diving modes. Since our estimate of total boating days includes Other Activities, we must make some adjustment to our findings for Bay County. In retrospect, we should have asked about these other activities so we could put fishing and diving in better perspective. This should be done in further studies of artificial reefs. However, we did make some adjustment for Other Activities by using probabilities from Bell(1995). We used the following expressions:

Days Fishing = Pr(DF)* Days Allocated to Fishing

Days Diving = Pr(DD)* Days Allocated to Diving

We first allocated total days on the basis of the fishing and diving proportions. Then, we asked the question as to the probability that the days allocated to fishing will, in effect, be used for fishing. Thus, Pr(DF)= probability that a day allocated to fishing will be used for fishing where "DF" is days fished. Similarly, Pr(DD) is the probability that

a day allocated to diving will actually be used for diving where "DD" is days diving. Bell(l995) has indicated the following values for these two probabilities:

$$Pr(DF) = .80 \text{ and } Pr(DD) = .25$$

Therefore, if there are 100 general boating days, 90 will be allocated to potential fishing and 10 to potential diving based upon our second survey or the boating visitor survey. Of the 90 days allocated to potential fishing, we estimate that 72(.8*90) will actually be used for fishing. In the case of diving, the 10 days will be deflated on the basis of the probability to 2.5(.25*10). Therefore, our best estimate is that the 100 generic boating days are spent in the following manner: Fishing: 72 days; Diving: 2.5 days; Other Activities: 25.5 days. This methodology was used to allocate the total days among the three categories. Thus, those that think that fishing and diving occupy most or all of the time of the total boating days of visitors to Bay County will feel that we have underestimated the economic impact of artificial reefs. Alternatively, we can say that our estimates that follow are conservative or at least made an allowance for the "Other Activities Effect". Finally, the total fishing and diving days proportion vary by fishing mode as shown in Table 2.8.

TABLE 2.8

ALLOCATION OF BOATING DAYS BY MODE AND ACTIVITY FOR WALTON COUNTY,FLORIDA

Boating Mode	Fishing %F(%T)	Diving %D(%T)
Own Boat	90%(80%)	10%(25%)
Charter	83%(100%)	17%(25%)
Party Boat	100%(100%)	0%(0%)
Private Rental	90%(80%)	10%(25%)

As expected, most of the boating days that were fishing and/or

diving were found to be used for recreational fishing.

This leads us to the estimated percentage of total days that are obtained from the sample survey for just fishing and diving that are spent on artificial reefs. We asked responds to allocate days boating by fishing and diving on or about artificial reefs. These proportions are shown in Table 2.9.

TABLE 2.9

PERCENT OF FISHING AND DIVING ON ARTIFICIAL REEFS

Fishing		Diving	
l. Own Boat:	58.0%	l. Own Boat:	95.6%
2. Charter Boat:	85.0%	2. Rentals:	50.0%
3. Party Boat:	90.9%		
4. Private Rental	31.6%		

The majority of boating days spent fishing was done on or about artificial reefs according to our findings. This was even more true for diving. Over 64 percent of all diving days were spent on artificial reefs. The estimates for diving, however, are based on a relatively small sample size (N=57).

NUMBER OF VISITORS; VISITOR SPENDING AND WAGES AND EMPLOYMENT ASSOCIATED WITH ARTIFICIAL REEFS

With the information developed above from the second sample survey of visitors, we are able to obtain an estimate of the economic impact of visitors to Walton County who use artificial reefs. We shall call these economic impacts artificial reef related. Also, we make no distinction between public and private artificial reefs. The following expression was used to obtain artificial reef related spending by boating mode for fishing:

TEOARF = (TBDO/SPO)$EPPDO * %F * %T * %AR

where, TEOARF = total artificial reef related expenditures by visitors engaged in fishing(Own Boat);
TBDO = total boating days by visitors using own boat;
SPO = average size of party(Own Boat);
$EPPDO = Expenditures per party/day by visitors using their own boat;
%F = percent of all boating days spent fishing;
%T = probability(Pr)or percent of a fishing day that will be spent fishing;

%AR = percent of days spent on artificial reefs.

The above equation is the generalized expression to determine artificial reef related spending in Walton County where we are using Own Boat as an illustration. The equation may seem difficult to understand; however, it is really quite simple. We have seen the first two terms of the expression in the discussion above. That is, (TBDO/SPO)$EPPDO is the total spending on boating by visitors using their own boat in Walton County. This is shown as $17.56 million in Table 2.5. These terms are followed by %F
which is what percent the spending was related to fishing. Next, %T is an adjustment of %F to account for Other Activities as discussed above. Finally, we multiply by the %AR or the percent of the days spent on the artificial reef to arrive at TEOARF or total expenditures by visitor using their own boat while using an artificial reef off Bay County, Florida. Since this is the "bottom line" of our presentation, it might be helpful to give a numerical illustration.

$7.48 million = (.2397 Million/4.26)$321.97 *.9 *.8 * .5802

Notice that all the numbers on the right hand side of the expression have been developed and explained in the above discussion(the $321.97 is in Table 2.4). Thus, our conservative estimate is that of the total boating visitors using their own boat, $7.48 million were spent while fishing on an artificial reef. Thus, about 42.6% of total boating visitor spending using their own boat was artificial reef related ($7.48/$17.56). This does not include diving on an artificial reefs or the other boat modes. It serves to illustrate how we went about deriving artificial reef related spending. Table 2.10 shows the application of this procedure for fishing and diving, including all modes of boating. It also shows the estimated wages and employment related to the artificial reef related spending.

The grand total of all spending that is artificial reef related is $18.24 million which supports $3.47 million in related wages and 382 employees. This money is injected by boating visitors into the Walton County economy. As this injection is multiplied throughout the economy, there is a direct impact of increasing sales, wages, and employment as discussed earlier in this chapter. Let us concentrate on direct wages injected. This will probably have a multiplier of 1.4. Therefore, the total wage impact is $4.86 million. Also, employment will increase by some multiplier, but probably less than the wage multiplier because the visitor sector

is composed of relative low paid jobs. Assuming a multiplier of 1.2 for employment, we would have 458 direct and indirect jobs created by boating visitors using artificial reefs. These are economically significant numbers, but must be placed in the same perspective that the entire visitors sector was in Table 2.3. Wages generated by visitor boating on artificial reef would be about 1.85% of all wages in the Walton County economy ($4.86/$262.5) and 3.6% of all employment(458/12,794). This is not to minimize the economic importance of artificial reefs. Any sector that is related to nearly 460 jobs is not inconsequential to the local area.

TABLE 2.10

ESTIMATED ARTIFICIAL REEF RELATED SPENDING;

WAGES AND EMPLOYMENT GENERATED IN WALTON COUNTY, FLORIDA

ACTIVITY/MODE	VISITOR SPENDING (MILLION$)	WAGES GENERATED (MILLION$)	EMPLOYMENT
OWN BOAT	**$7.96**	**$1.16**	**125**
FISHING	$7.48	$1.10	118
DIVING	$0.48	$0.06	7
CHARTER BOAT	**$9.20**	**$2.08**	**231**
FISHING	$9.07	$2.07	230
DIVING[1]	$0.13	$0.01	1
PARTY BOAT	**$0.43**	**$0.10**	**11**
FISHING	$0.43	$0.10	11
DIVING	$0.00	$0.00	0
PRIVATE RENTAL	**$0.64**	**$0.11**	**13**
FISHING	$0.64	$0.11	13
DIVING	$0.00	$0.00	0
TOTAL	**$18.24**	**$3.47**	**382**
FISHING	$17.62	$3.38	372
DIVING	$ 0.62	$0.09	10

1. For Diving, Charter, Party and Private Rental were combined.

We have not yet presented the total days and person-visits that are related to artificial reefs in Walton County. The former is important in developing recreational values in the section below while the latter is important in its relation to all visitors to the Walton County area. Let us consider total days spent on artificial reefs. The following expression can be used to estimate such days:

TBDARF = TBDO * %F * %T * %AR

where, TBDARF = total boating days on artificial reefs while fishing
%F, %T, and %AR were defined above.

The same general equation can be used for diving except %F is changed to %D and the numerical values of the other variables may change depending on boating mode since we have used "Own Boat" as an illustration. The artificial reef related boating days were estimated along with person-visits as shown in Table 2.11.

TABLE 2.11

RECREATIONAL DAYS AND PERSON-VISITS ASSOCIATED WITH ARTIFICIAL REEF USE FOR WALTON COUNTY, FLORIDA

Mode/Activity	Number of Person-days (Millions) (Millions)	Length of Stay (Days)	Person-visits
1. **Own Boat**	**0.1058**		**0.0248**
Fishing	0.1001	4.26	0.0233
Diving	0.0057	3.40	0.0015
2. **Charter Boat**	**0.0585**		**0.0117**
Fishing	0.0566	4.72	0.0113
Diving	0.0019	4.75	0.0004

3. **Party Boat**	**0.0040**		**0.0008**
Fishing	0.0040	3.24	0.0008
Diving	0.0000	0.00	0.0000
4. **Private Rental**	**0.0044**		**0.0015**
Fishing	0.0044	3.67	0.0015
Diving	0.0000	0.00	0.0000
Total	**0.1728**		**0.0388**
Fishing	0.1651		0.0369
Diving	0.0077		0.0019

About 173 thousand days were spent over the last 12 months on artificial reefs in Walton County. The use value of a recreational days will be discussed below. This will add more meaning to the measurement of recreational days.

Finally, we would like to know how many person-visits to Walton County are related to artificial reefs. Using "Own Boat" as an illustration, this may be measured by the following expression:

VOAR = TBDOAR/LSOAR

where, VOAR = person-visits for those using their own boat on artificial reefs;

TBDOAR = total boating days for those using own boat on artificial reefs;

LSOAR = length of stay for those using own boat on artificial reefs.

Therefore, to obtain person-visits, we only have to divide days on artificial reefs by the length of stay. This makes good intuitive sense since if one individual spent 10 days in Walton County and each stay was 5 days, then we would have two person-visits. In the right hand column of Table 2.11, we show the person-visits by fishing and diving and by boating mode that are related to artificial reefs. Over a 12 month period, Walton County attracted 39,000 person-visits for the sole purpose of fishing and/ or diving on an artificial reef. About 6.6% of all visitors to Walton County, as measured by person-visits, are attracted to fishing and/or diving on artificial reefs. Remember there are a little over 587 thousand person-visits made to Walton County annually (See Table 2.1).

EVALUATION OF ARTIFICIAL REEFS BY USERS

METHODOLOGY

As part of survey of boating visitors to Walton County, we asked the respondents to evaluate the artificial reefs that they used. Questions about the artificial reefs were restricted to those that actually used artificial reefs. The evaluation of artificial reefs took place in two steps. First, we asked respondents the reasons that might be important in their decision to use an artificial reef as a recreational aid in fishing or diving. Respondents rated each statement from Very Important to Not Important at All. The results were obtained with the percent that answered either Very Important or just Important as our measure of importance (see Table 2.12).

TABLE 2.12

REASONS BEHIND THE CHOICE OF AN ARTIFICIAL REEF FOR ARTIFICIAL REEF USERS IN WALTON COUNTY

Reason	Percent Very Import or Important
1. Better Catch Rate	79.8%
2. Previous Experience at Site	75.5%
3. Site Is Close to Shore	25.5%
4. Want to Fish Near Others	1.1%
5. Other Fishermen Recommended Site	53.2%
6. Site Is Easy to Locate	61.7%
7. Better Fishing than Natural Reefs	44.7%

It would appear that the choice to use an artificial reef is based upon better fishing and ease of location. Respondents did not mind going 10-15 miles from shore to fish(See Table 2.7, Item 12), appeared to want the entire reef to themselves in that they did not appear to want company. It would appear that artificial reefs offer an improved recreational experience for the fishermen and even divers.

We attempted to get respondents to evaluate the present status of artificial reefs of Northwest Florida in the Gulf of Mexico. This goes to the placement of reefs and how

crowed they are. Table 2.13 shows the results for fishers and divers. The existing pattern of artificial reefs seems to win the approval of fishers and divers using them. Users would like the reefs deployed some distance from shore to maximize fishing success, but placed in no more than 150 feet of water. They strongly believe that artificial reefs increase the overall abundance of fish. This is a perception which could be debated. It is true that artificial reefs add to the fishery habitat, but no scientific study is known to the authors that definitely establishes that the fish population is actually increased with artificial reefs. Users could be confusing an aggregation of fish that are attracted by new reefs from places with no reefs. This would be a redistribution with no actual increase in the population. Finally, the evaluation seems to be in favor of the expansion of the artificial reef program since only 1.6% felt there were too many artificial reefs.

TABLE 2.13

EVALUATION OF EXISITING ARTIFICIAL REEFS

OFF WALTON COUNTY, FLORIDA

CRITERIA FOR EVALUATION	PERCENT STRONGLY AGREE OR AGREE
1. Reefs Placed Too Far From Shore	20.3
2. Artificial Reef Too Crowded	45.3
3. Too Many Artificial Reefs Placed in Gulf of Mexico	1.6
4. Artificial Reefs Should Be in 150 Feet or Less of Water	70.9
5. Artificial Reefs More Productive Than Natural Reefs	37.5
6. Artificial Reefs Increase Abundance of Fish	81.0

Source: FSU Survey of Boating Visitors to Walton County.

VISITOR USE VALUE OF ARTIFICIAL REEFS

METHODOLOGY

Up to this point in the report, we have stressed the economic impact of visitors using artificial reefs on the local economy. In a later section of this chapter, we shall consider resident spending on boating that is related to artificial reefs. However, in this section we shall look at a new concept entitled "use or user value" of the recreational experience.

If we look at the natural resources used in creating a fishing or diving day, they are obviously fish and water. These resources are common property in nature. This means that there is no organized market to sell and buy these resources. In effect, fish are free to those wishing to fish for this resource. Except for a small amount paid for a fishing license, there is no substantial fee paid for the use of the fishery resource or even the waters of the Gulf of Mexico. Although a recreational day is a service rendered by nature, there is no overt price to be paid. We call this a nonmarket activity. This does not mean that recreation is worthless. In fact, various laws have been passed to protect natural resources so society as a whole can derive value from their use. In general, this is what we mean by use value. But how can it be measured?

For market goods, economists have a demand curve to measure the value of a good. Oranges, wheat, and steel have a demand curve where as price drops, more is consumed. Recreational fishing and diving are services rendered to recreationalists that should have a demand curve as well. The fact is that we cannot measure this demand curve directly because there is no price-quantity relationship to be observed. However, economists have developed techniques to indirectly measure the value obtained from the use of a natural resource that is common property.

Consider Figure 1. DD is the recreational demand curve for fishing. If there were a price, the quantity demanded would fall as the "price" increases. Thus, the demand curve is downward sloping. Since the price is zero for recreational fishing, anglers "consume" D(1) days fishing. The measure of consumption or production is usually measured in either days or trips for

recreation. Trips can be longer than one day in length and correspond to the person-visit concept we discussed earlier.

Consider the area under the DD or demand curve. What we see is that recreational fishermen would be willing to pay P(l) or even P(2) or higher for the right to fish the resource, but because of the common property nature of market, the price is actually zero. Thus, the difference between what recreationalists would be willing to pay and the actual price(i.e., zero) is called *consumer's surplus*. Such a concept exists with market goods such as oranges, but there is a price above zero. But, there are those that would be willing to pay an even higher price. This difference is conceptually the same and is called consumer's surplus. As we shall see, consumer's surplus derived by recreationalists is actually use value. But, let us consider the market for recreation just a little bit more.

FIGURE 1

THE DEMAND CURVE AND SHIFTS IN THE DEMAND

FOR RECREATIONAL FISHING

PRICE

D(1) D(2) RECREATIONAL DAYS FISHING

We have established that there is a demand curve for recreation indicated by DD in Figure 1. Now, let us introduce the artificial reef as a "recreational aid" in fishing(and diving too). How does the artificial reef influence this market. Remember that our survey respondents in the last section generally felt that artificial reefs increase fishery catch rate or generally improve the recreational experience. The impact of introducing an artificial reef is to shift the demand curve for recreational fishing in Figure 1 upward and to the right. This means that at every level of recreation as measured by days or trips the angler is willing to pay more for the recreational experience. In a market sense, this shows how the favorable attitude of recreational fishermen manifests itself by an upward shift in the demand curve. Notice that something else happens and that is an increase in consumer’s surplus or use value. The area between the two demand curves is the increase in use value as a result of deploying the artificial reef. In contrast to the discussion in the economic impact sections above, the increase in use value means that by investing in an artificial reef we have increased output in the entire economy. While artificial reefs impact a region, they, in theory, increase national output as well. The distinction between an economic impact and use value is that the former is distributional, while the latter is a rise in national output. By distributional, we mean that if visitors do not spend their money in Bay County, they will spend it elsewhere-- maybe in the Florida Keys.

An indirect way of measuring consumer’s surplus or use value
is to ask users a question designed to measure the shift in the recreational demand curve by deploying artificial reef. The following questions was asked respondents in our boating visitor survey:

> "The artificial reef program cost money. Suppose that the government proposed that all newly constructed reefs would be paid for by requiring that the reef user with their own boat either

> pay for a stamp as part of their fishing license or pay for a decal as part of their boat registration. If you used a rental of any kind, you would probably pay for the operator's stamp or decal in the form of higher fees to cover costs. The money would go into a trust fund that could only be used for the construction of artificial reefs. Would you be willing to pay $_____per year when you renew your fishing or boating license and/or use a rental boat of any kind to fund this construction program?”

In this question, we have phrased it so it conforms to some generally accepted standard. First, there is a statement as background on the question. Second, there is a payment vehicle that is well articulated. Third, there is an assurance that the moneys collected will go into a trust fund designed for the sole purpose of adding new artificial reefs. The respondent is presented with a figure which he or she accepts or rejects. Therefore, we close the question to a potential open-ended ones where respondents are asked what they would pay with no constraints. This kind of a question leads to numerous biases. To implement the methodology described in this section, there are three general approaches:

MEASUREMENT OF USE VALUE

1. The Turnbull Distribution

From our question discussed above, we relate the YES and NO answers to the payments requested. The payments ran from $1 to $50 per year. As the payments rise, the probability of the respondent answering YES is decreased. The area under the Turnbull distribution gives an approximation of use value of adding additional artificial reefs. This techniques will be further explained in the implementation section.

2. Dichotomous Choice Model

In the question above, the respondent is presented with and either or situation much like a consumer faces in the market where you are presented with a price and you either take it or leave it. This is a dichotomous choice. If we let "l" stand for YES to the payment amount and "0" stand for NO to the payment amount, we can form an equation of the following form:

Pr(l,0)= f {Payment Presented; Socioeconomic Vector; Other Shifters }

The dependent variable or Pr is called a binary variable where only one of two values can appear(i.e., YES and NO). The respondents base their choice on the payment presented. The socioeconomic vector includes income; sex; race; etc. while other shifters contain variables such as boat length; etc. to hold them constant while looking at how the probability of saying YES changes as the payment presented increases. As with the Turnbull distribution, we are look at the area under the J-shaped curve showing the relation between the probability of saying YES and the increasingly higher payment demanded. This will be another estimate of use value.

3. Travel Cost Techniques

This techniques is not based upon the willingness to pay question posed above. It is based upon the distance traveled by the boating visitors. We would expect that as the cost of travel rises, that fewer trips(and days) will be made to Bay County by visitors. The cost of these trips can be estimated and are also given as a response to a question on expenditures in the boating visitor survey. The following equation can be used to formulate the travel cost techniques:

Trips to Bay County = f {Travel Cost; Socioeconomic Vector; Other Shifters}

Travel cost is used as a proxy for price since as it rises, trips
taken should fall according to travel cost hypothesis. Once this expression is estimated, we may hold the other variables constant and estimate the area under the travel cost demand curve. This will yield another estimate of consumer’s surplus or use value.

EMPIRICAL IMPLEMENTATION

The Turnbull Approach

The Turnbull(1976) distribution is non-parametric, maximum likelihood(ML) estimator for interval-censored data which is what we have when presenting payments to respondents

and asking whether they would be willing to pay such an amount or not. The Turnbull estimator uses respondents' choices to construct an interval estimate for the latent willingness to pay implied by each respondent's choice. The individual's answer to a single question will distinguish either a lower or an upper bound for his or her WTP. By combining respondents', we obtain estimates for the relative frequency of responses at different WTP levels. The intervals start at zero and end at infinity. In doing our study, we established seven intervals as follows: (1) $0 to $1; (2) $1 to $5; (3) $5 to $10; (4) $10 to $20; (5) $20 to $30; (6) $30 to $50 and (7) $50 to infinity. The interval has an upper and lower bound. It is assumed that the
fraction of the sample estimated to be in each interval has a willingness to pay(WTP) value equal to the lower end point of the interval. This is referred to as the lower-bound estimate of willingness to pay and is considered to be a conservative estimate of use value.

Using the WTP question regarding artificial reef discussed above, we asked for a response from only those using artificial reefs. A prior analysis of the data indicated that the Turnbull distribution technique could not be implemented by county, but was in conformity to a priori theory for fishers from the five counties combined. The theory assumes that as the WTP amount is increased, the percent answering "YES" will decline. That is, the
more costly the artificial reef program, the smaller the percent of the users willing to pay for the program. The sample for fishers was 264 responses while those for divers was just 37 responses with many intervals with no answers. Therefore, we were restricted to applying the Turnbull distribution to only those engaged in fishing. Of course, this is the principal use of artificial reefs by visitors to each county. Also, using the whole sample assumes that the WTP does not vary from county to county. Given the geographical proximity of the counties involved, this is not an unreasonable assumption. Furthermore, other techniques employed below will give us the ability to test the influence of each county on the WTP. Table 2.14 shows the results of the application of the Turnbull estimator to our data on the willingness to pay(WTP) for the artificial reef program.

Consider the first interval in Table 2.14(i.e., from $0 to $l). 54 respondents were asked whether they would be willing to pay at least $1.00 as part of their fishing license/ or cost of boat rental over a 12 month period for funding the

artificial reef program. 49 respondents or 90.7 percent answered "YES". This gives us one point on the Turnbull Distribution. We cannot calculate the WTP unless we observe a change from one point on the distribution to another. This is called the change in density. The second interval when compared to the first interval shows how the willingness to pay responds to a progressive rise in the "payment price". Therefore, we multiply the lower bound of the interval by the change in density to get the incremental willingness to pay. When this is done for all the intervals in Table 2.14, we get the cumulative willingness to
pay of $22.17 per year. Respondents responding to the highest interval are assumed to have a maximum willingness to pay of $50.
This is not unreasonable when one looks at how rapidly the probability of saying "YES" to the payment drops off as the payment rises in Table 2.14. Since the willingness to pay question was asked of an individual(i.e., not a fishing party), we interpret the $22.17 to be the WTP by one visitor fisher over a 12 month period for the artificial reef program as contained in the willingness to pay question. Since the data are an aggregation for all counties in the study, this WTP will apply to any fisher in anyone of the five counties. In Walton County, the typical visitor spends 4.08 days per trip and visits the county about 2.28 times per year. Therefore, we interpret the $22.17 as the WTP for 9.3 days of boating adjusted for percent fishing and the percent engaged in other boating activities. We estimated above that 49.74 percent of all general boating days are spent fishing on or about artificial reefs. Thus, of the 9.3 days in total fishing, 49.74 percent or 4.62 days are spent per individual on artificial reefs. Taking the annual WTP of $22.17 per fisher, and dividing it by days spent on artificial reefs in Bay County, we have a WTP/Day of $4.80. What is this value? It is the interpreted as the incremental recreational value afforded to the average fisher by artificial reefs as a recreational aid on a fishing day. Why is this important? The basic reason is that the expenditures on artificial reefs not only has an economic impact which we have quantified, but increases output in the general economy. That is, since the market does not measure the value of recreational output by many natural resources such as the fishery as discussed above, we have an indirect measure of this value. The total annual use value of artificial reefs for fishing in Bay County is equal to about $0.7925 million ($4.80*0.1651 million days spent fishing on artificial reefs in Walton County). We shall discuss this further after we gave reviewed the two other procedures used to estimate the WTP as discussed above.

TABLE 2.14

APPLICATION OF THE TURNBULL ESTIMATOR TO THE WILLINGNESS TO PAY(WTP) FOR ARTIFICIAL REEFS

(1) Lower Bound for Interval	(2) Upper Bound for Interval	(3) Probability of Paying at at Upper Bound	(4) Change In Density	(6) WTP (1)*(4)	(7) N
$0	$1	.907	.093	0	54
$1	$5	.796	.111	$ .110	49
$5	$10	.804	-.008	-$ .008	46
$10	$20	.600	.204	$2.040	35
$20	$30	.411	.189	$3.780	34
$30	$50	.197	.215	$6.450	46
$50	Infinity	.000	.196	$9.800	N/A

Total Willingness to Pay(Total of Column 6): $22.172

Dichotomous Choice Application

The modeling approach followed here is one originally developed by Bishop and Heberlein (1979). There have been many applications using slightly different specifications of the model and Hanemann (1984) further developed the underlying economic theory behind various model specifications and the formulas for calculating consumer’s surplus or compensating variation. Compensating variation is consumer’s surplus adjusted for the income effects of price changes that would keep the consumer at the same level of total economic well-being as before the change in price. The answers to questions like the ones used in this study to measure the value of artificial reefs are assumed to yield estimates directly of compensating

variation. The general form of the dichotomous choice is as follows:

$$Pr\ (YES) = \alpha - \beta_{BID} * BID + \beta_{SE} * SE + \mu$$

where, Pr (YES)= the probability that the user will be willing to pay the randomly assigned dollar amount (BID).

BID = randomly assigned dollar amounts.

β_{BID} = estimated coefficient on BID.

SE = vector of other socioeconomic variables and/or natural resource attributes.

β_{SE} = estimated coefficients for SE vector.

μ = error term following logistic distribution for logit model and normal distribution for the probit model.

The above model was estimated using both the logistic and normal distribution assumption about μ. The BID variable was included in its linear and logarithmic form (natural logarithm of BID called LBID here). In the SE vector, we include a variety of socioeconomic factors including household income, age, years of experience boating in northwest Florida, race, and sex. Also, included were variables for differentiating charter and party boat mode use from use of the own boat and private rental boat modes. A variable was also entered to indicate artificial reef use and, when fishermen and divers were combined, a variable was entered to differentiate divers from fishermen. However, none of the variables in the SE vector were significant in any model specification. Some have argued that this finding calls into question the validity of the estimated values. We present eight model specifications that include only the bid amount as an explanatory variable (Table 1.15). The models differ by sample of users (e.g. all users versus fishermen only), by assumption about the distribution of the errors (e.g. the logit of probit model), and by specification of the bid amount (e.g. linear BID or log linear or natural logarithm of bid or LBID). The estimated values derived from these models range from $23.92 to $29.83 per user per year. The average of these eight values is $27.02.

The average value derived from the dichotomous choice models is slightly higher than that obtained using the same information and employing the Turnbull method $27.02 versus $22.17 or about 22 percent higher. The lowest value obtained from the dichotomous choice model is only 7.89 percent higher than that obtained using the Turnbull method ($23.92 versus $22.17). To derive an estimate of the willingness to pay per day, as with the Turnbull estimate above we divide the annual value per person by 4.62 days yielding an estimate of WTP/day of $5.85 ($27.02/4.62). And, our estimate of total annual value of artificial reef use in Walton County using the dichotomous choice method is $0.9658 million ($5.85 * 0.1651 million days of use).

TABLE 2.15

DICHOTOMOUS CHOICE MODELS

FOR ARTIFICIAL REEF USERS

IN NORTHWEST FLORIDA

Model Number	α	β_{BID} or β_{LBID}	BID or LBID	Users	Type of Model	N	WTP for Artificial Reef ($)[1]
1	2.2308 (9.455)*	-.07486 (-8.159)	BID	All	Logit	302	29.80
2	1.3392 (10.309)	-.04490 (-8.778)	BID	All	Probit	302	29.83
3	3.6048 (7.948)	-1.1233 (-7.299)	LBID	All	Logit	302	24.76
4	1.9752 (8.980)	-.6134 (-7.877)	LBID	All	Probit	302	25.03
5	2.1086 (8.448)	-.07167 (-7.551)	BID	Fish	Logit	260	29.42
6	1.2692 (9.145)	-.04305 (-8.104)	BID	Fish	Probit	260	29.48
7	3.3250 (7.187)	-1.0473 (-6.713)	LBID	Fish	Logit	260	23.92
8	1.8367 (8.124)	-.5783 (-7.282)	LBID	Fish	Probit	260	23.95
1-8 Average							27.02

* t-values in parentheses.

1. For linear model, annual willingness to pay (WTP) is equal to α/β_{BID}, while for the log linear model, WTP is equal to $\exp(\alpha/\beta_{LBID})$.

Travel Cost Demand Model Application

The modeling approach employed here is one that has recently been applied to visitors to the Florida Keys (See Leeworthy and Bowker 1997, and Bowker and Leeworthy 1998). The choice of this modeling approach is based on the similarity of the type of sample data collected that present problems of biased estimation of consumer's surplus. A major source of possible bias in estimating consumer's surplus is when the sample does not include those that do not consume the good or service, here fishing or diving in northwest Florida. Not including people that do not engage in fishing or diving in estimating the demand function can lead to what is called truncation bias. It is called truncation bias because the sample is truncated at one visit to the area or only includes people that made at least one trip to northwest Florida. Samples that are conducted on-site of visitors by definition only include people that have visited the area. This is done because obtaining a random sample of all people (visitors and non-visitors) is too expensive for practical purposes. However, statisticians and economists have developed methods to correct demand estimation with truncated samples and thus avoid the truncation bias.

Another aspect about trips is that one cannot take a fraction of a trip. Trips take on integer values (e.g., 1, 2, 3,…365). Statisticians and economists have also developed methods for estimating models where the dependent variable, like trips, have integer values. The methods are called count data models and include the Poisson model and the negative binomial model. The model we employ here is a special version of the count data models that uses a maximum likelihood method of estimation that also adjusts for truncation bias and are therefore called the truncated Poisson and truncated negative binomial models.

The travel cost model estimated here takes on the following general form:

$$Ln(TRIPS_i)=\beta_0 + \beta_{tc}TC_i + \beta_{se}\ SE_i + \mu_i$$

where, for the ith individual Ln(TRIPS) is the natural logarithm of the quantity of recreation trips, TC is the travel cost per trip, SE represents the vector including other relevant

socioeconomic variables and site attributes, the βs' are regression parameters estimated by the model that quantify the relationship between the right-hand side variables to TRIPS, and μ is an error term that is assumed to follow a gamma distribution with mean 1.0 and variance α (Greene, 1995).

Table 2.16 provides definitions of all the variables used in estimating the final model presented here. Several of the variables in Table 1.16 require further explanation. We followed Bowker, English & Donovan (1996), Leeworthy and Bowker (1997) and Bowker and Leeworthy (1998)and defined the dependent variable as a person-trip (NTRIPS). Hence a family of four visiting northwest Florida once per year would account for four person-trips as would an individual visiting northwest Florida four times in one year. However, given the same origins and travel modes, the price per person-trip would differ as the single visit cost for the family of four would be apportioned to four person-trips. While intuitively appealing, this construction of the dependent variable is practical for situations were group travel by car is common. In the boating visitors sample used here, all visitors came by automobile. In addition, the construction of the dependent variable used here helps to avoid the empirical malady of low dispersion of the dependent variable i.e., a clustering around one trip annually.

Travel costs per person-trip (TCOSTPP) is equal to round-trip road mileage times a cost per mile then divided by the number of people in the traveling party. Distance was calculated from the center of the zip code of the person's home to the center of the zip code of the site in northwest Florida where the person was interviewed. We used a computer program called Prophesy Plus and chose the route that was the fastest (would take the least time). Mileage cost was calculated using $0.14 per mile. This estimate is based on a recent study of travel costs by auto visitors to the Florida Keys (Leeworthy and Bowker 1997). This cost is less than what the Federal government uses to reimburse Federal employees for travel when using their private vehicles (currently $0.31 per mile). The reason is that the Federal government rate includes overhead costs such as insurance and maintenance as well as the depreciation of the vehicle. The costs used here only include trip related costs such as gasoline, oil, parking fees, and tolls. As discussed above, round-trip travel costs were divided by the number in the traveling party to put costs on a person-trip basis to be consistent with our definition of TRIPS (NTRIPS) or person-trips.

The inclusion of time costs, both in-transit and on-site is subject to considerable debate. Theoretically, Freeman (1993) demonstrates that both kinds of time costs should be included. However, he points out a number of problems which continue to plague applied researchers. One is the inability of a large portion of the population to easily substitute between working increased hours at their normal (or overtime) wage rate and leisure time. Another is the possibility of utility or disutility resulting from work, travel, or on-site time, hence rendering the full wage rate a potentially poor measure of the shadow cost of time. He points out that while most surveys elicit a pretax income measure, a more realistic wage rate would be derived from after tax income.

Many other researchers have used a percentage of the wage rate, some based on travel studies of the cost of travel congestion, while most use some arbitrary percent of the wage rate. We felt that resolving this issue was beyond the scope of this study and we used a more conservative approach and have not included the value of time.

It is important in travel cost modeling, especially when visitors come from origins of great distance, to control for the length of trip. The variable (STAY) is the length of the interview trip measured in number of days. Length of trip was used extensively in the beginning of the report to estimate the total number of person-trips. It is assumed that all trips over the year are the same length.

We included a host of standard socioeconomic variables including age (AGEH), household income (INCTTH), race/ethnicity (WHITE), years of experience visiting northwest Florida (EXPER), sex (MALE)and whether the person was a member of a fishing or diving club (CLUB). AGEH was scaled in hundreds of years and was used in estimation with it’s squared value (AGESQH). This specification tests if there is a parabolic relationship between the number of person-trips (NTRIPS) and age (AGEH). We will discuss this in more detail below when discussing the results of the estimation. Household income (INCTTH) was scaled to $10,000. Thus a value of one means a household income of $10,000. Household income was actually obtained in intervals (e.g. less than $10,000, $10,000-$19,999, $20,000-$29,999, etc.). We converted this to a continuous variable by setting the value of household income to the mid-point of the interval given by the person interviewed.

The variable (EXPER) is the number of years the person interviewed had been boating in the panhandle of Florida. For race/ethnicity, we created a dummy variable (WHITE) which takes on a value of one (1) if the person interviewed was White, not Hispanic and zero (0) otherwise. There were not enough Black or African American or Hispanic persons in the boating sample to construct separate variables for these groups. The variable (CLUB) is also a dummy variable that takes on a value of one (1) if the person was a member of a fishing or diving club and zero (0) otherwise. In addition, sex was represented as a dummy variable that takes on a value of one (1) if the person interviewed was a male and zero (0) otherwise.

We also constructed a set of intercept and slope dummy variables to test whether those that dive (DIVE), or used the charter boat mode (CHARTER), or used the party boat mode (PARTY), and, most importantly for this study, used an artificial reef (REEF) have different demands. That is, instead of estimating separate demand equations for each group (we don’t have enough people in the boating sample to do this), we can employ statistical techniques that allow us to estimate different demands while pooling the data. DIVE, CHARTER, PARTY and REEF are intercept dummies that take on values of one (1)or zero (0) just like variable WHITE, MALE, and CLUB discussed above. Intercept dummies let us test if, on average, different groups take more or less trips (NTRIPS). For example, do divers take more or less trips to northwest Florida for boating activities, holding all other factors constant, than fishermen.

Slope dummies test whether the slope of the demand function is different for different groups. As we will show below, this is important for two reasons. Slope dummies allow us to test whether different groups will respond differently to price. That is, for a given percentage change in price, what will be the percentage change in number of trips to northwest Florida for boating activities by different groups. Economists call this price elasticity. Price inelasticity means for a given percentage change in price their will be a smaller percentage change in number of trips. This has practical importance to local businesses because inelastic demands means that, for a price increase, total revenue will increase. The opposite is true if demand is elastic.

Another important use of slope dummies is in estimating consumer’s surplus or use value per trip. As we will show when we discuss later the formula for calculating consumer’s surplus or the use value per trip, the calculation depends on the slope

of the demand function. So groups with different demand slopes will have different use values per trip. Groups with demands with steeper slopes will have higher use values per trip and vice versa.

We constructed slope dummies for divers (DCOST1), for those that used charter boat mode (CHCOST1), for those that used the party boat mode (PARCOST1), and those that used an artificial reef (REFCOST1). The variables are created by simply multiplying the intercept dummy variable for each group by the travel cost variable (TCOSTPP). An estimated positive coefficient on a slope dummy means that the slope of the demand for boating trips is steeper for that group meaning that groups demand will be more inelastic and will mean that group has a higher use value per trip than the base group. For example, if the coefficient on DCOST1 is positive, it will mean that divers have more inelastic demands than fishermen, holding all other factors constant. It will also mean that divers have a higher use value per trip than fishermen.

TABLE 2.16

DEFINITIONS OF THE TRAVEL COST MODEL VARIABLES

Variable	Definition
NTRIPS	Annual number of person-trips to northwest Florida for boating activities.
TCOSTPP	Travel cost per person-trip. Round-trip mileage from home to the interview site times $0.14/mile.
STAY	Length of trip measured in number of days.
INCTTH	Household income (in 10,000 of $).
AGEH	Age of the person interviewed (in hundreds of years).
AGESQH	AGEH squared.
EXPER	Number of years have been boating in northwest Florida.
DIVE	Dummy variable (1=participated in diving).
CHARTER	Dummy variable (1=used charter boat mode).
PARTY	Dummy variable (1=used party boat mode).
CLUB	Dummy variable (1=member of a fishing or diving club).
REEF	Dummy variable (1=used artificial reef).
DCOST1	Slope dummy for diving (DIVE*TCOSTPP).
REFCOST1	Slope dummy for use of artificial reef(REEF*TCOSTPP).
CHCOST1	Slope dummy for charter boat mode use. (CHARTER*TCOSTPP).

PARCOST1 Slope dummy for party boat mode use (PARTY*TCOSTPP).

α Overdispersion parameter. A significant parameter indicates the presence of overdispersion and that the Poisson model is rejected in favor or the negative binomial model.

Results of the Travel Cost Demand Model

Truncated Poisson and negative binomial (TNB) models were estimated using LIMDEP Version 7.0 (Greene 1995). Only the TNB model is presented here because the hypothesis of no over dispersion was rejected based on a Wald test equivalent to the asymptotic t-ratio on the estimated dispersion parameter, α (Yen & Adamowicz, 1993). Table 2.17 summarizes the results of the TNB model.

Several variables included in Table 2.16 were dropped from the model because they were not statistically significant. The variables dropped were STAY, DCOST1, and REFCOST1. Length of trip (STAY) was negative but not significant. The slope dummy for diving (DCOST1) was positive but not significant meaning that the price elasticity and consumer's surplus or use value per trip was not different between fishermen and divers. And, most important here, the slope dummy for artificial reef use was positive but not significant meaning that the price elasticity and use value per trip was not different between users and nonusers of artificial reefs.

All the variables included in the final model presented in Table 2.17 are statistically significant, except household income (INCTTH). Because of incomes economic importance we kept it in the model despite it's insignificance. Dropping income from the equation did not significantly change any other estimated model coefficients in our tests of alternative model specifications. All the other variables included in the model were statistically significant with high levels of confidence as expressed in the column labeled, $P[\ |z| \geq z]$. This column contains the significance level for the test of whether the estimated coefficient is significantly different from zero. A value of 0.05 would indicate significance at the 5 percent level or that we are confident at the 95 percent level. Generally, the model variables were all significant at the 0.05 or below meaning these are fairly strong results.

Price Elasticities

The coefficient on TCOSTPP is negative indicating a downward sloping demand curve as presented in Figure 1. As discussed above, price elasticity of demand measures how the demand for trips (NTRIPS) changes with changes in prices (TCOSTPP), holding all other factors constant. Specifically, price elasticities measure the percentage change in the number of trips (NTRIPS) for a percentage change in price (TCOSTPP).

TABLE 2.17

TRAVEL COST MODEL RESULTS

FOR BOATING VISITORS

TO NORTHWEST FLORIDA

Variable	Coefficient	Standard Error	b/St.Er.	P[|Z|>z]	Mean of X
Constant	4.132307282	.60192811	6.865	.0000	1.00000
TCOSTPP	-.03937839110	.0024047564	-16.375	.0000	36.832241
CHCOST1	.02606125483	.0030188745	8.633	.0000	22.724031
PARCOST1	.01365062332	.0059164162	2.307	.0210	10.808520
INCTTH	.01485993937	.012251925	1.213	.2252	8.0092308
AGEH	-7.413161512	2.9668408	-2.499	.0125	.38021538
AGESQH	10.02846709	3.2960961	3.043	.0023	.15524892
MALE	.2889243810	.15285344	1.890	.0587	.85846154
CLUB	.6819655766	.14803140	4.607	.0000	.067692308
CHARTER	-1.346883501	.11960963	-11.261	.0000	.60923077
PARTY	-1.255882128	.23010332	-5.458	.0000	.20923077
REEF	.2897223689	.10902141	2.657	.0079	.53230769
	Overdispersion parameter for negative binomial model				
Alpha	.5272315531	.67047941E-01	7.864	.0000	

NTRIPS (mean) 9.19
Log likelihood function -877.5674
Restricted log likelihood -1607.626
Chi-squared 1460.118
Degrees of freedom 1
Significance level .0000000
LEFT Truncated data, at NTRIPS = 0.
N=325

In our particular specification of the demand model, price elasticity for those that used the own boat and private rental boat modes is equal to the estimated coefficient on TCOSTPP times TCOSTPP. That is, price elasticity varies with the level of price. At the mean or average travel cost, the price elasticity for the demand by those that used own boat or private rental boat for both fishing and diving was equal to -1.45 (-.0394*36.83 from Table 2.17). Thus the demand for own boat and private rental boat trips for fishing and diving in northwest Florida is considered elastic. That is, for a 10 percent increase in price, demand for trips will decrease by 14.5 percent. This means that price increases for this group would

result in decreases in total revenue to local businesses. And, price decreases will result in increases in total revenue.

For fishers and divers that used party and charter boating modes, price elasticities are calculated using the slope dummies we discussed above. For the party boat mode, the price elasticity at the overall sample mean travel cost is equal to -0.9484 [(-.0394+.01365)*36.83]. For a 10 percent increase in the price, party boat mode trips would decrease 9.48 percent. Since this price elasticity is less than -1.0 we say that the demand for party boat mode trips is inelastic. Meaning that for a price increase, total revenues would increase. And, price decreases will result in decreases in total revenue.

For fishers and divers that used the charter boat mode, the price elasticity at the sample mean travel cost is equal to -0.4898 [(-0.0394+.0261)*36.83]. For a ten percent increase in price, charter boat trips would decrease about 4.9 percent. Thus, for the charter boat mode, demand is price inelastic.

Relationship Between Trips and Age

As discussed above, the relationship between NTRIPS and the age of the person interviewed (AGEH) was expected to be parabolic. This was tested by including age squared (AGESQH) in the estimated travel cost demand model. The coefficient on AGEH is negative and the coefficient on AGESQH is positive meaning that as age increases, from age 16, the number of trips (NTRIPS) decreases, reaches a minimum, and then starts increasing with age (a u-shaped parabola). Below is the estimated relationship using our estimated travel cost model. Note that trips reach a minimum at age 35.

NTRIPS	AGE
2.0	16
1.7	25
1.5	35
1.6	45
1.9	55
2.3	65
2.6	70
3.4	80

Relationship Between Trips and Other Factors

For all other factors and trips, the marginal effects are reported here. The marginal effects are the changes in the

number of trips for a one unit change in the factor. For intercept dummies, discussed earlier, the calculation shows how many trips, on average, a group makes more than the reference group. Marginal effects are calculated as the mean number of NTRIPS times the estimated coefficient on the factor.

Household income has a relatively small effect on trip taking. An increase of $10,000 in household income would result in only a 0.14 increase in the number of trips (NTRIPS). Males, on average, make 2.65 more trips than females. Members of fishing and diving clubs (CLUB) make, on average, 6.27 more trips than non club members. Charter boat mode users make, on average, 12.38 fewer trips than those that use the own boat and private rental boat modes. Party boat users make, on average, 11.54 fewer trips than those that use the own boat and private rental boat modes. And finally, those that used artificial reefs (REEF) make, on average, 2.66 more trips than non reef users.

User Value of Artificial Reefs

As discussed above, we can use our estimated travel cost model to estimate consumer's surplus or use or user value for artificial reefs. We estimate these values per person-trip, per person-day, and the total annual value for Walton County. The estimates are presented by boat mode and for fishermen and divers.

For those that used the own boat or private rental boat mode (fishermen and divers), the following formula is used to calculate consumer's surplus per person-trip:

$$CSPT_{own} = (-1/\beta_{TCOSTPP}) * [1/1+(t_{TCOSTPP})^{-2}]$$

where, $CSPT_{own}$ = Consumer's surplus (use value) per person-trip for those that used the own boat or private rental boat modes, including both fishermen and divers.

$\beta_{TCOSTPP}$ = Estimated coefficient on the travel cost variable (TCOSTPP).

$t_{TCOSTPP}$ = Estimated t-value (from column labeled b/st.er. in Table 1.17) for the travel cost variable coefficient.

By substituting the values for the above variables from Table 2.17, we calculate $CSPT_{own}$ = [-1/-.0394] * $[1/1+(16.375)^{-2}]$ = [25.38] * [.9963] = $25.29. The above formula has two components. The first is the formula for calculating the area under the estimated travel cost demand model as shown in Figure 1 earlier in the chapter. The second component is an adjustment for bias in consumer's surplus estimates from demand functions. Even though the estimated demand function is unbiased, consumer's surplus estimates are biased (Zellner and Park, 1979). The correction factor is a simple function of the estimated t-value on the travel cost coefficient (Bockstael and Strand, 1987). When the estimated t-value is large, the correction factor for bias will be small.

An important finding from our travel cost demand modeling was that those that used the charter and party boat modes (fishermen and divers) had different price elasticities and different consumer's surpluses per person-trip. The formula for charter boat mode fishermen and divers is as follows:

$$CSPT_{CHARTER} = [-1/(\beta_{TCOSTPP} + \beta_{CHCOST1})] * [1/1+(t_{TCOSTPP})^{-2}] * [1/1+(t_{CHCOST1})^{-2}]$$

where, $CSPT_{CHARTER}$ = Consumer's surplus per person-trip for fishermen and divers that used the charter boat mode.

$\beta_{TCOSTPP}$ = Estimated coefficient on the travel cost variable.

$\beta_{CHCOST1}$ = Estimated coefficient on the slope dummy variable (CHCOST1).

$t_{TCOSTPP}$ = Estimated t-value (from column labeled b/st.er. in Table 1.17) for the travel cost variable coefficient.

$t_{CHCOST1}$= Estimated t-value (from column labeled b/st.er. in Table 1.17) for the slope dummy variable (CHCOST1) coefficient.

By substituting the values for each variable in the above formula from Table 2.17, we calculate $CSPT_{CHARTER}$ = [-1/(-.0394+.0261)] * $[1/1+(16.375)^{-2}]$ * $[1/1+(8.633)^{-2}]$ = [75.19] * [.9963] * [.9868] = $73.92. The above calculation is similar to the one for own boat and private rental boat modes except that

there are three components to the calculation. The first component adjusts for the change in slope of the demand function for charter boat mode users. The second and third components adjust for the bias in consumer's surplus and account for the bias from both the travel cost coefficient and the slope dummy for charter boat users.

The formula for party boat mode users is as follows:

$$CSPT_{PARTY} = [-1/(\beta_{TCOSTPP} + \beta_{PARCOST1})] * [1/1+(t_{TCOSTPP})^{-2}] * [1/1+(t_{PARCOST1})^{-2}]$$

where, $CSPT_{PARTY}$ = Consumer's surplus per person-trip for fishermen and divers that used the party boat mode.

$\beta_{TCOSTPP}$ = Estimated coefficient on the travel cost variable.

$\beta_{PARCOST1}$ = Estimated coefficient on the slope dummy variable (PARCOST1).

$t_{TCOSTPP}$ = Estimated t-value (from column labeled b/st.er. in Table 1.17) for the travel cost variable coefficient.

$T_{PARCOST1}$= Estimated t-value (from column labeled b/st.er. in Table 1.17) for the slope dummy variable (PARCOST1) coefficient.

By substituting the values for each variable in the above formula from Table 2.17, we calculate $CSPT_{PARTY} = [-1/(-.0394+.01365)] * [1/1+(16.375)^{-2}] * [1/1+(2.307)^{-2}] = [38.83] * [.9963] * [.8418] = \$32.57$. The above calculation is similar to the one for the charter boat mode.

Using the above estimates of consumer's surplus per person-trip, we can estimate the total annual value of artificial reefs and we can estimate the value on a per person-day value. We do this by referring back to our estimates of person-trips and person-days by boat mode and activity (see Table 2.11). We reproduce those estimates along with our estimates of total annual consumer's surplus and consumer's surplus per person-day in Table 2.18.

Table 2.18 shows the impacts of a variety of factors on total value for artificial reefs. Even though our estimate of consumer's surplus per person-trip was higher for party boat mode users than own boat mode users ($32.57 vs. $25.29), there is no significant difference on a per person-day basis ($6.53 vs. $5.88). And, even though the own boat mode and private rental mode users had the same value per person-trip ($25.29), private rental boat mode users had a higher value per person-day ($8.61 vs. 5.88). The reason for this difference is the difference in length of trip. Private rental boat mode users had, on average, shorter trips than those that used their own boats (3.67 vs.4.26).

Even though charter boat mode users made significantly less person-trips and spent less person-days in Walton county than the own boat mode users, total annual value for charter boat users was significantly higher than that of own boat mode users ($864.9 thousand vs. $627.2 thousand). The higher value per person-trip and per person-day, for charter boat users, more than offset the number of person-trips and person-days by own boat users.

Overall, for year 1997-1998, artificial reefs for Walton County visitors were worth about $1.56 million. Fishermen accounted for 95.7 percent of the total value, while divers accounted for 4.3 percent. Visitors that used charter boat fishing services accounted for 55.6 percent of the total value, while fishermen using their own boats accounted for 37.9 percent of the total value.

Comparison of User Values Across Methods

The Turnbull method resulted in an estimate of the value per person-day for artificial reef use (fishing only) of $4.80 compared to $5.85 for the dichotomous choice models, and $9.02 using the travel cost model. Total annual value for fishing on the artificial reefs in Walton County was estimated at $0.7925 million using the Turnbull method, $0.9658 million using the dichotomous choice models, and $1.48 million using the travel cost model. Because the willingness to pay questions resulted in estimated values that were not explained by differences in any socioeconomic factors, we conclude that the travel cost model results are the 'best' results for Walton County. Including fishermen and divers, we estimate the total annual value of artificial reef use in Walton County is worth $1.56 million.

TABLE 2.18

ANNUAL AND PER PERSON-DAY USE VALUES

FOR ARTIFICIAL REEFS IN WALTON COUNTY, FLORIDA

Boat Mode/ Activity	Person-Visits on Artificial Reefs (millions)[1]	Total Annual Use Value of Artificial Reefs (millions $)[2]	Person-days on Artificial Reefs (millions)[3]	User Value Per Person-day ($)[4]
Own Boat	**0.0248**	**0.6272**	**0.1058**	**5.93**
Fishing	0.0233	0.5893	0.1001	5.88
Diving	0.0015	0.0379	0.0057	6.65
Charter	**0.0117**	**0.8649**	**0.0585**	**14.78**
Fishing	0.0113	0.8353	0.0566	14.76
Diving	0.0004	0.0296	0.0019	15.58
Party	**0.0008**	**0.0261**	**0.0040**	**6.53**
Fishing	0.0008	0.0261	0.0040	6.53
Private Rental	**0.0015**	**0.0379**	**0.0044**	**8.61**
Fishing	0.0015	0.0379	0.0044	8.61
Total	**0.0388**	**1.5561**	**0.1728**	**9.01**
Fishing	0.0369	1.4886	0.1651	9.02
Diving	0.0019	0.0675	0.0077	8.77

1. See Table 2.11.
2. Total annual consumer's surplus for artificial reefs is equal to the estimated consumer's surplus per person-trip (CSPT) for each boating mode times the number of person-trips on artificial reefs. CSPT for own boat and private rental mode is $25.29, $73.92 for charter boat mode, and $32.57 for the party boat mode.
3. See Table 2.11.

4. Consumer’s surplus per person-day for artificial reef use is calculated as total annual consumer’s surplus for artificial reef use divided by total person-days on artificial reefs.

PART 2

RESIDENTS OF WALTON COUNTY

INTRODUCTION

When we consider artificial reefs, we must look at two well defined user groups. These are the visitors to Walton County which we have extensively analyzed above and the residents of that county. Such coastal residents engage in all forms of boating and also use artificial reefs as a recreational aid. In 1996, the population of Walton County, Florida was estimated at 34,328 individuals. These individuals took advantage of the coastal environment by registering 3,112 pleasure craft or a little over 11 persons per boat. In the State of Florida, there are over 19 persons per registered boat indicating that Walton County has about double the per capital ownership of pleasure craft. A coastal county requires a relatively large infrastructure for boating including piers, boat ramps, and marinas. In addition, we can add artificial reefs are part of this infrastructure.

A inventory taken by the Florida Department of Environmental Protection(1996) in l995 indicated that Walton County had the following boating infrastructure:

1. Piers: 1 with a length of 300 linear feet;

2. Boat Ramps: 10 with a total of 12 boating lanes;

3. Marinas: 4 with 223 slips and 168 dry racks.

It is estimated by the DEP, that there are 18 artificial reefs off Walton County. All of these facilities are available to both visitors and residents for boating use in the Gulf of Mexico.

We shall focus on the registered boats in Walton County as the universe for resident use of artificial reefs. Of course, residents, as was true of the visitor sector, may avail themselves of party, charter, and other rental boats operating from the county. This will also be treated in our economic analyses. However, we shall start with the registered pleasure boats. For purpose of analyses, these pleasure craft were broken down into three categories based on the length of the vessel as follows:

Class 1: Under 16 Feet	2,311
Class 2: 16 Feet to 39 Feet, 11 inches	792
Class 3: Over 40 Feet	9
Total	3,112

The boat registration data were obtained from the Florida Department of Highway Safety and Motor Vehicles. Even though finer class distinctions are available by length, we felt that dealing with the above classes made our study more manageable and targets the Class 2 pleasure crafts as those capable of reaching an artificial reef which we saw in the visitor study above is, on average, over 10 miles from shore. Thus, the decision was made to target those intermediate size pleasure craft that are more likely to use artificial reefs. The third class is relatively small and was included to assure we treated, in some way, all the pleasure craft registered in Walton County.

RESIDENTS ENGAGED IN BOATING

METHODOLOGY

Residents engaged in boating from Walton County were divided into two classes: those using their own boats and those using some kind of rental boat such as a party, charter, or other kind of rental boat. Let us consider the “own boat category” first.

As discussed above, the universe for this category includes all the registered boats in the county. It is possible that a resident of Walton County may registered his or her boat in another county. If this was the case, we made the assumption that the boating activity of that resident took place mainly in the county in which the pleasure craft was registered. This is what is called a simplifying assumption to limit the scope of this study. However, of more concern in a coastal county are those individuals that registered their craft there, but live elsewhere. Such individuals would not be defined as residents of the coastal county. For example, a resident of Tallahassee may berth his craft in one of the 4 marinas in Walton County. It would not be unreasonable for such an individual to have registered his boat in Walton County as a matter of convenience. Therefore, some adjustment must be made to the registered pleasure craft numbers to account for, delete, nonresidents.

For each of the Classes established above, the following expression was employed:

RESBT = REGBT * % RES

where,

RESBT = Registered resident boats(pleasure craft);
REGBT = Registered boats (pleasure craft) in the county under study;
%RES = Percent of registered boats registered to individuals with homes in the county under study.

Just how %RES(percent local residents) was determined will be discussed under sampling procedure below. Next, registered pleasure craft owned by local residents is merely a stock of boats which may or may not be used for boating or some element of boating such as fishing or diving. In our sampling procedures discussed below, we ascertained, from those owning registered boats, the number of days per year they were used predominately for saltwater fishing. For purposes of this study, we are only interested in fishing and diving since these activities are the primary recreational use of artificial reefs. The following expression may be useful in looking at a fishers use of a pleasure craft:

FPDYO = RESBT* FDPBPYO

where,
FPDYO = Fishing(saltwater) party days per year using own boat;
RESBT = Resident boats(pleasure craft);
FDPBPYO = Fishing(saltwater) days per own boat per year.

This is a rather simple expression which indicated that saltwater fishing days per year is the result of multiplying the number of boats by the average number of fishing days. This turns the stock of boats into a flow of days per year. Each day represents the action of a group of people or party. So, each day can be regarded as a “party day”. Such “days” refer to the use of the pleasure craft or boat by a residents of the county under study.

Next, we wish to translate fishing days into expenditures by residents using their boats in Walton County. To do this, we can use the following expression:

$EXPENDFO = FPDYO * $EPPDO

where,
$EXPENDFO = Total expenditures on saltwater fishing per year using own boat;
FPDYO = Fishing (saltwater) party days per year using own boat;
$EPPDO = Expenditures per party per day using own boat.

Notice that $EPPDO is expenditures by the entire party using a boat or pleasure craft on any given day for saltwater fishing. Such expenditures run from bait and fuel to slip rentals in a marina. Thus, we were able to obtain how much was spent by those residents using their own boat on bait, for example. This will be discussed in some detail below.

$EXPENDFO must be converted into how many job such expenditures support in Walton County and wages related to such jobs. This can be accomplished by the following expressions:

EMPLOYFO = $EXPENDFO / {($S/E)}

$WAGESO = %WAGES*$EXPENDFO

where,

EMPLOYFO = Number of full and part-time jobs generated by recreational saltwater fishers using own boat in the county;
$S/E = The ratio of sales-to-employment for those industries in which spending for good and services are made for saltwater fishing;
$WAGESO = Wages and salaries generated by own boat spending in industries related to saltwater fishing;
%WAGES = Percent wages are of total sales/expenditures in industries related to saltwater fishing.

The first expression above is used to derive employment by dividing expenditures which are sales by the published ratio of sales-to-employment in those industries related to saltwater fishing. Each of these industries generates wages as a cost of doing business. Therefore, we multiply this published ratio of wages-to-sales or %WAGES by $EXPENDFO to obtain the wages and salaries generated by these expenditures. In both expressions, we need published data that are taken from the U.S. Censuses of Retailing and Services for the county in question. In the case

of this chapter, we have published data for Walton County on all major industries serving the county. Published data are not always available for all the parameter needed for the above expression. In this case, we must turn to sampling which is discussed below in a separate section.

It should be recognized that not all residents use their own boat for saltwater fishing in Walton County. Rentals such as party and charter boats are readily available and are the choice of many visitors to the county as discussed in Part 1 in this chapter. How do we obtain the total expenditures by residents on this part of the saltwater fishing sector? Consider the following expression:

$EXPENDFR = ($EXPENDVISITOR/ %VIS) * %RES

where,

$EXPENDFR = Expenditures by county residents on charter; party and other rental boats for saltwater fishing;
$EXPENDVISITOR = Expenditures by all visitors on charter; party and other rental boats for saltwater fishing;
%VIS = Percent visitors are of the total demand for charter, party, and other rentals;
%RES = Percent residents are of the total demand for charter, party, and other rental boats.

The right hand side of the above expression has two terms. The first term merely “blows-up” visitor expenditures on all rental boats to total expenditure including, of course, those expenditures made by non-visitors or residents. The second term is merely what percent total expenditures are made by residents of the county in question. The “percents” are based on the number of days that visitors and residents make in connection with the
boat rental industry in the county. This is the best measure of demand available from the boat rental industry. This will be discussed below in some detail.

Finally, we would like to estimate the number of person fishing days spent by all residents of Walton County. The reason we say “person” fishing days is that we wish to derive the total number of fishing days by all persons engaged in saltwater fishing. These days will be used later to estimate the total use value of the recreational experience that was extensively discussed under the visitor’s section above. The

following expression can be used to estimate total saltwater person-days:

PDAYSFO = FPDYO * SPO

where,

PDAYSFO = Person-days saltwater fishing using own boat;
FPDYO = Fishing(saltwater) party days per year using own boat;
SPO = Size of party engaged in saltwater fishing using own boat.

Now, we shall turn to the survey techniques used with the residents to obtain some of the parameters of the expressions discussed above.

SAMPLE SURVEY

The researchers obtained a magnetic tape from the Florida Department of Highway Safety and Motor Vehicles (FDHSMV) containing all registered boat owners in the State of Florida. The computer tape was processed to yield only those registered boaters in the five West Florida Counties under study. These five counties contained 60,599 registered boat owners. This defined our universe of resident boaters. The purpose of obtaining the tape was to form the universe for telephone sampling of registered boat owners in each of the five counties. Unfortunately, the FDHSMV does not obtain the phone number of the registered boat owner. To overcome this problem, we obtained a CD-ROM of all listed phone numbers in the United States including Florida. The CD-ROM was interfaced with the magnetic tape of registered both owners to match as many owners with listed phone numbers. For the counties under study, we were able to “match” about 85 percent of the registered boat owns on the tape with phone numbers available on the CD-ROM. The “matched set” of registered boat owners in each county was randomized so they could be sampled. This was a substantial undertaking for the research team plus a graduate student in the Florida State University Statistics Department. But, it did form the basis for the telephone survey.

The random sample size was determined by the county under study and the budget for the project. That is, Bay, Okaloosa,

and Escambia Counties contain about 80 percent of the registered boat owners so this is where our sampling was concentrated. Further,
the budget for this project limited the size of the sampling even for the larger counties. After the survey instrument was developed for residents, the randomized boat owners were called by telephone in Walton County during the summer and early fall of 1998. The degree of cooperation by the boat owners called was exceedingly low with only 1 in 10 agreeing to be surveyed. This make the process even more expensive. We have no idea as to why the response rate was so low. In any event, 24 boat owners were completely surveyed in Walton County by the end of the allotted time for the resident survey. It was our intention to get a least 100 boat owners for the larger counties and this was generally
obtained. The survey instrument used for the residents is contained in Appendix 3 for the readers inspection.

ESTIMATION OF SPENDING;EMPLOYMENT; WAGES AND DAYS ON SALTWATER RECREATOINAL FISHING

Table 2.20 contains the necessary parameters to estimate the economic impact model formulated above. For the reader's insight into this process, let us work through an example. Consider size class 1 or own boats under 16 feet as discussed above and included in Table 2.20. Inserting the estimated values from Table 2.20 into the expressions explained above, we have the following:

(1) RESBT = RESBT * %RES = 2,311 * .74 = 1,711 (locally owned boats)

(2) FDPYO = RESBT * FDPBPYO = 1,711 *6.0 = .010266(Millions Party days)

(3) $EXPENDFO = FPDYO *$EPPDO = .010266(Millions) * $67.00
= $.688 (Million)

(4) EMPLOY = $EXPENDFO/{($S/E)} = $.688 / ($.6052)= 2 Employees

(5) $WAGESO = %WAGES * $EXPENDFO = .0868 * $.688 (Million)
= $.0597 (Million)

(6) PDAYSFO = FPDYO * SPO = .010266 (million) * 2.0
= .02053 (Million person days)

(7) $EXPENDFR = ($EXPENDVISITORS/%VIS) * %RES

= {$9.94(Million)/.96*.04
= $.4142(Million)

Summarizing the above analyses, we can state that the individuals in Walton County owning pleasure craft under 16 feet spent over $.69 million on saltwater recreational fishing which in term generated over $.06 million in wages which supported 2 jobs
in Walton County. In addition, the local individuals owning the pleasure craft provided over 20,000 person days of saltwater recreational fishing. Notice that these conclusions were reached using expressions (l) through (6) above. Expression (7) relates to an estimate of total spending of all Walton County residents on party, charter, and other rentals combined. These individuals either do not own boats or, if they do, choose to kick back and let someone else do the boating while they concentrate on
fishing. Table 2.21 summarizes all the analyses for the three classes and rentals.

TABLE 2.20

PARAMETERS ESTIMATED FROM THE SAMPLE
OR TAKEN FROM PUBLISHED DATA TO IMPLEMENT
THE WALTON COUNTY RESIDENTS ECONOMIC IMPACT
OF SALTWATER RECREATIONAL FISHING

	OWN BOAT			RENTAL
other Parameter	Class 1	Class 2	Class 3	All
RESBT (Registered boats)	2.311	792	9	N/A
%RES (Percent live in county)	74	74	75	N/A
FDPBPYO (Days per year/boat)	6	47.32	70.5	N/A
$EPPDO (Expenditures/party/ day)	$67.00	$107.56	$91.17	N/A
$S/E (Millions) (Sales to Employ- ment ratio)	$.6052	$.1009	$.0985	$.0473
%WAGES (Percent wages of sales)	.0868	.1021	.1057	.2163
SPO (Size of party)	2.00	3.36	5.33	N/A
%VIS (Percent visitors)	N/A	N/A	N/A	96
%RES (Percent residents)	N/A	N/A	N/A	4
$EXPENDVISITORS ($ Spent by visitors using party, charter, and other rentals in millions)	N/A	N/A	N/A	$9.94

_Source: Florida State University Sample Survey; U.S. Censuses of Retailing and Services, Walton County, Florida.

TABLE 2.21

ESTIMATED ECONOMIC IMPACT OF RESIDENT SALTWATER FISHING ON WALTON COUNTY, FLORIDA

ECONOMIC VARIABLE/ INDICATOR	CLASS 1	CLASS 2	CLASS 3	RENTAL	TOTAL
EXPENDITURES (Millions)	$.6878	$2.8515	$.0449	$.4114	$4.0436
WAGES (Millions)	$.06	$.2912	$.0048	$.0900	$.4453
EMPLOYMENT	2	25	1	9	37
PERSON-DAYS (Millions)	.0205	.2913	.0026	.00314	.119312

Source: Florida State University

Residents of Walton County, Florida spent nearly $4 million on saltwater recreational fishing over the last 12 months (primarily l998). According to summary Table 2.21, this generated about $.44 million in wages and salaries that supported about 37 full and part-time employees located in Walton County. In addition to the visitor spending discussed in the first part of this chapter, the residents of Walton County place considerable pressure on the boating infrastructure of the area. Of great importance, these conclusions only applying to saltwater fishing using a boat mode and does not include fishing from the shore. In addition, fishers spent 119,312 person-days over the last 12 months in the pursuit of recreational saltwater fishing. As explained under our discussion of visitors above, the number of person-days is a significant factor in computing the use value of the fishery resource and even recreational aids such as artificial reefs. This brings us to a direct consideration of that segment of the resident anglers using artificial reefs.

RESIDENTS USING ARTIFICIAL REEFS

As we mentioned above, our telephone survey covered 24 resident boaters in Walton County, Florida. Much of the information contained in Table 2.20 came from this survey. In addition to this information, we asked resident boaters about there fishing use of artificial reefs which engaged in saltwater recreational fishing. We measure participation in terms of days spent fishing. In fact, the days spent fishing are the driving force behind all our economic impact conclusions discussed above.

In total, the 24 resident boaters sampled spent 944 party days per year engaged in saltwater recreational fishing. This was the aggregate fishing effort by all of the three boat length classes discussed above. Respondents were asked to break down their saltwater fishing days into those days spent on or about artificial reefs off Walton County. Of the total party days, 316 party days were spent fishing on artificial reefs. Thus, about 34 percent of all party days spent on saltwater recreational fishing targeted artificial reefs as the place to engage in fishing. An independent survey of charter boat operators in all five counties by the authors indicated that artificial reefs are fished about 47% of the time. Thus, whether one used his own boat or a rental, it would appear that artificial reefs are use slightly less in Walton County than the five counties under study. Since days fishing is a multiplier to get all the economic impact information, then it follows that 34 percent of the total economic impact is artificial reef related. This is shown in Table 2.22.

For fishers only, they spent over $4 million on goods and services in Walton County, Florida that is artificial reef related. This expenditure supports 37 full and part-time employees with wages of $.445 million. These anglers spent 119,312 person-days on artificial reefs over the last 12 months(primarily l998). Lastly, we shall consider divers as a recreational group that uses artificial reefs.

TABLE 2.22

ESTIMATED ECONOMIC IMPACT OF RESIDENTIAL SALTWATER RECREATIONAL FISHING ON OR ABOUT ARTIFICIAL REEFS, WALTON COUNTY, FLORIDA

ECONOMIC VARIABLE / INDICATOR	VALUE
TOTAL EXPENDITURES	$1.375 MILLION
TOTAL WAGES	$.1514 MILLION
TOTAL EMPLOYMENT	12 EMPLOYEES
TOTAL PERSON-DAYS	.0406 MILLION

_ * 34 percent of total economic impact of saltwater recreational fishing by residents attributable to the existence of artificial reefs. See text for a further discussion. Figures in this table are 34 percent of the figures in Table 2.21.

Source: Florida State University

Up to this point, we have not mentioned diving as a recreational use of an artificial reef. From our sample, diving constitutes about 7 percent of all the days devoted to fishing and diving by the residents of Walton County, Florida. For the other counties we shall be reviewing, diving is even less important. To estimate the economic impact of diving, we performed the following procedure:

ADJFACTOR = DAYSDIV/ DAYSFISH

where,

ADJFACTOR = Adjustment factor to economic variables associated with recreational saltwater fishing to derive estimates of economic variables associated with diving;
DAYSDIV = Days spent diving by residents;
DAYSFISH = Days spent fishing by residents.

The ADJFACTOR is merely multiplied by the economic variables associated with recreational saltwater fishing on artificial reefs to derive an estimate of the economic importance of diving. The implicit assumption is that spending by divers per party
per day is about the same as that for fishers. Unfortunately, the sample for divers in Walton County that use artificial reefs was only 1 response. In comparing expenditures per party per day between fishermen and divers across all counties, we did not

find significant differences. Therefore, we used the fishing expenditure profiles for divers.

The fishers spent 944 days per year from the sample while the divers spent only 67. Therefore, the ADJFACTOR would be .071 (67/944). Applying this factor to the results in Table 2.22 yields a rough estimate of the economic extent of diving. All of this is summarized in Table 2.23. The combined economic impact of fishers and divers using artificial reefs in Walton County is reflected in spending of over $1.47 million, supporting 13 jobs and generating $.162 million in wages and salaries. These two groups spent 43,446 person-days on the artificial reefs over the last 12 months.

Next, we shall consider, as we did with visitors, the responses by fishers and divers to questions concerning their evaluation of artificial reefs as a recreational aid.

TABLE 2.23

ESTIMATED ECONOMIC IMPACT OF RESIDENTIAL SALTWATER FISHING AND DIVING ON ARTIFICIAL REEFS IN WALTON COUNTY, FLORIDA

ECONOMIC VARIABLE/ INDICATOR	FISHERS	DIVERS*	TOTAL
TOTAL EXPENDITUES (MILLIONS)	$1.375	$.098	$1.472
TOTAL WAGES (MILLIONS)	$0.162	$0.011	$0.1623
TOTAL EMPLOYMENT	12	1	13
TOTAL PERSON-DAYS (MILLIONS)	.0406	.0029	.0434

* Divers derived by multiplying fishers by the adjustment factor(ADJFACTOR) of .071 explained in the text.
Source: Florida State University

EVALUATION OF ARTIFICIAL REEFS BY RESIDENT USERS

METHODOLOGY AND EMPIRICAL RESULTS

As part of the phone survey to resident boat owns in Walton County, we asked respondents to evaluate the artificial reefs that they used. Such questions were restricted to those that have actually used one or more artificial reefs. We asked respondents the reasons that might be important in their decision to use an artificial reef as a recreational aid in either fishing or diving. Respondents rated each statement from Very Important to Not Important at All. The following results were obtained with the percent that answered either Very or just Important as their evaluation.

TABLE 2.24

Reasons Behind the Choice of an Artificial Reef by Fishers

Reason	Percent Very Important or Important
1. Better Catch Rate	93.8
2. Previous Experience at Site	93.8
3. Site Is Close to Shore	46.7
4. Want to Fish Near Others	18.8
5. Other Fishers Recommended Site	50.0
6. Site Is Easy to Locate	81.3
7. Better Fishing than Natural Reefs	46.7

Source: Florida State University

It would appear that fishing catch rate on artificial reefs was of paramount importance in the decision by fishers to use an artificial reef for a recreational aid. Apparently, artificial reefs raise use value as discussed in Part 1 dealing with visitors. In fact, we found that the travel cost model applied to visitors verified the hypotheses that recreational value is increased when an artificial reef is introduced into the recreational activity of saltwater fishing. A particular artificial reef was rated very important when the individual had previous experience with it. Respondents were evenly divided over the existing distribution of artificial reefs. About fifty percent of the respondents felt that artificial reefs where not too close to shore. Respondents definitely felt that they wanted to be alone on artificial reefs as less than 20 percent wanted to fish near others. About one-half of the artificial reef users felt that the recommendations of other fishers regarding a “good” artificial reef was either very or just important. Users generally felt that artificial reef was easily to locate indicating that location of the existing distribution of reefs may not be a particular problem. Finally, artificial reefs are a good man-made recreational aid; however; only about 47% of the users felt that man was better than nature- that is two thirds felt natural reefs yielded “better fishing”.

We asked both fishers and divers to evaluate artificial reefs from somewhat of a different perspective. In the above analyses, the respondents were restricted to fishers only. Table 2.25 shows the results from both users combined. With regard
to placement of artificial reefs too far from shore, all users were as the just fishers result evenly divided about this issue. Such strategic placement of artificial reefs is beyond the scope of this inquiry, but important enough to warrant further investigation. At present, most of the users of artificial reefs do not think that they are too crowded (i.e., only 30%). However, with the rapid expansion in boating in the Florida Panhandle, it would appear that this may be a problem in the immediate future. All users are not convinced that artificial reefs are more productive than natural reefs. This is consistent with the feelings of just fishers. Although crowding on artificial reefs does not appear to be a problem, only 10% of all the users felt that there were too many artificial reefs. There will be two issues arise from this result. First, should the investment in artificial reefs be expanded in the future since crowding may become critical problem. Second, some regard the expansion in artificial reefs will hasten overfishing of bottom dwelling fish such as red snapper and various groupers. The hypotheses advanced is that artificial reefs do not increase the size of the fishery population, but merely aggregate an existing population on reefs where they can be easily overfished. This view regards artificial reefs as devices to increase the “efficiency” of recreational fishers in catching fish. This debate has been covered lately in Grossman et al and Bohnsack et al (l997).

The consensus of users feel that artificial reefs should be placed in water less than 150 feet deep. This is understandable since bottom dwelling fish are seldom found no deeper than 150 feet. Finally, to add information to the debate over whether artificial reefs increase fishery population or actually diminish such populations, users perceive that artificial reefs “increase abundance”. An argument can be made that artificial reefs are man-made habitats that increase fishery stocks and hence abundance. This is an item for further study and is certainly beyond the scope of this report.

TABLE 2.25

EVALUATION OF EXISTING ARTIFICIAL REEFS
BY DIVERS AND FISHERS OFF WALTON COUNTY, FLORIDA

CRITERIA FOR EVALUATION	PERCENT STRONGLY AGREE OR AGREE
1. Reefs Placed Too Far From Shore	50%
2. Artificial Reefs Too Crowded	30%
3. Artificial Reefs More Productive Than Natural Reefs	30%
4. Too Many Artificial Reefs	10%
5. Artificial Reefs Should Be In Water Less Than 150 Feet	70%
6. Artificial Reefs Increase Abundance of Fish	80%

Source: Florida State University

RESIDENT USE VALUE OF ARTIFICIAL REEFS

METHODOLOGY

We shall not go through an extensive discussion of the analytics of use value as we did for the visitors in Part 1. The reader is referred to the section discussing use value in the visitor analyses above. As the reader will remember, use value is the recreational value placed upon a common property resource such as a fishery which does not trade in an organize market. Quite simply, until recently there was no saltwater fishing license required by Florida for fishing in its territorial waters; therefore, the fish were free to anglers for their recreational use. Despite the expenditures of these anglers which is the economic impact, there is an additional value called “use value” that is derived from this natural resource. We have argued and the survey results would seem to

support the hypotheses that the artificial reef is a recreational aid that increases the use value of the fishery or the waters above the artificial reef for divers. Thus, we have basic use value and
the incremental use value created by the artificial reef. It is well known that an increase in catch rates will increase use value. See Green(1984) and Leeworthy(1990) for examples. Artificial reef fishers contend that catch rates are indeed better there. Thus, those fishing on an artificial reef should experience increase use value from the saltwater recreational fishing experience. This was confirmed for visitors in Part 1 and has profound implications for a benefit/cost analyses of the artificial reef program. As with the visitors, we asked the residents to respond to the following question, which we shall repeat again for the reader:

> "The artificial reef program cost money. Suppose that the government proposed that all newly constructed reefs would be paid for by requiring that reef users with their own boat either pay for a stamp as part of their fishing license and/or if they used a rental boat probably pay higher fees for the operator's stamp. The money would go into a trust fund that could only be used for the construction of artificial reefs. Would you be willing to pay $_____ per year when you renew your fishing license/and or use a rental boat of any kind to fund this construction program?"

Notice that this question is directed at fishers only. The reason is that there were too few divers in the sample from all five counties to implement the estimation of use value procedure. To enlarge the sample, we combined all counties where telephone interviews of fishers were completed. A total of 339 responses were obtained among the five counties. On a random basis, the respondents were asked this question which we called "dichotomous choice". That is, the respondent answers YES or NO to the amount or payment presented. The amounts presented were $1; $5; $10; $15;$20;$30 and $50. Remember, a respondent is presented with only one of these "payment vehicles" in the single interview. In this way, we get a segment of the sample answering to each of the
assigned values for the payment vehicle.

In the case of the visitors discussed above, we used three procedures to estimate use value. For residents, the travel cost

method could not be used because of the short distance traveled to the boat launching site. Therefore, we are restricted to the Turnbull Distribution and the Dichotomous Choice Equation for the estimation of the use value for saltwater recreational fishing on artificial reefs. We interpret the question stated above to be the incremental use value of expanding the artificial reef program to satisfy the users. In Table 2.25, only 10 percent of the present reef users felt that there were enough artificial reefs off Walton County. Therefore, we would expect incremental use value from providing more artificial reefs. Just how many additional reefs was not directly addressed because we would have to get into placement; size and depth of additional reefs. This kind of detail was beyond the scope of this investigation.

APPLICATION OF THE TURNBULL DISTRIBUTION TO RESIDENTS

We shall not get into an extensive discussion of the Turnbull Distribution since this was covered in Part 1 dealing with visitors. We would expect that as the payment amount increased, that fewer and fewer respondents would be willing to pay for the expansion of the artificial reef program. This means that the percentage of respondents for each dollar amount should decline as the dollar amount presented to the fisher increased. Table 2.26 shows the computations using the Turnbull Distribution procedure.

As expected, the percent of fisher respondents willing to pay increasingly higher dollar values declines as the dollar value is raised from $1 to $50. Even at the $50 level, 39.4 percent of that group of fishers said YES that they would be willing to pay that amount. This shows a strong support for the expansion of the artificial reef program even when faced with a higher cost of fishing licenses and/or rental boat fees by residents of all five counties. From the analyses in Table 2.26, it would indicate that the typical fisher using an artificial reef would pay an additional $25.45 per year to support the expansion of the program. Notice that use value and willingness to pay is used interchangeably. In general, they are the same concept. The answer to our dichotomous choice question was given by one individual so the $25.45 refers to the annual individual willingness to pay or the incremental use value of the artificial reef as a recreational aid. This use value is usually expressed on a daily basis. The reason for this is that we have estimated the number of person-days connected with the artificial

reef usage above. For Walton County, Florida, the typical boat owner fishes 26.32 days per year. This figures combines classes 1-3 discussed above. Of course, only 34 percent or 8.95 days are spent on artificial reefs as discussed above. Therefore, the resident use value is about $2.84 per day($25.45/8.95 days). The residents use value is substantially less than that found for visitors($4.80/day) using the Turnbull technique. Since residents fish 5-6 times the days fished by visitors, one might expect diminishing marginal returns as one fishes more. This form of diminishing marginal utility might be responsible for the disparity between visitors and residents.

If we assume that the marginal willingness to pay is equal to the average willingness to pay, then we can compute total user value per year. Using the number of fishing days on artificial reefs by Walton County residents over the last 12 months, we can estimate the annual total flow of use value to Walton County fishers and divers assuming that the diver's use value is about the same as that of fishers. There were 43,446 days spent on artificial reefs by fishers and divers who are residents of Walton County, Florida. This is shown in Table 2.23. This allows us to make the following statement: Fisher and diver residents of Walton County derive $123,387 in recreational use value from the use of artificial reefs per year. This is a considerable flow of use value when it is compared to the cost of funding the artificial reef program. This will be considered in some detail when we finish all five of the counties under study.

TABLE 2.26

ESTIMATION OF RECREATIONAL SALTWATER FISHING USE VALUE FOR ARTIFICIAL REEFS OF NORTHWEST FLORIDA USING THE TURNBULL DISTRIBUTION

(1) Lower Bound for Interval	(2) Upper Bound For Interval	(3) Probability of Payment at Upper Bound	(4) Change in Density of Distribution	(5) Willingness to Pay (Use Value) (1)*(4)	(6) Sample Size
$0	$1	.771	.229	0	70

$1	$5	.657	.115	$.115	64
$5	$10	.586	.070	$.350	58
$10	$15	.545	.041	$.410	11
$15	$20	.547	-.002	-$.040	64
$20	$30	.410	.137	$4.110	39
$30	$50	.394	.016	$.800	33
$50	Infinity	0	.394	$19.700	N/A
Total Use Value(Sum Column 5)				$25.445	

Source: Florida State University

Dichotomous Choice Application

The modeling approach followed here is one originally developed by Bishop and Heberlein (1979). There have been many applications using slightly different specifications of the model and Hanemann (1984) further developed the underlying economic theory behind various model specifications and the formulas for calculating consumer's surplus or compensating variation. Compensating variation is consumer's surplus adjusted for the income effects of price changes that would keep the consumer at the same level of total economic well-being as before the change in price. The answers to questions like the ones used in this study to measure the value of artificial reefs are assumed to yield estimates directly of compensating variation. The general form of the dichotomous choice is as follows:

$$Pr\ (YES) = \alpha - \beta_{BID} * BID + \beta_{SE} * SE + \mu$$

where, Pr (YES)= the probability that the user will be willing to pay the randomly assigned dollar amount (BID).

BID = randomly assigned dollar amounts.

β_{BID} = estimated coefficient on BID.

SE = vector of other socioeconomic variables and/or natural resource attributes.

β_{SE} = estimated coefficients for SE vector.

μ = error term following logistic distribution for logit model and normal distribution for the probit model.

The above model was estimated using both the logistic and normal distribution assumption about μ. The BID variable was included in its linear and logarithmic form (natural logarithm of BID called LBID here). In the SE vector, we include a variety of socioeconomic factors including household income, education level, age, years of experience boating in northwest Florida, race, and sex. Also, included were variables for differentiating charter, party, and private rental boat mode use from use of the own boat. Boat length was also entered as possible explanatory variable. A variable was also entered to indicate artificial reef use and, when fishermen and divers were combined, a variable was entered to differentiate divers from fishermen. Dummy variables were also entered for the counties to test for differences in values by county, holding all other factors constant. Table 2.27 includes the definitions of all the variables used in estimating the dichotomous choice models.

A total of eight models were estimated. The models differ by sample of users (e.g. all users versus fishermen only), by assumption about the distribution of the errors (e.g. the logit of probit model), and by specification of the bid amount (e.g. linear BID or log linear or natural logarithm of bid or LBID). We only present the results of the model we considered the “best” model. Other results are available from the authors on request. Of the variables in Table 2.27, MALE, WHITE, EXPER, AGE, AGESQ, DIVE, and all the county dummy variables were not statistically significant in any model specification. Unlike the results from the visitor model, several variables were significant in explaining the willingness to pay for artificial reefs. Household income (INC) was positive and significant meaning that higher income households were willing to pay more for artificial reefs. All the education dummy variable were positive and significant meaning that those with an education level of high school graduate and above were willing to pay more for artificial reefs than those who had not graduated high school. The coefficients first increase then decline with higher levels of education suggesting a parabolic relationship

between education and willingness to pay for artificial reefs. College graduates and those with graduate degrees would be willing to pay slightly less than those that either graduated from high school or had some college or vocational training. Those that own larger boats are willing to pay more as are those that used artificial reefs. Those that belonged to fishing and diving clubs and those that used some form of rental boating were willing to pay less.

The results across the eight models were not significantly different and ranged from $29.23 to $31.57 with an average across the eight models of $30.74. The results presented in Table 2.28 are representative of the eight models and produces a value of $30.58 which is not significantly different from the average across all eight models.

The value derived from the dichotomous choice model is slightly higher than that obtained using the same information and employing the Turnbull method $25.45 versus $30.58 or about 20 percent higher. The lowest value obtained from the dichotomous choice model is about 15 percent higher than that obtained using the Turnbull method ($29.23 versus $25.45). To derive an estimate of the willingness to pay per day, as with the Turnbull estimate above we divide the annual value per person by 8.95 days yielding an estimate of WTP/day of $3.42 ($30.58/8.95). And, our estimate of total annual value of artificial reef use in Bay County using the dichotomous choice method is $150,758 ($3.42 * 43,446 days of use).

TABLE 2.27

DEFINITIONS OF VARIABLES

USED IN DICHOTOMOUS CHOICE MODELS

FOR RESIDENTS OF NORTHWEST FLORIDA

Variable	Definition
FWP to	Dependent Variable, 1=YES 0=NO, for willingness pay randomly assigned dollar amount. Fishermen only.
WPALL to	Dependent Variable, 1=YES 0=NO, for willingness pay randomly assigned dollar amount. Fishermen and divers combined.
FBID	Randomly assigned dollar amount or bid for fishermen only. Dollar amounts $1, $5, $10, $15, $20, $30, and $50.
LFBID	Natural logarithm of FBID.
BIDALL $1,	Randomly assigned dollar amount or bid for fishermen and divers combined. Dollar amounts $5, $10, $15, $20, $30, and $50.
LBIDALL	Natural logarithm of BIDALL.
AGE	Age of respondent in years.
AGESQ	Age of respondent squared.
INC	Household Income of respondent in thousands of dollars.
EXPER	Years of boating experience in northwest Florida.
BOATLEN	Length of boat owned measured in feet.

SHS	Dummy variable for education level. Some High School.
HSGRAD	Dummy variable for education level. High School Graduate.

TABLE 2.27 (CONTINUED)

Variable	Definition
SCOLLEGE	Dummy variable for education level. Some College or vocational training.
COLLGRAD	Dummy variable for education level. College Graduate.
GRADPROF	Dummy variable for education level. Graduate degree of Professional degree.
RENTAL rental	Dummy variable for use of charter, party or boat services.
REEF	Dummy variable for use of artificial reefs.
CLUB diving	Dummy variable for membership in fishing or club.
DIVE	Dummy variable for diving in northwest Florida.
MALE	Dummy variable for gender of respondent. 1=Male 0=female.
WHITE	Dummy variable for race/ethnicity. 1=White 0=all others.
BAY	Dummy variable for county of residence. 1=Bay County.
WALTON	Dummy variable for county of residence. 1=Walton County.
OKA	Dummy variable for county of residence. 1=Okaloosa County.
ESCAM 1=Escambia	Dummy variable for county of residence. County.
SANTA	Dummy variable for county of residence. 1=Santa Rosa County.

TABLE 2.28

RESULTS OF ESTIMATION OF DICHOTOMOUS CHOICE MODEL

Variable (X)	Coefficient(β)	Standard Error (β)	T-value (β)	Prob. T-value	Mean of X
Constant	-1.734013395	.80216741	-2.162	.0306	
LBIDALL	-.2934505106	.06741002	-4.353	.0000	2.1360793
INC	.0105656069	.00392190	2.694	.0071	59.409722
BOATLEN	.0287826639	.01629651	1.766	.0774	21.736111
HSGRAD	1.295912551	.65786491	1.970	.0489	.17708333
SCOLLEGE	1.333626579	.63790874	2.091	.0366	.41666667
COLLGRAD	1.306813660	.64188700	2.036	.0418	.28125000
GRADPROF	1.268269984	.67117464	1.890	.0588	.10763889
RENTAL	-.8063524979	.32159810	-2.507	.0122	.06597222
REEF	.4114559423	.18719732	2.198	.0280	.73611111
CLUB	-.5066315361	.26390973	-1.920	.0549	.10763889

N=288
Chi-Squared 51.816
Degrees of freedom 10
Chi-squared Significance .0000
Percent Correct Predictions 71.18
Mean of Dependent Variable WPALL=.6284
Estimated Consumer's Surplus=$30.58* (Annual per person)

* Of the eight models estimated, the range of estimated consumer's surpluses was from $29.23 to $31.57 with a mean across all eight models of $30.74.

DEMOGRAPHIC AND BOATING CHARACTERISTICS OF RESIDENT FISHERS AND DIVERS

Table 2.29 shows the demographic and boating characteristics of resident fishers and divers from the Walton County sample of boat owners. The typical respondent was a 53 year old white male with some college as an educational level and having a family income of about $55,000 per year. The demographic profile for all boaters was almost identical to the sub-sample of artificial reef users. There was no statistical difference between the demographic characteristics of general boaters and those using artificial reefs. A comparison of residents to visitors reveals somewhat of a contrast. Visitors tend to be much younger with a higher family income. See Table 2.7. Thus, the two markets for the two products-fishing and diving - is segmented into residents who are older and most probably living on pensions in comparison to visitors that a much younger and more affluent. This pattern is not unusual for many coastal communities. It does give us a contrast in terms of the constituency for artificial reefs. That is, when visitors are combined with residents, it would appear that artificial reefs are used by a broad spectrum of socioeconomic groups.

With respect to boater profile, the average pleasure craft size in the sample was 21 feet which is slightly larger than the average for the population of registered boats in Walton County which was a little over 18 feet. Boaters in the Florida Panhandle have been boating, on average, for 28 years. This is attributable to their age and, of course, their living in a coastal community. Only a little over 8% of the boat owners were members of some kind of boater’s club. The targeted species for fishers were very similar as that for visitors to Walton County in the snappers; groupers and mackerels are well represented. As expected, if one fished for those species that “just come along”, then the kind of species is much more diverse ranging from trigger fish to shark.
The daily party catch rates were 8.5 and 6.9 fishing for targeted and non-targeted species respectively. The catch rates were somewhat higher for residents than visitors which is to be expected based upon the difference in experience in fishing of Walton County (24 vs. 5 years). About 63% of the residents said

they used artificial reefs over the last twelve months; however, the fishing days spent on artificial reefs was about 34% of total days as indicated in our discussion above. Residents choose to use about 3 different artificial reefs in a 12 month period and, apparently, they are all off Walton County indicating a “stay at home preference”. Residents fished on artificial reefs that are about 6-7 miles from shore. Visitors using charter boats were apparently taken further offshore for fishing on artificial reefs (i.e., 11 miles).

TABLE 2.29

DEMOGRAPHIC AND BOATING CHARACTERISTICS OF

OF RESIDENT BOATERS IN WALTON COUNTY, FLORIDA

DEMOGRAPHICS:	AVERAGE/OTHER
1. Age	53 Years
2. %Male	100%
3. %White	98.6%
4. Family Income	$55,000
5. Education	Some College
BOATING PROFILE:	
1. Average Length of Boat Owned	21 Feet
2. Years Boating in Florida Panhandle	28 Years
3. Percent Members of Boating Club	8.3%
4. Targeted Species:	1. Grouper
	2. Kingfish
	3. Red Snapper
	4. Mackerels
	5. Sea Trout
5. Catch/Party/Day: Targeted Species	6.90 Fish
6. Species That Just Come Along	1. Snapper
	2. Amberjack
	3. Triggerfish
	4. Flounder
	5. Wahoo
7. Catch/Party/Day: Non-Targeted Species	8.50
8. Percent of Sampled Resident Boaters Using Artificial Reefs	62.5%
9. Number of Different Artificial Reefs Used Per Year by Those Using Them	2.75
10. Principal Artificial Reef Used During Year is Off Walton County (% of Users)	96%
11. Average Distance of Artificial Reef Used from Shore	6.46 Miles
12. Principal Fishing Method Used on Artificial Reef	Bottom Fishing

Source: Florida State University

SUMMARY AND CONCLUSIONS

ECONOMIC IMPACT OF ARTIFICIAL REEF VISITORS:

1. Over the last 12 months(l997-98), it was estimated that slightly over .5 million person-visits were made to Walton County for various forms of recreation and business;

2. The visitors to Walton County pumped over .2 billion dollars in spending directly_into the local economy supporting nearly 4,445 full and part-time employees and generating over $44 million dollars in wages. Visitors were directly responsible for nearly 17% of all wages paid in Walton County and a whopping 34.7 percent of full and part-time employment in this county;

3. All visitors to Walton County over the last 12 months(l997-98) spent over 2.3 million days in this county. The need for lodging; eating and shopping establishments while these visitor days were being spent generated the aggregate economic impact estimated
above;

4. Of significance to this study, it was estimated that 15% of all visitor days or .35 million days were spent by visitors engaged in saltwater recreational boating off the Gulf Coast of Walton County. The principal modes of boating chosen by visitors were the use of one’s own boat or the rental of a charter boat which accounted 92% of all boating days.
Party or head boats or other kinds of non-captain rentals accounted for the other 8%;

5. Visitor boating accounted for about $31.5 million in spending which supported 611 full and part-time employees who received about $5.6 million in wages;

6. One of the central thrusts of this study is to identify the economic impact of that segment of boating identified with fishing and diving so we could estimate the amount of visitor spending that is related to the existence of artificial reefs off Walton County. After adjusting for all other uses of boats(e.g., cruising; water skiing), we estimated that 72% and 2.5 of all saltwater boating days were spent for saltwater fishing and diving respectively. Of the total days estimated to be devoted to fishing and diving, about 49.74% were spent on

artificial reefs principally off Walton County. This led us to an estimate of the economic impact-related importance of artificial reefs for fishing and diving;

7. Over the last 12 month(l997-98), fishing and diving visitors using their own boat or some kind of rental boat(e.g., charter), spent over $18.24 million in Walton County on those days they engaged in saltwater fishing and diving on or about artificial reefs. This supports 382 employees who receive an estimated $3.47 million in wages. This is an artificial reef-related economic impact. The reader should not infer that if artificial reefs did not exist, that Walton County would loose this economic impact. However, our further inquiry of artificial reef users would tend to support the hypothesis that this "recreational aid" is important to the recreational fishing and diving experience.
This is discussed under "use value" below;

8. Boating visitors that use artificial reefs have a demographic profile of that of a white male who is about 37 years of age and was a college graduate as an educational background with an annual family income of $72,000. The typical visitor has a relatively large pleasure craft(28.57 feet) and has been boating in the Florida Panhandle for 5.4 years. About two-thirds of the visitors say they use artificial reef. About 93% of the artificial reef users that use Walton County as a base use such reefs directly off the this county. On average, the visitor artificial reef users travel 11.3 miles out into the Gulf of Mexico to use the public and private artificial reefs for saltwater fishing and diving;

9. Finally, we asked visitors to evaluate the existing artificial reefs off Walton County. About 45% of the visitors felt that artificial reefs were too crowded, while only 1.6% felt there were too many artificial reefs, indicating a possible need for additional artificial reefs. Only one in five artificial reef visitors felt that they are too far from shore. Since a large segment of the visitor demand comes via charter boats, this may
be, in part, a function of places the charter boat captains take them to optimize catch rates for fishers. Although only 37.5% of the visitors felt that artificial reefs were superior to natural reefs, about 81% of users did feel that artificial reefs increase the abundance of fish. As argued in the literature, artificial reefs may just redistribute or "collect" fish in one concentrated area rather than increase the fish population. If this is true, it is charged by some that artificial reefs hasten

overfishing. This is an area for important future research. Also, over 70% of visitors felt that artificial reefs should be placed in less than 150 feet of water. In summary, it would appear that present visitors that use artificial reefs view them as a definite recreational aid as shown by both their evaluation and their willingness to pay for an expansion in this program which is discussed under “use value” below.

USE VALUE(WILLINGNESS TO PAY) OF ARTIFICIAL REEFS VISITORS:

1. Use value or the willingness to pay is defined as the nonmarket value of a resource that is not openly traded in an organized market. Quite simply, units or day usage of the resource such as a recreational fishery do not have a price for their use or daily rental. Public goods such as artificial reefs fall in the same category since all can use this recreational aid, but government does not place a direct charge on the usage of this resource. The reason the use value or what users would be willing to pay for use of the resource is important is that it is the true value of additional output in the economy that is not counted in Gross Domestic Product or simply the well known GDP. In this study, we used three indirect methods to measure the use value of the artificial reef in conjunction with fishing and diving: (l) the Turnbull Distribution; (2) the Dichotomous Choice Model and finally (3) the Travel Cost Approach. Each approach has general acceptance among economist as a reasonable approach to estimating use value;

2. Using the Turnbull Distribution, it was found that visitors were willing to pay $4.80 per day for recreational saltwater fishing on artificial reefs. On the other hand, the dichotomous choice method yielded $5.85 per day while the travel cost procedure produced a willingness to pay per day of $9.01 for visitors to Walton County, Florida.

ECONOMIC IMPACT OF ARTIFICIAL REEF RESIDENTS:

1. We studied three classes of pleasure craft own by residents of Walton County. These classes were boats under 16 feet, those between 16 and 39 feet, and those over 39 feet. Overall, there were 3,112 registered pleasure craft in the county in l998. In addition to those owning their on pleasure craft, it was estimated that 4% of the demand for charter, party, and other kinds of rental boats in Walton County was accounted for by

local residents. Using owned and rental boats used by residents, it was estimated that that resident saltwater recreational fishermen spent $4.04 million which supported 37 full and part-time employees, earning $.45 million in wages and salaries;

2. Although residents predominately use their own boat for saltwater recreational fishing, visitors have a high use of all kinds of rentals(e.g., charter). Even so, we found that residents used about 34 percent of all party days spent on saltwater fishing off Walton County and targeted artificial reefs as a place to engage in fishing which is somewhat lower than the 49% founds for visitors. It could be inferred that artificial reefs are a somewhat greater attraction for visitors than local residents. Thus, artificial reefs may be view as an attractant for visitors to Walton County;

3. Diving days accounts for about 7% of the days spent saltwater fishing off Bay County. When the expenditures on saltwater recreational fishing are increased by 7% and multiplied by .34 or those days spent fishing and diving on artificial reefs, we found that $1.47 million was spent by residents that were related to
artificial reefs. This expenditures by divers and fishers generated $.16 million in wages and salaries and supported 13 full and part-time employees;

4. Compared to visitors, the resident demographic profile was that of an older individual (53 years old) who has been fishing off the Florida Panhandle for 24 years compared to only a little over 5 years for visitors to Walton County. The resident boater is a white male with some college as an educational level and having a family income of $55,000 per year;

5. About one-half of the Walton County residents felt that artificial reefs were too far from shore while only 1 in 5 visitors held this opinion in their evaluation of artificial reefs. About one third of the residents felt the artificial reefs were too crowded. The perception was much higher for visitors (45%). As with the visitors, only 1 in 10 felt there were too many artificial reefs. Residents and visitors share the same opinion about whether artificial reefs are more productive than natural reefs and that artificial reefs increase abundance of fish. That is, 30% of the residents supported the first proposition while 80% supported the second.

USE VALUE OF RESIDENTS:

1. The definition and explanation of use value was explained above under the visitor section;

2. Using the Turnbull Distribution, it was determined that resident willingness to pay or use value was $2.84 per day for fishers and divers using artificial reefs. This amounts to an annual total flow of recreational value for the residents of Walton County from the use of artificial reefs in conjunction with fishing and diving of $123,387. The Dichotomous Choice Model yielded a use value per day of $3.42 This translates into a total annual value of $150,758.

3. In the only other study of artificial reefs, Milon(1988) found that resident users of artificial reefs off the coast of Miami, Florida were willing to pay $23.81; $26.07; and $35.07 using the contribution; referendum and bidding methods respectively expressed in l998 dollars. These values were all on an annual basis. Using the Turnbull Distribution, we found a willingness to pay per annum of 25.45 for artificial reef use off the Florida Panhandle, while for the dichotomous choice model we estimated a value of $30.58. These values would appear to be comparable to the values found by Milon in his earlier study.

COMBINED ECONOMIC IMPACT OF VISITORS AND RESIDENTS:

1. Table 2.30 shows the combined economic impact of visitors and residents that use artificial reefs off Walton County, Florida. Ignoring indirect or multiplier effects by the visitors, those fishers and divers that used artificial reefs off this county,
spent $19.71 million over the last 12 month. This spending generated 395 full and part-time jobs in Walton County with a payroll of $3.63 million. By far, visitors played a greater role in the economic impact of artificial reef-related spending. That is, visitors accounted for 92.5% of the total spending impact, indicating how important boating visitors, and especially fishers and divers, that use artificial reefs are to the Walton County economy. Visitors are economically more important because of two reasons: (l) there are more fishing and diving days made

by visitors than local residents and (2) when visitors come to the
county, they spend several time what residents spend per party day.

2. Relative to the entire economic activity in the county, those visitors and residents using artificial reefs account for 1.38% of all wages and salaries in the county and 3.09% of all full and part-time employment in this county. This may not seem overwhelming; however, no one firm in Walton County would account for such an impact such as this. It certainly gives the reader some perspective on the targeted artificial reefs for recreational enjoyment by both visitors and residents alike. Again, we cannot say that if artificial reefs were removed or never were placed in the Gulf of Mexico that this economic impact would not have occurred. However, there is strong feeling among the users that artificial reefs are important recreational aids.

COMBINED USE VALUE OF VISITORS AND RESIDENTS:

1. Visitors and residents spent a little more than .216 million recreational days on or about artificial reefs off Walton County Florida. Using the Turnbull Distribution to estimate use value of artificial reefs as a recreational aid, we found that on a daily basis visitors were willing to pay $4.80, while residents were willing to pay only $2.84. One reason for this difference may be that the residents spend 3-4 times more days per person per year than visitors which may produce the law of diminishing marginal utility. Weighted by days, the combined use value of visitors and residents was estimated at $4.40 per day. This produces an annual flow of about $0.95 million of use value for the artificial reefs off Walton County. For the dichotomous choice model, we estimated for visitors a value per person day of $5.85, while for residents, we estimated a value per person per day of $3.42. The weighted average for visitors and residents was $5.37 per person per day. This produced an annual flow of about $1.16 million for the artificial reefs off Walton County. In the last Chapter of this report, we shall look into the asset value of the artificial reef system using the use value flow from each county relative to the cost of deploying the artificial reefs to get an idea of the benefit/cost ratio related to the artificial reef program managed by the State of Florida.

TABLE 2.30

COMBINED ECONOMIC IMPACT ON WALTON COUNTY, FLORIDA OF THOSE FISHERS AND DIVERS USING ARTIFICIAL REEFS

ECONOMIC VARIABLE	VISITORS	RESIDENTS	TOTAL
EXPENDITURES (MILLIONS)	$18.24	$1.47	$19.71
WAGES GENERATED (MILLIONS)	$3.47	$0.16	$3.63
FULL AND PART-TIME EMPLOYMENT	382	13	395
TOTAL COUNTY WAGES (MILLIONS)			$262.5
TOTAL COUNTY EMPLOYMENT			12,794
% ARTIFICIAL REEF RELATED DIRECT WAGES OF TOTAL WAGES IN THE COUNTY			1.38%
% ARTIFICIAL REEF RELATED DIRECT EMPLOYMET OF TOTAL EMPLOYMENT IN THE COUNTY			3.09%

TABLE 2.31

COMBINED RECREATONAL USE VALUE OF

VISITORS AND RESIDENTS FROM ARTIFICIAL REEFS

IN WALTON COUNTY, FLORIDA

ECONOMIC MEASURE	VISITORS	RESIDENTS	TOTAL
1. TOTAL USER DAYS ON ARTIFICIAL REEFS	172,800	43,446	216,246
2. ANNUAL VALUE PER PERSON			
a. Turnbull Method	$22.14	$25.45	$23.80*
b. Dichotomous Choice	$27.02	$30.58	$28.80*
c. Travel Cost	$41.63	N/A	N/A
3. VALUE PER PERSON/ RECREATIONAL DAY			
a. Turnbull Method	$4.80	$2.84	$4.40**
b. Dichotomous Choice	$5.85	$3.42	$5.37**
c. Travel Cost	$9.01	N/A	N/A
4. TOTAL USER VALUE FOR ALL USERS ($MIL)			
a. Turnbull Method	$0.829	$0.1234	$0.9524
b. Dichotomous Choice	$1.01	$0.1508	$1.16
c. Travel Cost	$1.56	N/A	N/A

*Simple arithmetic average of visitors and residents;
** Weighted arithmetic average of visitors and residents.

CHAPTER 3

ECONOMIC IMPACT AND IMPORTANCE OF ARTIFICIAL REEFS IN OKALOOSA COUNTY, FLORIDA

INTRODUCTION

The purpose of this chapter is to show how we estimated both the market economic impact (e.g., sales, income, employment) and the non-market economic use value (i.e. consumer’s surplus or the amount visitors or residents are willing to pay over and above the amount they actually spend) of visitors and residents of Okaloosa County, Florida. We estimate the market economic impacts for all visitors, boating visitors and residents, and, most importantly, for visitors and residents that used artificial reefs for fishing and diving. Also, we estimate the non-market economic use value of boating visitors and residents that fished and dived and the portion of this value attributable to artificial reefs. These values are used later in the report to conduct a rough benefit-cost analysis of the artificial reef program in northwest Florida.

In this chapter, we will first address the visitor population, then we will address the resident population of Okaloosa, County. We explain the economic concepts and our methods of estimation.

BACKGROUND

Okaloosa County is located to the west of Walton County in Florida. Measured by land, it contains 936 square miles of land ranking it 19th among the 67 counties in Florida. In l990, Okaloosa County had a resident population of 143,777 individuals, ranking the county 23rd among the state's 67 counties. Relative to other counties in Florida, Okaloosa County has a relatively low median age of 31.5 compared to the Florida-wide median of 36.4.

As its economic base, Okaloosa depends primarily upon the military(Eglin Air Force Base); tourism; manufacturing; retirement and commercial fishing for its economic survival.

Using rather crude estimates from traditional economic sectors, Bell(l996), estimated that the "tourist sector" was one of the largest sectors composing the economic base of Okaloosa County. This county has 45 individual saltwater beaches spanning nearly 19 miles in length. In 1995, Okaloosa County had 30 marinas attracting boaters to the area for fishing and general boating in the Gulf of Mexico. The tourist sector, as the other sectors that make up the economic base are also called basic industries.

Quantification of these "basic industries" is generally not difficult except for the tourism or visitation sector. The main reason for this is that the sector cuts across the two broad categories of retailing and services. That is, visitors spend money on a great variety of products and services. Such items are not designated as specific industries in the collection of data by the Federal and State governments. So, specific studies are necessary to quantify the economic importance of the visitor sector which is a collection of industries.

PART 1

VISITORS TO OKALOOSA COUNTY

METHODOLOGY

The model that was used to estimate visitation to a local area is called the "CAPACITY UTILIZATION MODEL". This model has been widely used throughout Florida in such counties as Monroe; Orange; Osceola; Seminole; Hillsborough and Leon. In the latter two counties, two of the authors of this report (Dr. Bell and Dr. Bonn) are currently engaged in continuing work on the quarterly and annual estimation of the number of visitors; spending; wages and employment generated and developing indices of how visitors view the amenities of these counties.

Although rather simple in concept, the "CAPACITY UTILIZATION MODEL" is complex to implement because of the number of variables to consider. This model is based upon where visitors to an area stay and that is the hotel and motel industry in the region. We call this an accommodation mode. Certainly, visitors may spend their nights with friends and relatives; in campgrounds; in condominiums or just come for the day (i.e., day visitors). The simplified "CAPACITY UTILIZATION MODEL" divides the visitor sector into those staying in hotels and motels and those staying in all other modes. If required, the residual sector can be broken down into its components, but this is at additional

expense and is usually requested by special interests(e.g., condominium owners want to know how many visitors use condominiums, etc.). Thus, the capacity of the hotel/motel industry in the local area gives us the ability to extrapolate the sample to the population. That is, if we know the number of rooms occupied per night, we can derive the number of individuals using hotels and motels merely by multiplying by the size of the party using a room. Data on the number of rooms and occupancy rates are obtained from Smith Travel, Inc. on a subscription basis. As demand for visitations to the local area increases, the number of hotel rooms should expand and with it our estimate of the number of visitors. The residual or all other accommodation modes sector is linked to the hotel/motel sector by the percent of the randomly sampled number of visitors that stayed in something other than a motel/hotel. This description will become clearer once we show the results for each of the counties discussed above. To show how we obtain the number of visitors using hotels and models, the following expression may be helpful:

$HMV = k*R*p*SP/LS$ where

HMV= number of person-visits using hotel/motel accommodations;
k = hotel/motel occupancy rate;
R = number of hotel and motel rooms in the county;
p = period of estimation in days (e.g., l month=30 days);
SP = size of party staying in hotel/motel room;
LS = length of stay in hotel/motel room (e.g., number of nights).

The right hand side of the above expression can be broken-down into quite meaningful concepts. First, we must multiply the occupancy rate (k) times the number of available rooms (R) in the area. The available rooms are obtained by an inventory of all hotels and motels in the area. This yields the number of rooms actually used by visitors per night. Next, the length of the period is important since it specifies how many rooms nights were used in a month; quarter or yearly. In practice, p=90 since we are dealing with quarter-by-quarter analyses. As mentioned above, we must multiply by (SP) or the size of the party to count all visitors occupying the hotel/motel room per night. This will, of course, vary from night to night, but we use an average over the period of analysis. Finally, the first four terms in the above expression will yield the number of hotel/motel occupants (person-days of occupancy) for any period of time, but to obtain HMV we must divide by the length of stay or (LS). This is not obvious, but can be explained by an example.

Assume one person attends a research seminar lasting 30 days and occupies one motel room each night. Then, we would have one person-visit per month. But, if we run two 15-day research

seminars where there is a different class every 15 days, then the motel room turns over once a month. Now, two person-visits would accrue to the motel room since two individuals would occupy the room in the thirty day period. Thus, as the (LS) decreases (e.g., from 30 to 15 days in the above example), the number of person-visits increases. This is the rationale for the length of stay in the above expression.

In all the counties in the Florida Panhandle mentioned above, there is both a seasonality and trend in visitation. This is expressed by the occupancy rate. As occupancy rates decline (i.e., off-season), the number of hotel/motel rooms being used declines, thus illustrating the fall in demand via person-visits or HMV. This can be studied over the four quarters of the year as to its impact on visitor spending; generation of wages and employment and how the local economy adjusts to this pattern.

This is but a brief illustration of the principal sector of the CAPACITY UTILIZATION MODEL. The other or residual sector is obtained by ascertaining what percent of total visitor use is accounted for by the hotels/motel accommodation mode. This percentage is obtained by a random sample of visitors to the area.

SAMPLE SURVEY

During the spring and early summer of l998, face-to-face interviews were conducted at hotels, beaches and other places frequented by visitors. A total of 125 visitors were interviewed during this period. The survey instrument was designed to obtain spending amounts and other economic profile data. In addition, respondents were asked about the extent of boating while in Okaloosa County. This is the data base upon which the next two sections depend for the estimation of the CAPACITY UTILIZATION MODEL discussed above.

VISITOR AND VISITOR SPENDING ESTIMATION

In 1995, the U.S. Bureau of Economic Analysis estimated that Okaloosa County had 101,211 full and part-time jobs in the community. While being a medium size county as measured by population or employment, Okaloosa County has 19 miles of beach and 30 marinas that attract visitors for beach and boating activities as well as meeting and shopping in this coastal community. By using the CAPACITY UTILIZATION MODEL, discussed above, we were able to determine the total visitors for the last twelve months which are shown in Table 3.1.

It is estimated that over the last 12 months or approximately June l997 to May l998, there were over 4.1 million person-visits to Okaloosa County of which nearly 29 percent stayed in hotel and motel rooms. Of the five counties under analysis, Okaloosa was only second to Bay County in person-visits. Other visitors to Okaloosa County used primarily condominiums for accommodations. Such visitors numbered over 2.9 million as shown in Table 3.1.

Table 3.2 displays an estimation of the spending of these visitors to Okaloosa County over a 12 month period. Visitors injected over $1.5 billion into the Okaloosa County economy over this period. Notice that although Okaloosa County had less person visits than Bay County (Chapter 1), aggregate spending was larger for the former than the latter. The reason is that visitors to Okaloosa spend more per party and stay in the county longer than those visitors to Bay County.

TABLE 3.1

OKALOOSA COUNTY VISITOR ESTIMATES
1997-98
(12 MONTHS)

ESTIMATION OF HOTEL/MOTEL VISITORS TO AREA(HMV)

(1) HMV = (k*R*p*SP)/LS = (.567*6,541*365*3.3)/ 3.8

= 1,177,713

where,

HMV = estimated number of visitors using hotels/motels;
k = occupancy rate over the year;
R = average number of rooms during year;
p = number of days in year = 365
SP = average size of party for those using H/M yearly;
LS = average length of stay for those using H/M yearly.

ESTIMATION OF TOTAL VISITORS TO AREA(TV)

(2) HMV = g*TV

where,

g = percent of total visitors to area using H/M;
TV = total visitors to the area or those staying in hotels and motels plus those staying elsewhere or day visitors.

Expressing (2) to solve for total visitors(TV), we have

(3) TV = HMV/g = 1,177,713 / .285

= 4,132,326

SUMMARY:

VISITORS USING HOTELS AND MOTELS(HMV):	1,177,713
OTHER VISITORS(FRIENDS/RELATIVES; CAMPING; CONDOS; DAY VISITORS OR 4,132,326 LESS 1,177,713)(OV):	2,954,613
TOTAL VISITORS	4,132,326

TABLE 3.2

ESTIMATION OF TOTAL SPENDING BY

VISITORS TO OKALOOSA COUNTY, FLORIDA

1997-98
(12 MONTHS)

ESTIMATION OF TOTAL HOTEL/MOTEL VISITOR SPENDING(TVSHM)

(1) $TVSHM = (HMV*LS)*($EPPD/SP) = (1,177,713*3.8)*($278.24/3.3)

= $376,839,900

where,

$TVSHM = total visitor spending staying in H/M;
HMV = number of H/M visitors from Table 7;
$EPPD = expenditures per party day for H/M visitors;
SP = size of party for H/M visitors;
LS = length of stay for H/M visitors;

ESTIMATION OF ALL OTHER VISITOR SPENDING(TVS0V)

(2) $TVSOV = (OV*LS)*($EPPD/SP) = (2,954,613*5.16)*($325.01/4.4)

= $1,126,145,000

TOTAL VISITOR SPENDING IN AREA(TVS)

(3) $TVS = $TVSHM + $TVSOV

= $376,839,900 + $1,126,145,000

= $ 1,502,985,000

SUMMARY:

TOTAL VISITOR SPENDING BY H/M USERS:	$376,839,900
TOTAL VISITOR SPENDING BY OTHER USERS:	$1,126,145,000
GRAND TOTAL OF VISITOR SPENDING:	$1,502,985,000

GENERATION OF WAGES AND EMPLOYMENT

The visitor spending in Okaloosa County of over $1.5 billion has two impacts upon this county as discussed in the analyses of Bay and Walton Counties above. First, this spending generates wages and employment for visitor-related industries. Second, there is an important multiplier effect associated with the creation of direct jobs in the local area.

Let us consider an estimate of the total direct wages and employment generated by visitors to the Okaloosa County area. Beneath the total category of expenditures by visitors, we have ten separate purchase categories ranging from lodging to local shopping. Each category can be matched to published data on sales; wages and employment. The most detailed breakdown of these categories can be obtained from the l992 Censuses of Retail Trade and Service Industries and updated to l997-98. Two important statistics emerge. They are the sales-to-employment ratio and the percent wages are of sales. These can be designed as S/E and %W respectively. They will vary by category since

some industries are more labor intensive than others. For example, a gasoline station has a high S/E since it is not very labor intensive(i.e., fully automated if just selling gas with credit cards) while a restaurant has a lower S/E ratio since each party needs the attention of a waitress. To obtain the estimated employment and wages, the following procedure was followed with the total spending broken into 10 categories or industries:

Employment = Spending in i'th industry /(S/E for i'th industry)

For example, if $150 million were spent on lodging and the sales-to-employment ratio for lodging was $50,000, we would estimate that 3,000 jobs would be sustained in this industry (i.e.,$150 million divided by $50,000). Further, assume that of the $150 million spent, 25% is required for wages or $37.5 million. Although all these calculations are not shown here, they are available from the authors upon request.

Table 3.3 shows the wages and employment generated by visitors to Okaloosa County. Compared to Bay and Walton Counties, Okaloosa is less dominated by visitors as an aspect of it economic base. That is, direct wages are 14.4% of total wages generated by the economy. Even so, this is an important part of the economic base of Okaloosa County. From an employment standpoint, visitor spending accounts for nearly 30 percent of the local economy; however, this does include a disproportionate share of part-time jobs and the kind of jobs that are generally unskilled. This is always a factor in analyzing the economic importance of the visitor sector.

The multiplier for Okaloosa County is probably about 1.4 as discussed above. Thus, indirect wages amount to as much as $137 million dollars for an aggregate impact of about $480 million or 20% of the entire economy. The visitor sector must share its place in the economic base with the military and the growing retirement community. Even so, the visitor sector is economically important and must be tracked by individual studies such as this one since is cuts across so many traditional sectors such as retailing and services.

The impact of indirect wages, as discussed above, is likely to be less because of the low paying jobs in the visitor sector. An employment multiplier of 1.1 seems reasonable and this would add about 3,000 indirect jobs to the already large labor force employed in businesses that cater to visitors from outside of Okaloosa County. We must also must reiterate that although Okaloosa entertains less visitors than Bay County, the visitors that do come spend more per party and stay somewhat longer than those visiting Bay County. A demographic analyses may shed some light on this economic phenomenon. It is not just the number of visitors that come to an area, but sometimes other factors that have an important bearing on the economic impact of this sector on the local economy.

TABLE 3.3

ESTIMATED DIRECT WAGES AND EMPLOYMENT
GENERATED BY VISITORS TO OKALOOSA COUNTY
COMPARED TO TOTAL WAGES AND EMPLOYMENT
OVER THE LAST 12 MONTHS
(1997-98)

	VISITOR GENERATED AMOUNT (MIL$)	TOTAL FOR AREA (MIL$)	VISITOR PERCENT OF TOTAL
WAGES AND SALARIES	$342.98	$2,382.44*	14.4%
FULL AND PART-TIME EMPLOYMENT	29,900	101,211**	29.5

* 1995 salaries and wages taken from the U.S. Bureau of Economic Research and adjusted upward for projected employment growth of 1.4% annually or 4.2% plus a rise in inflation of 6.7 percent over the l995-l998 period or 10.9% from University of Florida, Bureau of Economic and Business Research and the Presidents Economic Report, 1998.

**l995 employment from U.S. Bureau of Economic Research adjusted for job growth of 1.4% taken from University of Florida, Bureau of Economic and Business Research for a total percent increase of 4.2.

BOATING VISITORS

METHODOLOGY

As part of the sample survey of all visitors, we asked respondents about their participation in recreational boating during the last 12 months. The total visitors are an umbrella under which many activities are included including boating. Therefore, to go from general visitor days to days spent boating the following expression was employed:

$$(N*LS*TPY)/YRS = TVD$$

where, N= sample size;
LS= length of stay per trip;
TPY= trips per year to the area;
YRS= years (data was collected for a two-year period)
TVD= total visitor days.

From the data obtained in the sample survey of all visitors, we calculated the following:

$$(95*5*3.72)/2 = 857 \text{ visitor days from the sample.}$$

The respondents in the sample spend approximately 857 days per year in Okaloosa County. They also told us that they spend 69 boater days over the last 12 months. Therefore, we estimated that about 8% of all visitor days were spent boating annually. As an approximation, we shall use 8% as the way to go from general visitation to boater visitation measured in terms of days.

SAMPLE SURVEY

In the summer of l998,a second sample survey was conducted of just boating visitors to Okaloosa County. This survey linked the first survey of all visitors to just those engaged in some kind of boating. 76 boating visitors were interviewed to gather information regarding their mode of boating, expenditures in Okaloosa County while boating, and most importantly their use and evaluation of artificial reefs. The sample survey instrument is shown in Appendix 2. The survey was taken at such boating sites as boat ramps and marinas. Thus, the following analysis is based upon the second critical survey made in this study.

NUMBER OF VISITORS; VISITOR SPENDING AND WAGES AND EMPLOYMENT IMPACT OF BOATING VISITORS

Using the information from Tables 3.1 and 3.2, we calculated the total number of visitor days spent by all visitors using the following expression:

TVD = HMV*LSHM + OV*LSOV

where, TVD = total days for visitors to Okaloosa County;
HMV = person-visits using hotel/motel;
LSHM = average length of stay for those using H/M;
OV = all other person-visits;
LSOV = average length of stay for all other modes of accommodations.

Inserting the necessary information from Tables 3.1 and 3.2, we have the following:

19.765 Million = 1.178 Million*3.8 + 2.955 Million*5.17

Therefore, we have estimated that all visitors to Okaloosa County spent over 19.7 million days over the last 12 months. About 8% of these days were devoted to boating. Thus, aggregate boating days are 1.58 million over the last 12 months.

Using the sample distribution of days by mode of fishing, we have the following distribution:

Boating Mode	Estimated Number of Days in Last 12 Months
1.Own Boat	.7679 Million Days (48.6%)
2.Charter Boat	.7505 Million Days (47.5%)
3.Partyboat	.0348 Million Days (2.2%)
4.Private Rental/No Guide	.0269 Million Days (1.7%)

From the above, it can be concluded that boating visitors to Okaloosa County are nearly evenly split between the various rental and own boat modes. This pattern, varies from county to county depending on cost, distance, and the socioeconomic characteristics of the boating visitors.

As discussed above, each boating mode will involve somewhat different kinds of expenditures (e.g., no rental fee for own boat trailered to Okaloosa County) and the magnitude of the expenditures per party per day. This is one reason for breaking the boating modes down into four classifications. Therefore, we can compute the total expenditures on each mode by boating visitors using the following expression and "own boat" as an illustration:

TEO = TBDO * ($EPPDO/SPO)

where, TEO = total expenditures in Bay County by those those using their own boat;

TBDO = total boating days by those using their own boat;
$EPPDO = total expenditures per party/day for those using their own boat;
SPO = size of party

The rationale for the above expression is fairly straight forward. The second term is total party expenditures per day divided by the size of the party. This yields expenditures per day per person. When multiplied by total person-days, this yields an estimate of total expenditures for those visitors using their own boat. This expression can be used for the other three boating modes to derive total spending in each mode. The spending

is on many goods and services in Okaloosa County that either directly or indirectly facilitate the use of a boating mode. For example, those that come for a charter boat experience, spend money on hotels, eating and drinking places, and, of course, the charter boat rental, for example. All are charter boat related since this is the main purpose of the visit to Okaloosa County. Table 3.4 shows the average spending per party per day (EPPD) and party size (SP) by both boating mode and type of activity.

TABLE 3.4

ESTIMATED AVARAGE SPENDING PER PARTY
PER DAY AND PARTY SIZE FOR BOATERS
BY BOATING MODE AND ACTIVITY
OKALOOSA COUNTY, FLORIDA

BOATING MODE	AVERAGE SPENDING PER PARTY PER DAY EPPD($)	AVERAGE PARTY SIZE
OWN BOAT		
FISHING	$321.97	4.26
DIVING	$301.25	3.40
CHARTER BOAT		
FISHING	$815.24	4.91
DIVING1	$335.53	4.75
PARTY BOAT		
FISHING	$351.54	3.24
PRIVATE RENTAL		
FISHING	$529.19	3.67

1. For Diving, expenditures are for all rental (e.g. Charter, Party, and Private Rental).

Table 3.5 shows the results of our expenditure calculations. Boating visitors to Okaloosa County spend a little over $162 million on the four boating modes. The charter boat mode had the largest total expenditures of over $107 million. As with all

visitor spending, we also calculated the related wages and employment. This was done in the same way as described in the section on all visitors discussed above. Visitor boating-related expenditures generated a total of over $36 million in wages which supports 3,054 employees.

TABLE 3.5

ESTIMATION OF SPENDING BY BOATING VISITORS

CLASSIFIED BY BOATING MODE IN OKALOOSA COUNTY, FLORIDA

BOATING MODE	TOTAL EXPENDITURES (MILLION$)1	RELATED WAGES (MILLION$)2	RELATED EMPLOYMENT (FULL and PARTIME)3
1. OWN BOAT	$47.37	$7.22	709
2. CHARTER BOAT	$107.32	$27.11	2,192
3. PARTYBOAT	$3.78	$0.97	83
4. PRIVATE RENTAL	$3.88	$0.77	69
TOTAL	$162.35	$36.07	3,054

1. See Table 3.6 for TBD by boating mode and Table 3.4 for the average expenditures and party size by mode.

2. Wages are obtained by multiplying percent wages by each expenditure items contained in the boating survey instrument. Percent wages were obtained from the U.S. Census of Retailing and Services and updated to l998. See Appendix 2 for boating survey instrument.

3. Employment was derived by dividing total spending by the sales to employment ration(S/E) for each spending category in the boating survey instrument. The S/E ratio was obtained as the same source as given in footnote 2. See Appendix 2

for the boating survey instrument.

In addition to spending, wages, and employment, it is important to know how many person-visits were made to Bay County for the purpose of boating. This figure can be estimated by the following expression:

$$V = TBD/LS$$

where, V= person visits;
TBD= total boating days;
SP= size of the party.

The logic of the expression is that TBD are generated by all visitors to the county. Each visitor may stay for a particular number of days. To get the person-visits, this expression must be divided by the average length of stay. This yields an estimate of the total person-visits. We can apply this formula to each boating mode and thereby breakdown the person-visits by visitation by kind of boating. This is shown in Table 3.6

TABLE 3.6

ESTIMATION OF PERSON-VISITS
BY BOATING MODE FOR OKALOOSA COUNTY

BOATING MODE	BOATING DAYS (MILLIONS)	LENGTH OF STAY (DAYS)	PERSON-VISITS (MILLIONS)
1. Own Boat	.7679	3.87	.1984
2. Charter Boat	.7505	4.85	.1547
3. Party boat	.0348	5.00	.0070
4. Private Rental	.0269	3.00	.0090
Total	1.5801		.3691

From Table 3.1, there were over 4 million person-visits to Okaloosa County. Of these visitors, it is estimated that 369,100 were boating visitors over the last 12 months or about 8.9 percent of the total visitors. Notice that this percent corresponds to our approximately 8% estimate of the number of boating days as a percent of total days spent by the sample of visitors discussed above.

Table 3.7 shows the demographic and boating characteristics of boating visitors surveyed in our second and most extensive survey. Boating visitors were relatively young and affluent. They were overwhelmingly white males. Bottom fish were caught along with some pelagic fish. About one-half of the visitors said they used artificial reefs. However, this is not the same thing as the percent of total boating days that were spent on artificial reefs. This leads us to the central thrust of this study and that is visitors(and residents) using artificial reefs.

TABLE 3.7

DEMOGRAPHIC AND BOATING CHARACTERISTICS OF

BOATING VISITORS IN OKALOOSA COUNTY

DEMOGRAPHICS	AVERAGE/OTHER
1. Age	41 years
2. % Males	80.3%
3. % White	100.0%
4. Family Income	$91,800
5. Education	College Graduate
BOATING PROFILE	
1. Average Length of Boat(If owned)	23.9 feet
2. Years Boating in Florida Panhandle	9.5 years
3. Percent Owned Boat	23.7%
4. Percent Member of Boating Club	6.6%
5. Targeted Species	1.Red Snapper

	2.King Mackerel
	3.Grouper
	4.Cobia
	5.Spanish Mackerel
6. Catch/Party/Day: Targeted Species	15.0 Fish
7. Species That Just Came Along	1.Catfish
	2.Grouper
	3.Red Snapper
	4.Bonito
	5.Redfish
8.Catch/Party/Day:Non-Targeted Species	14.1 Fish
9.Percent of Visitors Using Artificial Reefs	50.0%
10. Number of Different Artificial Reefs Used Per Year by Those Using Them	3.0
ll. Principal Artificial Reef Used in a Year Is Off Okaloosa County	92.1%
12. Average Distance of Artificial Reef Used from Shore	15.45 Miles
13. Principal Fishing Method Used on Artificial Reefs	Bottom Fishing

Source: Sample Survey of Boating Visitors to Okaloosa County

VISITORS USING ARTIFICIAL REEFS

METHODOLOGY

Up to this point, two sample surveys were utilized in this study. The first concentrated on the general visitor to Okaloosa County and also the extent to which the respondent engaged in boating over the last 12 months. A recreational boating experience embraces many activities such as cruising; water skiing; rafting-up; racing; wildlife observation and, of course, fishing and diving. The latter activities are done from a boat and may or may not involve an artificial reef. Therefore, we can illustrate in the following manner:

Days Boating = {Fishing + Other Activities} + {Diving + Other Activities}

In the second survey of boating visitors, we focused on just fishing and diving which may or may not be performed in conjunction with an artificial reef. In Bay County, we found that of the total days spent either fishing and/or diving, that 90% were spent fishing and the balance were spent diving over the last 12 months according to the visiting boaters using their own boat. These proportions vary with fishing and diving modes. Since our estimate of total boating days includes Other Activities, we must make some adjustment to our findings for Okaloosa County. In retrospect, we should have asked about these other activities so we could put fishing and diving in better perspective. This should be done in further studies of artificial reefs. However, we did make some adjustment for Other Activities by using probabilities from Bell(1995). We used the following expressions:

Days Fishing = Pr(DF)* Days Allocated to Fishing

Days Diving = Pr(DD)* Days Allocated to Diving

We first allocated total days on the basis of the fishing and diving proportions. Then, we asked the question as to the probability that the days allocated to fishing will, in effect, be used for fishing. Thus, Pr(DF)= probability that a day allocated to fishing will be used for fishing where "DF" is days fished. Similarly, Pr(DD) is the probability that a day allocated to diving will actually be used for diving where "DD" is days diving. Bell(l995) has indicated the following values for these two probabilities:

Pr(DF) = .80 and Pr(DD) = .25

Therefore, if there are 100 general boating days, 90 will be allocated to potential fishing and 10 to potential diving based upon our second survey or the boating visitor survey. Of the 90 days allocated to potential fishing, we estimate that 72(.8*90) will actually be used for fishing. In the case of diving, the 10 days will be deflated on the basis of the probability to 2.5(.25*10). Therefore, our best

estimate is that the 100 generic boating days are spent in the following manner: Fishing: 72 days; Diving: 2.5 days; Other Activities: 25.5 days. This methodology was used to allocate the total days among the three categories. Thus, those that think that fishing and diving occupy most or all of the time of the total boating days of visitors to Bay County will feel that we have underestimated the economic impact of artificial reefs. Alternatively, we can say that our estimates that follow are conservative or at least made an allowance for the "Other Activities Effect". Finally, the total fishing and diving days proportion vary by fishing mode as shown in Table 3.8.

TABLE 3.8

ALLOCATION OF BOATING DAYS BY MODE AND ACTIVITY FOR OKALOOSA COUNTY,FLORIDA

Boating Mode	Fishing %F(%T)	Diving %D(%T)
Own Boat	90%(80%)	10%(25%)
Charter	83%(100%)	17%(25%)
Party Boat	100%(100%)	0%(0%)
Private Rental	90%(80%)	10%(25%)

As expected, most of the boating days that were fishing and/or diving were found to be used for recreational fishing.

This leads us to the estimated percentage of total days that are obtained from the sample survey for just fishing and diving that are spent on artificial reefs. We asked responds to allocate days boating by fishing and diving on or about

artificial reefs. These proportions are shown in Table 3.9.

TABLE 3.9

PERCENT OF FISHING AND DIVING ON ARTIFICIAL REEFS

Fishing		Diving	
l. Own Boat:	58.0%	l. Own Boat:	95.6%
2. Charter Boat:	84.0%	2. Rentals:	50.0%
3. Party Boat:	50.0%		
4. Private Rental	31.6%		

The majority of boating days spent fishing was done on or about artificial reefs according to our findings. This was even more true for diving. Over 64 percent of all diving days were spent on artificial reefs. The estimates for diving, however, are based on a relatively small sample size (N=57).

NUMBER OF VISITORS; VISITOR SPENDING AND WAGES AND EMPLOYMENT ASSOCIATED WITH ARTIFICIAL REEFS

With the information developed above from the second sample survey of visitors, we are able to obtain an estimate of the economic impact of visitors to Okaloosa County who use artificial reefs. We shall call these economic impacts artificial reef related. Also, we make no distinction between public and private artificial reefs. The following expression was used to obtain artificial reef related spending by boating mode for fishing:

TEOARF = (TBDO/SPO)$EPPDO * %F * %T * %AR

where, TEOARF = total artificial reef related expenditures by visitors engaged in fishing(Own Boat);
TBDO = total boating days by visitors using own

boat;

SPO = average size of party(Own Boat);

$EPPDO = Expenditures per party/day by visitors using their own boat;

%F = percent of all boating days spent fishing;

%T = probability(Pr)or percent of a fishing day that will be spent fishing;

%AR = percent of days spent on artificial reefs.

The above equation is the generalized expression to determine artificial reef related spending in Okaloosa County where we are using Own Boat as an illustration. The equation may seem difficult to understand; however, it is really quite simple. We have seen the first two terms of the expression in the discussion above. That is, (TBDO/SPO)$EPPDO is the total spending on boating by visitors using their own boat in Okaloosa County. This is shown as $47.37 million in Table 3.5. These terms are followed by %F which is what percent the spending was related to fishing.

Next, %T is an adjustment of %F to account for Other Activities as discussed above. Finally, we multiply by the %AR or the percent of the days spent on the artificial reef to arrive at TEOARF or total expenditures by visitor using their own boat while using an artificial reef off Okaloosa County, Florida. Since this is the "bottom line" of our presentation, it might be helpful to give a numerical illustration.

$23.96 million = (.7679 Million/4.26)$321.97 *.9 *.8 * .5802

Notice that all the numbers on the right hand side of the expression have been developed and explained in the above discussion(the $321.97 is in Table 3.4). Thus, our conservative estimate is that of the total boating visitors using their own boat, $23.96 million were spent while fishing on an artificial reef. Thus, about 14.8% of total boating visitor spending using their own boat was artificial reef related ($23.96/$162.35). This does not include diving on an artificial reefs or the other boat modes. It serves to illustrate how we went about deriving artificial reef related spending. Table 3.10 shows the application of this procedure for fishing and diving, including all modes of boating. It also shows the estimated wages and employment related to the artificial reef related spending.

The grand total of all spending that is artificial reef related is $116.23 million which supports $27.16 million in related wages and 2,278 employees. This money is injected by boating visitors into the Okaloosa County economy. As this

injection is multiplied throughout the economy, there is a direct impact of increasing sales, wages, and employment as discussed earlier in this chapter. Let us concentrate on direct wages injected. This will probably have a multiplier of 1.4. Therefore, the total wage impact is $38.02 million. Also, employment will increase by some multiplier, but probably less than the wage multiplier because the visitor sector is composed of relative low paid jobs. Assuming a multiplier of 1.2 for employment, we would have 2,374 direct and indirect jobs created by boating visitors using artificial reefs. These are economically significant numbers, but must be placed in the same perspective that the entire visitors sector was in Table 3.3. Wages generated by visitor boating on artificial reef would be about 1.6% of all wages in the Okaloosa County economy ($38.02/$2,382.44) and 2.3% of all employment(2,374/101,211). This is not to minimize the economic importance of artificial reefs. Any sector that is related to nearly 2,400 jobs is not inconsequential to the local area.

TABLE 3.10

ESTIMATED ARTIFICIAL REEF RELATED SPENDING;

WAGES AND EMPLOYMENT GENERATED IN OKALOOSA COUNTY, FLORIDA

ACTIVITY/MODE	VISITOR SPENDING (MILLION$)	WAGES GENERATED (MILLION$)	EMPLOYMENT
OWN BOAT	$25.52	$3.99	403
FISHING	$23.96	$3.75	380
DIVING	$1.56	$0.24	23
CHARTER BOAT	$87.94	$22.51	1,817
FISHING	$86.88	$22.26	1,794
DIVING1	$1.06	$0.25	23
PARTY BOAT	$1.89	$0.48	42
FISHING	$1.89	$0.48	42
DIVING	$0.00	$0.00	0

PRIVATE RENTAL	$0.88	$0.18	16
FISHING	$0.88	$0.18	16
DIVING	$0.00	$0.00	0
TOTAL	$116.23	$27.16	2,278
FISHING	$113.61	$26.67	2,232
DIVING	$2.62	$0.49	46

1. For Diving, Charter, Party and Private Rental were combined.

We have not yet presented the total days and person-visits that are related to artificial reefs in Okaloosa County. The former is important in developing recreational values in the section below while the latter is important in its relation to all visitors to the Bay County area. Let us consider total days spent on artificial reefs. The following expression can be used to estimate such days:

TBDARF = TBDO * %F * %T * %AR

where, TBDARF = total boating days on artificial reefs while fishing
%F, %T, and %AR were defined above.

The same general equation can be used for diving except %F is changed to %D and the numerical values of the other variables may change depending on boating mode since we have used "Own Boat" as an illustration. The artificial reef related boating days were estimated along with person-visits as shown in Table 3.11.

TABLE 3.11

RECREATIONAL DAYS AND PERSON-VISITS
ASSOCIATED WITH ARTIFICIAL REEF USE
FOR OKALOOSA COUNTY, FLORIDA

Mode/Activity	Number of Person-days (Millions)	Length of Stay (Days)	Person-visits (Millions)
1. Own Boat	0.3391		0.0789

Fishing	0.3208	4.30	0.0746
Diving	0.0183	4.30	0.0043
2. Charter Boat	0.6860		0.1079
Fishing	0.5232	5.00	0.1046
Diving	0.1628	5.00	0.0033
3. Party Boat	0.0174		0.0035
Fishing	0.0174	5.00	0.0035
Diving	0.0000	5.00	0.0000
4. Private Rental	0.0061		0.0020
Fishing	0.0061	3.00	0.0020
Diving	0.0000	3.00	0.0000
Total	0.9022		0.1923
Fishing	0.8676		0.1848
Diving	0.0346		0.0075

Over 900 thousand days were spent over the last 12 months on artificial reefs in Okaloosa County. The use value of a recreational days will be discussed below. This will add more meaning to the measurement of recreational days.

Finally, we would like to know how many person-visits to Okaloosa County are related to artificial reefs. Using "Own Boat" as an illustration, this may be measured by the following expression:

$$VOAR = TBDOAR/LSOAR$$

where, VOAR = person-visits for those using their own boat on artificial reefs;

TBDOAR = total boating days for those using own boat on artificial reefs;

LSOAR = length of stay for those using own boat on artificial reefs.

Therefore, to obtain person-visits, we only have to divide days on artificial reefs by the length of stay. This makes good intuitive sense since if one individual spent 10 days in Okaloosa County and each stay was 5 days, then we would have two person-visits. In the right hand column of Table 3.11, we

show the person-visits by fishing and diving and by boating mode that are related to artificial reefs. Over a 12 month period, Okaloosa County attracted 192,300 person-visits for the sole purpose of fishing and/ or diving on an artificial reef. About 4.6% of all visitors to Okaloosa County, as measured by person-visits, are attracted to fishing and/or diving on artificial reefs. Remember there are a little over 4 million person-visits made to Okaloosa County annually (See Table 3.1).

EVALUATION OF ARTIFICIAL REEFS BY USERS

METHODOLOGY

As part of survey of boating visitors to Okaloosa County, we asked the respondents to evaluate the artificial reefs that they used. Questions about the artificial reefs were restricted to those that actually used artificial reefs. The evaluation of artificial reefs took place in two steps. First, we asked respondents the reasons that might be important in their decision to use an artificial reef as a recreational aid in fishing or diving. Respondents rated each statement from Very Important to Not Important at All. The results were obtained with the percent that answered either Very Important or just Important as our measure of importance (see Table 3.12).

TABLE 3.12

REASONS BEHIND THE CHOICE OF AN ARTIFICIAL REEF
FOR ARTIFICIAL REEF USERS IN OKALOOSA COUNTY

Reason	Percent Very Import or Important
1. Better Catch Rate	85.8%
2. Previous Experience at Site	66.0%
3. Site Is Close to Shore	47.1%
4. Want to Fish Near Others	3.8%
5. Other Fishermen Recommended Site	45.3%
6. Site Is Easy to Locate	50.0%
7. Better Fishing than Natural Reefs	28.3%

It would appear that the choice to use an artificial reef is based upon better fishing and ease of location. Respondents did not mind going 10-15 miles from shore to fish(See Table 3.7, Item 12), appeared to want the entire reef to themselves in that they did not appear to want company. It would appear that artificial reefs offer an improved recreational experience for the fishermen and even divers.

We attempted to get respondents to evaluate the present status of artificial reefs of Northwest Florida in the Gulf of Mexico. This goes to the placement of reefs and how crowed they are. Table 3.13 shows the results for fishers and divers. The existing pattern of artificial reefs seems to win the approval of fishers and divers using them. Users would like the reefs deployed some distance from shore to maximize fishing success, but placed in no more than 150 feet of water. They strongly believe that artificial reefs increase the overall abundance of fish. This is a perception which could be debated. It is true that artificial reefs add to the fishery habitat, but no scientific study is known to the authors that definitely establishes that the fish population is actually increased with artificial reefs. Users could be confusing an aggregation of fish that are attracted by new reefs from places with no reefs. This would be a redistribution with no actual increase in the population. Finally, the evaluation seems to be in favor of the expansion of the artificial reef program since none felt there were too many artificial reefs.

TABLE 3.13

EVALUATION OF EXISITING ARTIFICIAL REEFS

OFF OKALOOSA COUNTY, FLORIDA

CRITERIA FOR EVALUATION	PERCENT STRONGLY AGREE OR AGREE
1. Reefs Placed Too Far From Shore	11.4

2. Artificial Reef Too Crowded	45.7
3. Too Many Artificial Reefs Placed in Gulf of Mexico	0.0
4. Artificial Reefs Should Be in 150 Feet or Less of Water	61.1
5. Artificial Reefs More Productive Than Natural Reefs	33.3
6. Artificial Reefs Increase Abundance of Fish	88.9

Source: FSU Survey of Boating Visitors to Okaloosa County.

VISITOR USE VALUE OF ARTIFICIAL REEFS

METHODOLOGY

Up to this point in the report, we have stressed the economic impact of visitors using artificial reefs on the local economy. In a later section of this chapter, we shall consider resident spending on boating that is related to artificial reefs. However, in this section we shall look at a new concept entitled "use or user value" of the recreational experience.

If we look at the natural resources used in creating a fishing or diving day, they are obviously fish and water. These resources are common property in nature. This means that there is no organized market to sell and buy these resources. In effect, fish are free to those wishing to fish for this resource. Except for a small amount paid for a fishing license, there is no substantial fee paid for the use of the fishery resource or even the waters of the Gulf of Mexico. Although a recreational day is a service rendered by nature, there is no overt price to be paid. We call this a nonmarket activity. This does not mean that recreation is worthless. In fact, various laws have been passed to protect natural resources so society as a whole can derive value from their use. In general, this is what we mean by use value. But how can it be measured?

For market goods, economists have a demand curve to measure the value of a good. Oranges, wheat, and steel have a demand curve where as price drops, more is consumed. Recreational fishing and diving are services rendered to recreationalists that should have a demand curve as well. The fact is that we cannot measure this demand curve directly because there is no price-quantity relationship to be observed. However, economists have developed techniques to indirectly measure the value obtained from the use of a natural resource that is common property.

Consider Figure 1. DD is the recreational demand curve for fishing. If there were a price, the quantity demanded would fall as the "price" increases. Thus, the demand curve is downward sloping. Since the price is zero for recreational fishing, anglers "consume" D(1) days fishing. The measure of consumption or production is usually measured in either days or trips for recreation. Trips can be longer than one day in length and correspond to the person-visit concept we discussed earlier.

Consider the area under the DD or demand curve. What we see is that recreational fishermen would be willing to pay P(l) or even P(2) or higher for the right to fish the resource, but because of the common property nature of market, the price is actually zero. Thus, the difference between what recreationalist would be willing to pay and the actual price(i.e., zero) is called consumer’s surplus. Such a concept exists with market goods such as oranges, but there is a price above zero. But, there are those that would be willing to pay an even higher price. This difference is conceptually the same and is called consumer’s surplus. As we shall see, consumer’s surplus derived by recreationalists is actually use value. But, let us consider the market for recreation just a little bit more.

FIGURE 1

THE DEMAND CURVE AND SHIFTS IN THE DEMAND

FOR RECREATIONAL FISHING

PRICE

D(1) D(2) RECREATIONAL DAYS FISHING

We have established that there is a demand curve for recreation indicated by DD in Figure 1. Now, let us introduce the artificial reef as a "recreational aid" in fishing(and diving too). How does the artificial reef influence this market. Remember that our survey respondents in the last section generally felt that artificial reefs increase fishery catch rate or generally improve the recreational experience. The impact of introducing an artificial reef is to shift the demand curve for recreational fishing in Figure 1 upward and to the right. This means that at every level of recreation as measured by days or trips the angler is willing to pay more for the recreational experience. In a market sense, this shows how the favorable attitude of recreational fishermen manifests itself by an upward shift in the demand curve. Notice that something else happens and that is an increase in consumer’s surplus or use value. The area between the two demand curves is the increase in use value as a result of deploying the artificial reef. In contrast to the discussion in the economic impact sections above, the increase in use value means that by investing in an artificial reef we have increased output in the entire economy. While artificial reefs impact a region, they, in theory,

increase national output as well. The distinction between an economic impact and use value is that the former is distributional, while the latter is a rise in national output. By distributional, we mean that if visitors do not spend their money in Bay County, they will spend it elsewhere-- maybe in the Florida Keys.

An indirect way of measuring consumer’s surplus or use value is to ask users a question designed to measure the shift in the recreational demand curve by deploying artificial reef. The following questions was asked respondents in our boating visitor survey:

> "The artificial reef program cost money. Suppose that the government proposed that all newly constructed reefs would be paid for by requiring that the reef user with their own boat either pay for a stamp as part of their fishing license or pay for a decal as part of their boat registration. If you used a rental of any kind, you would probably pay for the operator's stamp or decal in the form of higher fees to cover costs. The money would go into a trust fund that could only be used for the construction of artificial reefs. Would you be willing to pay $_____per year when you renew your fishing or boating license and/or use a rental boat of any kind to fund this construction program?”

In this question, we have phrased it so it conforms to some generally accepted standard. First, there is a statement as background on the question. Second, there is a payment vehicle that is well articulated. Third, there is an assurance that the moneys collected will go into a trust fund designed for the sole purpose of adding new artificial reefs. The respondent is presented with a figure which he or she accepts or rejects. Therefore, we close the question to a potential open-ended ones where respondents are asked what they would pay with no constraints. This kind of a question leads to numerous biases. To implement the methodology described in this section, there are three general approaches:

MEASUREMENT OF USE VALUE

1. The Turnbull Distribution

From our question discussed above, we relate the YES and NO answers to the payments requested. The payments ran from $1 to $50 per year. As the payments rise, the probability of the respondent answering YES is decreased. The area under the Turnbull distribution gives an approximation of use value of adding additional artificial reefs. This techniques will be further explained in the implementation section.

2. Dichotomous Choice Model

In the question above, the respondent is presented with and either or situation much like a consumer faces in the market where you are presented with a price and you either take it or leave it. This is a dichotomous choice. If we let "l" stand for YES to the payment amount and "0" stand for NO to the payment amount, we can form an equation of the following form:

Pr(l,0)= f {Payment Presented; Socioeconomic Vector; Other Shifters }

The dependent variable or Pr is called a binary variable where only one of two values can appear(i.e., YES and NO). The respondents base their choice on the payment presented. The socioeconomic vector includes income; sex; race; etc. while other shifters contain variables such as boat length; etc. to hold them constant while looking at how the probability of saying YES changes as the payment presented increases. As with the Turnbull distribution, we are look at the area under the J-shaped curve showing the relation between the probability of saying YES and the increasingly higher payment demanded. This will be another estimate of use value.

3. Travel Cost Techniques

This techniques is not based upon the willingness to pay question posed above. It is based upon the distance traveled by the boating visitors. We would expect that as the cost of travel rises, that fewer trips(and days) will be made to Okaloosa County by visitors. The cost of these trips can be estimated and are also given as a response to a question on expenditures

in the boating visitor survey. The following equation can be used to formulate the travel cost techniques:

Trips to Okaloosa County = f {Travel Cost; Socioeconomic Vector; Other Shifters}

Travel cost is used as a proxy for price since as it rises, trips taken should fall according to travel cost hypothesis. Once this expression is estimated, we may hold the other variables constant and estimate the area under the travel cost demand curve. This will yield another estimate of consumer's surplus or use value.

EMPIRICAL IMPLEMENTATION

The Turnbull Approach

The Turnbull(1976) distribution is non-parametric, maximum likelihood(ML) estimator for interval-censored data which is what we have when presenting payments to respondents and asking whether they would be willing to pay such an amount or not. The Turnbull estimator uses respondents' choices to construct an interval estimate for the latent willingness to pay implied by each respondent's choice. The individual's answer to a single question will distinguish either a lower or an upper bound for his or her WTP. By combining respondents', we obtain estimates for the relative frequency of responses at different WTP levels. The intervals start at zero and end at infinity. In doing our study, we established seven intervals as follows: (1) $0 to $1; (2) $1 to $5; (3) $5 to $10; (4) $10 to $20; (5) $20 to $30; (6) $30 to $50 and (7) $50 to infinity. The interval has an upper and lower bound. It is assumed that the fraction of the sample estimated to be in each interval has a willingness to pay(WTP) value equal to the lower end point of the interval. This is referred to as the lower-bound estimate of willingness to pay and is considered to be a conservative estimate of use value.

Using the WTP question regarding artificial reef discussed above, we asked for a response from only those using artificial reefs. A prior analysis of the data indicated that the Turnbull

distribution technique could not be implemented by county, but was in conformity to a priori theory for fishers from the five counties combined. The theory assumes that as the WTP amount is increased, the percent answering “YES” will decline. That is, the more costly the artificial reef program, the smaller the percent of the users willing to pay for the program. The sample for fishers was 264 responses while those for divers was just 37 responses with many intervals with no answers. Therefore, we were restricted to applying the Turnbull distribution to only those engaged in fishing. Of course, this is the principal use of artificial reefs by visitors to each county. Also, using the whole sample assumes that the WTP does not vary from county to county. Given the geographical proximity of the counties involved, this is not an unreasonable assumption. Furthermore, other techniques employed below will give us the ability to test the influence of each county on the WTP. Table 3.14 shows the results of the application of the Turnbull estimator to our data on the willingness to pay(WTP) for the artificial reef program.

Consider the first interval in Table 3.14(i.e., from $0 to $l). 54 respondents were asked whether they would be willing to pay at least $1.00 as part of their fishing license/ or cost of boat rental over a 12 month period for funding the artificial reef program. 49 respondents or 90.7 percent answered “YES”. This gives us one point on the Turnbull Distribution. We cannot calculate the WTP unless we observe a change from one point on the distribution to another. This is called the change in density. The second interval when compared to the first interval shows how the willingness to pay responds to a progressive rise in the “payment price”. Therefore, we multiply the lower bound of the interval by the change in density to get the incremental willingness to pay. When this is done for all the intervals in Table 3.14, we get the cumulative willingness to pay of $22.17 per year. Respondents responding to the highest interval are assumed to have a maximum willingness to pay of $50. This is not unreasonable when one looks at how rapidly the probability of saying “YES” to the payment drops off as the payment rises in Table 3.14. Since the willingness to pay question was asked of an individual(i.e., not a fishing party), we interpret the $22.17 to be the WTP by one visitor fisher over a 12 month period for the artificial reef program as contained in the willingness to pay question. Since the data are an aggregation for all counties in the study, this WTP will apply to

any fisher in anyone of the five counties. In Okaloosa County, the typical visitor spends 4.75 days per trip and visits the county about 1.6 times per year. Therefore, we interpret the $22.17 as the WTP for 7.7 days of boating adjusted for percent fishing and the percent engaged in other boating activities. We estimated above that 57.1 percent of all general boating days are spent fishing on or about artificial reefs. Thus, of the 7.7 days in total fishing, 57.1 percent or 4.39 days are spent per individual on artificial reefs. Taking the annual WTP of $22.17 per fisher, and dividing it by days spent on artificial reefs in Okaloosa County, we have a WTP/Day of $5.05. What is this value? It is the interpreted as the incremental recreational value afforded to the average fisher by artificial reefs as a recreational aid on a fishing day. Why is this important? The basic reason is that the expenditures on artificial reefs not only has an economic impact which we have quantified, but increases output in the general economy. That is, since the market does not measure the value of recreational output by many natural resources such as the fishery as discussed above, we have an indirect measure of this value. The total annual use value of artificial reefs for fishing in Okaloosa County is equal to about $4.38 million ($5.05*0.8676 million days spent fishing on artificial reefs in Okaloosa County). We shall discuss this further after we gave reviewed the two other procedures used to estimate the WTP as discussed above.

TABLE 3.14

APPLICATION OF THE TURNBULL ESTIMATOR TO THE WILLINGNESS TO PAY(WTP) FOR ARTIFICIAL REEFS

(1) Lower Bound for Interval	(2) Upper Bound for Interval	(3) Probability of Paying at at Upper Bound	(4) Change In Density	(6) WTP (1)*(4)	(7) N
$0	$1	.907	.093	0	54
$1	$5	.796	.111	$ .110	49
$5	$10	.804	-.008	-$ .008	46
$10	$20	.600	.204	$2.040	35

$20	$30	.411	.189	$3.780	34
$30	$50	.197	.215	$6.450	46
$50	Infinity	.000	.196	$9.800	N/A

Total Willingness to Pay(Total of Column 6): $22.172

Dichotomous Choice Application

The modeling approach followed here is one originally developed by Bishop and Heberlein (1979). There have been many applications using slightly different specifications of the model and Hanemann (1984) further developed the underlying economic theory behind various model specifications and the formulas for calculating consumer's surplus or compensating variation. Compensating variation is consumer's surplus adjusted for the income effects of price changes that would keep the consumer at the same level of total economic well-being as before the change in price. The answers to questions like the ones used in this study to measure the value of artificial reefs are assumed to yield estimates directly of compensating variation. The general form of the dichotomous choice is as follows:

$$Pr\ (YES) = \alpha - \beta BID * BID + \beta SE * SE + \mu$$

where, Pr (YES)= the probability that the user will be willing to pay the randomly assigned dollar amount (BID).

BID = randomly assigned dollar amounts.

βBID = estimated coefficient on BID.

SE = vector of other socioeconomic variables and/or natural resource attributes.

βSE = estimated coefficients for SE vector.

μ = error term following logistic distribution for logit model and normal distribution for the probit model.

The above model was estimated using both the logistic and normal distribution assumption about μ. The BID variable was included in its linear and logarithmic form (natural logarithm of BID called LBID here). In the SE vector, we include a variety of socioeconomic factors including household income, age, years of experience boating in northwest Florida, race, and sex. Also, included were variables for differentiating charter and party boat mode use from use of the own boat and private rental boat modes. A variable was also entered to indicate artificial reef use and, when fishermen and divers were combined, a variable was entered to differentiate divers from fishermen. However, none of the variables in the SE vector were significant in any model specification. Some have argued that this finding calls into question the validity of the estimated values. We present eight model specifications that include only the bid amount as an explanatory variable (Table 3.15). The models differ by sample of users (e.g. all users versus fishermen only), by assumption about the distribution of the errors (e.g. the logit of probit model), and by specification of the bid amount (e.g. linear BID or log linear or natural logarithm of bid or LBID). The estimated values derived from these models range from $23.92 to $29.83 per user per year. The average of these eight values is $27.02.

The average value derived from the dichotomous choice models is slightly higher than that obtained using the same information and employing the Turnbull method $27.02 versus $22.17 or about 22 percent higher. The lowest value obtained from the dichotomous choice model is only 7.89 percent higher than that obtained using the Turnbull method ($23.92 versus $22.17). To derive an estimate of the willingness to pay per day, as with the Turnbull estimate above we divide the annual value per person by 4.39 days yielding an estimate of WTP/day of $6.15 ($27.02/4.39). And, our estimate of total annual value of artificial reef use in Okaloosa County using the dichotomous choice method is $5.33 million ($6.15 * 0.8676 million days of use).

TABLE 3.15

DICHOTOMOUS CHOICE MODELS

FOR ARTIFICIAL REEF USERS

IN NORTHWEST FLORIDA

Model Number	α	βBID or βLBID	BID or LBID	Users	Type of Model	N	WTP for Artificial Reef ($)1
1	2.2308 (9.455)*	-.07486 (-8.159)	BID	All	Logit	302	29.80
2	1.3392 (10.309)	-.04490 (-8.778)	BID	All	Probit	302	29.83
3	3.6048 (7.948)	-1.1233 (-7.299)	LBID	All	Logit	302	24.76
4	1.9752 (8.980)	-.6134 (-7.877)	LBID	All	Probit	302	25.03
5	2.1086 (8.448)	-.07167 (-7.551)	BID	Fish	Logit	260	29.42
6	1.2692 (9.145)	-.04305 (-8.104)	BID	Fish	Probit	260	29.48
7	3.3250 (7.187)	-1.0473 (-6.713)	LBID	Fish	Logit	260	23.92
8	1.8367 (8.124)	-.5783 (-7.282)	LBID	Fish	Probit	260	23.95
1-8 Average							27.02

* t-values in parentheses.

1. For linear model, annual willingness to pay (WTP) is equal to α/βBID, while for the log linear model, WTP is equal to exp(α/βLBID).

Travel Cost Demand Model Application

The modeling approach employed here is one that has recently been applied to visitors to the Florida Keys (See Leeworthy and Bowker 1997, and Bowker and Leeworthy 1998). The choice of this modeling approach is based on the similarity of the type of sample data collected that present problems of biased estimation of consumer's surplus. A major source of possible bias in estimating consumer's surplus is when the sample does not include those that do not consume the good or service, here fishing or diving in northwest Florida. Not including people that do not engage in fishing or diving in estimating the demand function can lead to what is called truncation bias. It is called truncation bias because the sample is truncated at one visit to the area or only includes people that made at least one trip to northwest Florida. Samples that are conducted on-site of visitors by definition only include people that have visited the area. This is done because obtaining a random sample of all people (visitors and non-visitors) is too expensive for practical purposes. However, statisticians and economists have developed methods to correct demand estimation with truncated samples and thus avoid the truncation bias.

Another aspect about trips is that one cannot take a fraction of a trip. Trips take on integer values (e.g., 1, 2, 3,…365). Statisticians and economists have also developed methods for estimating models where the dependent variable, like trips, have integer values. The methods are called count data models and include the Poisson model and the negative binomial model. The model we employ here is a special version of the count data models that uses a maximum likelihood method of estimation that also adjusts for truncation bias and are therefore called the truncated Poisson and truncated negative binomial models.

The travel cost model estimated here takes on the following general form:

$$Ln(TRIPSi)=\beta 0 + \beta tcTCi + \beta se\ SEi + \mu i$$

where, for the ith individual Ln(TRIPS) is the natural logarithm of the quantity of recreation trips, TC is the travel cost per trip, SE represents the vector including other relevant socioeconomic variables and site attributes, the βs' are regression parameters estimated by the model that quantify the relationship between the right-hand side variables to TRIPS, and μ is an error term that is assumed to follow a gamma distribution with mean 1.0 and variance α (Greene, 1995).

Table 3.16 provides definitions of all the variables used in estimating the final model presented here. Several of the variables in Table 3.16 require further explanation. We followed Bowker, English & Donovan (1996), Leeworthy and Bowker (1997) and Bowker and Leeworthy (1998)and defined the dependent variable as a person-trip (NTRIPS). Hence a family of four visiting northwest Florida once per year would account for four person-trips as would an individual visiting northwest Florida four times in one year. However, given the same origins and travel modes, the price per person-trip would differ as the single visit cost for the family of four would be apportioned to four person-trips. While intuitively appealing, this construction of the dependent variable is practical for situations were group travel by car is common. In the boating visitors sample used here, all visitors came by automobile. In addition, the construction of the dependent variable used here helps to avoid the empirical malady of low dispersion of the dependent variable i.e., a clustering around one trip annually.

Travel costs per person-trip (TCOSTPP) is equal to round-trip road mileage times a cost per mile then divided by the number of people in the traveling party. Distance was calculated from the center of the zip code of the person’s home to the center of the zip code of the site in northwest Florida where the person was interviewed. We used a computer program called Prophesy Plus and chose the route that was the fastest (would take the least time). Mileage cost was calculated using $0.14 per mile. This estimate is based on a recent study of travel costs by auto visitors to the Florida Keys (Leeworthy and Bowker 1997). This cost is less than what the Federal government uses to reimburse Federal employees for travel when using their private vehicles (currently $0.31 per mile). The reason is that the Federal government rate includes overhead costs such as insurance and maintenance as well as the depreciation of the vehicle. The costs used here only include trip related costs such as gasoline, oil, parking fees, and tolls. As discussed above, round-trip travel costs were divided by the number in the traveling party to put costs on a person-trip basis to be consistent with our definition of TRIPS (NTRIPS) or person-trips.

The inclusion of time costs, both in-transit and on-site is subject to considerable debate. Theoretically, Freeman (1993) demonstrates that both kinds of time costs should be included. However, he points out a number of problems which continue to plague applied researchers. One is the inability of a large portion of the population to easily substitute between working increased hours at their normal (or overtime) wage rate and leisure time. Another is the possibility of utility or disutility resulting from work, travel, or on-site time, hence rendering the full wage rate a potentially poor measure of the shadow cost of time. He points out that while most surveys elicit a pretax income measure, a more realistic wage rate would

be derived from after tax income.

Many other researchers have used a percentage of the wage rate, some based on travel studies of the cost of travel congestion, while most use some arbitrary percent of the wage rate. We felt that resolving this issue was beyond the scope of this study and we used a more conservative approach and have not included the value of time.

It is important in travel cost modeling, especially when visitors come from origins of great distance, to control for the length of trip. The variable (STAY) is the length of the interview trip measured in number of days. Length of trip was used extensively in the beginning of the report to estimate the total number of person-trips. It is assumed that all trips over the year are the same length.

We included a host of standard socioeconomic variables including age (AGEH), household income (INCTTH), race/ethnicity (WHITE), years of experience visiting northwest Florida (EXPER), sex (MALE)and whether the person was a member of a fishing or diving club (CLUB). AGEH was scaled in hundreds of years and was used in estimation with it’s squared value (AGESQH). This specification tests if there is a parabolic relationship between the number of person-trips (NTRIPS) and age (AGEH). We will discuss this in more detail below when discussing the results of the estimation. Household income (INCTTH) was scaled to $10,000. Thus a value of one means a household income of $10,000. Household income was actually obtained in intervals (e.g. less than $10,000, $10,000-$19,999, $20,000-$29,999, etc.). We converted this to a continuous variable by setting the value of household income to the mid-point of the interval given by the person interviewed.

The variable (EXPER) is the number of years the person interviewed had been boating in the panhandle of Florida. For race/ethnicity, we created a dummy variable (WHITE) which takes on a value of one (1) if the person interviewed was White, not Hispanic and zero (0) otherwise. There were not enough Black or African American or Hispanic persons in the boating sample to construct separate variables for these groups. The variable (CLUB) is also a dummy variable that takes on a value of one (1) if the person was a member of a fishing or diving club and zero (0) otherwise. In addition, sex was represented as a dummy variable that takes on a value of one (1) if the person interviewed was a male and zero (0) otherwise.

We also constructed a set of intercept and slope dummy variables to test whether those that dive (DIVE), or used the charter boat mode (CHARTER), or used the party boat mode (PARTY),

and, most importantly for this study, used an artificial reef (REEF) have different demands. That is, instead of estimating separate demand equations for each group (we don't have enough people in the boating sample to do this), we can employ statistical techniques that allow us to estimate different demands while pooling the data. DIVE, CHARTER, PARTY and REEF are intercept dummies that take on values of one (1)or zero (0) just like variable WHITE, MALE, and CLUB discussed above. Intercept dummies let us test if, on average, different groups take more or less trips (NTRIPS). For example, do divers take more or less trips to northwest Florida for boating activities, holding all other factors constant, than fishermen.

Slope dummies test whether the slope of the demand function is different for different groups. As we will show below, this is important for two reasons. Slope dummies allow us to test whether different groups will respond differently to price. That is, for a given percentage change in price, what will be the percentage change in number of trips to northwest Florida for boating activities by different groups. Economists call this price elasticity. Price inelasticity means for a given percentage change in price their will be a smaller percentage change in number of trips. This has practical importance to local businesses because inelastic demands means that, for a price increase, total revenue will increase. The opposite is true if demand is elastic.

Another important use of slope dummies is in estimating consumer's surplus or use value per trip. As we will show when we discuss later the formula for calculating consumer's surplus or the use value per trip, the calculation depends on the slope of the demand function. So groups with different demand slopes will have different use values per trip. Groups with demands with steeper slopes will have higher use values per trip and vice versa.

We constructed slope dummies for divers (DCOST1), for those that used charter boat mode (CHCOST1), for those that used the party boat mode (PARCOST1), and those that used an artificial reef (REFCOST1). The variables are created by simply multiplying the intercept dummy variable for each group by the travel cost variable (TCOSTPP). An estimated positive coefficient on a slope dummy means that the slope of the demand for boating trips is steeper for that group meaning that groups demand will be more inelastic and will mean that group has a higher use value per trip than the base group. For example, if the coefficient on DCOST1 is positive, it will mean that divers have more inelastic demands than fishermen, holding all other factors constant. It will also mean that divers have a higher use value per trip than fishermen.

TABLE 3.16

DEFINITIONS OF THE TRAVEL COST MODEL VARIABLES

Variable	Definition
NTRIPS	Annual number of person-trips to northwest Florida for boating activities.
TCOSTPP	Travel cost per person-trip. Round-trip mileage from home to the interview site times $0.14/mile.
STAY	Length of trip measured in number of days.
INCTTH	Household income (in 10,000 of $).
AGEH	Age of the person interviewed (in hundreds of years).
AGESQH	AGEH squared.
EXPER	Number of years have been boating in northwest Florida.
DIVE	Dummy variable (1=participated in diving).
CHARTER	Dummy variable (1=used charter boat mode).
PARTY	Dummy variable (1=used party boat mode).
CLUB	Dummy variable (1=member of a fishing or diving club).
REEF	Dummy variable (1=used artificial reef).
DCOST1	Slope dummy for diving (DIVE*TCOSTPP).
REFCOST1	Slope dummy for use of artificial reef(REEF*TCOSTPP).
CHCOST1	Slope dummy for charter boat mode use.

	(CHARTER*TCOSTPP).
PARCOST1	Slope dummy for party boat mode use (PARTY*TCOSTPP).
α	Overdispersion parameter. A significant parameter indicates the presence of overdispersion and that the Poisson model is rejected in favor or the negative binomial model.

Results of the Travel Cost Demand Model

Truncated Poisson and negative binomial (TNB) models were estimated using LIMDEP Version 7.0 (Greene 1995). Only the TNB model is presented here because the hypothesis of no over dispersion was rejected based on a Wald test equivalent to the asymptotic t-ratio on the estimated dispersion parameter, α (Yen & Adamowicz, 1993). Table 3.17 summarizes the results of the TNB model.

Several variables included in Table 3.16 were dropped from the model because they were not statistically significant. The variables dropped were STAY, DCOST1, and REFCOST1. Length of trip (STAY) was negative but not significant. The slope dummy for diving (DCOST1) was positive but not significant meaning that the price elasticity and consumer's surplus or use value per trip was not different between fishermen and divers. And, most important here, the slope dummy for artificial reef use was positive but not significant meaning that the price elasticity and use value per trip was not different between users and nonusers of artificial reefs.

All the variables included in the final model presented in Table 3.17 are statistically significant, except household income (INCTTH). Because of incomes economic importance we kept it in the model despite it's insignificance. Dropping income from the equation did not significantly change any other estimated model coefficients in our tests of alternative model specifications. All the other variables included in the model were statistically significant with high levels of confidence as expressed in the column labeled, $P[\,|z| \geq z]$. This column contains the significance level for the test of whether the estimated coefficient is significantly different from zero. A value of 0.05 would indicate significance at the 5 percent level or that we are confident at the 95 percent level. Generally, the model variables were all significant at the 0.05 or below meaning these are fairly strong results.

Price Elasticities

The coefficient on TCOSTPP is negative indicating a downward sloping demand curve as presented in Figure 1. As discussed above, price elasticity of demand measures how the demand for trips (NTRIPS) changes with changes in prices (TCOSTPP), holding all other factors constant. Specifically, price elasticities measure the percentage change in the number of trips (NTRIPS) for a percentage change in price (TCOSTPP).

TABLE 3.17

TRAVEL COST MODEL RESULTS

FOR BOATING VISITORS

TO NORTHWEST FLORIDA

Variable	Coefficient	Standard Error	b/St.Er.	P[|Z|>z]	Mean of X
Constant	4.132307282	.60192811	6.865	.0000	1.00000
TCOSTPP	-.03937839110	.0024047564	-16.375	.0000	36.832241
CHCOST1	.02606125483	.0030188745	8.633	.0000	22.724031
PARCOST1	.01365062332	.0059164162	2.307	.0210	10.808520
INCTTH	.01485993937	.012251925	1.213	.2252	8.0092308
AGEH	-7.413161512	2.9668408	-2.499	.0125	.38021538
AGESQH	10.02846709	3.2960961	3.043	.0023	.15524892
MALE	.2889243810	.15285344	1.890	.0587	.85846154
CLUB	.6819655766	.14803140	4.607	.0000	.067692308
CHARTER	-1.346883501	.11960963	-11.261	.0000	.60923077
PARTY	-1.255882128	.23010332	-5.458	.0000	.20923077
REEF	.2897223689	.10902141	2.657	.0079	.53230769
Overdispersion parameter for negative binomial model					
Alpha	.5272315531	.67047941E-01	7.864	.0000	

NTRIPS (mean) 9.19

Log likelihood function -877.5674

```
Restricted log likelihood     -1607.626
Chi-squared                    1460.118
Degrees of freedom                    1
Significance level             .0000000
LEFT  Truncated data, at NTRIPS =  0.
N=325
```

In our particular specification of the demand model, price elasticity for those that used the own boat and private rental boat modes is equal to the estimated coefficient on TCOSTPP times TCOSTPP. That is, price elasticity varies with the level of price. At the mean or average travel cost, the price elasticity for the demand by those that used own boat or private rental boat for both fishing and diving was equal to -1.45 (-.0394*36.83 from Table 3.17). Thus the demand for own boat and private rental boat trips for fishing and diving in northwest Florida is considered elastic. That is, for a 10 percent increase in price, demand for trips will decrease by 14.5 percent. This means that price increases for this group would result in decreases in total revenue to local businesses. And, price decreases will result in increases in total revenue.

For fishers and divers that used party and charter boating modes, price elasticities are calculated using the slope dummies we discussed above. For the party boat mode, the price elasticity at the overall sample mean travel cost is equal to -0.9484 [(-.0394+.01365)*36.83]. For a 10 percent increase in the price, party boat mode trips would decrease 9.48 percent. Since this price elasticity is less than -1.0 we say that the demand for party boat mode trips is inelastic. Meaning that for a price increase, total revenues would increase. And, price decreases will result in decreases in total revenue.

For fishers and divers that used the charter boat mode, the price elasticity at the sample mean travel cost is equal to -0.4898 [(-0.0394+.0261)*36.83]. For a ten percent increase in price, charter boat trips would decrease about 4.9 percent. Thus, for the charter boat mode, demand is price inelastic.

Relationship Between Trips and Age

As discussed above, the relationship between NTRIPS and the age of the person interviewed (AGEH) was expected to be parabolic. This was tested by including age squared (AGESQH) in the estimated travel cost demand model. The coefficient on AGEH is negative and the coefficient on AGESQH is positive meaning

that as age increases, from age 16, the number of trips (NTRIPS) decreases, reaches a minimum, and then starts increasing with age (a u-shaped parabola). Below is the estimated relationship using our estimated travel cost model. Note that trips reach a minimum at age 35.

NTRIPS	AGE
2.0	16
1.7	25
1.5	35
1.6	45
1.9	55
2.3	65
2.6	70
3.4	80

Relationship Between Trips and Other Factors

For all other factors and trips, the marginal effects are reported here. The marginal effects are the changes in the number of trips for a one unit change in the factor. For intercept dummies, discussed earlier, the calculation shows how many trips, on average, a group makes more than the reference group. Marginal effects are calculated as the mean number of NTRIPS times the estimated coefficient on the factor.

Household income has a relatively small effect on trip taking. An increase of $10,000 in household income would result in only a 0.14 increase in the number of trips (NTRIPS). Males, on average, make 2.65 more trips than females. Members of fishing and diving clubs (CLUB) make, on average, 6.27 more trips than non club members. Charter boat mode users make, on average, 12.38 fewer trips than those that use the own boat and private rental boat modes. Party boat users make, on average, 11.54 fewer trips than those that use the own boat and private rental boat modes. And finally, those that used artificial reefs (REEF) make, on average, 2.66 more trips than non reef users.

User Value of Artificial Reefs

As discussed above, we can use our estimated travel cost model to estimate consumer’s surplus or use or user value for artificial reefs. We estimate these values per person-trip, per person-day, and the total annual value for Okaloosa County. The estimates are presented by boat mode and for fishermen and divers.

For those that used the own boat or private rental boat mode (fishermen and divers), the following formula is used to calculate consumer's surplus per person-trip:

$$CSPTown = (-1/\beta TCOSTPP) * [1/1+(tTCOSTPP)-2]$$

where, CSPTown = Consumer's surplus (use value) per person-trip for those that used the own boat or private rental boat modes, including both fishermen and divers.

βTCOSTPP = Estimated coefficient on the travel cost variable (TCOSTPP).

tTCOSTPP = Estimated t-value (from column labeled b/st.er. in Table 1.17) for the travel cost variable coefficient.

By substituting the values for the above variables from Table 3.17, we calculate CSPTown = [-1/-.0394] * [1/1+(16.375)-2] = [25.38] * [.9963] = $25.29. The above formula has two components. The first is the formula for calculating the area under the estimated travel cost demand model as shown in Figure 1 earlier in the chapter. The second component is an adjustment for bias in consumer's surplus estimates from demand functions. Even though the estimated demand function is unbiased, consumer's surplus estimates are biased (Zellner and Park, 1979). The correction factor is a simple function of the estimated t-value on the travel cost coefficient (Bockstael and Strand, 1987). When the estimated t-value is large, the correction factor for bias will be small.

An important finding from our travel cost demand modeling was that those that used the charter and party boat modes (fishermen and divers) had different price elasticities and different consumer's surpluses per person-trip. The formula for charter boat mode fishermen and divers is as follows:

$$CSPTCHARTER = [-1/(\beta TCOSTPP + \beta CHCOST1)] * [1/1+(tTCOSTPP)-2] * [1/1+(tCHCOST1)-2]$$

where, CSPTCHARTER = Consumer's surplus per person-trip for fishermen and divers that used the charter boat mode.

βTCOSTPP = Estimated coefficient on the travel cost variable.

βCHCOST1 = Estimated coefficient on the slope dummy variable (CHCOST1).

tTCOSTPP = Estimated t-value (from column labeled b/st.er. in Table 3.17) for the travel cost variable coefficient.

tCHCOST1= Estimated t-value (from column labeled b/st.er. in Table 3.17) for the slope dummy variable (CHCOST1) coefficient.

By substituting the values for each variable in the above formula from Table 1.17, we calculate CSPTCHARTER = [-1/(-.0394+.0261)] * [1/1+(16.375)-2] * [1/1+(8.633)-2] = [75.19] * [.9963] * [.9868] = $73.92. The above calculation is similar to the one for own boat and private rental boat modes except that there are three components to the calculation. The first component adjusts for the change in slope of the demand function for charter boat mode users. The second and third components adjust for the bias in consumer's surplus and account for the bias from both the travel cost coefficient and the slope dummy for charter boat users.

The formula for party boat mode users is as follows:

CSPTPARTY = [-1/(βTCOSTPP + βPARCOST1)] * [1/1+(tTCOSTPP)-2] * [1/1+(tPARCOST1)-2]

where, CSPTPARTY = Consumer's surplus per person-trip for fishermen and divers that used the party boat mode.

βTCOSTPP = Estimated coefficient on the travel cost variable.

βPARCOST1 = Estimated coefficient on the slope dummy variable (PARCOST1).

tTCOSTPP = Estimated t-value (from column labeled b/st.er. in Table 3.17) for the travel cost variable coefficient.

TPARCOST1= Estimated t-value (from column labeled b/st.er. in Table 3.17) for the slope dummy variable (PARCOST1) coefficient.

By substituting the values for each variable in the above formula from Table 3.17, we calculate CSPTPARTY = [-1/(-.0394+.01365)] * [1/1+(16.375)-2] * [1/1+(2.307)-2] = [38.83] * [.9963] * [.8418] = $32.57. The above calculation is similar to the one for the charter boat mode.

Using the above estimates of consumer's surplus per person-trip, we can estimate the total annual value of artificial reefs and we can estimate the value on a per person-day value. We do this by referring back to our estimates of person-trips and person-days by boat mode and activity (see Table 3.11). We reproduce those estimates along with our estimates of total annual consumer's surplus and consumer's surplus per person-day in Table 3.18.

Table 3.18 shows the impacts of a variety of factors on total value for artificial reefs. Even though our estimate of consumer's surplus per person-trip was the same for own boat mode users and private rental boat mode users ($25.29), there is a significant difference on a per person-day basis ($8.29 vs. $5.88). The reason for this difference is the difference in length of trip. Private rental boat mode users had, on average, shorter trips than those that used their own boats (3.0 vs.3.87).

Overall, for year 1997-1998, artificial reefs for Okaloosa County visitors were worth over $10 million. Fishermen accounted for 96.5 percent of the total value, while divers accounted for 3.5 percent. Visitors that used charter boat fishing services accounted for 78.7 percent of the total value, while fishermen using their own boats accounted for 18.6 percent of the total value.

Comparison of User Values Across Methods

The Turnbull method resulted in an estimate of the value per person-day for artificial reef use of $5.05 compared to $6.15 for the dichotomous choice models, and $11.23 using the travel cost model. Total annual value for the artificial reefs in Okaloosa County was estimated at $4.38 million using the Turnbull method, $5.33 million using the dichotomous choice models, and $10.13 million using the travel cost model. Because the willingness to pay questions resulted in estimated values that were not explained by differences in any socioeconomic factors, we conclude that the travel cost model results are the 'best'

results for Okaloosa County.

TABLE 3.18

ANNUAL AND PER PERSON-DAY USE VALUES

FOR ARTIFICIAL REEFS IN OKALOOSA COUNTY, FLORIDA

Boat Mode/ Activity	Person-Visits on Artificial Reefs (millions)1	Total Annual Use Value of Artificial Reefs (millions $)2	Person-days on Artificial Reefs (millions)3	User Value Per Person-day ($)4
Own Boat	0.0789	1.9954	0.3391	5.88
Fishing	0.0746	1.8867	0.3208	5.88
Diving	0.0043	0.1087	0.0183	5.94
Charter	0.1079	7.9760	0.6860	11.63
Fishing	0.1046	7.7320	0.5232	14.78
Diving	0.0033	0.2440	0.1628	1.50
Party	0.0035	0.1140	0.0174	6.55
Fishing	0.0035	0.1140	0.0174	6.55
Private Rental	0.0020	0.0506	0.0061	8.29
Fishing	0.0020	0.0506	0.0061	8.29
Total	0.1923	10.1360	0.9022	11.23
Fishing	0.1848	9.7833	0.8676	11.28
Diving	0.0075	0.3527	0.0346	10.19

1. See Table 3.11.
2. Total annual consumer's surplus for artificial reefs is equal to the estimated consumer's surplus per person-trip (CSPT) for each boating mode times the number of person-trips on artificial reefs. CSPT for own boat and private rental mode is $25.29, $73.92 for charter boat mode, and $32.57 for the party boat mode.
3. See Table 3.11.
4. Consumer's surplus per person-day for artificial reef use is

calculated as total annual consumer’s surplus for artificial reef use divided by total person-days on artificial reefs.

PART 2

RESIDENTS OF OKALOOSA COUNTY

INTRODUCTION

When we consider artificial reefs, we must look at two well defined user groups. These are the visitors to Okaloosa County which we have extensively analyzed above and the residents of that county. Such coastal residents engage in all forms of boating and also use artificial reefs as a recreational aid. In 1996, the population of Okaloosa County, Florida was estimated at 165,319 individuals. These individuals took advantage of the coastal environment by registering 15,867 pleasure craft or a little over 10 persons per boat. In the State of Florida, there are over 19 persons per registered boat indicating that Okaloosa County has about double the per capita ownership of pleasure craft. A coastal county requires a relatively large infrastructure for boating including piers, boat ramps, and marinas. In addition, we can add artificial reefs are part of this infrastructure.

A inventory taken by the Florida Department of Environmental Protection(1996) in l995 indicated that Okaloosa County had the following boating infrastructure:

1. Piers: 6 with a length of 1,658 linear feet;

2. Boat Ramps: 37 with a total of 41 boating lanes;

3. Marinas: 30 with 1,449 slips and 1,033 dry racks.

It is estimated by the DEP, that there are 57 artificial reefs off Okaloosa County. All of these facilities are available to both visitors and residents for boating use in the Gulf of Mexico.

We shall focus on the registered boats in Okaloosa County as the universe for resident use of artificial reefs. Of course, residents, as was true of the visitor sector, may avail themselves of party; charter and other rental boats operating from the county. This will also be treated in our economic analyses. However, we shall start with the registered pleasure boats. For purpose of analyses, these pleasure craft were broken down into three categories based on the length of the vessel as follows:

Class 1: Under 16 Feet	7,734
Class 2: 16 Feet to 39 Feet, 11 inches	8,003
Class 3: Over 40 Feet	130
Total	15,867

The boat registration data were obtained from the Florida Department of Highway Safety and Motor Vehicles. Even though finer class distinctions are available by length, we felt that dealing with the above classes made our study more manageable and targets the Class 2 pleasure crafts as those capable of reaching an artificial reef which we saw in the visitor study above is, on average, over 10 miles from shore. Thus, the decision was made to target those intermediate size pleasure craft that are more likely to use artificial reefs. The third class is relatively small and was included to assure we treated, in some way, all the pleasure craft registered in Okaloosa County.

RESIDENTS ENGAGED IN BOATING

METHODOLOGY

Residents engaged in boating from Okaloosa County were divided into two classes: those using their own boats and those using some kind of rental boat such as a party, charter, or other kind of rental boat. Let us consider the “own boat category” first. As discussed above, the universe for this category includes all the registered boats in the county. It is possible that a resident of Okaloosa County may registered his or her boat in another county. If this is the case, we made the assumption that the boating activity of that resident took place mainly in the county in which the pleasure craft was registered. This is what is called a simplifying assumption to limit the scope of this study. However, of more concern in a coastal county is those individuals that registered their craft there, but live elsewhere. Such individuals would not be defined as residents of the coastal county. For example, a resident of Tallahassee may berth his craft in one of the 30 marinas in Okaloosa County. It would not be unreasonable for such an individual to registered his boat in Okaloosa County as a matter of convenience. Therefore, some adjustment must be made to the registered pleasure craft numbers to account for, delete, nonresidents. For each of the Classes established above, the following expression was employed:

RESBT = REGBT * % RES

where,

RESBT = Registered resident boats(pleasure craft);
REGBT = Registered boats (pleasure craft) in the county under study;
%RES = Percent of registered boats registered to individuals with homes in the county under study.

Just how %RES(percent local residents) was determined will be discussed under sampling procedure below. Next, registered pleasure craft owned by local residents is merely a stock of boats which may or may not be used for boating or some element of boating such as fishing or diving. In our sampling procedures discussed below, we ascertained from those owning registered boats the number of days per year they were used for predominately for saltwater fishing. For purposes of this study, we are only interested in fishing and diving since these activities are the primary recreational use of artificial reefs. The following expression may be useful in looking at a fishers use of a pleasure craft:

FPDYO = RESBT* FDPBPYO

where,
FPDYO = Fishing(saltwater) party days per year using own boat;
RESBT = Resident boats(pleasure craft);
FDPBPYO = Fishing(saltwater) days per own boat per year.

This is a rather simple expression which indicated that saltwater fishing days per year is the result of multiplying the number of boats by the average number of fishing days. This turns the stock of boats into a flow of days per year. Each day represents the action of a group of people or party. So, each day can be regarded as a “party day”. Such “days” refer to the use of the pleasure craft or boat by a residents of the county under study.

Next, we wish to translate fishing days into expenditures by residents using their boats in Okaloosa County. To do this, we can use the following expression:

$EXPENDFO = FPDYO * $EPPDO

where,
$EXPENDFO = Total expenditures on saltwater fishing per year using own boat;

FPDYO = Fishing (saltwater) party days per year using own boat;

$EPPDO = Expenditures per party per day using own boat.

Notice that $EPPDO is expenditures by the entire party using a boat or pleasure craft on any given day for saltwater fishing. Such expenditures run from bait and fuel to slip rentals in a marina. Thus, we were able to obtain how much was spent by those residents using their own boat on bait, for example. This will be discussed in some detail below.

$EXPENDFO must be converted into how many job such expenditures support in Okaloosa County and wages related to such jobs. This can be accomplished by the following expressions:

EMPLOYFO = $EXPENDFO / {($S/E)}

$WAGESO = %WAGES*$EXPENDFO

where,

EMPLOYFO = Number of full and part-time jobs generated by recreational saltwater fishers using own boat in the county;

$S/E = The ratio of sales to employment for those industries in which spending for good and services are made for saltwater fishing;

$WAGESO = Wages and salaries generated by own boat spending in industries related to saltwater fishing;

%WAGES = Percent wages are of total sales/expenditures in industries related to saltwater fishing.

The first expression above is used to derive employment by dividing expenditures which are sales by the published ratio of sales-to-employment in those industries related to saltwater fishing. Each of these industries generates wages as a cost of doing business. Therefore, we multiply this published ratio of wages-to-sales or %WAGES by $EXPENDFO to obtain the wages and salaries generated by these expenditures. In both expressions, we need published data that are taken from the U.S. Censuses of Retailing and Services for the county in question. In the case of this chapter, we have published data for Okaloosa County on all major industries serving the county. Published data are not always available for all the parameter needed for the above expression. In this case, we must turn to sampling which is discussed below in a separate section.

It should be recognized that not all residents use their own boat for saltwater fishing in Okaloosa County. Rentals such as

party and charter boats are readily available and are the choice of many visitors to the county as discussed in Part 1 in this chapter. How do we obtain the total expenditures by residents on this part of the saltwater fishing sector? Consider the following expression:

$EXPENDFR = ($EXPENDVISITOR/ %VIS) * %RES

where,

$EXPENDFR = Expenditures by county residents on charter, party, and other rental boats for saltwater fishing;
$EXPENDVISITOR = Expenditures by all visitors on charter, party, and other rental boats for saltwater fishing;
%VIS = Percent visitors are of the total demand for charter, party, and other rentals;
%RES = Percent residents are of the total demand for charter, party, and other rental boats.

The right hand side of the above expression has two terms. The first term merely “blows-up” visitor expenditures on all rental boats to total expenditure including, of course, those expenditures made by non-visitors or residents. The second term is merely what percent total expenditures are made by residents of the county in question. The “percents” are based on the number of days that visitors and residents make in connection with the boat rental industry in the county. This is the best measure of demand available from the boat rental industry. This will be discussed below in some detail.

Finally, we would like to estimate the number of person fishing days spent by all residents of Okaloosa County. The reason we say “person” fishing days is that we wish to derive the total number of fishing days by all persons engaged in saltwater fishing. These days will be used later to estimate the total use value of the recreational experience that was extensively discussed under the visitor’s section above. The following expression can be used to estimate total saltwater person-days:

PDAYSFO = FPDYO * SPO

where,

PDAYSFO = Person-days saltwater fishing using own boat;
FPDYO = Fishing(saltwater) party days per year using own boat;

SPO = Size of party engaged in saltwater fishing using own boat.

Now, we shall turn to the survey techniques used with the residents to obtain some of the parameters of the expressions discussed above.

SAMPLE SURVEY

The researchers obtained a magnetic tape from the Florida Department of Highway Safety and Motor Vehicles (FDHSMV) containing all registered boat owners in the State of Florida. The computer tape was processed to yield only those registered boaters in the five West Florida Counties under study. These five counties contained 60,599 registered boat owners. This defined our universe of resident boaters. The purpose of obtaining the tape was to form the universe for telephone sampling of registered boat owners in each of the five counties. Unfortunately, the FDHSMV does not obtain the phone number of the registered boat owner. To overcome this problem, we obtained a CD-ROM of all listed phone numbers in the United States including Florida. The CD-ROM was interfaced with the magnetic tape of registered both owners to match as many owners with listed phone numbers. For the counties under study, we were able to “match” about 85 percent of the registered boat owns on the tape with phone numbers available on the CD-ROM. The “matched set” of registered boat owners in each county was randomized so they could be sampled. This was a substantial undertaking for the research team plus a graduate student in the Florida State University Statistics Department. But, it did form the basis for the telephone survey.

The random sample size was determined by the county under study and the budget for the project. That is, Bay, Okaloosa, and Escambia Counties contain about 80 percent of the registered boat owners so this is where our sampling was concentrated. Further, the budget for this project limited the size of the sampling even for the larger counties. After the survey instrument was developed for residents, the randomized boat owners were called by telephone in Okaloosa County during the summer and early fall of 1998. The degree of cooperation by the boat owners called was exceedingly low with only 1 in 10 agreeing to be surveyed. This made the process even more expensive. We have no idea as to why the response rate was so low. In any event, 106 boat owners were completely surveyed in Okaloosa County by the end of the allotted time for the resident survey. It was our intention to get a least 100 boat owners for the larger counties and this was generally obtained. The survey instrument used for the residents is

contained in Appendix 3 for the readers inspection.

ESTIMATION OF SPENDING;EMPLOYMENT; WAGES AND DAYS ON SALTWATER RECREATOINAL FISHING

Table 3.20 contains the necessary parameters to estimate the economic impact model formulated above. For the reader's insight into this process, let us work through an example. Consider size class 1 or own boats under 16 feet as discussed above and included in Table 3.20. Inserting the estimated values from Table 3.20 into the expressions explained above, we have the following:

(1) RESBT = RESBT * %RES = 7,734 * .869 = 6,722 (locally owned boats)

(2) FDPYO = RESBT * FDPBPYO = 6,722 * 8.75 = .058818(Millions party days)

(3)$EXPENDFO = FPDYO *$EPPDO = .058818(Millions) * $51.25
= $3.014 (Million)

(4) EMPLOY = $EXPENDFO/{($S/E)} = $3.014/ ($.0883)= 34 Employees

(5) $WAGESO = %WAGES * $EXPENDFO = .1157 * $3.014 (Million)
= $.3488 (Million)

(6) PDAYSFO = FPDYO * SPO = .058818(million) * 2.75
= .161748(Million person-days)

(7) $EXPENDFR = ($EXPENDVISITORS/%VIS) * %RES
= {$76.36(Million)/.86}*.14
= $12.43 (Million)

Summarizing the above analyses, we can state that the individuals in Okaloosa County owning pleasure craft under 16 feet spent over $3 million on saltwater recreational fishing which in term generated over $.35 million in wages which supported 34 jobs in Okaloosa County. In addition, the local individuals owning the pleasure craft provided over .16 million person-days of saltwater recreational fishing. Notice that these conclusions were reached using expressions (l) through (6) above. Expression (7) relates to an estimate of total spending of all Okaloosa County residents on party, charter, and other rentals combined.

These individuals either do not own boats or, if they do, choose to kick back and let someone else do the boating while they concentrate on fishing. Table 3.21 summarizes all the analyses for the three classes and rentals.

TABLE 3.20

PARAMETERS ESTIMATED FROM THE SAMPLE
OR TAKEN FROM PUBLISHED DATA TO IMPLEMENT
THE OKALOOSA RESIDENT ECONOMIC IMPACT MODEL
OF SALTWATER RECREATIONAL FISHING

	OWN BOAT			RENTAL
Parameter	Class 1	Class 2	Class 3	All other
RESBT (Registered boats)	7,734	8,003	130	N/A
%RES (Percent live in county)	87	77	64	N/A
FDPBPYO (Days per year/boat)	8.75	15.78	130	N/A
$EPPDO (Expenditures/party/ day)	$5.25	$97.92	$87.33	N/A
$S/E (Millions) (Sales to Employ- ment ratio)	$.0883	$.1210	$.0982	$.0493
%WAGES (Percent wages of sales)	.1157	.1083	.1264	.250
SPO (Size of party)	2.75	2.24	3.0	N/A
%VIS (Percent visitors)	N/A	N/A	N/A	86
%RES (Percent residents)	N/A	N/A	N/A	14
$EXPENDVISITORS ($ Spent by visitors using party, charter and other rentals in millions)	N/A	N/A	N/A	$76.36

Source: Florida State University Sample Survey; U.S. Censuses of Retailing and
Services, Okaloosa County, Florida.

TABLE 3.21

ESTIMATED ECONOMIC IMPACT OF RESIDENT
SALTWATER FISHING ON OKALOOSA COUNTY, FLORIDA

ECONOMIC VARIABLE/ INDICATOR	CLASS 1	CLASS 2	CLASS 3	RENTAL	TOTAL
EXPENDITURES (Millions)	$ 3.01	$ 9.55	$.47	$12.43	$25.46
WAGES (Millions)	$0.35	$ 1.03	$.059	$3.11	$4.55
EMPLOYMENT	34	79	5	252	370
PERSON-DAYS (Millions)	.1617	.0435	.0160	.0899	.3112

Source: Florida State University

Residents of Okaloosa County, Florida spent nearly $25.5 million on saltwater recreational fishing over the last 12 months (primarily l998). According to summary Table 3.21, this generated about $4.5 million in wages and salaries that supported about 370 full and part-time employees located in Okaloosa County. In addition to the visitor spending discussed in the first part of this chapter, the residents of Okaloosa County place considerable pressure on the boating infrastructure of the area. Of great importance, these conclusions only applying to saltwater fishing using a boat mode and does not include fishing from the shore. In addition, fishers spent 311,228 person-days over the last 12 months in the pursuit of recreational saltwater fishing. As explained under our discussion of visitors above, the number of person-days is a significant factor in computing the use value of the fishery resource and even recreational aids such as artificial reefs. This brings us to a direct consideration of that segment of the resident anglers using artificial reefs.

RESIDENTS USING ARTIFICIAL REEFS

As we mentioned above, our telephone survey covered 106 resident boaters in Okaloosa County, Florida. Much of the information contained in Table 3.20 came from this survey. In addition to this information, we asked resident boaters about there fishing use of artificial reefs which engaged in saltwater recreational fishing. We measure participation in terms of days spent fishing. In fact, the days spent fishing are the driving force behind all our economic impact conclusions discussed above. In total, the 106 resident boaters sampled spent 1,723 party days per year engaged in saltwater recreational fishing. This was the aggregate fishing effort by all of the three boat length classes discussed above. Respondents were asked to break down their saltwater fishing days into those days spent on or about artificial reefs off Okaloosa County. Of the total party days, 619 party days were spent fishing on artificial reefs. Thus, about 36 percent of all party days spent on saltwater recreational fishing targeted artificial reefs as the place to engage in fishing. An independent survey of charter boat operators by the authors indicated that artificial reefs are fished over 47 percent of the fishing days. Therefore, whether one uses his own boat or a rental, it would appear that artificial reefs are used between 36 to 47 percent of the time devoted to saltwater recreational fishing. Since days fishing is a multiplier to get all the economic impact information, then it follows that 36 percent of the total economic impact is artificial reef related. This is shown in Table 3.22.

For fishers only, they spent nearly $9.16 million on goods and services in Okaloosa County, Florida that is artificial reef-related. This expenditure supports 133 full and part-time employees with wages of $1.64 million. These anglers spent 112,042 person-days on artificial reefs over the last 12 months(primarily l998). Lastly, we shall consider divers as a recreational group that uses artificial reefs.

TABLE 3.22

ESTIMATED ECONOMIC IMPACT OF RESIDENTIAL SALTWATER RECREATIONAL FISHING ON OR ABOUT ARTIFICIAL REEFS, OKALOOSA COUNTY, FLORIDA

ECONOMIC VARIABLE / INDICATOR	VALUE
TOTAL EXPENDITURES	$ 9.16 MILLION

TOTAL WAGES	$ 1.64 MILLION
TOTAL EMPLOYMENT	133 EMPLOYEES
TOTAL PERSON-DAYS	.112042 MILLION

* 36 percent of total economic impact of saltwater recreational fishing by residents attributable to the existence of artificial reefs. See text for a further discussion. Figures in this table are 36 percent of the figures in Table 3.21.

Source: Florida State University

Up to this point, we have not mentioned diving as a recreational use of an artificial reef. From our sample, diving constitutes about 5.9 percent of all the days devoted to fishing by the residents of Okaloosa County, Florida. For the other counties we shall be reviewing, diving is even less important. To estimate the economic impact of diving, we performed the following procedure:

ADJFACTOR = DAYSDIV/ DAYSFISH

where,

ADJFACTOR = Adjustment factor to economic variables associated with recreational saltwater fishing to derive estimates of economic variables associated with diving;
DAYSDIV = Days spent diving by residents;
DAYSFISH = Days spent fishing by residents.

The ADJFACTOR is merely multiplied by the economic variables associated with recreational saltwater fishing on artificial reefs to derive an estimate of the economic importance of diving. The implicit assumption is that spending by divers per party per day is about the same as that for fishers. Unfortunately, the sample for divers in Okaloosa County that use artificial reefs was only 9 responses. In comparing fishing and diving expenditure profiles for the entire sample in northwest Florida, we found no significant differences between fishing and diving expenditures. So we use the fishing expenditures profiles for divers.

The fishers spent 1,723 days per year from the sample while the divers spent only 102. Therefore, the ADJFACTOR would be .059

(102/1,723). This factor was applied to the results in Table 3.22 to obtain a rough estimate of the economic extent of diving. All of this is summarized in Table 3.23. The combined economic impact of fishers and divers using artificial reefs in Okaloosa County is reflected in spending of over $9.7 million, supporting 141 jobs and generating $1.73 million in wages and salaries. These two groups spent 118,653 person-days on the artificial reefs over the last 12 months.

Next, we shall consider, as we did with visitors, the responses by fishers and divers to questions concerning their evaluation of artificial reefs as a recreational aid.

TABLE 3.23

ESTIMATED ECONOMIC IMPACT OF RESIDENTIAL

SALTWATER FISHING AND DIVING ON ARTIFICIAL

REEFS IN OKALOOSA COUNTY, FLORIDA

ECONOMIC VARIABLE/ INDICATOR	FISHERS	DIVERS*	TOTAL
TOTAL EXPENDITUES (MILLIONS)	$ 9.17	$0.54	$ 9.71
TOTAL WAGES (MILLIONS)	$ 1.64	$0.097	$ 1.73
TOTAL EMPLOYMENT	133	8	141
TOTAL PERSON-DAYS (MILLIONS)	.1120	.0066	.1186

* Divers derived by multiplying fishers by the adjustment factor(ADJFACTOR) of .059 explained in the text.
Source: Florida State University

EVALUATION OF ARTIFICIAL REEFS BY RESIDENT USERS

METHODOLOGY AND EMPIRICAL RESULTS

As part of the phone survey to resident boat owns in Okaloosa County, we asked respondents to evaluate the artificial reefs that they used. Such questions were restricted to those that have actually used one or more artificial reefs. We asked respondents the reasons that might be important in their decision to use an artificial reef as a recreational aid in either fishing or diving. Respondents rated each statement from Very Important to Not Important at All. The following results were obtained with the percent that answered either Very or just Important as their evaluation.

TABLE 3.24

Reasons Behind the Choice of an Artificial Reef by Fishers

Reason	Percent Very Important or Important
1. Better Catch Rate	97.9
2. Previous Experience at Site	97.9
3. Site Is Close to Shore	63.8
4. Want to Fish Near Others	18.8
5. Other Fishers Recommended Site	54.3
6. Site Is Easy to Locate	76.6
7. Better Fishing than Natural Reefs	65.2

Source: Florida State University

It would appear that fishing catch rate on artificial reefs was of paramount importance in the decision by fishers to use an artificial reef for a recreational aid. Apparently, artificial reefs raise use value as discussed in Part 1 dealing with visitors. In fact, we found that the travel cost model applied to visitors verified the hypotheses that recreational value is increased when an artificial reef is introduced into the recreational activity of saltwater fishing. A particular artificial reef was rated very important when the individual had previous experience with it. Nearly two-thirds of the respondents felt that the site being close to shore was an advantage in using artificial reefs. Respondents definitely felt that they wanted to be alone on artificial reefs as less than 20 percent wanted to fish near others. A little over one-half of the artificial reef users felt that the recommendations of other fishers regarding a “good” artificial reef was either very or just important. Three quarters of the users were among those feeling artificial reefs were easily to locate indicating that location of the existing distribution of reefs may not be a significant a problem. Finally, artificial reefs are a good man-made recreational aid and about two-thirds of the users felt that man was better than nature- that is two thirds felt artificial reefs yielded “better fishing”. This feeling is at variance with the boaters from Bay and Walton Counties reviewed earlier.

We asked both fishers and divers to evaluate artificial reefs from somewhat of a different perspective. In the above analyses, the respondents were restricted to fishers only. Table 3.25 shows the results from both users combined. With regard to placement of artificial reefs too far from shore, all users

were as the just fishers result divided about this issue. Such strategic placement of artificial reefs is beyond the scope of this inquiry, but important enough to warrant further investigation. At present, most of the users of artificial reefs do not think that they are too crowded (i.e., 10%). However, with the rapid expansion in boating in the Florida Panhandle, it would appear that this may be a problem in the immediate future. All users are not convinced that artificial reefs are more productive than natural reefs. This is consistent with the feelings of just fishers. Only 18% of all the users felt that there were too many artificial reefs. There will be two issues arise from this result. First, should the investment in artificial reefs be expanded in the future since crowding may become a critical problem. Second, some regard the expansion in artificial reefs will hasten overfishing of bottom dwelling fish such as red snapper and various groupers. The hypotheses advanced is that artificial reefs do not increase the size of the fishery population, but merely aggregate an existing population on reefs where they can be easily overfished. This view regards artificial reefs as devices to increase the “efficiency” of recreational fishers in catching fish. This debate has been covered lately in Grossman et al and Bohnsack et al (l997).

The consensus of users feel that artificial reefs should be placed in water less than 150 feet deep. This is understandable since bottom dwelling fish are seldom found no deeper than 150 feet. Finally, to add information to the debate over whether artificial reefs increase fishery population or actually diminish such populations, users perceive that artificial reefs “increase abundance”. An argument can be made that artificial reefs are man-made habitats that increase fishery stocks and hence abundance. This is an item for further study and is certainly beyond the scope of this report.

TABLE 3.25

EVALUATION OF EXISTING ARTIFICIAL REEFS

BY DIVERS AND FISHERS OFF OKALOOSA COUNTY, FLORIDA

CRITERIA FOR EVALUATION	PERCENT STRONGLY AGREE OR AGREE
1. Reefs Placed Too Far From Shore	37%
2. Artificial Reefs Too Crowded	9%
3. Artificial Reefs More Productive Than Natural Reefs	55%
4. Too Many Artificial Reefs	82%
5. Artificial Reefs Should Be In Water Less Than 150 Feet	70%
6. Artificial Reefs Increase Abundance of Fish	90%

Source: Florida State University

RESIDENT USE VALUE OF ARTIFICIAL REEFS

METHODOLOGY

We shall not go through an extensive discussion of analytics of use value as we did for the visitors in Part 1. The reader is referred to the section discussing use value in the visitor analyses above. As the reader will remember, use value is the recreational value placed upon a common property resource such as a fishery which does not trade in an organize market. Quite simply, until recently there was no saltwater fishing license required by Florida for fishing in its territorial waters; therefore, the fish were free to anglers for their recreational use. Despite the expenditures of these anglers which is the economic impact, there is an additional value called “use value” that is derived from this natural resource. We have argued and the survey results would seem to support the hypotheses that the artificial reef is a recreational aid that increases the use

value of the fishery or the waters above the artificial reef for divers. Thus, we have basic use value and the incremental use value created by the artificial reef. It is well known that an increase in catch rates will increase use value. See Green(1984) and Leeworthy(1990) for examples. Artificial reef fishers contend that catch rates are indeed better there. Thus, those fishing on an artificial reef should experience increase use value from the saltwater recreational fishing experience. This was confirmed for visitors in Part 1 and has profound implications for a benefit/cost analyses of the artificial reef program. As with the visitors, we asked the residents to respond to the following question, which we shall repeat again for the reader:

> "The artificial reef program cost money. Suppose that the government proposed that all newly constructed reefs would be paid for by requiring that reef users with their own boat either pay for a stamp as part of their fishing license and/or if they used a rental boat probably pay higher fees for the operator's stamp. The money would go into a trust fund that could only be used for the construction of artificial reefs. Would you be willing to pay $_____ per year when you renew your fishing license/and or use a rental boat of any kind to fund this construction program?"

Notice that this question is directed at fishers only. The reason is that there were too few divers in the sample from all five counties to implement the estimation of use value procedure. To enlarge the sample, we combined all counties where telephone interviews of fishers were completed. A total of 339 responses were obtained among the five counties. On a random basis, the respondents were asked this question which we called "dichotomous choice". That is, the respondent answers YES or NO to the amount or payment presented. The amounts presented were $1; $5; $10; $15;$20;$30 and $50. Remember, a respondent is presented with only one of these "payment vehicles" in the single interview. In this way, we get a segment of the sample answering to each of the assigned values for the payment vehicle.

In the case of the visitors discussed above, we used three procedures to estimate use value. For residents, the travel cost method could not be used because of the short distance traveled to the boat launching site. Therefore, we are restricted to the Turnbull Distribution and the Dichotomous Choice Equation for the estimation of the use value for saltwater recreational fishing on artificial reefs. We interpret the question stated above to be the incremental use value of expanding the artificial reef program to satisfy the users. In Table 3.25, only 18 percent of the present reef users felt that there were enough artificial reefs off Okaloosa County. Therefore, we would expect incremental use value from providing more artificial reefs. Just how many

additional reefs was not directly addressed because we would have to get into placement, size, and depth of additional reefs. This kind of detail was beyond the scope of this investigation.

APPLICATION OF THE TURNBULL DISTRIBUTION TO RESIDENTS

We shall not get into an extensive discussion of the Turnbull Distribution since this was covered in Part 1 dealing with visitors. We would expect that as the payment amount increased, that fewer and fewer respondents would be willing to pay for the expansion of the artificial reef program. This means that the percentage of respondents for each dollar amount should decline as the dollar amount presented to the fisher increased. Table 3.26 shows the computations using the Turnbull Distribution procedure.

As expected, the percent of fisher respondents willing to pay increasingly higher dollar values declines as the dollar value is raised from $1 to $50. Even at the $50 level, 39.4 percent of that group of fishers said YES that they would be willing to pay that amount. This shows a strong support for the expansion of the artificial reef program even when faced with a higher cost of fishing licenses and/or rental boat fees by residents of all five counties. From the analyses in Table 3.26, it would indicate that the typical fisher using an artificial reef would pay an additional $25.45 per year to support the expansion of the program. Notice that use value and willingness to pay is used interchangeably. In general, they are the same concept. The answer to our dichotomous choice question was given by one individual so the $25.45 refers to the annual individual willingness to pay or the incremental use value of the artificial reef as a recreational aid. This use value is usually expressed on a daily basis. The reason for this is that we have estimated the number of person days connected with the artificial reef usage above. For Okaloosa County, Florida, the typical boat owner fishes 17.25 days per year. This figures combines classes 1-3 discussed above. Of course, only 36 percent or 6.21 days are spent on artificial reefs as discussed above. Therefore, the resident use value is about $4.10 per day($25.45/6.21 days). The residents use value is substantially less than that found for visitors($6.15/day) using the Turnbull technique. Since residents fish about 50 percent more days than visitors, one might expect diminishing marginal returns as one fishes more. This form of diminishing marginal utility might be responsible for the disparity between visitors and residents.

If we assume that the marginal willingness to pay is equal to the average willingness to pay, then we can compute total user value per year. Using the number of fishing days on artificial reefs by Okaloosa County residents over the last 12 months, we can estimate the annual total flow of use value to Okaloosa County fishers and divers assuming that the diver's use value is about the same as that of fishers. There were 118,653 days spent on artificial reefs by fishers and divers who are residents of Okaloosa County, Florida. This is shown in Table 3.31. This allows us to make the following statement: Fisher and diver residents of Okaloosa County derive $486,477 in recreational use value from the use of artificial reefs per year. This is a considerable flow of use value when it is compared to the cost of funding the artificial reef program. This will be considered in some detail when we finish all five of the counties under study.

TABLE 3.26

ESTIMATION OF RECREATIONAL SALTWATER

FISHING USE VALUE FOR ARTIFICIAL REEFS OF NORTHWEST FLORIDA

USING THE TURNBULL DISTRIBUTION

(1) Lower Bound Willingness for Pay	(2) Upper Bound For Interval	(3) Probability of Payment at Upper Bound	(4) Change in Density of Distribution	(5) Sample Size	(6) to (Use Value) (1)*(4)
					$
$0	$1	.771	.229	0	70
$1	$5	.657	.115	$.115	64
$5	$10	.586	.070	$.350	58

$10	$15	.545	.041	$.410	11
$15	$20	.547	-.002	-$.040	64
$20	$30	.410	.137	$4.110	39
$30	$50	.394	.016	$.800	33
$50	Infinity	0	.394	$19.700	N/A
		Total Use Value(Sum Column 5)		$25.445	

Source: Florida State University

Dichotomous Choice Application

The modeling approach followed here is one originally developed by Bishop and Heberlein (1979). There have been many applications using slightly different specifications of the model and Hanemann (1984) further developed the underlying economic theory behind various model specifications and the formulas for calculating consumer's surplus or compensating variation. Compensating variation is consumer's surplus adjusted for the income effects of price changes that would keep the consumer at the same level of total economic well-being as before the change in price. The answers to questions like the ones used in this study to measure the value of artificial reefs are assumed to yield estimates directly of compensating variation. The general form of the dichotomous choice is as follows:

$$Pr\ (YES) = \alpha - \beta BID * BID + \beta SE * SE + \mu$$

where, Pr (YES)= the probability that the user will be willing to pay the randomly assigned dollar amount (BID).

BID = randomly assigned dollar amounts.

βBID = estimated coefficient on BID.

SE = vector of other socioeconomic variables and/or natural resource attributes.

βSE = estimated coefficients for SE vector.

μ = error term following logistic distribution for logit model and normal distribution for the probit model.

The above model was estimated using both the logistic and normal distribution assumption about μ. The BID variable was included in its linear and logarithmic form (natural logarithm of BID called LBID here). In the SE vector, we include a variety of socioeconomic factors including household income, education level, age, years of experience boating in northwest Florida, race, and sex. Also, included were variables for differentiating charter, party, and private rental boat mode use from use of the own boat. Boat length was also entered as possible explanatory variable. A variable was also entered to indicate artificial reef use and, when fishermen and divers were combined, a variable was entered to differentiate divers from fishermen. Dummy variables were also entered for the counties to test for differences in values by county, holding all other factors constant. Table 3.27 includes the definitions of all the variables used in estimating the dichotomous choice models.

A total of eight models were estimated. The models differ by sample of users (e.g. all users versus fishermen only), by assumption about the distribution of the errors (e.g. the logit of probit model), and by specification of the bid amount (e.g. linear BID or log linear or natural logarithm of bid or LBID). We only present the results of the model we considered the “best” model. Other results are available from the authors on request. Of the variables in Table 3.27, MALE, WHITE, EXPER, AGE, AGESQ, DIVE, and all the county dummy variables were not statistically significant in any model specification. Unlike the results from the visitor model, several variables were significant in explaining the willingness to pay for artificial reefs. Household income (INC) was positive and significant meaning that higher income households were willing to pay more for artificial reefs. All the education dummy variable were positive and significant meaning that those with an education level of high school graduate and above were willing to pay more for artificial reefs than those who had not graduated high school. The coefficients first increase then decline with higher levels of education suggesting a parabolic relationship between education and willingness to pay for artificial reefs. College graduates and those with graduate degrees would be willing to pay slightly less than those that either graduated from high school or had some college or vocational training. Those that own larger boats are willing to pay more as are those that used artificial reefs. Those that belonged to fishing and diving clubs and those that used some form of rental boating were willing to pay less.

The results across the eight models were not significantly different and ranged from $29.23 to $31.57 with an average across the eight models of $30.74. The results presented in Table 2.28 are representative of the eight models and produces a value of $30.58 which is not significantly different from the average across all eight models.

The value derived from the dichotomous choice model is slightly higher than that obtained using the same information and employing the Turnbull method $25.45 versus $30.58 or about 20 percent higher. The lowest value obtained from the dichotomous choice model is about 15 percent higher than that obtained using the Turnbull method ($29.23 versus $25.45). To derive an estimate of the willingness to pay per day, as with the Turnbull estimate above we divide the annual value per person by 6.21 days yielding an estimate of WTP/day of $4.92 ($30.58/6.21). And, our estimate of total annual value of artificial reef use in Bay County using the dichotomous choice method is $583,772 ($4.92 * 118,653 days of use).

TABLE 3.27

DEFINITIONS OF VARIABLES

USED IN DICHOTOMOUS CHOICE MODELS

FOR RESIDENTS OF NORTHWEST FLORIDA

Variable	Definition
FWP	Dependent Variable, 1=YES 0=NO, for willingness to pay randomly assigned dollar amount. Fishermen only.
WPALL	Dependent Variable, 1=YES 0=NO, for willingness to pay randomly assigned dollar amount. Fishermen and divers combined.
FBID	Randomly assigned dollar amount or bid for fishermen only. Dollar amounts $1, $5, $10, $15, $20, $30, and $50.
LFBID	Natural logarithm of FBID.
BIDALL	Randomly assigned dollar amount or bid for fishermen and divers combined. Dollar amounts $1, $5, $10, $15, $20, $30, and $50.
LBIDALL	Natural logarithm of BIDALL.
AGE	Age of respondent in years.
AGESQ	Age of respondent squared.
INC	Household Income of respondent in thousands of dollars.
EXPER	Years of boating experience in northwest Florida.
BOATLEN	Length of boat owned measured in feet.

SHS	Dummy variable for education level.	Some High School.
HSGRAD	Dummy variable for education level.	High School Graduate.

TABLE 3.27 (CONTINUED)

Variable	Definition
SCOLLEGE	Dummy variable for education level. Some College or vocational training.
COLLGRAD	Dummy variable for education level. College Graduate.
GRADPROF	Dummy variable for education level. Graduate degree of Professional degree.
RENTAL	Dummy variable for use of charter, party or rental boat services.
REEF	Dummy variable for use of artificial reefs.
CLUB	Dummy variable for membership in fishing or diving club.
DIVE	Dummy variable for diving in northwest Florida.
MALE	Dummy variable for gender of respondent. 1=Male 0=female.
WHITE	Dummy variable for race/ethnicity. 1=White 0=all others.
BAY	Dummy variable for county of residence. 1=Bay County.
WALTON	Dummy variable for county of residence. 1=Walton County.
OKA	Dummy variable for county of residence. 1=Okaloosa County.
ESCAM	Dummy variable for county of residence. 1=Escambia County.
SANTA	Dummy variable for county of residence. 1=Santa Rosa County.

TABLE 3.28

RESULTS OF ESTIMATION OF DICHOTOMOUS CHOICE MODEL

Variable (X)	Coefficient(β)	Standard Error (β)	T-value (β)	Prob. T-value	Mean of X
Constant	-1.734013395	.80216741	-2.162	.0306	
LBIDALL	-.2934505106	.06741002	-4.353	.0000	2.1360793
INC	.0105656069	.00392190	2.694	.0071	59.409722
BOATLEN	.0287826639	.01629651	1.766	.0774	21.736111
HSGRAD	1.295912551	.65786491	1.970	.0489	.17708333
SCOLLEGE	1.333626579	.63790874	2.091	.0366	.41666667
COLLGRAD	1.306813660	.64188700	2.036	.0418	.28125000
GRADPROF	1.268269984	.67117464	1.890	.0588	.10763889
RENTAL	-.8063524979	.32159810	-2.507	.0122	.06597222
REEF	.4114559423	.18719732	2.198	.0280	.73611111
CLUB	-.5066315361	.26390973	-1.920	.0549	.10763889

N=288
Chi-Squared 51.816
Degrees of freedom 10
Chi-squared Significance .0000
Percent Correct Predictions 71.18
Mean of Dependent Variable WPALL=.6284
Estimated Consumer's Surplus=$30.58* (Annual per person)

* Of the eight models estimated, the range of estimated consumer's surpluses was from $29.23 to $31.57 with a mean across

all eight models of $30.74.

DEMOGRAPHIC AND BOATING CHARACTERISTICS

OF RESIDENT FISHERS AND DIVERS

Table 3.29 shows the demographic and boating characteristics of resident fishers and divers from the Okaloosa County sample of boat owners. The typical respondent was a 50 year old white male with some college as an educational level and having a family income of about $55,000 per year. The demographic profile for all boaters was almost identical to the sub-sample of artificial reef users. There was no statistical difference between the demographic characteristics of general boaters and those using artificial reefs. A comparison of residents to visitors reveals somewhat of a contrast. Visitors tend to be much younger with a higher family income. See Table 3.7. Thus, the two markets for the two products-fishing and diving - is segmented into residents who are older and most probably living on pensions in comparison to visitors that a much younger and more affluent. This pattern is not unusual for many coastal communities. It does give us a contrast in terms of the constituency for artificial reefs. That is, when visitors are combined with residents, it would appear that artificial reefs are used by a broad spectrum of socioeconomic groups.

With respect to boater profile, the average pleasure craft size in the sample was 23 feet which is slightly larger than the average for the population of registered boats in Okaloosa County which was a little over 18 feet. Boaters in the Florida Panhandle have been boating, on average, for 16 years. This is attributable to their age and, of course, their living in a coastal community. Of significance, 21.2% of the boat owners were members of some kind of boater’s club. The targeted species for fishers were very similar as that for visitors to Okaloosa County in the snappers, groupers, and mackerels are well represented. As expected, if one fished for those species that “just come along”, then the kind of species is much more diverse ranging from Bonita to catfish. The daily party catch rates were 7.86 and 3.53 fishing for targeted and non-targeted species respectively. The catch rates were somewhat higher for residents than visitors which is to be expected based upon the difference in experience in fishing of Okaloosa County (16 vs. 9.5 years). About 45% of the residents said they used artificial reefs over the last twelve months; however, the fishing days spent on artificial reefs was about 36% of total days as indicated in our discussion above. Residents choose to use about 3 different artificial reefs in a 12 month period and, apparently, they are mostly off Okaloosa County indicating a “stay at home preference”. Residents fished on artificial reefs that are about 12-13 miles from shore. Visitors using charter boats were apparently taken about the same distance

offshore for fishing on artificial reefs (i.e., 15 miles).

TABLE 3.29

DEMOGRAPHIC AND BOATING CHARACTERISTICS OF

OF RESIDENT BOATERS IN OKALOOSA COUNTY, FLORIDA

DEMOGRAPHICS:	AVERAGE/OTHER
1. Age	50 Years
2. %Male	86.7%
3. %White	99.0%
4. Family Income	$55,000
5. Education	Some College
BOATING PROFILE:	
1. Average Length of Boat Owned	23 Feet
2. Years Boating in Florida Panhandle	16 Years
3. Percent Members of Boating Club	21.2%
4. Targeted Species:	1. Grouper
	2. Kingfish
	3. Red Snapper
	4. Red Fish
	5. Sea Trout
5. Catch/Party/Day: Targeted Species	7.86 Fish
6. Species That Just Come Along	1. Bonita
	2. Catfish
	3. Wahoo
	4. King Fish
	5. Snappers
7. Catch/Party/Day: Non-Targeted Species	3.53 Fish
8. Percent of Sampled Resident Boater Using Artificial Reefs	45.3%
9. Number of Different Artificial Reefs Used Per Year by Those Using Them	2.72
10. Principal Artificial Reef Used During Year is Off Okaloosa County(% of Users)	80%
11. Average Distance of Artificial Reef Used from Shore	12.29 Miles
12. Principal Fishing Method Used on Artificial Reef	Bottom Fishing

Source: Florida State University

SUMMARY AND CONCLUSIONS

ECONOMIC IMPACT OF ARTIFICIAL REEF VISITORS:

1. Over the last 12 months(l997-98), it was estimated that slightly over 4.1 million person-visits were made to Okaloosa County for various forms of recreation and business;

2. The visitors to Okaloosa County pumped over $1.5 billion dollars in spending directly into the local economy supporting nearly 29,900 full and part-time employees and generating nearly $343 million dollars in wages. Visitors were directly responsible for nearly 15% of all wages paid in Okaloosa County and a whopping 30 percent of full and part-time employment in this county;

3. All visitors to Okaloosa County over the last 12 months(l997-98) spent about 19.7 million days in this county. The need for lodging; eating and shopping establishments while these visitor days were being spent generated the aggregate economic impact estimated above;

4. Of significance to this study, it was estimated that 8% of all visitor days or 1.6 million days were spent by visitors engaged in saltwater recreational boating off the Gulf Coast of Okaloosa County. The principal modes of boating chosen by visitors were the use of one’s own boat or the rental of a charter boat which accounted 96% of all boating days. Party or head boats or other kinds of non-captain rentals accounted for the other 4%;

5. Visitor boating accounted for over $162 million in spending which supported 3,054 full and part-time employees who received over $36 million in wages. Because boating visitors spend money on fishing supplies and charter rental fees in addition to motels and restaurants as a general visitor would, they tend to spend more money per party than the average visitor. Thus, even though boating visitors account for 8% of visitor days, they account for over 10.7% of all visitor spending in Okaloosa County. It also follows that boating visitors generated proportionately more direct employment and wages than the “average visitor” to this county;

6. One of the central thrusts of this study is to identify the economic impact of that segment of boating identified with fishing and diving so we could estimate the amount of visitor spending that is related to the existence of artificial reefs off

Okaloosa County. After adjusting for all other uses of boats(e.g., cruising; water skiing), we estimated that 72% and 2.5% of all saltwater boating days were spent for saltwater fishing and diving respectively. Of the total days estimated to be devoted to fishing and diving, about 57% were spent on artificial reefs principally off Okaloosa County. This led us to an estimate of the economic impact-related importance of artificial reefs for fishing and diving;

7. Over the last 12 month(l997-98), fishing and diving visitors using their own boat or some kind of rental boat(e.g., charter), spent over $116.2 million in Okaloosa County on those days they engaged in saltwater fishing and diving on or about artificial reef. This supports 2,278 employees who receive an estimated $27.16 million in wages. This is an artificial reef-related economic impact. The reader should not infer that if artificial reefs did not exist, that Okaloosa County would loose this economic impact. However, our further inquiry of artificial reef users would tend to support the hypothesis that this “recreational aid” is important to the recreational fishing and diving experience. This is discussed under “use value” below;

8. Boating visitors that use artificial reefs have a demographic profile of that of a white male who is about 41 years of age and has some college as an educational background with an annual family income of $92,000. The typical visitor has a relatively large pleasure craft(24 feet) and has been boating in the Florida Panhandle for a somewhat less than 10 years. Only one-half of the visitors say they use artificial reef, but those that do use them very intensively. About 92% of the artificial reef users that use Okaloosa County as a base use such reefs directly off the this county. On average, the visitor artificial reef users travel about 15.5 miles out into the Gulf of Mexico to use the public and private artificial reefs for saltwater fishing and diving;

9. Finally, we asked visitors to evaluate the existing artificial reefs off Okaloosa County. About 46% of the visitors felt that artificial reefs were too crowded while no one felt there were too many artificial reefs, indicating a possible need for additional artificial reefs. Only one in ten artificial reef visitors felt that they are too far from shore. Since a large segment of the visitor demand comes via charter boats, this may be, in part, a function of places the charter boat captains take them to optimize catch rates for fishers. Although only about one third of the visitors felt that artificial reefs were superior to natural reefs, about 89 percent the users did feel that artificial reefs increase the abundance of fish. As argued in the literature, artificial reefs may just redistribute or “collect” fish in one concentrated area rather than increase the fish population. If this is true, it is charged by some that

artificial reefs hasten overfishing. This is an area for important future research. Also, visitors felt that artificial reefs should be placed in less than 150 feet of water. In summary, it would appear that present visitors that use artificial reefs view them as a definite recreational aid as shown by both their evaluation and their willingness to pay for an expansion in this program which is discussed under “use value” below.

USE VALUE(WILLINGNESS TO PAY) OF ARTIFICIAL REEFS VISITORS:

1. Use value or the willingness to pay is defined as the nonmarket value of a resource that is not openly traded in an organized market. Quite simply, units or day usage of the resource such as a recreational fishery do not have a price for their use or daily rental. Public goods such as artificial reefs fall in the same category since all can use this recreational aid, but government does not place a direct charge on the usage of this resource. The reason the use value or what users would be willing to pay for use of the resource is important is that it is the true value of additional output in the economy that is not counted in Gross Domestic Product or simply the well known GDP. In this study, we used three indirect methods to measure the use value of the artificial reef in conjunction with fishing and diving: (l) the Turnbull Distribution;(2) the Dichotomous Choice Model and finally (3) the Travel Cost Approach. Each approach has general acceptance among economist as a reasonable approach to estimating use value;

2. Using the Turnbull Distribution, it was found that visitors were willing to pay $5.05 per day for recreational saltwater fishing on artificial reefs. On the other hand, the dichotomous choice method yielded $6.15 per day while the travel cost procedure produced a willingness to pay per day of $11.23 for visitors to Okaloosa County, Florida.

ECONOMIC IMPACT OF ARTIFICIAL REEF RESIDENTS:

1. We studied three classes of pleasure craft own by residents of Okaloosa County. These classes were boats under 16 feet, those between 16 and 39 feet, and those over 39 feet. Overall, there were 15,867 registered pleasure craft in the county in l998. In addition to those owning their on pleasure craft, it was estimated that 14% of the demand for charter, party and other kinds of rental boats in Okaloosa County was accounted for by local residents. Using owned and rental boats used by residents, it was estimated that that resident saltwater recreational fishermen spent $25.46 million which supported 370 full and part-time employees, earning $4.55 million in wages and salaries;

2. Although residents predominately use their own boat for saltwater recreational fishing, visitors have a higher use of all kinds of rentals(e.g., charter). Even so, we found that residents used about 36 percent of all party days spent on saltwater fishing off Okaloosa County and targeted artificial reefs as a place to engage in fishing which is somewhat lower than the 57% founds for visitors. It could be inferred that artificial reefs are a somewhat greater attraction for visitors than local residents. Thus, artificial reefs may be view as an attractant for visitors to Okaloosa County;

3. Diving days accounts for about 5.9% of the days spent saltwater fishing off Okaloosa County. When the expenditures on saltwater recreational fishing are increased by 5.9% and multiplied by .36 for those days spent fishing and diving on artificial reefs, we found that $9.7 million was spent by residents that were related to artificial reefs. These expenditures by divers and fishers generated $1.73 million in wages and salaries and supported 141 full and part-time employees;

4. Compared to visitors, the resident demographic profile was that of an older individual (50 years old) who has been fishing off the Florida Panhandle for 16 years compared to only a little over 10 years for the visitor to Okaloosa County. The resident boater is a white male with some college as an educational level and having a family income of $55,000 per year;

5. About one-third of the Okaloosa County residents felt that artificial reefs were too far from shore in evaluating artificial reefs. About 10% of the residents felt the artificial reefs were too crowded. The perception was much higher for visitors(45%). As with the visitors, only 1 in 10 felt there were too many artificial reefs. Residents and visitors share the same opinion about whether artificial reefs are more productive than natural reefs and that artificial reefs increase abundance of fish. That is, 30% of the residents supported the first proposition while 90% supported the second.

USE VALUE OF RESIDENTS:

1. The definition and explanation of use value was explained above under the visitor section;

2. Using the Turnbull Distribution, it was determined that resident willingness to pay or use value was $4.10 per day for fishers and divers using artificial reefs. This amounts to an annual total flow of recreational value for the residents of

Okaloosa County from the use of artificial reefs in conjunction with fishing and diving of $486,477. The Dichotomous Choice Model yielded a use value per day of $4.92 and this translates into a total annual value of $583,772.

3. In the only other study of artificial reefs, Milon(1988) found that resident users of artificial reefs off the coast of Miami, Florida were willing to pay $23.81; $26.07; and $35.07 using the contribution; referendum and bidding methods respectively expressed in l998 dollars. These values were all on an annual basis. Using the Turnbull Distribution, we found a willingness to pay per annum of $25.45 for artificial reef use off the Florida Panhandle, while the Dichotomous Choice model yielded a value of $30.58. These values would appear to be comparable to the values found by Milon in his earlier study.

COMBINED ECONOMIC IMPACT OF VISITORS AND RESIDENTS:

1. Table 3.30 shows the combined economic impact of visitors and residents that use artificial reefs off Okaloosa County, Florida. Ignoring indirect or multiplier effects by the visitors, those fishers and divers that used artificial reefs off this county, spent $125.94 million over the last 12 month. This spending generated 2,419 full and part-time jobs in Okaloosa County with a payroll of $28.89 million. By far, visitors played a greater role in the economic impact of artificial reef-related spending. That is, visitors accounted for 92.3% of the total spending impact, indicating how important boating visitors and especially fishers and divers that use artificial reefs are to the Okaloosa County economy. Visitors are economically more important because of two reasons: (l) there are more fishing and diving days made by visitors than local residents and (2) when visitors come to the county, they spend several time what residents spend per party day.

2. Relative to the entire economic activity in the county, those visitors and residents using artificial reefs account for 1.2% of all wages and salaries in the county and 2.39% of all full and part-time employment in this county. This may not seem overwhelming; however, no one firm in Okaloosa County would account for such an impact such as this. It certainly gives the reader some perspective on the targeted artificial reefs for recreational enjoyment by both visitors and residents alike. Again, we cannot say that if artificial reefs were removed or never were placed in the Gulf of Mexico that this economic impact would not have occurred. However, there is strong feeling among the users that artificial reefs are important recreational aids.

COMBINED USE VALUE OF VISITORS AND RESIDENTS:

1. Visitors and residents spent over 1 million recreational days on or about artificial reefs off Okaloosa County Florida. Using the Turnbull Distribution to estimate use value of artificial reefs as a recreational aid, we found that on a daily basis visitors were willing to pay $5.05 while residents were willing to pay only $4.10. One reason for this difference may be that the residents spend 50 percent more days per person per year than visitors which may produce the law of diminishing marginal utility. Weighted by days, the combined use value of visitors and residents was estimated at $4.95 per day. This produces an annual flow of about $5.05 million of use value for the artificial reefs off Okaloosa County. The Dichotomous Choice model yielded an estimate of $6.15 per person per day for visitors and $4.92 for residents with a weighted average of $6.01. This translates into a total annual value for the use of artificial reefs of $6.13 million. In the last Chapter of this report, we shall look into the asset value of the artificial reef system using the use value flow from each county relative to the cost of deploying the artificial reefs to get an idea of the benefit/cost ratio related to the artificial reef program managed by the State of Florida.

TABLE 3.30

COMBINED ECONOMIC IMPACT ON OKALOOSA COUNTY,

FLORIDA OF THOSE FISHERS AND DIVERS USING ARTIFICIAL REEFS

ECONOMIC VARIABLE	VISITORS1	RESIDENTS2	TOTAL
EXPENDITURES (MILLIONS)	$116.23	$ 9.71	$125.94
WAGES GENERATED (MILLIONS)	$27.16	$ 1.73	$28.89
FULL AND PART-TIME EMPLOYMENT	2,278	141	2,419
TOTAL COUNTY WAGES (MILLIONS)			$2,382
TOTAL COUNTY EMPLOYMENT			101,211

% ARTIFICIAL REEF RELATED DIRECT WAGES OF TOTAL WAGES IN THE COUNTY	1.2%
% ARTIFICIAL REEF RELATED DIRECT EMPLOYMET OF TOTAL EMPLOYMENT IN THE COUNTY	2.9%

1. Table 3.10
2. Table 3.23

TABLE 3.31

COMBINED RECREATONAL USE VALUE OF

VISITORS AND RESIDENTS FROM ARTIFICIAL REEFS

IN OKALOOSA COUNTY, FLORIDA

ECONOMIC MEASURE	VISITORS	RESIDENTS	TOTAL_
1. TOTAL USER DAYS ON ARTIFICIAL REEFS	902,200	118,653	1,020,853
2. ANNUAL VALUE PER PERSON			
a. Turnbull Method	$22.14	$25.45	$23.80*
b. Dichotomous Choice	$27.02	$30.58	$28.80*
c. Travel Cost	$49.30	N/A	N/A
3. VALUE PER PERSON/ RECREATIONAL DAY			
a. Turnbull Method	$5.05	$4.10	$4.95**
b. Dichotomous Choice	$6.15	$4.92	$6.01**
c. Travel Cost	$11.23	N/A	N/A
4. TOTAL ANNUAL USER VALUE FOR ALL USERS ($MIL)			
a. Turnbull Method	$4.56	$0.49	$5.05
b. Dichotomous Choice	$5.55	$0.58	$6.13
c. Travel cost	$10.13	N/A	N/A

*Simple arithmetic average of visitors and residents;
** Weighted arithmetic average of visitors and residents.

CHAPTER 4

ECONOMIC IMPACT AND IMPORTANCE OF ARTIFICIAL REEFS IN SANTA ROSA COUNTY, FLORIDA

INTRODUCTION

The purpose of this chapter is to show how we estimated both the market economic impact (e.g., sales, income, employment) and the non-market economic use value (i.e. consumer's surplus or the amount visitors or residents are willing to pay over and above the amount they actually spend) of visitors and residents of Santa Rosa County, Florida. We estimate the market economic impacts for all visitors, boating visitors and boating residents, and, most importantly, for visitors and residents that used artificial reefs for fishing and diving. Also, we estimate the non-market economic use value of boating visitors and residents that fished and dived and the portion of this value attributable to artificial reefs. These values are used later in the report to conduct a rough benefit-cost analysis of the artificial reef program in northwest Florida.

In this chapter, we will first address the visitor population, then we will address the resident population of Santa Rosa, County. We explain the economic concepts and our methods of estimation.

BACKGROUND

Santa Rosa County is located to the west of Okaloosa County discussed above. This county contains 1,016 square miles of land ranking it 16th among the 67 counties in Florida. In 1990, Santa Rosa County had a resident population of 81,608 individuals. Of note, Santa Rosa County has a relatively low median age of 32.5 years compared to the Florida-wide median of 36.5 years.

The economic base of Santa Rosa County is to be found in five industries. These are manufacturing; the military; Federal civilian employment; tourism and the county's function as a bedroom community for Escambia County just to the west of Santa Rosa County according to Bell(l996). Thus, visitors to the county are very important to the economic base. Santa Rosa County has 17 individual saltwater beaches which are 9.5 miles

in length. There are four marina on the shores of the Gulf of Mexico that also
attract visitors. The tourist sector, as the other sectors that make up the economic base are also called basic industries.

Quantification of these "basic industries" is generally not difficult except for the tourism or visitation sector. The main reason for this is that the sector cuts across the two broad categories of retailing and services. That is, visitors spend money on a great variety of products and services. Such items are not designated as specific industries in the collection of data by the Federal and State governments. So, specific studies are necessary to quantify the economic importance of the visitor sector which is a collection of industries.

PART 1

VISITORS TO SANTA ROSA COUNTY

METHODOLOGY

The model that was used to estimate visitation to a local area is called the "CAPACITY UTILIZATION MODEL". This model has been widely used throughout Florida in such counties as Monroe; Orange; Osceola; Seminole; Hillsborough and Leon. In the latter two counties, two of the authors of this report (Dr. Bell and Dr. Bonn) are currently engaged in continuing work on the quarterly and annual estimation of the number of visitors; spending; wages and employment generated and developing indices of how visitors view the amenities of these counties.

Although rather simple in concept, the "CAPACITY UTILIZATION MODEL" is complex to implement because of the number of variables to consider. This model is based upon where visitors to an area stay and that is the hotel and motel industry in the region. We call this an accommodation mode. Certainly, visitors may spend their nights with friends and relatives; in campgrounds; in condominiums or just come for the day (i.e., day visitors). The simplified "CAPACITY UTILIZATION MODEL" divides the visitor sector into those staying in hotels and motels and those staying in all other modes. If required, the residual sector can be broken down into its components, but this is at additional expense and is usually requested by special interests(e.g., condominium owners want to know how many visitors use condominiums, etc.). Thus, the capacity of the

hotel/motel industry in the local area gives us the ability to extrapolate the sample to the population. That is, if we know the number of rooms occupied per night, we can derive the number of individuals
using hotels and motels merely by multiplying by the size of the party using a room. Data on the number of rooms and occupancy rates are obtained from Smith Travel, Inc. on a subscription basis. As demand for visitations to the local area increases, the number of hotel rooms should expand and with it our estimate of the number of visitors. The residual or all other accommodation modes sector is linked to the hotel/motel sector by the percent of the randomly sampled number of visitors that stayed in something other than a motel/hotel. This description will become clearer once we show the results for each of the counties discussed above. To show how we obtain the number of visitors using hotels and models, the following expression may be helpful:

$$HMV = k*R*p*SP/LS \quad \text{where}$$

HMV= number of person-visits using hotel/motel accommodations;
k = hotel/motel occupancy rate;
R = number of hotel and motel rooms in the county;
p = period of estimation in days (e.g., l month=30 days);
SP = size of party staying in hotel/motel room;
LS = length of stay in hotel/motel room (e.g., number of nights).

The right hand side of the above expression can be broken-down into quite meaningful concepts. First, we must multiply the occupancy rate (k) times the number of available rooms (R) in the area. The available rooms are obtained by an inventory of all hotels and motels in the area. This yields the number of rooms actually used by visitors per night. Next, the length of the period is important since it specifies how many rooms nights were used in a month; quarter or yearly. In practice, p=90 since we are dealing with quarter-by-quarter analyses. As mentioned above, we must multiply by (SP) or the size of the party to count all visitors occupying the hotel/motel room per night. This will, of course, vary from night to night, but we use an average over the period of analysis. Finally, the first four terms in the above expression will yield the number of hotel/motel occupants (person-days of occupancy) for any period of time, but to obtain HMV we must divide by the length of stay

or (LS). This is not obvious, but can be explained by an example.

Assume one person attends a research seminar lasting 30 days and occupies one motel room each night. Then, we would have one person-visit per month. But, if we run two 15-day research seminars where there is a different class every 15 days, then the motel room turns over once a month. Now, two person-visits would accrue to the motel room since two individuals would occupy the room in the thirty day period. Thus, as the (LS) decreases (e.g., from 30 to 15 days in the above example), the number of person-visits increases. This is the rationale for the length of stay in the above expression.

In all the counties in the Florida Panhandle mentioned above, there is both a seasonality and trend in visitation. This is expressed by the occupancy rate. As occupancy rates decline (i.e., off-season), the number of hotel/motel rooms being used declines, thus illustrating the fall in demand via person-visits or HMV. This can be studied over the four quarters of the year as to its impact on visitor spending; generation of wages and employment and how the local economy adjusts to this pattern.

This is but a brief illustration of the principal sector of the CAPACITY UTILIZATION MODEL. The other or residual sector is obtained by ascertaining what percent of total visitor use is accounted for by the hotels/motel accommodation mode. This percentage is obtained by a random sample of visitors to the area.

SAMPLE SURVEY

During the spring and early summer of l998, face-to-face interviews were conducted at hotels, beaches and other places frequented by visitors. A total of 125 visitors were interviewed during this period. The survey instrument was designed to obtain spending amounts and other economic profile data. In addition, respondents were asked about the extent of boating while in Santa Rosa County. This is the data base upon which the next two sections depend for the estimation of the CAPACITY UTILIZATION MODEL discussed above.

It is estimated that over the last 12 months or approximately June 1997 to May l998, there were 1,047,069 person visits to Santa Rosa County using the CAPACITY UTILIZATION

MODEL. These calculations of visitor estimates are shown in Table 4.1. About one third of the visitors used hotels and models as their accommodation mode. Santa Rosa County has more visitors than Walton County (Chapter 2), but fewer visitors than Bay (Chapter 1); Okaloosa (Chapter 3) and Escambia(Chapter 5) Counties
in the study area.

Table 4.2 displays an estimation of the spending of the over l million visitors to Santa Rosa County over a 12 month period. Visitors injected slightly over $300 million into the Santa Rosa County over the last 12 months. Users of hotels and motels accounted for about 29% of the total spending with the larger component of spending scattered among those staying in condos; campgrounds; with friends and day visitors as is shown in Table 4.2.

TABLE 4.1

SANTA ROSA COUNTY VISITOR ESTIMATES
1997-98
(12 MONTHS)

ESTIMATION OF HOTEL/MOTEL VISITORS TO AREA(HMV)

(1) HMV = (k*R*p*SP)/LS = (.594*1,462*365*4.07)/3.71

= 348,674

where,

HMV = estimated number of visitors using hotels/motels;
k = occupancy rate over the year;
R = average number of rooms during the year;
SP = average size of party for those using H/M yearly;
LS = average length of stay for those using H/M yearly.

ESTIMATION OF TOTAL VISITORS TO AREA(TV)

(2) HMV = g*TV

where,

g = percent of total visitors to area using H/M;
TV = total visitors to the area or those staying in hotels and motels plus those staying elsewhere or day visitors.

Expressing (2) to solve for total visitors(TV), we have

(3) TV = HMV/g = 349,674 / .333

= 1,047,069

SUMMARY:

VISITORS USING HOTELS AND MOTELS(HMV):	348,674
OTHER VISITORS(FRIENDS/RELATIVES; CAMPING; CONDOS DAY VISITORS OR 1,047,069 LESS 348,674):	698,395

TOTAL VISITORS	1,047,069

TABLE 4.2

ESTIMATION OF TOTAL SPENDING BY

VISITORS TO SANTA ROSA COUNTY, FLORIDA

1997-98
(12 MONTHS)

ESTIMATION OF TOTAL HOTEL/MOTEL VISITOR SPENDING(TVSHM)

(1) $TVSHM = (HMV*LS)*($EPPD/SP) = (348,674*3.71)*($270.15/4.07)

= $85,862,580

where,

$TVSHM = total visitor spending staying in H/M;
HMV = number of H/M visitors from Table 10;
$EPPD = expenditures per party day for H/M visitors;
SP = size of party for H/M visitors;
LS = length of stay for H/M visitors;

ESTIMATION OF ALL OTHER VISITOR SPENDING(TVSOV)

(2) $TVSOV = (OV*LS)*($EPPD/SP) = (698,395*5.0)*($3.30/5.3)

= $217,793,800

TOTAL SPENDING IN AREA(TVS)

(3) $TVS = $TVSHM + $TVSOV

= $85,862,580 + $217,793,800

= $303,656,400

SUMMARY:

TOTAL VISITOR SPENDING BY H/M USERS:
$85,862,580

TOTAL VISITOR SPENDING BY OTHER USERS:
$217,793,800

GRAND TOTAL OF VISITOR SPENDING:
$303,656,400

GENERATION OF WAGES AND EMPLOYMENT

The visitor spending in Santa Rosa County is over $300 million has the two economic impacts which were discussed above with the other counties. First, the spending generates wages and employment for visitor-related industries. Second, there is an important multiplier effect associated with the creation of direct jobs in the local area.

Let us consider an estimate of the total direct wages and employment generated by visitors to the Escambia County area. Beneath the total category of expenditures by visitors, we have ten separate purchase categories ranging from lodging to local shopping. Each category can be matched to published data on sales; wages and employment. The most detailed breakdown of these categories can be obtained from the l992 Censuses of Retail Trade and Service Industries and updated to l997-98. Two important statistics emerge. They are the sales-to-employment
ratio and the percent wages are of sales. These can be designed as S/E and %W respectively. They will vary by category since some industries are more labor intensive than others. For example, a gasoline station has a high S/E since it is not very labor intensive(i.e., fully automated if just selling gas with credit cards) while a restaurant has a lower S/E ratio since each party needs the attention of a waitress. To obtain the estimated employment and wages, the following procedure was

followed with the total spending broken into 10 categories or industries:

Employment = Spending in i'th industry /(S/E for i'th industry)

For example, if $150 million were spent on lodging and the sales-
to-employment ratio for lodging was $50,000, we would estimate that 3,000 jobs would be sustained in this industry (i.e.,$150 million divided by $50,000). Further, assume that of the $150 million spent, 25% is required for wages or $37.5 million. Although all these calculations are not shown here, they are available from the authors upon request.

Table 4.3 shows the estimated wages and employment generated by visitors to Santa Rosa County. Of all the counties reviewed so far, Santa Rosa's economic base is less dominated by visitors than in Bay, Okaloosa or Walton Counties, but more dominated by visitors than Escambia County. Less than 10% of the salaries and wages in the county are directly generated by those industries serving visitors. As pointed out in the introduction to this county, Eglin Air Force Base and those living in Santa Rosa County and working in Escambia(bedroom community effect) occupy a large percent of the economic base of this county. However, because of the low wage industries serving the visitor sector and the disproportionate number of part-time jobs in this sector, it is now surprising and is consistent with other counties analyzed in this report that visitor-related employment is nearly 20% of all full and part-time jobs in the community.

Santa Rosa County is still a relatively small economy that would have a relatively low multiplier effect from injections of spending by visitors. We estimate that the wage multiplier is about 1.2, yielding an indirect effect of the creation of wages by visitors of about $13 million dollars for a combined effect of a little over *$80 million dollars in direct and indirect wages or l0.8 percent of all wages in the community*. Because of the low wage industries catering to visitors, the multiplier effect is probably less for employment. We would estimate that the employment multiplier for Santa Rosa County is about the same as Walton County or about 1.05. This would add about 330 indirect jobs to the jobs directly serving visitors. Thus, *about 1 in 5 jobs in Santa Rosa County is directly tied to visitors.* This would seem in line with what is known about the Santa Rosa economy.

TABLE 4.3

ESTIMATED DIRECT WAGE AND EMPLOYMENT
GENERATED BY VISITORS TO SANTA ROSA COUNTY
COMPARED TO TOTAL WAGES AND EMPLOYMENT
OVER THE LAST 12 MONTHS
(1997-98)

	VISITOR GENERATED AMOUNT (MIL$)	TOTAL FOR AREA (MIL$)	VISITOR PERCENT OF TOTAL
WAGES AND SALARIES	$66.84	$745.89*	9.0%
FULL AND PART-TIME EMPLOYMENT	6,575	33,652*	19.5%

* 1995 salaries and wages taken from the U.S. Bureau of Economic Research and adjusted upward for projected employment growth of 1.4% annually or 4.2% plus a rise in inflation of 6.7 percent over the l995-l998 period or 10.9% from University of Florida, Bureau of Economic and Business Research and the Presidents Economic Report, 1998.

**l995 employment from U.S. Bureau of Economic Research adjusted for job growth of 1.4% taken from University of Florida, Bureau of Economic and Business Research for a total percent increase of 4.2.

BOATING VISITORS

METHODOLOGY

As part of the sample survey of all visitors, we asked respondents about their participation in recreational boating during the last 12 months. The total visitors are an umbrella under which many activities are included including boating. Therefore, to go from general visitor days to days spent boating the following expression was employed:

$$(N*LS*TPY)/YRS = TVD$$

where, N= sample size;
LS= length of stay per trip;
TPY= trips per year to the area;
YRS= number of years (data was obtained for two years)
TVD= total visitor days.

From the data obtained in the sample survey of all visitors, we calculated the following:

$$(84*6*3.65)/2 = 920 \text{ visitor days from the sample.}$$

The respondents in the sample spend approximately 920 days per year in Santa Rosa County. They also told us that they spend 55 boater days over the last 12 months. Therefore, we estimated that
nearly 6% of all visitor days were spent boating annually. As an approximation, we shall use 6% as the way to go from general visitation to boater visitation measured in terms of days.

SAMPLE SURVEY

In the summer of l998,a second sample survey was conducted of just boating visitors to Escambia and Santa Rosa County. This survey linked the first survey of all visitors to just those engaged in some kind of boating. 133 boating visitors were interviewed to gather information regarding their mode of boating, expenditures in Santa Rosa County while boating, and most importantly their use and evaluation of artificial reefs. The sample survey instrument is shown in Appendix 2. The survey was taken at such boating sites as boat ramps and marinas. Thus, the following analysis is based upon the second critical survey made in this study.

NUMBER OF VISITORS; VISITOR SPENDING AND WAGES AND EMPLOYMENT IMPACT OF BOATING VISITORS

Using the information from Tables 4.1 and 4.2, we calculated the total number of visitor days spent by all visitors
using the following expression:

TVD = HMV*LSHM + OV*LSOV

where, TVD = total days for visitors to Bay County;
HMV = person-visits using hotel/motel;
LSHM = average length of stay for those using H/M;
OV = all other person-visits;
LSOV = average length of stay for all other modes of accommodations.

Inserting the necessary information from Tables 4.1 and 4.2, we have the following:

4.6717 Million = 348,674*3.71 + 698,395*4.83

Therefore, we have estimated that all visitors to Santa Rosa County spent over 4.67 million days over the last 12 months. About 6% of these days were devoted to boating. Thus, aggregate boating days are 0.2803 million over the last 12 months.

Using the sample distribution of days by mode of fishing, we have the following distribution:

Boating Mode	Estimated Number of Days in Last 12 Months
1.Own Boat	0.1334 Million Days (47.6%)
2.Charter Boat	0.1082 Million Days (38.6%)
3.Partyboat	0.0334 Million Days (11.9%)
4.Private Rental/No Guide	0.0182 Million Days (1.9%)

From the above, it can be concluded that boating visitors to Santa Rosa County are almost evenly split between use of their own boats and some rental boat mode. About 39% of the boating visitors prefer the charter boat mode and an additional 11.9% prefer the party boat mode. This pattern varied from county to county depending on cost, distance, and the socioeconomic characteristics of the boating visitors.

As discussed above, each boating mode will involve somewhat different kinds of expenditures (e.g., no rental fee for own boat trailered to Bay County) and the magnitude of the expenditures per party per day. This is one reason for breaking the boating modes down into four classifications. Therefore, we can compute the total expenditures on each mode by boating visitors using the following expression and "own boat" as an illustration:

$$TEO = TBDO * (\$EPPDO/SPO)$$

where, TEO = total expenditures in Bay County by those those using their own boat;

TBDO = total boating days by those using their own boat;
$EPPDO = total expenditures per party/day for those using their own boat;
SPO = size of party

The rationale for the above expression is fairly straight forward. The second term is total party expenditures per day divided by the size of the party. This yields expenditures per day per person. When multiplied by total person-days, this yields an estimate of total expenditures for those visitors using their own boat. This expression can be used for the other three boating modes to derive total spending in each mode. The spending is on many goods and services in Santa Rosa County that either directly or indirectly facilitate the use of a boating mode. For example, those that come for a charter boat experience, spend money on hotels, eating and drinking places, and, of course, the charter boat rental, for example. All are charter boat related since this is the main purpose of the visit to Santa Rosa County. Table 4.4 shows the average spending per party per day (EPPD) and party size (SP) by both boating mode and type of activity.

TABLE 4.4

ESTIMATED AVARAGE SPENDING PER PARTY
PER DAY AND PARTY SIZE FOR BOATERS
BY BOATING MODE AND ACTIVITY
SANTA ROSA COUNTY, FLORIDA

BOATING MODE	AVERAGE SPENDING PER PARTY PER DAY EPPD($)	AVERAGE PARTY SIZE
OWN BOAT		
FISHING	$321.97	4.24
DIVING	$301.25	3.40
CHARTER BOAT		
FISHING	$756.48	4.72
DIVING[1]	$309.53	4.75
PARTY BOAT		
FISHING	$351.54	3.24
PRIVATE RENTAL		
FISHING	$529.19	3.67

1. For Diving, expenditures are for all rental (e.g. Charter, Party, and Private Rental).

Table 4.5 shows the results of our expenditure calculations.
Boating visitors to Santa Rosa County spend a little over $27 million on the four boating modes. The charter boat mode is the largest with total expenditures of over $14.67 million. As with all visitor spending, we also calculated the related wages and employment. This was done in the same way as described in the section on all visitors discussed above. Visitor boating-related expenditures generated a total of over $6.26 million in wages which supports 584 employees.

TABLE 4.5

ESTIMATION OF SPENDING BY BOATING VISITORS

CLASSIFIED BY BOATING MODE IN SANTA ROSA COUNTY, FLORIDA

BOATING MODE	TOTAL EXPENDITURES (MILLION$)[1]	RELATED WAGES (MILLION$)[2]	RELATED EMPLOYMENT (FULL and PARTIME)[3]

1. OWN BOAT	$8.78	$1.29	149
2. CHARTER BOAT	$14.67	$3.97	341
3. PARTYBOAT	$2.96	$0.83	76
4. PRIVATE RENTAL	$0.98	$0.17	18
TOTAL	$27.40	$6.26	584

1. See Table 4.6 for TBD by boating mode and Table 4.4 for the average expenditures and party size by mode.

2. Wages are obtained by multiplying percent wages by each expenditure items contained in the boating survey instrument. Percent wages were obtained from the U.S. Census of Retailing and Services and updated to l998. See Appendix 2 for boating survey instrument.

3. Employment was derived by dividing total spending by the sales to employment ration(S/E) for each spending category in the boating survey instrument. The S/E ratio was obtained as the same source as given in footnote 2. See Appendix 2 for the boating survey instrument.

In addition to spending, wages, and employment, it is important to know how many person-visits were made to Santa Rosa County for the purpose of boating. This figure can be estimated by the following expression:

$$V = TBD/LS$$

where, V= person visits;
TBD= total boating days;
SP= size of the party.

The logic of the expression is that TBD are generated by all visitors to the county. Each visitor may stay for a particular number of days. To get the person-visits, this expression must be divided by the average length of stay. This yields an estimate of the total person-visits. We can apply this formula to each boating mode and thereby breakdown the person-visits

by visitation by kind of boating. This is shown in Table 4.6

TABLE 4.6

ESTIMATION OF PERSON-VISITS
BY BOATING MODE FOR SANTA ROSA COUNTY

BOATING MODE	BOATING DAYS (MILLIONS)	LENGTH OF STAY (DAYS)	PERSON-VISITS (MILLIONS)
1. Own Boat	0.1334	5.13	.0260
2. Charter Boat	0.1082	4.50	.0240
3. Party boat	0.0334	5.45	.0061
4. Private Rental	0.0053	5.00	.0011
Total	0.2803		.0572

From Table 4.1, there were over 1 million person-visits to Santa Rosa County. Of these visitors, it is estimated that 57,200 were boating visitors over the last 12 months or about 5.5 percent of the total visitors. Notice that this percent corresponds closely with our estimate of 6% for the number of boating days as a percent of total days spent by the sample of visitors discussed above.

Table 4.7 shows the demographic and boating characteristics of boating visitors surveyed in our second and most extensive survey. Boating visitors were relatively young and affluent. They were overwhelmingly white males. Bottom fish were caught along with some pelagic fish. About one-third of the visitors said they used artificial reefs. However, this is not the same thing as the percent of total boating days that were spent on artificial reefs. This leads us to the central thrust of this study and that is visitors(and residents) using artificial reefs.

TABLE 4.7

DEMOGRAPHIC AND BOATING CHARACTERISTICS OF

BOATING VISITORS IN SANTA ROSA COUNTY

DEMOGRAPHICS	AVERAGE/OTHER
1. Age	38 years
2. % Males	88.5%
3. % White	96.9
4. Family Income	$80,000
5. Education	College Graduate
BOATING PROFILE	
1. Average Length of Boat(If owned)	22.9 feet
2. Years Boating in Florida Panhandle	5.9 years
3. Percent Owned Boat	22.9%
4. Percent Member of Boating Club	9.9%
5. Targeted Species	1.Red Snapper 2.King Mackerel 3.Grouper 4.RedFish 5.Dolphin Fish
6. Catch/Party/Day: Targeted Species	13.94 Fish
7. Species That Just Came Along	1.Catfish
8.Catch/Party/Day:Non-Targeted Species	5.72 Fish
9.Percent of Visitors Using Artificial Reefs	42.0%
10. Number of Different Artificial Reefs Used Per Year by Those Using Them	3.24
ll. Principal Artificial Reef Used in a Year Is Off Santa Rosa County	97.4%
12. Average Distance of Artificial Reef Used from Shore	17.4 Miles
13. Principal Fishing Method Used on Artificial Reefs	Bottom Fishing

Source: Sample Survey of Boating Visitors to Santa Rosa County

VISITORS USING ARTIFICIAL REEFS

METHODOLOGY

Up to this point, two sample surveys were utilized in this study. The first concentrated on the general visitor to Santa Rosa County and also the extent to which the respondent engaged in boating over the last 12 months. A recreational boating experience embraces many activities such as cruising; water skiing; rafting-up; racing; wildlife observation and, of course, fishing and diving. The latter activities are done from a boat and may or may not involve an artificial reef. Therefore, we can illustrate in the following manner:

Days Boating = {Fishing + Other Activities} + {Diving + Other Activities}

In the second survey of boating visitors, we focused on just fishing and diving which may or may not be performed in conjunction with an artificial reef. In Santa Rosa County, we found that of the total days spent either fishing and/or diving, that 90% were spent fishing and the balance were spent diving over the last 12 months according to the visiting boaters using their own boat. These proportions vary with fishing and diving modes. Since our estimate of total boating days includes Other Activities, we must make some adjustment to our findings for Santa Rosa County. In retrospect, we should have asked about these other activities so we could put fishing and diving in better perspective. This should be done in further studies of artificial reefs. However, we did make some adjustment for Other Activities by using probabilities from Bell(1995). We used the following expressions:

Days Fishing = Pr(DF)* Days Allocated to Fishing

Days Diving = Pr(DD)* Days Allocated to Diving

We first allocated total days on the basis of the fishing and diving proportions. Then, we asked the question as to the probability that the days allocated to fishing will, in effect, be used for fishing. Thus, Pr(DF)= probability that a day allocated to fishing will be used for fishing where "DF"

is days fished. Similarly, Pr(DD) is the probability that a day allocated to diving will actually be used for diving where "DD" is days diving. Bell(l995) has indicated the following values for these two probabilities:

$$Pr(DF) = .80 \text{ and } Pr(DD) = .25$$

Therefore, if there are 100 general boating days, 90 will be allocated to potential fishing and 10 to potential diving based upon our second survey or the boating visitor survey. Of the 90 days allocated to potential fishing, we estimate that 72(.8*90) will actually be used for fishing. In the case of diving, the 10 days will be deflated on the basis of the probability to 2.5(.25*10). Therefore, our best estimate is that the 100 generic boating days are spent in the following manner: Fishing: 72 days; Diving: 2.5 days; Other Activities: 25.5 days. This methodology was used to allocate the total days among the three categories. Thus, those that think that fishing and diving occupy most or all of the time of the total boating days of visitors to Santa Rosa County will feel that we have underestimated the economic impact of artificial reefs. Alternatively, we can say that our estimates that follow are conservative or at least made an allowance for the "Other Activities Effect". Finally, the total fishing and diving days proportion vary by fishing mode as shown in Table 4.8.

TABLE 4.8

ALLOCATION OF BOATING DAYS BY MODE AND ACTIVITY FOR SANTA ROSA COUNTY,FLORIDA

Boating Mode	Fishing %F(%T)	Diving %D(%T)
Own Boat	90%(80%)	10%(25%)
Charter	83%(100%)	17%(25%)
Party Boat	100%(100%)	0%(0%)
Private Rental	90%(80%)	10%(25%)

As expected, most of the boating days that were fishing and/or diving were found to be used for recreational fishing.

This leads us to the estimated percentage of total days that are obtained from the sample survey for just fishing and diving that are spent on artificial reefs. We asked responds to allocate days boating by fishing and diving on or about artificial reefs. These proportions are shown in Table 4.9.

TABLE 4.9

PERCENT OF FISHING AND DIVING ON ARTIFICIAL REEFS

Fishing		Diving	
l. Own Boat:	58.02%	l. Own Boat:	95.6%
2. Charter Boat:	100.0%	2. Rentals:	50.0%
3. Party Boat:	50.0%		
4. Private Rental	31.6%		

The majority of boating days spent fishing was done on or about artificial reefs according to our findings. This was even more true for diving. Over 64 percent of all diving days were spent on artificial reefs. The estimates for diving, however, are based on a relatively small sample size (N=57).

NUMBER OF VISITORS; VISITOR SPENDING AND WAGES AND EMPLOYMENT ASSOCIATED WITH ARTIFICIAL REEFS

With the information developed above from the second sample survey of visitors, we are able to obtain an estimate of the economic impact of visitors to Santa Rosa County who use artificial reefs. We shall call these economic impacts artificial reef related. Also, we make no distinction between public and private artificial reefs. The following expression was used to obtain artificial reef related spending by boating mode for fishing:

TEOARF = TBDO*($EPPDO/SPO) * %F * %T * %AR

where, TEOARF = total artificial reef related expenditures by visitors engaged in fishing(Own Boat);
TBDO = total boating days by visitors using own boat;
SPO = average size of party(Own Boat);
$EPPDO = Expenditures per party/day by visitors using their own boat;
%F = percent of all boating days spent fishing;
%T = probability(Pr)or percent of a fishing day that will be spent fishing;
%AR = percent of days spent on artificial reefs.

The above equation is the generalized expression to determine artificial reef related spending in Santa Rosa County where we are using Own Boat as an illustration. The equation may seem difficult to understand; however, it is really quite simple. We have seen the first two terms of the expression in the discussion above. That is, TBDO*($EPPDO/SPO) is the total spending on boating by visitors using their own boat in Santa Rosa County. This is shown as $8.78 million in Table 4.5. These terms are followed by %F which is what percent the spending was related to fishing. Next, %T is an adjustment of %F to account for Other Activities as discussed above. Finally, we multiply by the %AR or the percent of the days spent on the artificial reef to arrive
at TEOARF or total expenditures by visitor using their own boat while using an artificial reef off Santa Rosa County, Florida. Since this is the "bottom line" of our presentation, it might be helpful to give a numerical illustration.

$4.16 million = (0.1334 Million)($321.97/4.24) *.9 *.8 * .5802

Notice that all the numbers on the right hand side of the expression have been developed and explained in the above discussion(the $321.97 is in Table 4.4). Thus, our conservative estimate is that of the total boating visitors using their own boat, $4.16 million were spent while fishing on an artificial reef. Diving using own boat generated an additional $0.27 million. Thus, about 50.4% of total boating visitor spending using their own boat was artificial reef related ($4.43/$8.78). This does not include the other boat modes. It serves to illustrate how we went about deriving artificial reef related spending. Table 4.10 shows the application of this procedure for fishing and diving, including all modes of boating. It also shows the estimated wages and employment related to the artificial reef related spending.

The grand total of all spending that is artificial reef related is $20.97 million which supports $5.23 million in related wages and 467 employees. This money is injected by boating visitors into the Santa Rosa County economy. As this injection is multiplied throughout the economy, there is a direct impact of increasing sales, wages, and employment as discussed earlier in this chapter. Let us concentrate on direct wages injected. This will probably have a multiplier of 1.4. Therefore, the total wage impact is $7.32 million. Also, employment will increase by some multiplier, but probably less than the wage multiplier because the visitor sector

is composed of relative low paid jobs. Assuming a multiplier of 1.2 for employment, we would have 560 direct and indirect jobs created by boating visitors using artificial reefs. These are economically significant numbers, but must be placed in the same perspective that the entire visitors sector was in Table 4.3. Wages generated by visitor boating on artificial reef would be about 1.0% of all wages in the Santa Rosa County economy
($7.32/$745.89) and 1.7% of all employment(560/33,652). This is not to minimize the economic importance of artificial reefs. Any sector that is related to nearly 560 jobs is not inconsequential to the local area.

TABLE 4.10

ESTIMATED ARTIFICIAL REEF RELATED SPENDING;

WAGES AND EMPLOYMENT GENERATED IN SANTA ROSA COUNTY, FLORIDA

ACTIVITY/MODE	VISITOR SPENDING (MILLION$)	WAGES GENERATED (MILLION$)	EMPLOYMENT
OWN BOAT	**$4.43**	**$0.64**	**71**
FISHING	$4.16	$0.61	67
DIVING	$0.27	$0.03	4
CHARTER BOAT	**$14.55**	**$4.05**	**345**
FISHING	$14.39	$4.01	341
DIVING[1]	$0.16	$0.04	4
PARTY BOAT	**$1.81**	**$0.50**	**48**
FISHING	$1.81	$0.50	48
DIVING	$0.00	$0.00	0
PRIVATE RENTAL	**$0.17**	**$0.04**	**3**
FISHING	$0.17	$0.04	3
DIVING	$0.00	$0.00	0
TOTAL	**$20.97**	**$5.23**	**467**
FISHING	$20.54	$5.15	459
DIVING	$0.43	$0.08	8

1. For Diving, Charter, Party and Private Rental were combined.

We have not yet presented the total days and person-visits that are related to artificial reefs in Santa Rosa County. The former is important in developing recreational values in the section below while the latter is important in its relation to all visitors to the Santa Rosa County area. Let us consider total days spent on artificial reefs. The following expression can be used to estimate such days:

TBDARF = TBDO * %F * %T * %AR

where, TBDARF = total boating days on artificial reefs

while fishing
%F, %T, and %AR were defined above.

The same general equation can be used for diving except %F is changed to %D and the numerical values of the other variables may change depending on boating mode since we have used "Own Boat" as an illustration. The artificial reef related boating days were estimated along with person-visits as shown in Table 4.11.

TABLE 4.11

RECREATIONAL DAYS AND PERSON-VISITS
ASSOCIATED WITH ARTIFICIAL REEF USE
FOR SANTA ROSA COUNTY, FLORIDA

Mode/Activity	Number of Person-days (Millions) (Millions)	Length of Stay (Days)	Person-visits
1. Own Boat	**0.0589**		**0.0115**
Fishing	0.0557	5.13	0.0109
Diving	0.0032	5.13	0.0006
2. Charter Boat	**0.0922**		**0.0205**
Fishing	0.0898	4.50	0.0200
Diving	0.0024	4.50	0.0005
3. Party Boat	**0.0167**		**0.0031**
Fishing	0.0167	5.45	0.0031
Diving	0.0000	5.45	0.0000
4. Private Rental	**0.0012**		**0.0002**
Fishing	0.0012	5.00	0.0002
Diving	0.0000	5.00	0.0000
Total	**0.1690**		**0.0352**
Fishing	0.1634		0.0341
Diving	0.0056		0.0011

About 169,000 days were spent over the last 12 months on artificial reefs in Santa Rosa County. The use value of a recreational days will be discussed below. This will add more meaning to the measurement of recreational days.

Finally, we would like to know how many person-visits to Santa Rosa County are related to artificial reefs. Using "Own Boat" as an illustration, this may be measured by the following expression:

$$VOAR = TBDOAR/LSOAR$$

where, VOAR = person-visits for those using their own boat on artificial reefs;

TBDOAR = total boating days for those using own boat on artificial reefs;

LSOAR = length of stay for those using own boat on artificial reefs.

Therefore, to obtain person-visits, we only have to divide days on artificial reefs by the length of stay. This makes good intuitive sense since if one individual spent 10 days in Santa Rosa County and each stay was 5 days, then we would have
two person-visits. In the right hand column of Table 4.11, we show the person-visits by fishing and diving and by boating mode that are related to artificial reefs. Over a 12 month period, Santa Rosa County attracted 35,200 person-visits for the sole purpose of fishing and/ or diving on an artificial reef. About 3.36% of all visitors to Santa Rosa County, as measured by person-visits, are attracted to fishing and/or diving on artificial reefs. Remember there are a little over 1 million person-visits made to Santa Rosa County annually (See Table 4.1).

EVALUATION OF ARTIFICIAL REEFS BY USERS

METHODOLOGY

As part of survey of boating visitors to Santa Rosa County, we asked the respondents to evaluate the artificial reefs that they used. Questions about the artificial reefs were restricted to those that actually used artificial reefs. The evaluation of artificial reefs took place in two steps. First, we asked respondents the reasons that might be important in their decision to use an artificial reef as a recreational aid in fishing or diving. Respondents rated each statement from

Very Important to Not Important at All. The results were obtained with the percent that answered either Very Important or just Important as our measure of importance (see Table 1.12).

TABLE 4.12

REASONS BEHIND THE CHOICE OF AN ARTIFICIAL REEF FOR ARTIFICIAL REEF USERS IN SANTA ROSA COUNTY

Reason	Percent Very Import or Important
1. Better Catch Rate	91.8%
2. Previous Experience at Site	85.2%
3. Site Is Close to Shore	48.0%
4. Want to Fish Near Others	0.0%
5. Other Fishermen Recommended Site	69.4%
6. Site Is Easy to Locate	79.2%
7. Better Fishing than Natural Reefs	56.2%

It would appear that the choice to use an artificial reef is based upon better fishing and ease of location. Respondents did not mind going over 17 miles from shore to fish(See Table 4.7, Item 12), appeared to want the entire reef to themselves in that they did not appear to want company. It would appear that artificial reefs offer an improved recreational experience for the fishermen and even divers.

We attempted to get respondents to evaluate the present status of artificial reefs of Northwest Florida in the Gulf of Mexico. This goes to the placement of reefs and how crowed they are. Table 4.13 shows the results for fishers and divers. The existing pattern of artificial reefs seems to win the approval of fishers and divers using them. Users would like the reefs deployed some distance from shore to maximize fishing success, but placed in no more than 150 feet of water. They strongly believe that artificial reefs increase the overall abundance of fish. This is a perception which could be debated. It is true that artificial reefs add to the fishery habitat, but no scientific study is known to the authors that definitely establishes that the fish population is actually increased with artificial reefs. Users could be confusing an aggregation of fish that are attracted by new reefs from places with no reefs. This would be a redistribution

with no actual increase in the population. Finally, the evaluation seems to be in favor of the expansion of the artificial reef program since only 5.3 % felt there were too many artificial reefs.

TABLE 4.13

EVALUATION OF EXISITING ARTIFICIAL REEFS

OFF SANTA ROSA COUNTY, FLORIDA

CRITERIA FOR EVALUATION	PERCENT STRONGLY AGREE OR AGREE
1. Reefs Placed Too Far From Shore	23.7
2. Artificial Reef Too Crowded	26.4
3. Too Many Artificial Reefs Placed in Gulf of Mexico	5.3
4. Artificial Reefs Should Be in 150 Feet or Less of Water	65.8
5. Artificial Reefs More Productive Than Natural Reefs	39.5
6. Artificial Reefs Increase Abundance of Fish	92.1

Source: FSU Survey of Boating Visitors to Santa Rosa County.

VISITOR USE VALUE OF ARTIFICIAL REEFS

METHODOLOGY

Up to this point in the report, we have stressed the economic impact of visitors using artificial reefs on the local economy. In a later section of this chapter, we shall consider resident spending on boating that is related to artificial reefs. However, in this section we shall look at a new concept entitled "use or user value" of the recreational experience.

If we look at the natural resources used in creating a fishing or diving day, they are obviously fish and water. These resources are common property in nature. This means that there is no organized market to sell and buy these resources. In effect, fish are free to those wishing to fish for this resource. Except for a small amount paid for a fishing license, there is no substantial fee paid for the use of the fishery resource or even the waters of the Gulf of Mexico. Although a recreational day is a service rendered by nature, there is no overt price to be paid. We call this a nonmarket activity. This does not mean that recreation is worthless. In fact, various laws have been passed to protect natural resources so society as a whole can derive value from their use. In general, this is what we mean by use value. But how can it be measured?

For market goods, economists have a demand curve to measure the value of a good. Oranges, wheat, and steel have a demand curve where as price drops, more is consumed. Recreational fishing and diving are services rendered to recreationalists that should have a demand curve as well. The fact is that we cannot measure this demand curve directly because there is no price-quantity relationship to be observed. However, economists have developed techniques to indirectly measure the value obtained from the use of a natural resource that is common property.

Consider Figure 1. DD is the recreational demand curve for fishing. If there were a price, the quantity demanded would fall as the "price" increases. Thus, the demand curve is downward sloping. Since the price is zero for recreational fishing, anglers "consume" D(1) days fishing. The measure of consumption or production is usually measured in either days or trips for

recreation. Trips can be longer than one day in length and correspond to the person-visit concept we discussed earlier.

Consider the area under the DD or demand curve. What we see is that recreational fishermen would be willing to pay P(l) or even P(2) or higher for the right to fish the resource, but because of the common property nature of market, the price is actually zero. Thus, the difference between what recreationalist would be willing to pay and the actual price(i.e., zero) is called *consumer's surplus*. Such a concept exists with market goods such as oranges, but there is a price above zero. But, there are those that would be willing to pay an even higher price. This difference is conceptually the same and is called consumer's surplus. As we shall see, consumer's surplus derived by recreationalists is actually use value. But, let us consider the market for recreation just a little bit more.

FIGURE 1

THE DEMAND CURVE AND SHIFTS IN THE DEMAND

FOR RECREATIONAL FISHING

PRICE

D(1) D(2) RECREATIONAL DAYS FISHING

We have established that there is a demand curve for recreation indicated by DD in Figure 1. Now, let us introduce the artificial reef as a "recreational aid" in fishing(and diving too). How does the artificial reef influence this market. Remember that our survey respondents in the last section generally felt that artificial reefs increase fishery catch rate or generally improve the recreational experience. The impact of introducing an artificial reef is to shift the demand curve for recreational fishing in Figure 1 upward and to the right. This means that at every level of recreation as measured by days or trips the angler is willing to pay more for the recreational experience. In a market sense, this shows how the favorable attitude of recreational fishermen manifests itself by an upward shift in the demand curve. Notice that something else happens and that is an increase in consumer’s surplus or use value. The area between the two demand curves is the increase in use value as a result of deploying the artificial reef. In contrast to the discussion in the economic impact sections above, the increase in use value means that by investing in an artificial reef we have increased output in the entire economy. While artificial reefs impact a region, they, in theory, increase national output as well. The distinction between an economic impact and use value is that the former is distributional, while the latter is a rise in national output. By distributional, we mean that if visitors do not spend their money in Santa Rosa County, they will spend it elsewhere-- maybe in the Florida Keys.

An indirect way of measuring consumer’s surplus or use value
is to ask users a question designed to measure the shift in the recreational demand curve by deploying artificial reef. The following questions was asked respondents in our boating visitor survey:

> "The artificial reef program cost money. Suppose that the government proposed that all newly constructed reefs would be paid for by requiring that the reef user with their own boat either pay for a stamp as part of their fishing license

> or pay for a decal as part of their boat registration. If you used a rental of any kind, you would probably pay for the operator's stamp or decal in the form of higher fees to cover costs. The money would go into a trust fund that could only be used for the construction of artificial reefs. Would you be willing to pay $_____per year when you renew your fishing or boating license and/or use a rental boat of any kind to fund this construction program?”

In this question, we have phrased it so it conforms to some generally accepted standard. First, there is a statement as background on the question. Second, there is a payment vehicle that is well articulated. Third, there is an assurance that the moneys collected will go into a trust fund designed for the sole purpose of adding new artificial reefs. The respondent is presented with a figure which he or she accepts or rejects. Therefore, we close the question to a potential open-ended ones where respondents are asked what they would pay with no constraints. This kind of a question leads to numerous biases. To implement the methodology described in this section, there are three general approaches:

MEASUREMENT OF USE VALUE

1. The Turnbull Distribution

From our question discussed above, we relate the YES and NO answers to the payments requested. The payments ran from $1 to $50 per year. As the payments rise, the probability of the respondent answering YES is decreased. The area under the Turnbull distribution gives an approximation of use value of adding additional artificial reefs. This techniques will be further explained in the implementation section.

2. Dichotomous Choice Model

In the question above, the respondent is presented with and either or situation much like a consumer faces in the market where you are presented with a price and you either take it or leave it. This is a dichotomous choice. If we let "l" stand for YES to the payment amount and "0" stand for NO to the payment amount, we can form an equation of the following form:

Pr(l,0)= f {Payment Presented; Socioeconomic Vector; Other

Shifters }

The dependent variable or Pr is called a binary variable where only one of two values can appear(i.e., YES and NO). The respondents base their choice on the payment presented. The socioeconomic vector includes income; sex; race; etc. while other shifters contain variables such as boat length; etc. to hold them constant while looking at how the probability of saying YES changes as the payment presented increases. As with the Turnbull distribution, we are look at the area under the J-shaped curve showing the relation between the probability of saying YES and the increasingly higher payment demanded. This will be another estimate of use value.

3. Travel Cost Techniques

This techniques is not based upon the willingness to pay question posed above. It is based upon the distance traveled by the boating visitors. We would expect that as the cost of travel rises, that fewer trips(and days) will be made to Bay County by visitors. The cost of these trips can be estimated and are also given as a response to a question on expenditures in the boating visitor survey. The following equation can be used to formulate the travel cost techniques:

Trips to Santa Rosa County = f {Travel Cost; Socioeconomic Vector; Other Shifters}

Travel cost is used as a proxy for price since as it rises, trips
taken should fall according to travel cost hypothesis. Once this expression is estimated, we may hold the other variables constant and estimate the area under the travel cost demand curve. This will yield another estimate of consumer’s surplus or use value.

EMPIRICAL IMPLEMENTATION

The Turnbull Approach

The Turnbull(1976) distribution is non-parametric, maximum likelihood(ML) estimator for interval-censored data which is what we have when presenting payments to respondents and asking whether they would be willing to pay such an amount or not. The Turnbull estimator uses respondents’ choices to construct an interval estimate for the latent willingness to

pay implied by each respondent's choice. The individual's answer to a single question will distinguish either a lower or an upper bound for his or her WTP. By combining respondents', we obtain estimates for the relative frequency of responses at different WTP levels. The intervals start at zero and end at infinity. In doing our study, we established seven intervals as follows: (1) $0 to $1; (2) $1 to $5; (3) $5 to $10; (4) $10 to $20; (5) $20 to $30; (6) $30 to $50 and (7) $50 to infinity. The interval has an upper and lower bound. It is assumed that the fraction of the sample estimated to be in each interval has a willingness to pay(WTP) value equal to the lower end point of the interval. This is referred to as the lower-bound estimate of willingness to pay and is considered to be a conservative estimate of use value.

Using the WTP question regarding artificial reef discussed above, we asked for a response from only those using artificial reefs. A prior analysis of the data indicated that the Turnbull distribution technique could not be implemented by county, but was in conformity to a priori theory for fishers from the five counties combined. The theory assumes that as the WTP amount is increased, the percent answering "YES" will decline. That is, the more costly the artificial reef program, the smaller the percent of the users willing to pay for the program. The sample for fishers was 264 responses while those for divers was just 37 responses with many intervals with no answers. Therefore, we were restricted to applying the Turnbull distribution to only those engaged in fishing. Of course, this is the principal use of artificial reefs by visitors to each county. Also, using the whole sample assumes that the WTP does not vary from county to county. Given the geographical proximity of the counties involved, this is not an unreasonable assumption. Furthermore, other techniques employed below will give us the ability to test the influence of each county on the WTP. Table 4.14 shows the results of the application of the Turnbull estimator to our data on the willingness to pay(WTP) for the artificial reef program.

Consider the first interval in Table 4.14(i.e., from $0 to $l). 54 respondents were asked whether they would be willing to pay at least $1.00 as part of their fishing license/ or cost of boat rental over a 12 month period for funding the artificial reef program. 49 respondents or 90.7 percent answered "YES". This gives us one point on the Turnbull Distribution. We cannot calculate the WTP unless we observe a change from one

point on the distribution to another. This is called the change in density. The second interval when compared to the first interval shows how the willingness to pay responds to a progressive rise in the “payment price”. Therefore, we multiply the lower bound of the interval by the change in density to get the incremental willingness to pay. When this is done for all the intervals in Table 4.14, we get the cumulative willingness to
pay of $22.17 per year. Respondents responding to the highest interval are assumed to have a maximum willingness to pay of $50.
This is not unreasonable when one looks at how rapidly the probability of saying “YES” to the payment drops off as the payment rises in Table 4.14. Since the willingness to pay question was asked of an individual(i.e., not a fishing party), we interpret the $22.17 to be the WTP by one visitor fisher over a 12 month period for the artificial reef program as contained in the willingness to pay question. Since the data are an aggregation for all counties in the study, this WTP will apply to any fisher in anyone of the five counties. In Santa Rosa County, the typical visitor spends 5.04 days per trip and visits the county about 2.18 times per year. Therefore, we interpret the $22.17 as the WTP for 10.987 days of boating adjusted for percent fishing and the percent engaged in other boating activities. We estimated above that 60.29 percent of all general boating days are spent fishing on or about artificial reefs. Thus, of the 10.987 days in total fishing, 60.29 percent or 6.62 days are spent per individual on artificial reefs. Taking the annual WTP of $22.17 per fisher, and dividing it by days spent on artificial reefs in Santa Rosa County, we have a WTP/Day of $3.35. What is this value? It is the interpreted as the incremental recreational value afforded to the average fisher by artificial reefs as a recreational aid on a fishing day. Why is this important? The basic reason is that the expenditures on artificial reefs not only has an economic impact which we have quantified, but increases output in the general economy. That is, since the market does not measure the value of recreational output by many natural resources such as the fishery as discussed above, we have an indirect measure of this value. The total annual use value of artificial reefs for fishing in Santa Rosa County is equal to about $0.547 million ($3.35*0.1634 million days spent fishing on artificial reefs in Santa Rosa County). We shall discuss this further after we gave reviewed the two other procedures used to estimate the WTP as discussed above.

TABLE 4.14

APPLICATION OF THE TURNBULL ESTIMATOR TO THE WILLINGNESS TO PAY(WTP) FOR ARTIFICIAL REEFS

(1) Lower Bound for Interval	(2) Upper Bound for Interval	(3) Probability of Paying at at Upper Bound	(4) Change In Density	(6) WTP (1)*(4)	(7) N
$0	$1	.907	.093	0	54
$1	$5	.796	.111	$ .110	49
$5	$10	.804	-.008	-$ .008	46
$10	$20	.600	.204	$2.040	35
$20	$30	.411	.189	$3.780	34
$30	$50	.197	.215	$6.450	46
$50	Infinity	.000	.196	$9.800	N/A

Total Willingness to Pay(Total of Column 6): $22.172

Dichotomous Choice Application

The modeling approach followed here is one originally developed by Bishop and Heberlein (1979). There have been many applications using slightly different specifications of the model and Hanemann (1984) further developed the underlying economic theory behind various model specifications and the formulas for calculating consumer’s surplus or compensating variation. Compensating variation is consumer’s surplus adjusted for the income effects of price changes that would keep the consumer at the same level of total economic well-being as before the change in price. The answers to questions like the ones used in this study to measure the value of artificial reefs are assumed to yield estimates directly of compensating variation. The general form of the dichotomous choice is as follows:

$$Pr\ (YES) = \alpha - \beta_{BID} * BID + \beta_{SE} * SE + \mu$$

where, Pr (YES)= the probability that the user will be willing to pay the randomly assigned dollar amount (BID).

BID = randomly assigned dollar amounts.

β_{BID} = estimated coefficient on BID.

SE = vector of other socioeconomic variables and/or natural resource attributes.

β_{SE} = estimated coefficients for SE vector.

μ = error term following logistic distribution for logit model and normal distribution for the probit model.

The above model was estimated using both the logistic and normal distribution assumption about μ. The BID variable was included in its linear and logarithmic form (natural logarithm of BID called LBID here). In the SE vector, we include a variety of socioeconomic factors including household income, age, years of experience boating in northwest Florida, race, and sex. Also, included were variables for differentiating charter and party boat mode use from use of the own boat and private rental boat modes. A variable was also entered to indicate artificial reef use and, when fishermen and divers were combined, a variable was entered to differentiate divers from fishermen. However, none of the variables in the SE vector were significant in any model specification. Some have argued that this finding calls into question the validity of the estimated values. We present eight model specifications that include only the bid amount as an explanatory variable (Table 1.15). The models differ by sample of users (e.g. all users versus fishermen only), by assumption about the distribution of the errors (e.g. the logit of probit model), and by specification of the bid amount (e.g. linear BID or log linear or natural logarithm of bid or LBID). The estimated values derived from these models range from $23.92 to $29.83 per user per year. The average of these eight values is $27.02.

The average value derived from the dichotomous choice models is slightly higher than that obtained using the same information and employing the Turnbull method $27.02 versus $22.17 or about 22 percent higher. The lowest value obtained

from the dichotomous choice model is only 7.89 percent higher than that obtained using the Turnbull method ($23.92 versus $22.17). To derive an estimate of the willingness to pay per day, as with the Turnbull estimate above we divide the annual value per person by 6.62 days yielding an estimate of WTP/day of $4.08 ($27.02/6.62). And, our estimate of total annual value of artificial reef use in Santa Rosa County using the dichotomous choice method is $0.667 million ($4.08 * 0.1634 million days of use).

TABLE 4.15
DICHOTOMOUS CHOICE MODELS
FOR ARTIFICIAL REEF USERS
IN NORTHWEST FLORIDA

Model Number	α	β_{BID} or β_{LBID}	BID or LBID	Users	Type of Model	N	WTP for Artificial Reef ($)[1]
1	2.2308 (9.455)*	-.07486 (-8.159)	BID	All	Logit	302	29.80
2	1.3392 (10.309)	-.04490 (-8.778)	BID	All	Probit	302	29.83
3	3.6048 (7.948)	-1.1233 (-7.299)	LBID	All	Logit	302	24.76
4	1.9752 (8.980)	-.6134 (-7.877)	LBID	All	Probit	302	25.03
5	2.1086 (8.448)	-.07167 (-7.551)	BID	Fish	Logit	260	29.42
6	1.2692 (9.145)	-.04305 (-8.104)	BID	Fish	Probit	260	29.48
7	3.3250 (7.187)	-1.0473 (-6.713)	LBID	Fish	Logit	260	23.92
8	1.8367 (8.124)	-.5783 (-7.282)	LBID	Fish	Probit	260	23.95
1-8 Average							27.02

* t-values in parentheses.
1. For linear model, annual willingness to pay (WTP) is equal to α/β_{BID}, while for the log linear model, WTP is equal to $\exp(\alpha/\beta_{LBID})$.

Travel Cost Demand Model Application

The modeling approach employed here is one that has recently been applied to visitors to the Florida Keys (See Leeworthy and Bowker 1997, and Bowker and Leeworthy 1998). The choice of this modeling approach is based on the similarity of the type of sample data collected that present problems of biased estimation of consumer's surplus. A major source of possible bias in estimating consumer's surplus is when the sample does not include those that do not consume the good or service, here fishing or diving in northwest Florida. Not including people that do not engage in fishing or diving in estimating the demand function can lead to what is called truncation bias. It is called truncation bias because the sample is truncated at one visit to the area or only includes people that made at least one trip to northwest Florida. Samples that are conducted on-site of visitors by definition only include people that have visited the area. This is done because obtaining a random sample of all people (visitors and non-visitors) is too expensive for practical purposes. However, statisticians and economists have developed methods to correct demand estimation with truncated samples and thus avoid the truncation bias.

Another aspect about trips is that one cannot take a fraction of a trip. Trips take on integer values (e.g., 1, 2, 3,…365). Statisticians and economists have also developed methods for estimating models where the dependent variable, like trips, have integer values. The methods are called count data models and include the Poisson model and the negative binomial model. The model we employ here is a special version of the count data models that uses a maximum likelihood method of estimation that also adjusts for truncation bias and are therefore called the truncated Poisson and truncated negative binomial models.

The travel cost model estimated here takes on the following general form:

$$Ln(TRIPS_i)=\beta_0 + \beta_{tc}TC_i + \beta_{se}\ SE_i + \mu_i$$

where, for the ith individual Ln(TRIPS) is the natural logarithm of the quantity of recreation trips, TC is the travel cost per trip, SE represents the vector including other relevant socioeconomic variables and site attributes, the βs' are regression parameters estimated by the model that quantify the relationship between the right-hand side variables to TRIPS, and μ is an error term that is assumed to follow a gamma distribution with mean 1.0 and variance α (Greene, 1995).

Table 4.16 provides definitions of all the variables used in estimating the final model presented here. Several of the variables in Table 1.16 require further explanation. We followed Bowker, English & Donovan (1996), Leeworthy and Bowker (1997) and Bowker and Leeworthy (1998)and defined the dependent variable as a person-trip (NTRIPS). Hence a family of four visiting northwest Florida once per year would account for four person-trips as would an individual visiting northwest Florida four times in one year. However, given the same origins and travel modes, the price per person-trip would differ as the single visit cost for the family of four would be apportioned to four person-trips. While intuitively appealing, this construction of the dependent variable is practical for situations were group travel by car is common. In the boating visitors sample used here, all visitors came by automobile. In addition, the construction of the dependent variable used here helps to avoid the empirical malady of low dispersion of the dependent variable i.e., a clustering around one trip annually.

Travel costs per person-trip (TCOSTPP) is equal to round-trip road mileage times a cost per mile then divided by the number of people in the traveling party. Distance was calculated from the center of the zip code of the person’s home to the center of the zip code of the site in northwest Florida where the person was interviewed. We used a computer program called Prophesy Plus and chose the route that was the fastest (would take the least time). Mileage cost was calculated using $0.14 per mile. This estimate is based on a recent study of travel costs by auto visitors to the Florida Keys (Leeworthy and Bowker 1997). This cost is less than what the Federal government uses to reimburse Federal employees for travel when using their private vehicles (currently $0.31 per mile). The reason is that the Federal government rate includes overhead costs such as insurance and maintenance as well as the depreciation of the vehicle. The costs used here only include trip related costs such as gasoline, oil, parking fees, and tolls. As discussed above, round-trip travel costs were divided by the number in the traveling party to put costs on a person-trip basis to be consistent with our definition of TRIPS (NTRIPS) or person-trips.

The inclusion of time costs, both in-transit and on-site is subject to considerable debate. Theoretically, Freeman (1993) demonstrates that both kinds of time costs should be included. However, he points out a number of problems which continue to plague applied researchers. One is the inability of a large

portion of the population to easily substitute between working increased hours at their normal (or overtime) wage rate and leisure time. Another is the possibility of utility or disutility resulting from work, travel, or on-site time, hence rendering the full wage rate a potentially poor measure of the shadow cost of time. He points out that while most surveys elicit a pretax income measure, a more realistic wage rate would be derived from after tax income.

Many other researchers have used a percentage of the wage rate, some based on travel studies of the cost of travel congestion, while most use some arbitrary percent of the wage rate. We felt that resolving this issue was beyond the scope of this study and we used a more conservative approach and have not included the value of time.

It is important in travel cost modeling, especially when visitors come from origins of great distance, to control for the length of trip. The variable (STAY) is the length of the interview trip measured in number of days. Length of trip was used extensively in the beginning of the report to estimate the total number of person-trips. It is assumed that all trips over the year are the same length.

We included a host of standard socioeconomic variables including age (AGEH), household income (INCTTH), race/ethnicity (WHITE), years of experience visiting northwest Florida (EXPER), sex (MALE)and whether the person was a member of a fishing or diving club (CLUB). AGEH was scaled in hundreds of years and was used in estimation with it’s squared value (AGESQH). This specification tests if there is a parabolic relationship between the number of person-trips (NTRIPS) and age (AGEH). We will discuss this in more detail below when discussing the results of the estimation. Household income (INCTTH) was scaled to $10,000. Thus a value of one means a household income of $10,000. Household income was actually obtained in intervals (e.g. less than $10,000, $10,000-$19,999, $20,000-$29,999, etc.). We converted this to a continuous variable by setting the value of household income to the mid-point of the interval given by the person interviewed.

The variable (EXPER) is the number of years the person interviewed had been boating in the panhandle of Florida. For race/ethnicity, we created a dummy variable (WHITE) which takes on a value of one (1) if the person interviewed was White, not Hispanic and zero (0) otherwise. There were not enough Black or African American or Hispanic persons in the boating sample to

construct separate variables for these groups. The variable (CLUB) is also a dummy variable that takes on a value of one (1) if the person was a member of a fishing or diving club and zero (0) otherwise. In addition, sex was represented as a dummy variable that takes on a value of one (1) if the person interviewed was a male and zero (0) otherwise.

We also constructed a set of intercept and slope dummy variables to test whether those that dive (DIVE), or used the charter boat mode (CHARTER), or used the party boat mode (PARTY), and, most importantly for this study, used an artificial reef (REEF) have different demands. That is, instead of estimating separate demand equations for each group (we don't have enough people in the boating sample to do this), we can employ statistical techniques that allow us to estimate different demands while pooling the data. DIVE, CHARTER, PARTY and REEF are intercept dummies that take on values of one (1)or zero (0) just like variable WHITE, MALE, and CLUB discussed above. Intercept dummies let us test if, on average, different groups take more or less trips (NTRIPS). For example, do divers take more or less trips to northwest Florida for boating activities, holding all other factors constant, than fishermen.

Slope dummies test whether the slope of the demand function is different for different groups. As we will show below, this is important for two reasons. Slope dummies allow us to test whether different groups will respond differently to price. That is, for a given percentage change in price, what will be the percentage change in number of trips to northwest Florida for boating activities by different groups. Economists call this price elasticity. Price inelasticity means for a given percentage change in price their will be a smaller percentage change in number of trips. This has practical importance to local businesses because inelastic demands means that, for a price increase, total revenue will increase. The opposite is true if demand is elastic.

Another important use of slope dummies is in estimating consumer's surplus or use value per trip. As we will show when we discuss later the formula for calculating consumer's surplus or the use value per trip, the calculation depends on the slope of the demand function. So groups with different demand slopes will have different use values per trip. Groups with demands with steeper slopes will have higher use values per trip and vice versa.

We constructed slope dummies for divers (DCOST1), for those that used charter boat mode (CHCOST1), for those that used the party boat mode (PARCOST1), and those that used an artificial reef (REFCOST1). The variables are created by simply multiplying the intercept dummy variable for each group by the travel cost variable (TCOSTPP). An estimated positive coefficient on a slope dummy means that the slope of the demand for boating trips is steeper for that group meaning that groups demand will be more inelastic and will mean that group has a higher use value per trip than the base group. For example, if the coefficient on DCOST1 is positive, it will mean that divers have more inelastic demands than fishermen, holding all other factors constant. It will also mean that divers have a higher use value per trip than fishermen.

TABLE 4.16

DEFINITIONS OF THE TRAVEL COST MODEL VARIABLES

Variable	Definition
NTRIPS	Annual number of person-trips to northwest Florida for boating activities.
TCOSTPP	Travel cost per person-trip. Round-trip mileage from home to the interview site times $0.14/mile.
STAY	Length of trip measured in number of days.
INCTTH	Household income (in 10,000 of $).
AGEH	Age of the person interviewed (in hundreds of years).
AGESQH	AGEH squared.
EXPER	Number of years have been boating in northwest Florida.
DIVE	Dummy variable (1=participated in diving).
CHARTER	Dummy variable (1=used charter boat mode).
PARTY	Dummy variable (1=used party boat mode).
CLUB	Dummy variable (1=member of a fishing or diving club).
REEF	Dummy variable (1=used artificial reef).
DCOST1	Slope dummy for diving (DIVE*TCOSTPP).
REFCOST1	Slope dummy for use of artificial reef(REEF*TCOSTPP).
CHCOST1	Slope dummy for charter boat mode use. (CHARTER*TCOSTPP).

PARCOST1 Slope dummy for party boat mode use (PARTY*TCOSTPP).

α Overdispersion parameter. A significant parameter indicates the presence of overdispersion and that the Poisson model is rejected in favor or the negative binomial model.

Results of the Travel Cost Demand Model

Truncated Poisson and negative binomial (TNB) models were estimated using LIMDEP Version 7.0 (Greene 1995). Only the TNB model is presented here because the hypothesis of no over dispersion was rejected based on a Wald test equivalent to the asymptotic t-ratio on the estimated dispersion parameter, α (Yen & Adamowicz, 1993). Table 4.17 summarizes the results of the TNB model.

Several variables included in Table 4.16 were dropped from the model because they were not statistically significant. The variables dropped were STAY, DCOST1, and REFCOST1. Length of trip (STAY) was negative but not significant. The slope dummy for diving (DCOST1) was positive but not significant meaning that the price elasticity and consumer's surplus or use value per trip was not different between fishermen and divers. And, most important here, the slope dummy for artificial reef use was positive but not significant meaning that the price elasticity and use value per trip was not different between users and nonusers of artificial reefs.

All the variables included in the final model presented in Table 4.17 are statistically significant, except household income (INCTTH). Because of incomes economic importance we kept it in the model despite it's insignificance. Dropping income from the equation did not significantly change any other estimated model coefficients in our tests of alternative model specifications. All the other variables included in the model were statistically significant with high levels of confidence as expressed in the column labeled, $P[\ |z| \geq z]$. This column contains the significance level for the test of whether the estimated coefficient is significantly different from zero. A value of 0.05 would indicate significance at the 5 percent level or that we are confident at the 95 percent level. Generally,

the model variables were all significant at the 0.05 or below meaning these are fairly strong results.

Price Elasticities

The coefficient on TCOSTPP is negative indicating a downward sloping demand curve as presented in Figure 1. As discussed above, price elasticity of demand measures how the demand for trips (NTRIPS) changes with changes in prices (TCOSTPP), holding all other factors constant. Specifically, price elasticities measure the percentage change in the number of trips (NTRIPS) for a percentage change in price (TCOSTPP).

TABLE 4.17

TRAVEL COST MODEL RESULTS

FOR BOATING VISITORS

TO NORTHWEST FLORIDA

Variable	Coefficient	Standard Error	b/St.Er.	P[|Z|>z]	Mean of X
Constant	4.132307282	.60192811	6.865	.0000	1.00000
TCOSTPP	-.03937839110	.0024047564	-16.375	.0000	36.832241
CHCOST1	.02606125483	.0030188745	8.633	.0000	22.724031
PARCOST1	.01365062332	.0059164162	2.307	.0210	10.808520
INCTTH	.01485993937	.012251925	1.213	.2252	8.0092308
AGEH	-7.413161512	2.9668408	-2.499	.0125	.38021538
AGESQH	10.02846709	3.2960961	3.043	.0023	.15524892
MALE	.2889243810	.15285344	1.890	.0587	.85846154
CLUB	.6819655766	.14803140	4.607	.0000	.067692308
CHARTER	-1.346883501	.11960963	-11.261	.0000	.60923077
PARTY	-1.255882128	.23010332	-5.458	.0000	.20923077
REEF	.2897223689	.10902141	2.657	.0079	.53230769
	Overdispersion parameter for negative binomial model				
Alpha	.5272315531	.67047941E-01	7.864	.0000	

NTRIPS (mean) 9.19

Log likelihood function	-877.5674
Restricted log likelihood	-1607.626
Chi-squared	1460.118
Degrees of freedom	1
Significance level	.0000000

LEFT Truncated data, at NTRIPS = 0.

N=325

In our particular specification of the demand model, price elasticity for those that used the own boat and private rental boat modes is equal to the estimated coefficient on TCOSTPP times TCOSTPP. That is, price elasticity varies with the level of price. At the mean or average travel cost, the price elasticity for the demand by those that used own boat or private rental boat for both fishing and diving was equal to -1.45 (-.0394*36.83 from Table 4.17). Thus the demand for own boat and private rental boat trips for fishing and diving in northwest Florida is considered elastic. That is, for a 10 percent increase in price, demand for trips will decrease by 14.5 percent. This means that price increases for this group would result in decreases in total revenue to local businesses. And, price decreases will result in increases in total revenue.

For fishers and divers that used party and charter boating modes, price elasticities are calculated using the slope dummies we discussed above. For the party boat mode, the price elasticity at the overall sample mean travel cost is equal to -0.9484 [(-.0394+.01365)*36.83]. For a 10 percent increase in the price, party boat mode trips would decrease 9.48 percent. Since this price elasticity is less than -1.0 we say that the demand for party boat mode trips is inelastic. Meaning that for a price increase, total revenues would increase. And, price decreases will result in decreases in total revenue.

For fishers and divers that used the charter boat mode, the price elasticity at the sample mean travel cost is equal to -0.4898 [(-0.0394+.0261)*36.83]. For a ten percent increase in price, charter boat trips would decrease about 4.9 percent. Thus, for the charter boat mode, demand is price inelastic.

Relationship Between Trips and Age

As discussed above, the relationship between NTRIPS and the age of the person interviewed (AGEH) was expected to be parabolic. This was tested by including age squared (AGESQH) in the estimated travel cost demand model. The coefficient on AGEH is negative and the coefficient on AGESQH is positive meaning that as age increases, from age 16, the number of trips (NTRIPS) decreases, reaches a minimum, and then starts increasing with

age (a u-shaped parabola). Below is the estimated relationship using our estimated travel cost model. Note that trips reach a minimum at age 35.

NTRIPS	AGE
2.0	16
1.7	25
1.5	35
1.6	45
1.9	55
2.3	65
2.6	70
3.4	80

Relationship Between Trips and Other Factors

For all other factors and trips, the marginal effects are reported here. The marginal effects are the changes in the number of trips for a one unit change in the factor. For intercept dummies, discussed earlier, the calculation shows how many trips, on average, a group makes more than the reference group. Marginal effects are calculated as the mean number of NTRIPS times the estimated coefficient on the factor.

Household income has a relatively small effect on trip taking. An increase of $10,000 in household income would result in only a 0.14 increase in the number of trips (NTRIPS). Males, on average, make 2.65 more trips than females. Members of fishing and diving clubs (CLUB) make, on average, 6.27 more trips than non club members. Charter boat mode users make, on average, 12.38 fewer trips than those that use the own boat and private rental boat modes. Party boat users make, on average, 11.54 fewer trips than those that use the own boat and private rental boat modes. And finally, those that used artificial reefs (REEF) make, on average, 2.66 more trips than non reef users.

User Value of Artificial Reefs

As discussed above, we can use our estimated travel cost model to estimate consumer’s surplus or use or user value for artificial reefs. We estimate these values per person-trip, per person-day, and the total annual value for Santa Rosa County. The estimates are presented by boat mode and for fishermen and divers.

For those that used the own boat or private rental boat mode (fishermen and divers), the following formula is used to calculate consumer's surplus per person-trip:

$$CSPT_{own} = (-1/\beta_{TCOSTPP}) * [1/1+(t_{TCOSTPP})^{-2}]$$

where, $CSPT_{own}$ = Consumer's surplus (use value) per person-trip for those that used the own boat or private rental boat modes, including both fishermen and divers.

$\beta_{TCOSTPP}$ = Estimated coefficient on the travel cost variable (TCOSTPP).

$t_{TCOSTPP}$ = Estimated t-value (from column labeled b/st.er. in Table 4.17) for the travel cost variable coefficient.

By substituting the values for the above variables from Table 1.17, we calculate $CSPT_{own} = [-1/-.0394] * [1/1+(16.375)^{-2}] = [25.38] * [.9963] = \$25.29$. The above formula has two components. The first is the formula for calculating the area under the estimated travel cost demand model as shown in Figure 1 earlier in the chapter. The second component is an adjustment for bias in consumer's surplus estimates from demand functions. Even though the estimated demand function is unbiased, consumer's surplus estimates are biased (Zellner and Park, 1979). The correction factor is a simple function of the estimated t-value on the travel cost coefficient (Bockstael and Strand, 1987). When the estimated t-value is large, the correction factor for bias will be small.

An important finding from our travel cost demand modeling was that those that used the charter and party boat modes (fishermen and divers) had different price elasticities and different consumer's surpluses per person-trip. The formula for charter boat mode fishermen and divers is as follows:

$$CSPT_{CHARTER} = [-1/(\beta_{TCOSTPP} + \beta_{CHCOST1})] * [1/1+(t_{TCOSTPP})^{-2}] * [1/1+(t_{CHCOST1})^{-2}]$$

where, $CSPT_{CHARTER}$ = Consumer's surplus per person-trip for fishermen and divers that used the charter boat mode.

$\beta_{TCOSTPP}$ = Estimated coefficient on the travel cost variable.

$\beta_{CHCOST1}$ = Estimated coefficient on the slope dummy variable (CHCOST1).

$t_{TCOSTPP}$ = Estimated t-value (from column labeled b/st.er. in Table 4.17) for the travel cost variable coefficient.

$t_{CHCOST1}$= Estimated t-value (from column labeled b/st.er. in Table 4.17) for the slope dummy variable (CHCOST1) coefficient.

By substituting the values for each variable in the above formula from Table 4.17, we calculate $CSPT_{CHARTER}$ = [-1/(-.0394+.0261)] * $[1/1+(16.375)^{-2}]$ * $[1/1+(8.633)^{-2}]$ = [75.19] * [.9963] * [.9868] = $73.92. The above calculation is similar to the one for own boat and private rental boat modes except that there are three components to the calculation. The first component adjusts for the change in slope of the demand function for charter boat mode users. The second and third components adjust for the bias in consumer's surplus and account for the bias from both the travel cost coefficient and the slope dummy for charter boat users.

The formula for party boat mode users is as follows:

$$CSPT_{PARTY} = [-1/(\beta_{TCOSTPP} + \beta_{PARCOST1})] * [1/1+(t_{TCOSTPP})^{-2}] * [1/1+(t_{PARCOST1})^{-2}]$$

where, $CSPT_{PARTY}$ = Consumer's surplus per person-trip for fishermen and divers that used the party boat mode.

$\beta_{TCOSTPP}$ = Estimated coefficient on the travel cost variable.

$\beta_{PARCOST1}$ = Estimated coefficient on the slope dummy variable (PARCOST1).

$t_{TCOSTPP}$ = Estimated t-value (from column labeled b/st.er. in Table 4.17) for the travel cost variable coefficient.

$T_{PARCOST1}$= Estimated t-value (from column labeled b/st.er. in Table 4.17) for the slope dummy variable (PARCOST1) coefficient.

By substituting the values for each variable in the above formula from Table 4.17, we calculate $CSPT_{PARTY}$ = [-1/(-.0394+.01365)] * [1/1+$(16.375)^{-2}$] * [1/1+$(2.307)^{-2}$] = [38.83] * [.9963] * [.8418] = $32.57. The above calculation is similar to the one for the charter boat mode.

Using the above estimates of consumer's surplus per person-trip, we can estimate the total annual value of artificial reefs and we can estimate the value on a per person-day value. We do this by referring back to our estimates of person-trips and person-days by boat mode and activity (see Table 4.11). We reproduce those estimates along with our estimates of total annual consumer's surplus and consumer's surplus per person-day in Table 4.18.

Table 4.18 shows the impacts of a variety of factors on total value for artificial reefs. Even though our estimate of consumer's surplus per person-trip was higher for party boat mode users than own boat mode users ($32.57 vs. $25.29), the difference on a per person-day basis is much smaller($6.05 vs. $4.94). And, even though the own boat mode and private rental mode users had the same value per person-trip ($25.29), private rental boat mode users had a lower value per person-day ($4.22 vs. 4.94).

Overall, for year 1997-1998, artificial reefs for Santa Rosa County visitors were worth over $1.91 million. Fishermen accounted for 97.2 percent of the total value, while divers accounted for 2.8 percent. Visitors that used charter boat fishing services accounted for 79.2 percent of the total value, while fishermen using their own boats accounted for 14.4 percent of the total value.

Comparison of User Values Across Methods

The Turnbull method resulted in an estimate of the value per person-day for artificial reef use of $3.35 compared to $4.08 for the dichotomous choice models, and $11.32 using the travel cost model. Total annual value for the artificial reefs in Santa Rosa County was estimated at $0.547 million using the Turnbull method, $0.667 million using the dichotomous choice models, and $1.91 million using the travel cost model. Because the willingness to pay questions resulted in estimated values

that were not explained by differences in any socioeconomic factors, we conclude that the travel cost model results are the 'best' results for Santa Rosa County.

TABLE 4.18

ANNUAL AND PER PERSON-DAY USE VALUES

FOR ARTIFICIAL REEFS IN SANTA ROSA COUNTY, FLORIDA

Boat Mode/ Activity	Person-Visits on Artificial Reefs (millions)[1]	Total Annual Use Value of Artificial Reefs (millions $)[2]	Person-days on Artificial Reefs (millions)[3]	User Value Per Person-day ($)[4]
Own Boat	**0.0115**	**0.2908**	**0.0589**	**4.94**
Fishing	0.0109	0.2757	0.0557	4.95
Diving	0.0006	0.0151	0.0032	4.74
Charter	**0.0205**	**1.5154**	**0.0922**	**16.44**
Fishing	0.0200	1.4784	0.0898	16.46
Diving	0.0005	0.0370	0.0024	15.40
Party	**0.0031**	**0.1010**	**0.0167**	**6.05**
Fishing	0.0031	0.1010	0.0167	6.05
Private Rental	**0.0002**	**0.0051**	**0.0012**	**4.22**
Fishing	0.0002	0.0051	0.0012	4.22
Total	**0.0352**	**1.9123**	**0.1690**	**11.32**
Fishing	0.0341	1.8602	0.1634	11.38
Diving	0.0011	0.0521	0.0056	9.30

1. See Table 4.11.
2. Total annual consumer's surplus for artificial reefs is equal to the estimated consumer's surplus per person-trip (CSPT) for each boating mode times the number of person-trips on

artificial reefs. CSPT for own boat and private rental mode is $25.29, $73.92 for charter boat mode, and $32.57 for the party boat mode.

3. See Table 4.11.
4. Consumer’s surplus per person-day for artificial reef use is calculated as total annual consumer’s surplus for artificial reef use divided by total person-days on artificial reefs.

PART 2

RESIDENTS OF SANTA ROSA COUNTY

INTRODUCTION

When we consider artificial reefs, we must look at two well defined user groups. These are the visitors to Santa Rosa County which we have extensively analyzed above and the residents of that county. Such coastal residents engage in all forms of boating and also use artificial reefs as a recreational aid. In 1996, the population of Santa Rosa County, Florida was estimated at 98,491 individuals. These individuals took advantage of the coastal environment by registering 9,464 pleasure craft or a little over 10 persons per boat. In the State of Florida, there are over 19 persons per registered boat indicating that Santa Rosa County has almost double the per capita ownership of pleasure craft. A coastal county requires a relatively large infrastructure for boating including piers, boat ramps, and marinas. In addition, we can add artificial reefs are part of this infrastructure.

A inventory taken by the Florida Department of Environmental Protection(1996) in l995 indicated that Santa Rosa County had the following boating infrastructure:

1. Piers: 6 with a length of 10,318 linear feet;

2. Boat Ramps: 17 with a total of 19 boating lanes;

3. Marinas: 4 with 96 slips and 180 dry racks.

It is estimated by the DEP, that there are 4 artificial reefs off Santa Rosa County. All of these facilities are available to both visitors and residents for boating use in the Gulf of Mexico.

We shall focus on the registered boats in Santa Rosa County as the universe for resident use of artificial reefs. Of course, residents, as was true of the visitor sector, may avail themselves of party, charter, and other rental boats operating from the county. This will also be treated in our economic analyses. However, we shall start with the registered pleasure boats. For purpose of analyses, these pleasure craft were broken down into three categories based on the length of the vessel as follows:

Class 1: Under 16 Feet	5,565
Class 2: 16 Feet to 39 Feet, 11 inches	3,871
Class 3: Over 40 Feet	30
Total	9,464

The boat registration data were obtained from the Florida Department of Highway Safety and Motor Vehicles. Even though finer class distinctions are available by length, we felt that dealing with the above classes made our study more manageable and targets the Class 2 pleasure crafts as those capable of reaching an artificial reef which we saw in the visitor study above is, on average, over 10 miles from shore. Thus, the decision was made to target those intermediate size pleasure craft that are more likely to use artificial reefs. The third class is relatively small and was included to assure we treated, in some way, all the pleasure craft registered in Santa Rosa County.

RESIDENTS ENGAGED IN BOATING

METHODOLOGY

Residents engaged in boating from Santa Rosa County were divided into two classes: those using their own boats and those using some kind of rental boat such as a party, charter, or other kind of rental boat. Let us consider the “own boat category” first. As discussed above, the universe for this category includes all the registered boats in the county. It is possible that a resident of Santa Rosa County may registered his or her
boat in another county. If this is the case, we made the assumption that the boating activity of that resident took place mainly in the county in which the pleasure craft was registered. This is what is called a simplifying assumption to limit the scope of this study. However, of more concern in a coastal county is those individuals that registered their craft there, but live elsewhere. Such individuals would not be defined as residents of the coastal county. For example, a resident of Tallahassee may berth his craft in one of the 4 marinas in Santa Rosa County. It would not be unreasonable for such an individual to have registered his boat in Santa Rosa County as a matter of convenience. Therefore, some adjustment must be made to the registered pleasure craft numbers to account for, delete, nonresidents. For each of the Classes established above, the following expression was employed:

RESBT = REGBT * % RES

where,

RESBT = Registered resident boats(pleasure craft);
REGBT = Registered boats (pleasure craft) in the county under study;
%RES = Percent of registered boats registered to individuals with homes in the county under study.

Just how %RES(percent local residents) was determined will be discussed under sampling procedure below. Next, registered pleasure craft owned by local residents is merely a stock of boats which may or may not be used for boating or some element of boating such as fishing or diving. In our sampling procedures discussed below, we ascertained, from those owning registered boats, the number of days per year they were used for predominately for saltwater fishing. For purposes of this study, we are only interested in fishing and diving since these activities are the primary recreational use of artificial reefs. The following expression may be useful in looking at a fishers use of a pleasure craft:

FPDYO = RESBT* FDPBPYO

where,
FPDYO = Fishing(saltwater) <u>party</u> days per year using own boat;
RESBT = Resident boats(pleasure craft);
FDPBPYO = Fishing(saltwater) days per own boat per year.

This is a rather simple expression which indicated that saltwater fishing days per year is the result of multiplying the number of boats by the average number of fishing days. This turns the stock of boats into a flow of days per year. <u>Each day represents the action of a group of people or party.</u> So, each day can be regarded as a “party day”. Such “days” refer to the use of the pleasure craft or boat by a residents of the county under study.

Next, we wish to translate fishing days into expenditures by residents using their boats in Santa Rosa County. To do this, we can use the following expression:

$EXPENDFO = FPDYO * $EPPDO

where,

$EXPENDFO = Total expenditures on saltwater fishing per year using own boat;
FPDYO = Fishing (saltwater) party days per year using own boat;
$EPPDO = Expenditures per party per day using own boat.

Notice that $EPPDO is expenditures by the entire party using a boat or pleasure craft on any given day for saltwater fishing. Such expenditures run from bait and fuel to slip rentals in a marina. Thus, we are able to obtained how much was spent by those residents using their own boat on bait for example. This will be discussed in some detail below.

$EXPENDFO must be converted into how many job such expenditures support in Santa Rosa County and wages related to such jobs. This can be accomplished by the following expressions:

EMPLOYFO = $EXPENDFO / {($S/E)}

$WAGESO = %WAGES*$EXPENDFO

where,

EMPLOYFO = Number of full and part-time jobs generated by recreational saltwater fishers using own boat in the county;
$S/E = The ratio of sales to employment for those industries in which spending for good and services are made for saltwater fishing;
$WAGESO = Wages and salaries generated by own boat spending in industries related to saltwater fishing;
%WAGES = Percent wages are of total sales/expenditures in industries related to saltwater fishing.

The first expression above is used to derive employment by dividing expenditures which are sales by the published ratio of sales-to-employment in those industries related to saltwater fishing. Each of these industries generates wages as a cost of doing business. Therefore, we multiply this published ratio of wages-to-sales or %WAGES by $EXPENDFO to obtain the wages and salaries generated by these expenditures. In both expressions, we need published data that are taken from the U.S. Censuses of Retailing and Services for the county in question. In the case

of this chapter, we have published data for Santa Rosa County on all major industries serving the county. Published data are not always available for all the parameter needed for the above expression. In this case, we must turn to sampling which is discussed below in a separate section.

It should be recognized that not all residents use their own boat for saltwater fishing in Santa Rosa County. Rentals such as party and charter boats are readily available and are the choice of many visitors to the county as discussed in Part 1 in this chapter. How do we obtain the total expenditures by residents on this part of the saltwater fishing sector? Consider the following expression:

$EXPENDFR = ($EXPENDVISITOR/ %VIS) * %RES

where,

$EXPENDFR = Expenditures by county residents on charter, party, and other rental boats for saltwater fishing;
$EXPENDVISITOR = Expenditures by all visitors on charter, party, and other rental boats for saltwater fishing;
%VIS = Percent visitors are of the total demand for charter, party, and other rentals;
%RES = Percent residents are of the total demand for charter, party, and other rental boats.

The right hand side of the above expression has two terms. The first term merely “blows-up” visitor expenditures on all rental boats to total expenditure including, of course, those expenditures made by non-visitors or residents. The second term is merely what percent total expenditures are made by residents of the county in question. The “percents” are based on the number of days that visitors and residents make in connection with the
boat rental industry in the county. This is the best measure of demand available from the boat rental industry. This will be discussed below in some detail.

Finally, we would like to estimate the number of person fishing days spent by all residents of Santa Rosa County. The reason we say “person” fishing days is that we wish to derive the total number of fishing days by all persons engaged in saltwater fishing. These days will be used later to estimate the total use value of the recreational experience that was extensively discussed under the visitor’s section above. The

following expression can be used to estimate total saltwater person-days:

PDAYSFO = FPDYO * SPO

where,

PDAYSFO = Person days saltwater fishing using own boat;
FPDYO = Fishing(saltwater) party days per year using own boat;
SPO = Size of party engaged in saltwater fishing using own boat.

Now, we shall turn to the survey techniques used with the residents to obtain some of the parameters of the expressions discussed above.

SAMPLE SURVEY

The researchers obtained a magnetic tape from the Florida Department of Highway Safety and Motor Vehicles (FDHSMV) containing all registered boat owners in the State of Florida. The computer tape was processed to yield only those registered boaters in the five West Florida Counties under study. These five counties contained 60,599 registered boat owners. This defined our universe of resident boaters. The purpose of obtaining the tape was to form the universe for telephone sampling of registered boat owners in each of the five counties. Unfortunately, the FDHSMV does not obtain the phone number of the registered boat owner. To overcome this problem, we obtained a CD-ROM of all listed phone numbers in the United States including Florida. The CD-ROM was interfaced with the magnetic tape of registered both owners to match as many owners with listed phone numbers. For the counties under study, we were able to “match” about 85 percent of the registered boat owns on the tape with phone numbers available on the CD-ROM. The “matched set” of registered boat owners in each county was randomized so they could be sampled. This was a substantial undertaking for the research team plus a graduate student in the Florida State University Statistics Department. But, it did form the basis for the telephone survey.

The random sample size was determined by the county under study and the budget for the project. That is, Bay, Okaloosa,

and Escambia Counties contain about 80 percent of the registered boat owners so this is where our sampling was concentrated. Further,
the budget for this project limited the size of the sampling even for the larger counties. After the survey instrument was developed for residents, the randomized boat owners were called by telephone in Santa Rosa County during the summer and early fall of 1998. The degree of cooperation by the boat owners called was exceedingly low with only 1 in 10 agreeing to be surveyed. This made the process even more expensive. We have no idea
as to why the response rate was so low. In any event, 51 boat owners were completely surveyed in Santa Rosa County by the end of the allotted time for the resident survey. It was our intention to get a least 100 boat owners for the larger counties and this was generally obtained. The survey instrument used for the residents is contained in Appendix 3 for the readers inspection.

ESTIMATION OF SPENDING;EMPLOYMENT; WAGES AND DAYS ON SALTWATER RECREATOINAL FISHING

Table 4.20 contains the necessary parameters to estimate the economic impact model formulated above. For the reader's insight into this process, let us work through an example. Consider size class 1 or own boats under 16 feet as discussed above and included in Table 4.20. Inserting the estimated values from Table 4.20 into the expressions explained above, we have the following:

(1) RESBT = RESBT * %RES = 5,563 * .914 = 5,085 (locally owned boats)

(2) FDPYO = RESBT * FDPBPYO = 5,085 * 15.00 = .076275(Millions party days)

(3) $EXPENDFO = FPDYO *$EPPDO = .076275(Millions) * $62.80
= $4.795 (Million)

(4) EMPLOY = $EXPENDFO/{($S/E)} = $4.795/ ($.1242)= 39 Employees

(5) $WAGESO = %WAGES * $EXPENDFO = .0882 * $4.795 (Million)
= $.4228 (Million)

(6) PDAYSFO = FPDYO * SPO = .076275(million) * 2.0

= .15255(Million person days)

(7) $EXPENDFR = ($EXPENDVISITORS/%VIS) * %RES
= {$4.61(Million)/.868}*.132
= $.7017 (Million)

Summarizing the above analyses, we can state that the individuals in Santa Rosa County owning pleasure craft under 16 feet spent $4.795 million on saltwater recreational fishing which in term generated over $.42 million in wages which supported 39 jobs
in Santa Rosa County. In addition, the local individuals owning the pleasure craft provided over 150,000 person-days of saltwater recreational fishing. Notice that these conclusions were reached using expressions (l) through (6) above. Expression (7) relates to an estimate of total spending of all Santa Rosa County residents on party, charter, and other rentals combined. These individuals either do not own boats or, if they do, choose to kick back and let someone else do the boating while they concentrate on fishing. Table 4.21 summarizes all the analyses for the three classes and rentals.

TABLE 4.20

PARAMETERS ESTIMATED FROM THE SAMPLE OR TAKEN FROM PUBLISHED DATA TO IMPLEMENT THE SANTA ROSA RESIDENT ECONOMIC IMPACT MODEL OF SALTWATER RECREATIONAL FISHING

	OWN BOAT			RENTAL
Parameter	Class 1	Class 2	Class 3	All other
RESBT (Registered boats)	5,563	3,871	30	N/A
%RES (Percent live in county)	92	83	90	N/A
FDPBPYO (Days per year/boat)	15.00	24.49	30.00	N/A
$EPPDO (Expenditures/party/ day)	$62.87	$106.46	$100.53	N/A
$S/E (Millions) (Sales to Employ- ment ratio)	$.1242	$.1321	$.0938	$.042
%WAGES (Percent wages of sales)	.0882	.0862	.1414	.27
SPO (Size of party)	2.00	3.83	4.5	N/A
%VIS (Percent visitors)	N/A	N/A	N/A	87
%RES (Percent residents)	N/A	N/A	N/A	13
$EXPENDVISITORS ($ Spent by visitors using party, charter, and other rentals in millions)	N/A	N/A	N/A	$4.61

Source: Florida State University Sample Survey; U.S. Censuses of Retailing and Services, Santa Rosa County, Florida.

TABLE 4.21

ESTIMATED ECONOMIC IMPACT OF RESIDENT SALTWATER FISHING ON SANTA ROSA, FLORIDA

ECONOMIC VARIABLE/ INDICATOR	CLASS 1	CLASS 2	CLASS 3	RENTAL	TOTAL
EXPENDITURES (Millions)	$ 4.80	$8.84	$.043	$0.702	$14.38
WAGES (Millions)	$0.423	$0.763	$.006	$0.616	$1.38
EMPLOYMENT	39	67	1	17	124
PERSON-DAYS (Millions)	.1525	.3180	.0019	.0718	.5443

Source: Florida State University

Residents of Santa Rosa County, Florida spent nearly $14.4 million on saltwater recreational fishing over the last 12 months (primarily l998). According to summary Table 4.21, this generated about $1.4 million in wages and salaries that supported about 124 full and part-time employees located in Santa Rosa County. In addition to the visitor spending discussed in the first part of this chapter, the residents of Santa Rosa County place considerable pressure on the boating infrastructure of the area. Of great importance, these conclusions only applying to saltwater fishing using a boat mode and does not include fishing from the shore. In addition, fishers spent 544,314 person-days over the last 12 months in the pursuit of recreational saltwater fishing. As explained under our discussion of visitors above, the number of person-days is a significant factor in computing the use value of the fishery resource and even recreational aids such as artificial reefs. This brings us to a direct consideration of that segment of the resident anglers using artificial reefs.

RESIDENTS USING ARTIFICIAL REEFS

As we mentioned above, our telephone survey covered 51 resident boaters in Santa Rosa County, Florida. Much of the information contained in Table 4.20 came from this survey. In addition to this information, we asked resident boaters about their fishing use of artificial reefs which engaged in saltwater recreational fishing. We measure participation in terms of days spent fishing. In fact, the days spent fishing are the driving force behind all our economic impact conclusions discussed above.

In total, the 51 resident boaters sampled spent 1,089 party days per year engaged in saltwater recreational fishing. This was the aggregate fishing effort by all of the three boat length classes discussed above. Respondents were asked to break down their saltwater fishing days into those days spent on or about artificial reefs off Santa Rosa County. Of the total party days, 423 party days were spent fishing on artificial reefs. Thus, about 39 percent of all party days spent on saltwater recreational fishing targeted artificial reefs as the place to engage in fishing. An independent survey of charter boat operators by the authors indicated that artificial reefs are fished over 47 percent of the fishing days. Therefore, whether one used his own boat or a rental, it would appear that artificial reefs are used a great deal of the time while saltwater recreational fishing. Since days fishing is a multiplier to get all the economic impact information, then it follows that 39 percent of the total economic impact is artificial reef related. This is shown in Table 4.22.

For fishers only, they spent over $ 5.6 million on goods and services in Santa Rosa County, Florida that is artificial reef-related. This expenditure supports 48 full and part-time employees with wages of $.54 million. These anglers spent 212,283 person-days on artificial reefs over the last 12 months(primarily l998). Lastly, we shall consider divers as a recreational group that uses artificial reefs.

TABLE 4.22

ESTIMATED ECONOMIC IMPACT OF RESIDENTIAL SALTWATER RECREATIONAL FISHING ON OR ABOUT ARTIFICIAL REEFS, SANTA ROSA, FLORIDA

ECONOMIC VARIABLE / INDICATOR	VALUE
TOTAL EXPENDITURES	$5.61 MILLION
TOTAL WAGES	$.54 MILLION
TOTAL EMPLOYMENT	48 EMPLOYEES
TOTAL PERSON-DAYS	.2122 MILLION

* 39 percent of total economic impact of saltwater recreational fishing by residents attributable to the existence of artificial reefs. See text for a further discussion. Figures in this table are 50 percent of the figures in Table 4.22.

Source: Florida State University

Up to this point, we have not mentioned diving as a recreational use of an artificial reef. From our sample, diving constitutes about 2.8 percent of all the days devoted to fishing and diving by the residents of Santa Rosa County, Florida. For the other counties we shall be reviewing, diving is even less important. To estimate the economic impact of diving, we performed the following procedure:

ADJFACTOR = DAYSDIV/ DAYSFISH

where,

ADJFACTOR = Adjustment factor to economic variables associated with recreational saltwater fishing to derive estimates of economic variables associated with diving;
DAYSDIV = Days spent diving by residents;
DAYSFISH = Days spent fishing by residents.

The ADJFACTOR is merely multiplied by the economic variables associated with recreational saltwater fishing on artificial reefs to derive an estimate of the economic importance of diving. The implicit assumption is that spending by divers per party
per day is about the same as that for fishers. Unfortunately, the sample for divers in Santa Rosa County that use artificial reefs was only 5 responses. When we compared fishing and diving expenditure profiles for the entire sample of boaters in northwest Florida, we did not find any significant differences. So we use the fishing expenditure profiles for divers.

The fishers spent 1,089 days per year from the sample while the divers spent only 30. Therefore, the ADJFACTOR would be .028 (30/1,089). We applied this factor to the results in Table 4.22 to obtain a rough estimate of the economic extent of diving. All of this is summarized in Table 4.23. The combined economic impact of fishers and divers using artificial reefs in Santa Rosa County is reflected in spending of over $5.76 million, supporting 51 jobs and generating $ .554 million in wages and salaries. These two groups spent 218,226 person days on the artificial reefs over the last 12 months.

Next, we shall consider, as we did with visitors, the responses by fishers and divers to questions concerning their evaluation of artificial reefs as a recreational aid.

TABLE 4.23
ESTIMATED ECONOMIC IMPACT OF RESIDENTIAL SALTWATER FISHING AND DIVING ON ARTIFICIAL REEFS IN SANTA ROSA COUNTY, FLORIDA

ECONOMIC VARIABLE/ INDICATOR	FISHERS	DIVERS*	TOTAL
TOTAL EXPENDITUES (MILLIONS)	$5.61	$0.16	$ 5.77
TOTAL WAGES (MILLIONS)	$0.538	$0.015	$0.554
TOTAL EMPLOYMENT	49	2	51
TOTAL PERSON-DAYS (MILLIONS)	.212283	.005944	.218226

---

* Divers derived by multiplying fishers by the adjustment factor(ADJFACTOR) of .028 explained in the text.
Source: Florida State University

EVALUATION OF ARTIFICIAL REEFS BY RESIDENT USERS

METHODOLOGY AND EMPIRICAL RESULTS

As part of the phone survey to resident boat owns in Santa Rosa County, we asked respondents to evaluate the artificial reefs that they used. Such questions were restricted to those that have actually used one or more artificial reefs. We asked respondents the reasons that might be important in their decision to use an artificial reef as a recreational aid in either fishing or diving. Respondents rated each statement from Very Important to Not Important at All. The following results were obtained with the percent that answered either Very or just Important as their evaluation.

TABLE 4.24

Reasons Behind the Choice of an Artificial Reef by Fishers

Reason	Percent Very Important or Important
1. Better Catch Rate	93.9
2. Previous Experience at Site	84.8
3. Site Is Close to Shore	63.6
4. Want to Fish Near Others	6.1
5. Other Fishers Recommended Site	37.5
6. Site Is Easy to Locate	66.7
7. Better Fishing than Natural Reefs	29.0

Source: Florida State University

It would appear that fishing catch rate on artificial reefs was of paramount importance in the decision by fishers to use an artificial reef for a recreational aid. Apparently, artificial reefs raise use value as discussed in Part 1 dealing with visitors. In fact, we found that the travel cost model applied to visitors verified the hypotheses that recreational value is increased when an artificial reef is introduced into the recreational activity of saltwater fishing. A particular artificial reef was rated very important when the individual had previous experience with it. About 64% percent of the respondents favored artificial reefs that were close to shore. Respondents

definitely felt that they wanted to be alone on artificial reefs as less than 7 percent wanted to fish near others. A little over one-third of the artificial reef users felt that the recommendations of other fishers regarding a “good” artificial reef was either very or just important. Users manifested a feeling that artificial reef should be easy to locate which is understandable. Finally, artificial reefs are a good man-made recreational aid; however; only one-third of the users felt that man was better than nature- that is two thirds felt natural reefs yielded “better fishing” and was very important to reef selection.

We asked both fishers and divers to evaluate artificial reefs from somewhat of a different perspective. In the above analyses, the respondents were restricted to fishers only. Table 4.25 shows the results from both users combined. With regard to placement of artificial reefs too far from shore, only 25% of all users felt the placement of artificial reefs was too far from shore. Such strategic placement of artificial reefs is important and users appear to give the present placement high marks in this county. At present, 50% of the users of artificial reefs do think that they are too crowed. However, with the rapid expansion in boating in the Florida Panhandle, it would appear that this may be a growing problem in the immediate future. All users are not convinced that artificial reefs are more productive than natural reefs. In fact, only 25% hold this opinion. Crowding on artificial reefs does appear to be a problem, and this was reinforced by the feeling by all respondents that there are not too many artificial reefs. One half of the users felt that artificial reefs should be in water less than 150 feet. Finally, all users felt that artificial reefs increase abundance of fish.

There will be two issues arise from this result. First, should the investment in artificial reefs be expanded in the future since crowding may become critical problem. Second, some regard the expansion in artificial reefs will hasten overfishing of bottom dwelling fish such as red snapper and various groupers. The hypotheses advanced is that artificial reefs do not increase the size of the fishery population, but merely aggregate an existing population on reefs where they can be easily overfished. This view regards artificial reefs as devices to increase the “efficiency” of recreational fishers in catching fish. This debate has been covered lately in Grossman et al and Bohnsack et al (l997).

TABLE 4.25

EVALUATION OF EXISTING ARTIFICIAL REEFS
BY DIVERS AND FISHERS OFF SANTA ROSA COUNTY, FLORIDA

CRITERIA FOR EVALUATION	PERCENT STRONGLY AGREE OR AGREE
1. Reefs Placed Too Far From Shore	25%
2. Artificial Reefs Too Crowded	50%
3. Artificial Reefs More Productive Than Natural Reefs	100%
4. Too Many Artificial Reefs	0%
5. Artificial Reefs Should Be In Water Less Than 150 Feet	50%
6. Artificial Reefs Increase Abundance of Fish	100%

Source: Florida State University

RESIDENT USE VALUE OF ARTIFICIAL REEFS

METHODOLOGY

We shall not go through an extensive discussion of the analytics of use value as we did for the visitors in Part 1. The reader is referred to the section discussing use value in the visitor analyses above. As the reader will remember, use value is the recreational value placed upon a common property resource such as a fishery which does not trade in an organize market. Quite simply, until recently there was no saltwater fishing license required by Florida for fishing in its territorial waters; therefore, the fish were free to anglers for their recreational use. Despite the expenditures of these anglers which is the economic impact, there is an additional value called “use value” that is derived from this natural resource. We have argued and the survey results would seem to support the hypotheses that the artificial reef is a recreational aid that increases the use value of the fishery or the waters above the artificial reef for divers. Thus, we have basic use value and

the incremental use value created by the artificial reef. It is well known that an increase in catch rates will increase use value. See Green(1984) and Leeworthy(1990) for examples. Artificial reef fishers contend that catch rates are indeed better there. Thus, those fishing on an artificial reef should experience increase use value from the saltwater recreational fishing experience. This was confirmed for visitors in Part 1 and has profound implications for a benefit/cost analyses of the artificial reef program. As with the visitors, we asked the residents to respond to the following question, which we shall repeat again for the reader:

> "The artificial reef program cost money. Suppose that the government proposed that all newly constructed reefs would be paid for by requiring that reef users with their own boat either pay for a stamp as part of their fishing license and/or if they used a rental boat probably pay higher fees for the operator's stamp. The money would go into a trust fund that could only be used for the construction of artificial reefs. Would you be willing to pay $_____ per year when you renew your fishing license/and or use a rental boat of any kind to fund this construction program?"

Notice that this question is directed at fishers only. The reason is that there were too few divers in the sample from all five counties to implement the estimation of use value procedure. To enlarge the sample, we combined all counties where telephone interviews of fishers were completed. A total of 339 responses were obtained among the five counties. On a random basis, the respondents were asked this question which we called "dichotomous choice". That is, the respondent answers YES or NO to the amount or payment presented. The amounts presented were $1; $5; $10; $15;$20;$30 and $50. Remember, a respondent is presented with only one of these "payment vehicles" in the single interview. In this way, we get a segment of the sample answering to each of the
assigned values for the payment vehicle.

In the case of the visitors discussed above, we used three procedures to estimate use value. For residents, the travel cost method could not be used because of the short distance traveled to the boat launching site. Therefore, we are restricted to the Turnbull Distribution and the Dichotomous Choice Equation for the estimation of the use value for saltwater recreational

fishing on artificial reefs. We interpret the question stated above to be the incremental use value of expanding the artificial reef program to satisfy the users. Only 10 percent of the present reef users felt that there were enough artificial reefs off Santa Rosa County. Therefore, we would expect incremental use value from providing more artificial reefs. Just how many additional reefs was not directly addressed because we would have to get into placement, size, and depth of additional reefs. This kind of detail was beyond the scope of this investigation.

APPLICATION OF THE TURNBULL DISTRIBUTION TO RESIDENTS

We shall not get into an extensive discussion of the Turnbull Distribution since this was covered in Part 1 dealing with visitors. We would expect that as the payment amount increased, that fewer and fewer respondents would be willing to pay for the expansion of the artificial reef program. This means that the percentage of respondents for each dollar amount should decline as the dollar amount presented to the fisher increased. Table 4.26 shows the computations using the Turnbull Distribution procedure.

As expected, the percent of fisher respondents willing to pay increasingly higher dollar values declines as the dollar value is raised from $1 to $50. Even at the $50 level, 39.4 percent of that group of fishers said YES that they would be willing to pay that amount. This shows a strong support for the expansion of the artificial reef program even when faced with a higher cost of fishing licenses and/or rental boat fees by residents of all five counties. From the analyses in Table 4.26, it would indicate that the typical fisher using an artificial reef would pay an additional $25.45 per year to support the expansion of the program. Notice that use value and willingness to pay is used interchangeably. In general, they are the same concept. The answer to our dichotomous choice question was given by one individual so the $25.45 refers to the annual individual willingness to pay or the incremental use value of the artificial reef as a recreational aid. This use value is usually expressed on a daily basis. The reason for this is that we have estimated the number of person days connected with the artificial reef usage above. For Santa Rosa County, Florida, the typical boat owner fishes 18.81 days per year. This figures combines classes 1-3 discussed above. Of course, only 39 percent or 7.33 days are spent on artificial reefs as discussed above.

Therefore, the resident use value is about $3.47 per day($25.45/7.33 days). The residents use value is slightly higher than that found for visitors($3.35/day) using the Turnbull technique.

If we assume that the marginal willingness to pay is equal to the average willingness to pay, then we can compute total user value per year. Using the number of fishing days on artificial reefs by Santa Rosa County residents over the last 12 months, we can estimate the annual total flow of use value to Santa Rosa County fishers and divers assuming that the diver's use value is about the same as that of fishers. There were 218,226 days spent on artificial reefs by fishers and divers who are residents of Santa Rosa County, Florida. This is shown in Table 4.23. This allows us to make the following statement: Fisher and diver residents of Santa Rosa County derive $757,244 in recreational use value from the use of artificial reefs per year. This is a considerable flow of use value when it is compared to the cost of funding the artificial reef program. This will be considered in some detail when we finish all five of the counties under study.

TABLE 4.26

ESTIMATION OF RECREATIONAL SALTWATER

FISHING USE VALUE FOR ARTIFICIAL REEFS OF NORTHWEST FLORIDA

USING THE TURNBULL DISTRIBUTION

(1) Lower Bound Sample for Interval	(2) Upper Bound For Interval	(3) Probability of Payment at Upper Bound	(4) Change in Density of Distribution	(5) Willingness to Pay (1)*(4) $	(6) Size
$0	$1	.771	.229	0	70
$1	$5	.657	.115	$.115	64
$5	$10	.586	.070	$.350	58
$10	$15	.545	.041	$.410	11
$15	$20	.547	-.002	-$.040	64
$20	$30	.410	.137	$4.110	39
$30	$50	.394	.016	$.800	33
$50	Infinity	0	.394	$19.700	N/A
			Total Use Value(Sum Column 5)	$25.445	

Source: Florida State University

Dichotomous Choice Application

The modeling approach followed here is one originally developed by Bishop and Heberlein (1979). There have been many applications using slightly different specifications of the model and Hanemann (1984) further developed the underlying economic theory behind various model specifications and the

formulas for calculating consumer's surplus or compensating variation. Compensating variation is consumer's surplus adjusted for the income effects of price changes that would keep the consumer at the same level of total economic well-being as before the change in price. The answers to questions like the ones used in this study to measure the value of artificial reefs are assumed to yield estimates directly of compensating variation. The general form of the dichotomous choice is as follows:

$$Pr\ (YES) = \alpha - \beta_{BID} * BID + \beta_{SE} * SE + \mu$$

where, Pr (YES)= the probability that the user will be willing to pay the randomly assigned dollar amount (BID).

BID = randomly assigned dollar amounts.

β_{BID} = estimated coefficient on BID.

SE = vector of other socioeconomic variables and/or natural resource attributes.

β_{SE} = estimated coefficients for SE vector.

μ = error term following logistic distribution for logit model and normal distribution for the probit model.

The above model was estimated using both the logistic and normal distribution assumption about μ. The BID variable was included in its linear and logarithmic form (natural logarithm of BID called LBID here). In the SE vector, we include a variety of socioeconomic factors including household income, education level, age, years of experience boating in northwest Florida, race, and sex. Also, included were variables for differentiating charter, party, and private rental boat mode use from use of the own boat. Boat length was also entered as possible explanatory variable. A variable was also entered to indicate artificial reef use and, when fishermen and divers were combined, a variable was entered to differentiate divers from fishermen. Dummy variables were also entered for the counties to test for differences in values by county, holding all other factors constant. Table 4.27 includes the definitions of all the variables used in estimating the dichotomous choice models.

A total of eight models were estimated. The models differ by sample of users (e.g. all users versus fishermen only), by

assumption about the distribution of the errors (e.g. the logit of probit model), and by specification of the bid amount (e.g. linear BID or log linear or natural logarithm of bid or LBID). We only present the results of the model we considered the "best" model. Other results are available from the authors on request. Of the variables in Table 4.27, MALE, WHITE, EXPER, AGE, AGESQ, DIVE, and all the county dummy variables were not statistically significant in any model specification. Unlike the results from the visitor model, several variables were significant in explaining the willingness to pay for artificial reefs. Household income (INC) was positive and significant meaning that higher income households were willing to pay more for artificial reefs. All the education dummy variable were positive and significant meaning that those with an education level of high school graduate and above were willing to pay more for artificial reefs than those who had not graduated high school. The coefficients first increase then decline with higher levels of education suggesting a parabolic relationship between education and willingness to pay for artificial reefs. College graduates and those with graduate degrees would be willing to pay slightly less than those that either graduated from high school or had some college or vocational training. Those that own larger boats are willing to pay more as are those that used artificial reefs. Those that belonged to fishing and diving clubs and those that used some form of rental boating were willing to pay less.

The results across the eight models were not significantly different and ranged from $29.23 to $31.57 with an average across the eight models of $30.74. The results presented in Table 4.28 are representative of the eight models and produces a value of $30.58 which is not significantly different from the average across all eight models.

The value derived from the dichotomous choice model is slightly higher than that obtained using the same information and employing the Turnbull method $25.45 versus $30.58 or about 20 percent higher. The lowest value obtained from the dichotomous choice model is about 15 percent higher than that obtained using the Turnbull method ($29.23 versus $25.45). To derive an estimate of the willingness to pay per day, as with the Turnbull estimate above we divide the annual value per person by 7.33 days yielding an estimate of WTP/day of $4.17 ($30.58/7.33). And, our estimate of total annual value of artificial reef use in Bay County using the dichotomous choice method is $910,002 ($4.17 * 218,226 days of use).

TABLE 4.27

DEFINITIONS OF VARIABLES

USED IN DICHOTOMOUS CHOICE MODELS

FOR RESIDENTS OF NORTHWEST FLORIDA

Variable	Definition
FWP to	Dependent Variable, 1=YES 0=NO, for willingness pay randomly assigned dollar amount. Fishermen only.
WPALL to	Dependent Variable, 1=YES 0=NO, for willingness pay randomly assigned dollar amount. Fishermen and divers combined.
FBID	Randomly assigned dollar amount or bid for fishermen only. Dollar amounts $1, $5, $10, $15, $20, $30, and $50.
LFBID	Natural logarithm of FBID.
BIDALL $1,	Randomly assigned dollar amount or bid for fishermen and divers combined. Dollar amounts $5, $10, $15, $20, $30, and $50.
LBIDALL	Natural logarithm of BIDALL.
AGE	Age of respondent in years.
AGESQ	Age of respondent squared.
INC	Household Income of respondent in thousands of dollars.
EXPER	Years of boating experience in northwest Florida.
BOATLEN	Length of boat owned measured in feet.

SHS	Dummy variable for education level. Some High School.
HSGRAD	Dummy variable for education level. High School Graduate.

TABLE 4.27 (CONTINUED)

Variable	Definition
SCOLLEGE	Dummy variable for education level. Some College or vocational training.
COLLGRAD	Dummy variable for education level. College Graduate.
GRADPROF	Dummy variable for education level. Graduate degree of Professional degree.
RENTAL rental	Dummy variable for use of charter, party or boat services.
REEF	Dummy variable for use of artificial reefs.
CLUB diving	Dummy variable for membership in fishing or club.
DIVE	Dummy variable for diving in northwest Florida.
MALE	Dummy variable for gender of respondent. 1=Male 0=female.
WHITE	Dummy variable for race/ethnicity. 1=White 0=all others.
BAY	Dummy variable for county of residence. 1=Bay County.
WALTON	Dummy variable for county of residence. 1=Walton County.

OKA	Dummy variable for county of residence. 1=Okaloosa County.
ESCAM 1=Escambia	Dummy variable for county of residence. County.
SANTA	Dummy variable for county of residence. 1=Santa Rosa County.

_

TABLE 4.28

RESULTS OF ESTIMATION OF DICHOTOMOUS CHOICE MODEL

Variable (X)	Coefficient(β)	Standard Error (β)	T-value (β)	Prob. T-value	Mean of X
Constant	-1.734013395	.80216741	-2.162	.0306	
LBIDALL	-.2934505106	.06741002	-4.353	.0000	2.1360793
INC	.0105656069	.00392190	2.694	.0071	59.409722
BOATLEN	.0287826639	.01629651	1.766	.0774	21.736111
HSGRAD	1.295912551	.65786491	1.970	.0489	.17708333
SCOLLEGE	1.333626579	.63790874	2.091	.0366	.41666667
COLLGRAD	1.306813660	.64188700	2.036	.0418	.28125000
GRADPROF	1.268269984	.67117464	1.890	.0588	.10763889
RENTAL	-.8063524979	.32159810	-2.507	.0122	.06597222
REEF	.4114559423	.18719732	2.198	.0280	.73611111
CLUB	-.5066315361	.26390973	-1.920	.0549	.10763889

N=288
Chi-Squared 51.816
Degrees of freedom 10
Chi-squared Significance .0000
Percent Correct Predictions 71.18
Mean of Dependent Variable WPALL=.6284
Estimated Consumer's Surplus=$30.58* (Annual per person)

* Of the eight models estimated, the range of estimated consumer's surpluses was from $29.23 to $31.57 with a mean across all eight models of $30.74.

DEMOGRAPHIC AND BOATING CHARACTERISTICS OF RESIDENT FISHERS AND DIVERS

Table 4.29 shows the demographic and boating characteristics of resident fishers and divers from the Santa Rosa County sample of boat owners. The typical respondent was a 50 year old white male with some college as an educational level and having a family income of about $55,000 per year. The demographic profile for all boaters was almost identical to the sub-sample of artificial reef users. There was no statistical difference between the demographic characteristics of general boaters and those using artificial reefs. A comparison of residents to visitors reveals somewhat of a contrast. Visitors tend to be

much younger with a higher family income. See Table 4.7. Thus, the two markets for the two products-fishing and diving - is segmented into residents who are older and most probably living on pensions in comparison to visitors that a much younger and more affluent. This pattern is not unusual for many coastal communities. It does give us a contrast in terms of the constituency for artificial reefs. That is, when visitors are combined with residents, it would appear that artificial reefs are used by a broad spectrum of socioeconomic groups.

With respect to boater profile, the average pleasure craft size in the sample was 22 feet which is slightly larger than the average for the population of registered boats in Santa Rosa County which was a little over 18 feet. Boaters in the Florida Panhandle have been boating, on average, for 24 years. This is attributable to their age and, of course, their living in a coastal community. About 14% of the boat owners were members of some kind of boater’s club. The targeted species for fishers were very similar as that for visitors to Santa Rosa County in the snappers, groupers, and mackerels are well represented. As expected, if one fished for those species that “just come along” then the kind of species is much more diverse ranging from Triggerfish to catfish. The daily party catch rates were 6.09 and 2.67 fishing for targeted and non-targeted species respectively. The catch rates were somewhat higher for residents than visitors
which is to be expected based upon the difference in experience in fishing of Santa Rosa County (24 vs. 6 years). About 65% of the residents said they used artificial reefs over the last twelve months; however, the fishing days spent on artificial reefs was about 39% of total days as indicated in our discussion above. Residents choose to use about 3 different artificial reefs in a 12 month period and, apparently, most of them are a off Santa Rosa County indicating a “stay at home preference”. Residents fished on artificial reefs that are about 7-8 miles from shore. Visitors using charter boats were apparently taken further offshore for fishing on artificial reefs (i.e., 17 miles).

TABLE 4.29

DEMOGRAPHIC AND BOATING CHARACTERISTICS OF

OF RESIDENT BOATERS IN SANTA ROSA COUNTY, FLORIDA

DEMOGRAPHICS:	AVERAGE/OTHER
1. Age	50 Years
2. %Male	93.8%
3. %White	97.9%
4. Family Income	$55,000
5. Education	Some College
BOATING PROFILE:	
1. Average Length of Boat Owned	22 Feet
2. Years Boating in Florida Panhandle	24 Years
3. Percent Members of Boating Club	14%
4. Targeted Species:	1. Grouper
	2. Kingfish
	3. Red Snapper
	4. Mackerels
	5. Sea Trout
5. Catch/Party/Day: Targeted Species	6.09 Fish
6. Species That Just Come Along	1. Catfish
	2. Flounder
	3. Bonito
	4. Angel Fish
	5. Triggerfish
7. Catch/Party/Day: Non-Targeted Species	2.67 Fish
8. Percent of Sampled Resident boaters Using Artificial Reefs	65%
9. Number of Different Artificial Reefs Used Per Year by Those Using Them	2.47
10. Principal Artificial Reef Used During Year is Off Santa Rosa County(% of Users)	42%
11. Average Distance of Artificial Reef Used from Shore	7.70 Miles
12. Principal Fishing Method Used on Artificial Reef	Bottom Fishing

Source: Florida State University

SUMMARY AND CONCLUSIONS

ECONOMIC IMPACT OF ARTIFICIAL REEF VISITORS:

1. Over the last 12 months(l997-98), it was estimated that slightly over 1 million person-visits were made to Santa Rosa County for various forms of recreation and business;

2. The visitors to Santa Rosa County pumped over $.3 billion dollars in spending directly into the local economy supporting nearly 6,575 full and part-time employees and generating nearly $67 million dollars in wages. Visitors were directly responsible for 9% of all wages paid in Santa Rosa County and nearly 20 percent of full and part-time employment in this county;

3. All visitors to Santa Rosa County over the last 12 months(l997-98) spent about 4.7 million days in this county. The need for lodging; eating and shopping establishments while these visitor days were being spent generated the aggregate economic impact estimated above;

4. Of significance to this study, it was estimated that 6% of all visitor days or .3 million days were spent by visitors engaged in saltwater recreational boating off the Gulf Coast of Santa Rosa County. The principal modes of boating chosen by visitors were the use of one’s own boat or the rental of a charter boat which accounted 86% of all boating days. Party or head boats or other kinds of non-captain rentals accounted for the other 14%;

5. Visitor boating accounted for over $27 million in spending which supported 584 full and part-time employees who received nearly $6.3 million in wages. Because boating visitors spend money on fishing supplies and charter rental fees in addition to motels and restaurants as a general visitor would, they tend to spend more money per party than the average visitor. Thus, even though boating visitors account for 6% of visitor days, they account for over 9% of all visitor spending in Santa Rosa County. It also follows that boating visitors generated proportionately more direct employment and wages than the “average visitor” to this county;

6. One of the central thrusts of this study is to identify the economic impact of that segment of boating identified with fishing and diving so we could estimate the amount of visitor

spending that is related to the existence of artificial reefs off Santa Rosa County. After adjusting for all other uses of boats(e.g., cruising; water skiing), we estimated that 72% and 2.5% of all saltwater boating days were spent for saltwater fishing and diving respectively. Of the total days estimated to be devoted to fishing and diving, about 60% were spent on artificial reefs principally off Santa Rosa County. This led us to an estimate of the economic impact-related importance of artificial reefs for fishing and diving;

7. Over the last 12 month(l997-98), fishing and diving visitors using their own boat or some kind of rental boat(e.g., charter), spent over $21 million in Santa Rosa County on those days they engaged in saltwater fishing and diving on or about artificial reef. This supports 467 employees who receive an estimated $5.23 million in wages. This is an artificial reef-related economic impact. The reader should not infer that if artificial reefs did not exist, that Santa Rosa County would loose this economic impact. However, our further inquiry of artificial reef users would tend to support the hypothesis that this “recreational aid” is important to the recreational fishing and diving experience.
This is discussed under “use value” below;

8. Boating visitors that use artificial reefs have a demographic profile of that of a white male who is about 38 years of age and a college graduate as an educational background with an annual family income of $80,000. The typical visitor has a relatively large pleasure craft(23 feet) and has been boating in the Florida Panhandle for a almost 6 years. Only 42% of the visitors say they use artificial reef, but those that do use them very intensively. About 97% of the artificial reef users that use Santa Rosa County as a base use such reefs directly off the this county. On average, the visitor artificial reef users travel over 17 miles out into the Gulf of Mexico to use the public and private artificial reefs for saltwater fishing and diving;

9. Finally, we asked visitors to evaluate the existing artificial reefs off Santa Rosa County. Since there were too few respondents(11 interviewed), we felt that Escambia County would be more reflective of the evaluation and the reader is referred to Chapter 5 dealing with Escambia County.

USE VALUE(WILLINGNESS TO PAY) OF ARTIFICIAL REEFS VISITORS:

1. Use value or the willingness to pay is defined as the nonmarket value of a resource that is not openly traded in an organized market. Quite simply, units or day usage of the resource such as a recreational fishery do not have a price for their use or daily rental. Public goods such as artificial reefs fall in the same category since all can use this recreational aid, but government does not place a direct charge on the usage of this resource. The reason the use value or what users would be willing to pay for use of the resource is important is that it is the true value of additional output in the economy that is not counted in Gross Domestic Product or simply the well known GDP. In this study, we used three indirect methods to measure the use value of the artificial reef in conjunction with fishing and diving: (l) the Turnbull Distribution; (2) the Dichotomous Choice Model and finally (3) the Travel Cost Approach. Each approach has general acceptance among economist as a reasonable approach to estimating use value;

2. Using the Turnbull Distribution, it was found that visitors were willing to pay $3.35 per day for recreational saltwater fishing on artificial reefs. On the other hand, the dichotomous choice method yielded $4.08 per day while the travel cost procedure produced a willingness to pay per day of $11.32 for visitors to Santa Rosa County, Florida.

ECONOMIC IMPACT OF ARTIFICIAL REEF RESIDENTS:

1. We studied three classes of pleasure craft own by residents of Santa Rosa County. These classes were boats under 16 feet; those between 16 and 39 feet and those over 39 feet. Overall, there were 9,464 registered pleasure craft in the county in l998. In addition to those owning their on pleasure craft, it was estimated that 13.2% of the demand for charter, party, and other kinds of rental boats in Santa Rosa County was accounted for by local residents. Using owned and rental boats used by residents,
it was estimated that that resident saltwater recreational fishermen spent $14.4 million which supported 123 full and part-time employees, earning $1.38 million in wages and salaries;

2. Although residents predominately use their own boat for saltwater recreational fishing, visitors have a high use of all kinds of rentals(e.g., charter). Even so, we found that residents used about 39 percent of all party days spent on saltwater fishing off Santa Rosa County and targeted artificial reefs as a place to engage in fishing which is somewhat lower

than the 60% founds for visitors. It could be inferred that artificial reefs are a somewhat greater attraction for visitors than local residents. Thus, artificial reefs may be view as an attractant for visitors to Santa Rosa County;

3. Diving days accounts for about 2.8% of the days spent saltwater fishing off Santa Rosa County. When 39% of the expenditures on saltwater fishing are designated as artificial reef-related and increased by 2.8% to account for diving on such reefs, we found that $5.76 million was spent by residents that were related to artificial reefs. These expenditures by divers and fishers generated $.55 million in wages and salaries and supported 50 full and part-time employees;

4. Compared to visitors, the resident demographic profile was that of an older individual (50 years old) who has been fishing off the Florida Panhandle for 24 years compared to only about 6 years for visitors to Santa Rosa County. The resident boater is a white male with some college as an educational level and having a family income of $55,000 per year;

5. About one-fourth of the Santa Rosa County residents felt that artificial reefs were too far from shore which was the same for visitors. 50% of the residents felt the artificial reefs were too crowded. All resident respondents felt that artificial reefs were more productive than natural reefs which was surprising. All of the respondents strongly disagreed that there were too many artificial reefs. 50% of the residents felt that artificial reefs should be in water less than 150 feet. Finally, all residents interviewed agreed that artificial reefs increase fish abundance.

USE VALUE OF RESIDENTS:

1. The definition and explanation of use value was explained above under the visitor section;

2. Using the Turnbull Distribution, it was determined that resident willingness to pay or use value was $3.47 per day for fishers and divers using artificial reefs. This amounts to an annual total flow of recreational value for the residents of Santa Rosa County from the use of artificial reefs in conjunction with fishing and diving of $757,244. The Dichotomous Choice Model yielded a use value per day of $4.17 and a total annual value of $910,002.

3. In the only other study of artificial reefs, Milon(1988) found that resident users of artificial reefs off the coast of Miami, Florida were willing to pay $23.81; $26.07; and $35.07 using the contribution; referendum and bidding methods respectively expressed in l998 dollars. These values were all on an annual basis. Using the Turnbull Distribution, we found a willingness to pay per annum of $25.45 for artificial reef use off the Florida Panhandle, while the Dichotomous Choice model yielded a value of $30.58. These values would appear to be comparable to the values found by Milon in his earlier study.

COMBINED ECONOMIC IMPACT OF VISITORS AND RESIDENTS:

1. Table 4.30 shows the combined economic impact of visitors and residents that use artificial reefs off Santa Rosa County, Florida. Ignoring indirect or multiplier effects by the visitors, those fishers and divers that used artificial reefs off this county, spent $26.73 million over the last 12 month. This spending generated 516 full and part-time jobs in Santa Rosa County with a payroll of $5.78 million. By far, visitors played a greater role in the economic impact of artificial reef-related
spending. That is, visitors accounted for 78.4% of the total spending impact, indicating how important boating visitors and especially fishers and divers that use artificial reefs are to the Santa Rosa County economy. Visitors are economically more important because of one reason: when visitors come to the county, they spend several time what residents spend per party day.

2. Relative to the entire economic activity in the county, those visitors and residents using artificial reefs account for 0.77% of all wages and salaries in the county and 1.5% of all full and part-time employment in this county. This may not seem overwhelming; however, no one firm in Santa Rosa County would account for such an impact such as this. It certainly gives the reader some perspective on the targeted artificial reefs for recreational enjoyment by both visitors and residents alike. Again, we cannot say that if artificial reefs were removed or never were placed in the Gulf of Mexico that this economic impact would not have occurred. However, there is strong feeling among the users that artificial reefs are important recreational aids.

COMBINED USE VALUE OF VISITORS AND RESIDENTS:

1. Visitors and residents spent over .387 million recreational days on or about artificial reefs off Santa Rosa County Florida. Using the Turnbull Distribution to estimate use value of artificial reefs as a recreational aid, we found that on a daily basis visitors were willing to pay $3.35 while residents were willing to pay only $3.47. Weighted by days, the combined use value of visitors and residents was estimated at $3.44 per day. This produces an annual flow of about $1.33 million of use value from the usage of artificial reefs off Santa Rosa County. The dichotomous choice model yielded an estimate of $4.08 per person per day for visitors and $4.17 for residents with a weighted average of $4.13. This translates into $1.6 million in total annual use value. In the last Chapter of this report, we shall look into the asset value of the artificial reef system using the use value flow from each county relative to the cost of deploying the artificial reefs to get an idea of the benefit/cost ratio related to the artificial reef program managed by the State of Florida.

TABLE 4.30

COMBINED ECONOMIC IMPACT ON SANTA ROSA COUNTY, FLORIDA OF THOSE FISHERS AND DIVERS USING ARTIFICIAL REEFS

ECONOMIC VARIABLE	VISITORS[1]	RESIDENTS[2]	TOTAL
EXPENDITURES (MILLIONS)	$20.97	$5.76	$26.73
WAGES GENERATED (MILLIONS)	$5.23	$0.55	$5.78
FULL AND PART-TIME EMPLOYMENT	467	49	217
TOTAL COUNTY WAGES (MILLIONS)			$745.89
TOTAL COUNTY EMPLOYMENT			33,652
% ARTIFICIAL REEF RELATED DIRECT WAGES OF TOTAL WAGES IN THE COUNTY			0.77%
% ARTIFICIAL REEF RELATED DIRECT EMPLOYMET OF TOTAL EMPLOYMENT IN THE COUNTY			1.5%

1. Table 4.10
2. Table 4.23

TABLE 4.31

COMBINED RECREATONAL USE VALUE OF

VISITORS AND RESIDENTS FROM ARTIFICIAL REEFS

IN SANTA ROSA COUNTY, FLORIDA

ECONOMIC MEASURE	VISITORS	RESIDENTS	TOTAL
1. TOTAL USER DAYS ON ARTIFICIAL REEFS	169,000	218,226	387,226
2. ANNUAL VALUE PER PERSON			
a. Turnbull Method	$22.14	$25.45	$23.80*
b. Dichotomous Choice	$27.02	$30.58	$28.80*
c. Travel cost	$74.94	N/A	N/A
3. VALUE PER PERSON/ RECREATIONAL DAY			
a. Turnbull Method	$3.35	$3.47	$3.44**
b. Dichotomous Choice	$4.08	$4.17	$4.13**
c. Travel Cost	$11.32	N/A	N/A
4. TOTAL USER VALUE FOR ALL USERS ($MIL)			
a. Turnbull Method	$0.57	$0.76	$1.33
b. Dichotomous Choice	$0.69	$0.91	$1.60
c. Travel Cost	$1.91	N/A	N/A

*Simple arithmetic average of visitors and residents;
** Weighted arithmetic average of visitors and residents.

CHAPTER 5

ECONOMIC IMPACT AND IMPORTANCE OF ARTIFICIAL REEFS IN ESCAMBIA COUNTY, FLORIDA

INTRODUCTION

The purpose of this chapter is to show how we estimated both the market economic impact (e.g., sales, income, employment) and the non-market economic use value (i.e. consumer's surplus or the amount visitors or residents are willing to pay over and above the amount they actually spend) of visitors and residents of Escambia County, Florida. We estimate the market economic impacts for all visitors, boating visitors and residents, and, most importantly, for visitors and residents that used artificial reefs for fishing and diving. Also, we estimate the non-market economic use value of boating visitors and residents that fished and dived and the portion of this value attributable to artificial reefs. These values are used later in the report to conduct a rough benefit-cost analysis of the artificial reef program in northwest Florida.

In this chapter, we will first address the visitor population, then we will address the resident population of Escambia, County. We explain the economic concepts and our methods of estimation.

BACKGROUND

Escambia County is located in the very western end of the study area on the Gulf of Mexico. This county contains 664 square miles of land ranking it 38th among the 67 counties in Florida. In 1990, Escambia County had a resident population of 262,797 which ranked this county 15th among the state's 67 counties with respect to population. As with all the other counties in this study, Escambia County has a relative low median age compared to the entire state of Florida. Thus, this county is the largest of the five counties under study both in population and employment.

As its economic base, Escambia County depends on a number

of export industries. These export industries are composed of a sizable manufacturing sector(e.g., paper and allied products; printing and publishing; and stone, clay and glass products); water transportation; Federal employment including a navy base at Pensacola; a health services center for the region and, of course, tourism. According to Bell(l996), tourism is less important to Escambia County than the other counties considered in this report because of the many export activities cited above. This is not to minimize tourism to the area since Escambia County has 37 individual saltwater beaches which are 50.9 miles in length along with 28 marinas in this area. Thus, Escambia County has a large and diverse economy unlike the counties reviewed above. The tourist sector, as the other sectors that make up the economic base are also called basic industries.

Quantification of these "basic industries" is generally not difficult except for the tourism or visitation sector. The main reason for this is that the sector cuts across the two broad categories of retailing and services. That is, visitors spend money on a great variety of products and services. Such items are not designated as specific industries in the collection of data by the Federal and State governments. So, specific studies are necessary to quantify the economic importance of the visitor sector which is a collection of industries.

PART 1

VISITORS TO ESCAMBIA COUNTY

METHODOLOGY

The model that was used to estimate visitation to a local area is called the "**CAPACITY UTILIZATION MODEL**". This model has been widely used throughout Florida in such counties as Monroe; Orange; Osceola; Seminole; Hillsborough and Leon. In the latter two counties, two of the authors of this report (Dr. Bell and Dr. Bonn) are currently engaged in continuing work on the quarterly and annual estimation of the number of visitors; spending; wages and employment generated and developing indices of how visitors view the amenities of these counties.

Although rather simple in concept, the "**CAPACITY UTILIZATION MODEL**" is complex to implement because of the number of variables to consider. This model is based upon where visitors to an area

stay and that is the hotel and motel industry in the region. We call this an accommodation mode. Certainly, visitors may spend their nights with friends and relatives; in campgrounds; in condominiums or just come for the day (i.e., day visitors). The simplified "CAPACITY UTILIZATION MODEL" divides the visitor sector into those staying in hotels and motels and those staying in all other modes. If required, the residual sector can be broken down into its components, but this is at additional expense and is usually requested by special interests(e.g., condominium owners want to know how many visitors use condominiums, etc.). Thus, the capacity of the hotel/motel industry in the local area gives us the ability to extrapolate the sample to the population. That is, if we know the number of rooms occupied per night, we can derive the number of individuals using hotels and motels merely by multiplying by the size of the party using a room. Data on the number of rooms and occupancy rates are obtained from Smith Travel, Inc. on a subscription basis. As demand for visitations to the local area increases, the number of hotel rooms should expand and with it our estimate of the number of visitors. The residual or all other accommodation modes sector is linked to the hotel/motel sector by the percent of the randomly sampled number of visitors that stayed in something other than a motel/hotel. This description will become clearer once we show the results for each of the counties discussed above. To show how we obtain the number of visitors using hotels and models, the following expression may be helpful:

$$HMV = k*R*p*SP/LS \quad \text{where}$$

HMV= number of person-visits using hotel/motel accommodations;
k = hotel/motel occupancy rate;
R = number of hotel and motel rooms in the county;
p = period of estimation in days (e.g., l month=30 days);
SP = size of party staying in hotel/motel room;
LS = length of stay in hotel/motel room (e.g., number of nights).

The right hand side of the above expression can be broken-down into quite meaningful concepts. First, we must multiply the occupancy rate (k) times the number of available rooms (R) in the area. The available rooms are obtained by an inventory of all hotels and motels in the area. This yields the number of rooms actually used by visitors per night. Next, the length of the period is important since it specifies how many rooms nights were used in a month; quarter or yearly. In practice, p=90 since we are dealing with quarter-by-quarter analyses. As mentioned above, we must multiply by (SP) or the size of the party to count all visitors occupying the hotel/motel room per night. This will, of course, vary from night to night, but we use an average over the period of analysis. Finally, the first four terms in the

above expression will yield the number of hotel/motel occupants (person-days of occupancy) for any period of time, but to obtain HMV we must divide by the length of stay or (LS). This is not obvious, but can be explained by an example.

Assume one person attends a research seminar lasting 30 days and occupies one motel room each night. Then, we would have one person-visit per month. But, if we run two 15-day research seminars where there is a different class every 15 days, then the motel room turns over once a month. Now, two person-visits would accrue to the motel room since two individuals would occupy the room in the thirty day period. Thus, as the (LS) decreases (e.g., from 30 to 15 days in the above example), the number of person-visits increases. This is the rationale for the length of stay in the above expression.

In all the counties in the Florida Panhandle mentioned above, there is both a seasonality and trend in visitation. This is expressed by the occupancy rate. As occupancy rates decline (i.e., off-season), the number of hotel/motel rooms being used declines, thus illustrating the fall in demand via person-visits or HMV. This can be studied over the four quarters of the year as to its impact on visitor spending; generation of wages and employment and how the local economy adjusts to this pattern.

This is but a brief illustration of the principal sector of the CAPACITY UTILIZATION MODEL. The other or residual sector is obtained by ascertaining what percent of total visitor use is accounted for by the hotels/motel accommodation mode. This percentage is obtained by a random sample of visitors to the area.

SAMPLE SURVEY

During the spring and early summer of l998, face-to-face interviews were conducted at hotels, beaches and other places frequented by visitors. A total of 125 visitors were interviewed during this period. The survey instrument was designed to obtain spending amounts and other economic profile data. In addition, respondents were asked about the extent of boating while in Escambia County. This is the data base upon which the next two sections depend for the estimation of the CAPACITY UTILIZATION MODEL discussed above.

VISITOR AND VISITOR SPENDING ESTIMATION

In 1995, the U.S. Bureau of Economic Analysis estimated that Escambia County had 157,659 full and part-time jobs in the community. While being a medium size county as measured by

population or employment, Escambia County has 50.9 miles of beach and 28 marinas that attract visitors for beach and boating activities as well as meeting and shopping in this coastal community. By using the **CAPACITY UTILIZATION MODEL,** discussed above, we were able to determine the total visitors for the last twelve months which are shown in Table 5.1.

Almost 2.2 million per visits were made to Escambia County over the last year. As expected, visitation to this county ranked third behind Bay and Okaloosa Counties discussed above. About one half of the visitors used hotel and motel rooms for accommodations while in the Escambia County area. We see somewhat of a shift away from condominiums for accommodation when compared to especially Okaloosa and Santa Rosa counties. Table 5.2 displays an estimate of the spending by visitors to Escambia County.

TABLE 5.1

ESCAMBIA COUNTY VISITOR ESTIMATES
1997-98
(12 MONTHS)

ESTIMATION OF HOTEL/MOTEL VISITORS TO AREA(HMV)

(1) HMV = (k*R*p*SP)/LS = (.68*4,279*365*2.95)/ 3.0

= 1,083,289

where,

HMV = estimated number of visitors using hotels/motels;
k = occupancy rate over the year;
R = average number of rooms during the year;
SP = average size of party for those using H/M yearly;
LS = average length of stay for those using H/M yearly.

ESTIMATION OF TOTAL VISITORS TO AREA(TV)

(2) HMV = g*TV

where,

q = percent of total visitors to area using H/M;
TV = total visitors to the area or those staying in hotels and motels plus those staying elsewhere or day visitors.

Expressing (2) to solve for total visitors(TV), we have

(3) TV = HMV/g = 1,083,289 / .50

= 2,166,578

SUMMARY:

VISITORS USING HOTELS AND MOTELS(HMV):	1,083,289
OTHER VISITORS(FRIENDS/RELATIVES; CAMPING; CONDOS; DAY VISITORS OR 2,166,578 LESS 1,083,289)(OV)	1,083,289
TOTAL VISITORS	2,166,576

TABLE 5.2

ESTIMATION OF TOTAL SPENDING BY

VISITORS TO ESCAMBIA COUNTY, FLORIDA

1997-98
(12 MONTHS)

ESTIMATION OF TOTAL HOTEL/MOTEL VISITOR SPENDING(TVSHM)

(1) $TVHM = (HMV*LS)*($EPPD/SP) = (1,083,289*3.0)*($228.27/2.95)

= $252,228,100

where,

$TVHM = total visitor spending staying in H/M;
HMV = number of H/M visitors from Table 5.1;
$EPPD = expenditures by H/M per party day;
SP = size of party for H/M visitors;
LS = length of stay for H/M visitors.

ESTIMATION OF ALL OTHER VISITOR SPENDING(TVSOV)

(2) $TVSOV = (OV*LS)*($EPPD/SP) = (1,083,289*5.0)*($223.12/4.27)

= $277,475,600

TOTAL VISITOR SPENDING IN AREA(TVS)

(3) $TVS = $TVSHM + $TVSOV

= $252,228,100 + $277,475,600

= $529,703,700

SUMMARY:

TOTAL VISITOR SPENDING BY H/M USERS:	$252,228,100
TOTAL VISITOR SPENDING BY OTHER USERS:	$277,475,600
GRAND TOTAL OF VISITOR SPENDING:	$529,703,700

Visitors injected well over one half billion dollars into the Escambia County economy during the last 12 months. In our five county analyses, Escambia County was in third place with respect to visitor spending in that it trailed Bay and Okaloosa counties both in spending and, of course, the number of visitors. The other economic activities in Escambia County more than offset its relatively small visitor sector when compared to the other two counties mentioned above.

GENERATION OF WAGES AND EMPLOYMENT

The visitor spending in Escambia County has two important economic impacts. First, it creates direct wages and employment in the local economy. Such industries as hotels and motels and eating and drinking places cater directly to visitors to the area. Second, there is an important multiplier effect of an injection of about $530 million dollars per year into the local economy.

Let us consider an estimate of the total direct wages and employment generated by visitors to the Escambia County area. Beneath the total category of expenditures by visitors, we have ten separate purchase categories ranging from lodging to local shopping. Each category can be matched to published data on sales; wages and employment. The most detailed breakdown of these categories can be obtained from the l992 Censuses of Retail Trade and Service Industries and updated to l997-98. Two important statistics emerge. They are the sales-to-employment ratio and the percent wages are of sales. These can be designed as S/E and %W respectively. They will vary by category since some industries are more labor intensive than others. For example, a gasoline station has a high S/E since it is not very labor intensive(i.e., fully automated if just selling gas with credit cards) while a restaurant has a lower S/E ratio since each party needs the attention of a waitress. To obtain the estimated employment and wages, the following procedure was followed with the total spending broken into 10 categories or industries:

Employment = Spending in i'th industry /(S/E for i'th industry)

For example, if $150 million were spent on lodging and the sales-to-employment ratio for lodging was $50,000, we would estimate that 3,000 jobs would be sustained in this industry (i.e.,$150 million divided by $50,000). Further, assume that of the $150

million spent, 25% is required for wages or $37.5 million. Although all these calculations are not shown here, they are available from the authors upon request.

Table 5.3 shows the wages and employment generated by visitors to Escambia County. Compared to other counties in northwest Florida, Escambia County is less dominated by visitors as an aspect of it economic base. That is, direct wages are 2.7% of total wages generated by the economy. Even so, this is an important part of the economic base of Escambia County. From an employment standpoint, visitor spending accounts for nearly 7 percent of the local economy; however, this does include a disproportionate share of part-time jobs and the kind of jobs that are generally unskilled. This is always a factor in analyzing the economic importance of the visitor sector.

As pointed out before, visitor spending is a direct injection of spending that produces a multiplier effect throughout the area. The wage multiplier in Escambia County is likely to be in the range of 1.4. Therefore, additional or indirect wages of about $45 million might be anticipated. The ***total wage impact would be over $157 million or 3.8% of all wages generated by the entire industrial complex in Escambia County.*** The employment multiplier would be somewhat less because of factors treated in previous chapters(i.e., low wage industries coupled with lots off part-time employment) or in the l.2 range. This would increased employment by over 2,000 job, bringing the ***total employment impact of 12,410 jobs or 7.9% of all employment***.

TABLE 5.3

ESTIMATED DIRECT WAGE AND EMPLOYMENT
GENERATED BY VISITORS TO ESCAMBIA COUNTY
COMPARED TO TOTAL WAGES AND EMPLOYMENT
OVER THE LAST 12 MONTHS
(1997-98)

	VISITOR GENERATED AMOUNT (MIL$)	TOTAL FOR AREA (MIL$)	VISITOR PERCENT OF TOTAL
WAGES AND SALARIES	$112.24	$4,109.6*	2.7%

FULL AND PART-TIME EMPLOYMENT	10,342	157,659*	6.6%

* 1995 salaries and wages taken from the U.S. Bureau of Economic Research and adjusted upward for projected employment growth of 1.4% annually or 4.2% plus a rise in inflation of 6.7 percent over the l995-l998 period or 10.9% from University of Florida, Bureau of Economic and Business Research and the Presidents Economic Report, 1998.

**l995 employment from U.S. Bureau of Economic Research adjusted for job growth of 1.4% taken from University of Florida, Bureau of Economic and Business Research for a total percent increase of 4.2.

BOATING VISITORS

METHODOLOGY

As part of the sample survey of all visitors, we asked respondents about their participation in recreational boating during the last 12 months. The total visitors are an umbrella under which many activities are included including boating. Therefore, to go from general visitor days to days spent boating the following expression was employed:

$$(N*LS*TPY)/YRS = TVD$$

where, N= sample size;
LS= length of stay per trip;
TPY= trips per year to the area;
YRS= years (data was collected for two-year time period)
TVD= total visitor days.

From the data obtained in the sample survey of all visitors, we calculated the following:

$$(110*4*3.61)/2 = 794 \text{ visitor days from the sample.}$$

The respondents in the sample spend approximately 794 days per year in Escambia County. They also told us that they spend 83

boater days over the last 12 months. Therefore, we estimated that 10.5% or a little over 10% of all visitor days were spent boating annually. As an approximation, we shall use 10.5% as the way to go from general visitation to boater visitation measured in terms of days.

SAMPLE SURVEY

In the summer of l998,a second sample survey was conducted of just boating visitors to Escambia County. This survey linked the first survey of all visitors to just those engaged in some kind of boating. 122 boating visitors were interviewed to gather information regarding their mode of boating, expenditures in Escambia County while boating, and most importantly their use and evaluation of artificial reefs. The sample survey instrument is shown in Appendix 2. The survey was taken at such boating sites as boat ramps and marinas. Thus, the following analysis is based upon the second critical survey made in this study.

NUMBER OF VISITORS; VISITOR SPENDING AND WAGES AND EMPLOYMENT IMPACT OF BOATING VISITORS

Using the information from Tables 5.1 and 5.2, we calculated the total number of visitor days spent by all visitors using the following expression:

$$TVD = HMV*LSHM + OV*LSOV$$

where, TVD = total days for visitors to Escambia County;
HMV = person-visits using hotel/motel;
LSHM = average length of stay for those using H/M;
OV = all other person-visits;
LSOV = average length of stay for all other modes of accommodations.

Inserting the necessary information from Tables 5.1 and 5.2, we have the following:

$$8.666 \text{ Million} = 1.083 \text{ Million}*3.0 + 1.083 \text{ Million}*5.0$$

Therefore, we have estimated that all visitors to Escambia County spent almost 8.7 million days over the last 12 months. About 10.5% of these days were devoted to boating. Thus, aggregate

boating days are 0.9099 million over the last 12 months.

Using the sample distribution of days by mode of fishing, we have the following distribution:

Boating Mode	Estimated Number of Days in Last 12 Months
1.Own Boat	0.4249 Million Days (46.7%)
2.Charter Boat	0.3512 Million Days (38.6%)
3.Partyboat	0.1256 Million Days (13.8%)
4.Private Rental/No Guide	0.0082 Million Days (0.9%)

From the above, it can be concluded that boating visitors to Escambia County are almost evenly split between use of their own boats and some type of rental boat mode. Almost 39% of the boating visitors prefer the Charter boat mode. This pattern varied from county to county depending on cost, distance, and the socioeconomic characteristics of the boating visitors.

As discussed above, each boating mode will involve somewhat different kinds of expenditures (e.g., no rental fee for own boat trailored to Escambia County) and the magnitude of the expenditures per party per day. This is one reason for breaking the boating modes down into four classifications. Therefore, we can compute the total expenditures on each mode by boating visitors using the following expression and "own boat" as an illustration:

TEO = TBDO * ($EPPDO/SPO)

where, TEO = total expenditures in Escambia County by those those using their own boat;

TBDO = total boating days by those using their own boat;

$EPPDO = total expenditures per party/day for those using their own boat;

SPO = size of party

The rationale for the above expression is fairly straight

forward. The second term is total party expenditures per day divided by the size of the party. This yields expenditures per day per person. When multiplied by total person-days, this yields an estimate of total expenditures for those visitors using their own boat. This expression can be used for the other three boating modes to derive total spending in each mode. The spending is on many goods and services in Escambia County that either directly or indirectly facilitate the use of a boating mode. For example, those that come for a charter boat experience, spend money on hotels, eating and drinking places, and, of course, the charter boat rental, for example. All are charter boat related since this is the main purpose of the visit to Escambia County. Table 5.4 shows the average spending per party per day (EPPD) and party size (SP) by both boating mode and type of activity.

TABLE 5.4

ESTIMATED AVARAGE SPENDING PER PARTY PER DAY AND PARTY SIZE FOR BOATERS BY BOATING MODE AND ACTIVITY ESCAMBIA COUNTY, FLORIDA

BOATING MODE	AVERAGE SPENDING PER PARTY PER DAY EPPD($)	AVERAGE PARTY SIZE
OWN BOAT		
FISHING	$321.97	4.26
DIVING	$301.25	3.40
CHARTER BOAT		
FISHING	$821.45	4.80
DIVING[1]	$309.53	4.75
PARTY BOAT		
FISHING	$351.54	3.24
PRIVATE RENTAL		
FISHING	$529.19	3.67

1. For Diving, expenditures are for all rental (e.g. Charter, Party, and Private Rental).

Table 5.5 shows the results of our expenditure calculations.

Boating visitors to Escambia County spend almost $107 million on the four boating modes. The charter boat mode is the largest total expenditures of over $54 million. As with all visitor spending, we also calculated the related wages and employment. This was done in the same way as described in the section on all visitors discussed above. Visitor boating-related expenditures generated a total of over $22 million in wages which supports 2,265 employees.

TABLE 5.5

ESTIMATION OF SPENDING BY BOATING VISITORS

CLASSIFIED BY BOATING MODE IN ESCAMBIA COUNTY, FLORIDA

BOATING MODE	RELATED TOTAL EXPENDITURES (MILLION$)[1]	RELATED WAGES (MILLION$)[2]	EMPLOYMENT (FULL and PARTIME)[3]
1. OWN BOAT	$38.98	$5.98	600
2. CHARTER BOAT	$54.31	$13.03	1,351
3. PARTYBOAT	$12.05	$2.83	290
4. PRIVATE RENTAL	$1.47	$0.24	24
TOTAL	$106.82	$22.08	2,265

1. See Table 5.6 for TBD by boating mode and Table 5.4 for the average expenditures and party size by mode.

2. Wages are obtained by multiplying percent wages by each expenditure items contained in the boating survey instrument. Percent wages were obtained from the U.S. Census of Retailing and Services and updated to l998. See Appendix 2 for boating survey instrument.

3. Employment was derived by dividing total spending by the sales to employment ration(S/E) for each spending category in the boating survey instrument. The S/E ratio was obtained as the same source as given in footnote 2. See Appendix 2 for the boating survey instrument.

In addition to spending, wages, and employment, it is important to know how many person-visits were made to Escambia County for the purpose of boating. This figure can be estimated by the following expression:

$$V = TBD/LS$$

where, V= person visits;
TBD= total boating days;
SP= size of the party.

The logic of the expression is that TBD are generated by all visitors to the county. Each visitor may stay for a particular number of days. To get the person-visits, this expression must be divided by the average length of stay. This yields an estimate of the total person-visits. We can apply this formula to each boating mode and thereby breakdown the person-visits by visitation by kind of boating. This is shown in Table 5.6

TABLE 5.6

ESTIMATION OF PERSON-VISITS
BY BOATING MODE FOR ESCAMBIA COUNTY

BOATING MODE	BOATING DAYS (MILLIONS)	LENGTH OF STAY (DAYS)	PERSON-VISITS (MILLIONS)
1. Own Boat	0.4249	4.61	.0922

2. Charter Boat	0.3512	5.42	.0648
3. Party boat	0.1256	5.45	.0230
4. Private Rental	0.0082	5.00	.0016
Total	0.9099		.1816

From Table 5.1, there were about 2.2 million person-visits to Escambia County. Of these visitors, it is estimated that 181,600 were boating visitors over the last 12 months or about 8.4 percent of the total visitors. Notice that this percent is slightly lower than our estimate of 10.5% of the number of boating days as a percent of total days spent by the sample of visitors discussed above.

Table 5.7 shows the demographic and boating characteristics of boating visitors surveyed in our second and most extensive survey. Boating visitors were relatively young and affluent. They were overwhelmingly white males. Bottom fish were caught along with some pelagic fish. About one-third of the visitors said they used artificial reefs. However, this is not the same thing as the percent of total boating days that were spent on artificial reefs. This leads us to the central thrust of this study and that is visitors(and residents) using artificial reefs.

TABLE 5.7

DEMOGRAPHIC AND BOATING CHARACTERISTICS OF

BOATING VISITORS IN ESCAMBIA COUNTY

DEMOGRAPHICS	AVERAGE/OTHER
1. Age	38 years
2. % Males	89.2%
3. % White	96.7
4. Family Income	$81,000
5. Education	College Graduate

BOATING PROFILE

1. Average Length of Boat(If owned)	22.56 feet
2. Years Boating in Florida Panhandle	6.08 years
3. Percent Owned Boat	20.8%
4. Percent Member of Boating Club	10.8%
5. Targeted Species	1.Grouper 2.King Mackerel 3.Red Fish 4.Dolphin Fish 5.Red Snapper
6. Catch/Party/Day: Targeted Species	13.98 Fish
7. Species That Just Came Along	1.Catfish 2.Grouper 3.Red Snapper 4.Cobia 5.Amberjack
8.Catch/Party/Day:Non-Targeted Species	5.95 Fish
9.Percent of Visitors Using Artificial Reefs	43.3%
10. Number of Different Artificial Reefs Used Per Year by Those Using Them	3.3
ll. Principal Artificial Reef Used in a Year Is Off Escambia County	100.0%
12. Average Distance of Artificial Reef Used from Shore	18.67 Miles
13. Principal Fishing Method Used on Artificial Reefs	Bottom Fishing

Source: Sample Survey of Boating Visitors to Escambia County

VISITORS USING ARTIFICIAL REEFS

METHODOLOGY

Up to this point, two sample surveys were utilized in this study. The first concentrated on the general visitor to Escambia County and also the extent to which the respondent engaged in boating over the last 12 months. A recreational boating experience embraces many activities such as cruising; water skiing; rafting-up; racing; wildlife observation and, of

course, fishing and diving. The latter activities are done from a boat and may or may not involve an artificial reef. Therefore, we can illustrate in the following manner:

Days Boating = {Fishing + Other Activities} + {Diving + Other Activities}

In the second survey of boating visitors, we focused on just fishing and diving which may or may not be performed in conjunction with an artificial reef. In Escambia County, we found that of the total days spent either fishing and/or diving, that 90% were spent fishing and the balance were spent diving over the last 12 months according to the visiting boaters using their own boat. These proportions vary with fishing and diving modes. Since our estimate of total boating days includes Other Activities, we must make some adjustment to our findings for Escambia County. In retrospect, we should have asked about these other activities so we could put fishing and diving in better perspective. This should be done in further studies of artificial reefs. However, we did make some adjustment for Other Activities by using probabilities from Bell(1995). We used the following expressions:

Days Fishing = Pr(DF)* Days Allocated to Fishing

Days Diving = Pr(DD)* Days Allocated to Diving

We first allocated total days on the basis of the fishing and diving proportions. Then, we asked the question as to the probability that the days allocated to fishing will, in effect, be used for fishing. Thus, Pr(DF)= probability that a day allocated to fishing will be used for fishing where "DF" is days fished. Similarly, Pr(DD) is the probability that a day allocated to diving will actually be used for diving where "DD" is days diving. Bell(l995) has indicated the following values for these two probabilities:

Pr(DF) = .80 and Pr(DD) = .25

Therefore, if there are 100 general boating days, 90 will be allocated to potential fishing and 10 to potential diving based upon our second survey or the boating visitor survey.

Of the 90 days allocated to potential fishing, we estimate that 72(.8*90) will actually be used for fishing. In the case of diving, the 10 days will be deflated on the basis of the probability to 2.5(.25*10). Therefore, our best estimate is that the 100 generic boating days are spent in the following manner: Fishing: 72 days; Diving: 2.5 days; Other Activities: 25.5 days. This methodology was used to allocate the total days among the three categories. Thus, those that think that fishing and diving occupy most or all of the time of the total boating days of visitors to Bay County will feel that we have underestimated the economic impact of artificial reefs. Alternatively, we can say that our estimates that follow are conservative or at least made an allowance for the "Other Activities Effect". Finally, the total fishing and diving days proportion vary by fishing mode as shown in Table 5.8.

TABLE 5.8

ALLOCATION OF BOATING DAYS BY MODE AND ACTIVITY FOR ESCAMBIA COUNTY,FLORIDA

Boating Mode	Fishing %F(%T)	Diving %D(%T)
Own Boat	90%(80%)	10%(25%)
Charter	83%(100%)	17%(25%)
Party Boat	100%(100%)	0%(0%)
Private Rental	90%(80%)	10%(25%)

As expected, most of the boating days that were fishing and/or diving were found to be used for recreational fishing.

This leads us to the estimated percentage of total days that are obtained from the sample survey for just fishing and diving that are spent on artificial reefs. We asked responds to allocate days boating by fishing and diving on or about artificial reefs. These proportions are shown in Table 5.9.

TABLE 5.9

PERCENT OF FISHING AND DIVING ON ARTIFICIAL REEFS

Fishing		Diving	
l. Own Boat:	58.02%	l. Own Boat:	95.6%
2. Charter Boat:	100.0%	2. Rentals:	50.0%
3. Party Boat:	50.0%		
4. Private Rental	31.6%		

The majority of boating days spent fishing was done on or about artificial reefs according to our findings. This was even more true for diving. Over 64 percent of all diving days were spent on artificial reefs. The estimates for diving, however, are based on a relatively small sample size (N=57).

NUMBER OF VISITORS; VISITOR SPENDING AND WAGES AND EMPLOYMENT ASSOCIATED WITH ARTIFICIAL REEFS

With the information developed above from the second sample survey of visitors, we are able to obtain an estimate of the economic impact of visitors to Escambia County who use artificial reefs. We shall call these economic impacts artificial reef related. Also, we make no distinction between public and private artificial reefs. The following expression was used to obtain artificial reef related spending by boating mode for fishing:

TEOARF = (TBDO)*($EPPDO/SPO) * %F * %T * %AR

where, TEOARF = total artificial reef related expenditures by visitors engaged in fishing(Own Boat);
TBDO = total boating days by visitors using own boat;
SPO = average size of party(Own Boat);
$EPPDO = Expenditures per party/day by visitors using their own boat;

%F = percent of all boating days spent fishing;

%T = probability(Pr)or percent of a fishing day that will be spent fishing;

%AR = percent of days spent on artificial reefs.

The above equation is the generalized expression to determine artificial reef related spending in Escambia County where we are using Own Boat as an illustration. The equation may seem difficult to understand; however, it is really quite simple. We have seen the first two terms of the expression in the discussion above. That is, TBDO*($EPPDO/SPO) is the total spending on boating by visitors using their own boat in Escambia County. This is shown as $38.98 million in Table 5.5. These terms are followed by %F which is what percent the spending was related to fishing.

Next, %T is an adjustment of %F to account for Other Activities as discussed above. Finally, we multiply by the %AR or the percent of the days spent on the artificial reef to arrive at TEOARF or total expenditures by visitor using their own boat while using an artificial reef off Escambia County, Florida. Since this is the "bottom line" of our presentation, it might be helpful to give a numerical illustration.

$13.26 million = 0.4249 Million*($321.97/4.26) *.9 *.8 * .5802

Notice that all the numbers on the right hand side of the expression have been developed and explained in the above discussion(the $321.97 is in Table 5.4). Thus, our conservative estimate is that of the total boating visitors using their own boat, $13.26 million were spent while fishing on an artificial reef. Adding diving using a similar procedure yields an estimate for the own boat mode of $14.12 million. Thus, about 36.2% of total boating visitor spending using their own boat was artificial reef related $14.12/$38.98). Table 5.10 shows the application of this procedure for fishing and diving, including all modes of boating. It also shows the estimated wages and employment related to the artificial reef related spending.

The grand total of all spending that is artificial reef related is $71.58 million which supports $15.7 million in related wages and 1,614 employees. This money is injected by boating visitors into the Escambia County economy. As this injection is multiplied throughout the economy, there is a direct impact of increasing sales, wages, and employment as discussed earlier in this chapter. Let us concentrate on direct wages injected. This will probably have a multiplier of 1.4. Therefore, the total wage impact is $21.98 million. Also, employment will increase by some multiplier, but probably less than the wage multiplier because

the visitor sector is composed of relative low paid jobs. Assuming a multiplier of 1.2 for employment, we would have 1,937 direct and indirect jobs created by boating visitors using artificial reefs. These are economically significant numbers, but must be placed in the same perspective that the entire visitors sector was in Table 5.3. Wages generated by visitor boating on artificial reef would be about 0.5% of all wages in the Escambia County economy $21.98/$4,109.6) and 1.22% of all employment(1,937/157,659). This is not to minimize the economic importance of artificial reefs. Any sector that is related to nearly 2,000 jobs is not inconsequential to the local area.

TABLE 5.10
ESTIMATED ARTIFICIAL REEF RELATED SPENDING;
WAGES AND EMPLOYMENT GENERATED IN ESCAMBIA COUNTY, FLORIDA

ACTIVITY/MODE	VISITOR SPENDING (MILLION$)	WAGES GENERATED (MILLION$)	EMPLOYMENT
OWN BOAT	**$14.12**	**$2.05**	**206**
FISHING	$13.26	$1.93	194
DIVING	$0.86	$0.12	12
CHARTER BOAT	**$50.38**	**$12.05**	**1,243**
FISHING	$49.89	$11.94	1,232
DIVING[1]	$0.49	$0.11	11
PARTY BOAT	**$6.81**	**$1.55**	**160**
FISHING	$6.81	$1.55	160
DIVING	$0.00	$0.00	0
PRIVATE RENTAL	**$0.27**	**$0.05**	**5**
FISHING	$0.27	$0.05	5
DIVING	$0.00	$0.00	0
TOTAL	**$71.58**	**$15.70**	**1,614**
FISHING	$70.23	$15.48	1,591
DIVING	$1.35	$0.22	23

1. For Diving, Charter, Party and Private Rental were combined.

We have not yet presented the total days and person-visits that are related to artificial reefs in Escambia County. The former is important in developing recreational values in the section below while the latter is important in its relation to all visitors to the Escambia County area. Let us consider total days spent on artificial reefs. The following expression can be used to estimate such days:

TBDARF = TBDO * %F * %T * %AR

where, TBDARF = total boating days on artificial reefs while fishing

%F, %T, and %AR were defined above.

The same general equation can be used for diving except %F is changed to %D and the numerical values of the other variables may change depending on boating mode since we have used "Own Boat" as an illustration. The artificial reef related boating days were estimated along with person-visits as shown in Table 5.11.

TABLE 5.11

RECREATIONAL DAYS AND PERSON-VISITS ASSOCIATED WITH ARTIFICIAL REEF USE FOR ESCAMBIA COUNTY, FLORIDA

Mode/Activity	Number of Person-days (Millions)	Length of Stay (Days)	Person-visits (Millions)
1. **Own Boat**	**0.1877**	**0.0407**	
Fishing	0.1775	4.61	0.0385
Diving	0.0102	4.61	0.0022
2. **Charter Boat**	**0.2991**		**0.0552**
Fishing	0.2915	5.42	0.0538
Diving	0.0076	5.42	0.0014
3. **Party Boat**	**0.0628**		**0.0115**
Fishing	0.0628	5.45	0.0115
Diving	0.0000	5.45	0.0000
4. **Private Rental**	**0.0019**		**0.0004**
Fishing	0.0019	5.00	0.0004
Diving	0.0000	5.00	0.0000
Total	**0.5514**		**0.1078**
Fishing	0.5337		0.1042
Diving	0.0177		0.0036

About 551,400 days were spent over the last 12 months on artificial reefs in Escambia County. The use value of a recreational days will be discussed below. This will add more meaning to the measurement of recreational days.

Finally, we would like to know how many person-visits to Escambia County are related to artificial reefs. Using "Own Boat" as an illustration, this may be measured by the following expression:

$$VOAR = TBDOAR/LSOAR$$

where, VOAR = person-visits for those using their own boat on artificial reefs;

TBDOAR = total boating days for those using own boat on artificial reefs;

LSOAR = length of stay for those using own boat on artificial reefs.

Therefore, to obtain person-visits, we only have to divide days on artificial reefs by the length of stay. This makes good intuitive sense since if one individual spent 10 days in Escambia County and each stay was 5 days, then we would have two person-visits. In the right hand column of Table 5.11, we show the person-visits by fishing and diving and by boating mode that are related to artificial reefs. Over a 12 month period, Escambia County attracted 107,800 person-visits for the sole purpose of fishing and/ or diving on an artificial reef. About 5.0% of all visitors to Escambia County, as measured by person-visits, are attracted to fishing and/or diving on artificial reefs. Remember there are a little over 2.1 million person-visits made to Escambia County annually (See Table 5.1).

EVALUATION OF ARTIFICIAL REEFS BY USERS

METHODOLOGY

As part of survey of boating visitors to Escambia County, we asked the respondents to evaluate the artificial reefs that they used. Questions about the artificial reefs were restricted to those that actually used artificial reefs. The evaluation of artificial reefs took place in two steps. First, we asked respondents the reasons that might be important in their decision to use an artificial reef as a recreational aid in fishing or diving. Respondents rated each statement from Very Important to Not Important at All. The results were obtained with the percent that answered either Very Important or just Important as our measure of importance (see Table 5.12).

TABLE 5.12

REASONS BEHIND THE CHOICE OF AN ARTIFICIAL REEF
FOR ARTIFICIAL REEF USERS IN ESCAMBIA COUNTY

Reason	Percent Very Import or Important
1. Better Catch Rate	90.8%
2. Previous Experience at Site	83.3%
3. Site Is Close to Shore	44.7%
4. Want to Fish Near Others	0.0%
5. Other Fishermen Recommended Site	70.1%
6. Site Is Easy to Locate	77.6%
7. Better Fishing than Natural Reefs	52.8%

It would appear that the choice to use an artificial reef is based upon better fishing and ease of location. Respondents did not mind going over 18 miles from shore to fish(See Table 5.7, Item 12), appeared to want the entire reef to themselves in that they did not appear to want company. It would appear that artificial reefs offer an improved recreational experience for the fishermen and even divers.

We attempted to get respondents to evaluate the present status of artificial reefs of Northwest Florida in the Gulf of Mexico. This goes to the placement of reefs and how crowed they are. Table 5.13 shows the results for fishers and divers. The existing pattern of artificial reefs seems to win the approval of fishers and divers using them. Users would like the reefs deployed some distance from shore to maximize fishing success, but placed in no more than 150 feet of water. They strongly believe that artificial reefs increase the overall abundance of fish. This is a perception which could be debated. It is true that artificial reefs add to the fishery habitat, but no scientific study is known to the authors that definitely establishes that the fish population is actually increased with artificial reefs. Users could be confusing an aggregation of fish that are attracted by new reefs from places with no reefs. This would be a redistribution with no actual increase in the population. Finally, the evaluation seems to be in favor of the expansion of the

artificial reef program since only 5.3 % felt there were too many artificial reefs.

TABLE 5.13

EVALUATION OF EXISITING ARTIFICIAL REEFS

OFF ESCAMBIA COUNTY, FLORIDA

CRITERIA FOR EVALUATION	PERCENT STRONGLY AGREE OR AGREE
1. Reefs Placed Too Far From Shore	23.7
2. Artificial Reef Too Crowded	26.4
3. Too Many Artificial Reefs Placed in Gulf of Mexico	5.3
4. Artificial Reefs Should Be in 150 Feet or Less of Water	65.8
5. Artificial Reefs More Productive Than Natural Reefs	39.5
6. Artificial Reefs Increase Abundance of Fish	92.1

Source: FSU Survey of Boating Visitors to Escambia County.

VISITOR USE VALUE OF ARTIFICIAL REEFS

METHODOLOGY

Up to this point in the report, we have stressed the economic impact of visitors using artificial reefs on the local economy. In a later section of this chapter, we shall consider resident spending on boating that is related to artificial reefs. However, in this section we shall look at a new concept entitled "use or user value" of the recreational experience.

If we look at the natural resources used in creating a

fishing or diving day, they are obviously fish and water. These resources are common property in nature. This means that there is no organized market to sell and buy these resources. In effect, fish are free to those wishing to fish for this resource. Except for a small amount paid for a fishing license, there is no substantial fee paid for the use of the fishery resource or even the waters of the Gulf of Mexico. Although a recreational day is a service rendered by nature, there is no overt price to be paid. We call this a nonmarket activity. This does not mean that recreation is worthless. In fact, various laws have been passed to protect natural resources so society as a whole can derive value from their use. In general, this is what we mean by use value. But how can it be measured?

For market goods, economists have a demand curve to measure the value of a good. Oranges, wheat, and steel have a demand curve where as price drops, more is consumed. Recreational fishing and diving are services rendered to recreationalists that should have a demand curve as well. The fact is that we cannot measure this demand curve directly because there is no price-quantity relationship to be observed. However, economists have developed techniques to indirectly measure the value obtained from the use of a natural resource that is common property.

Consider Figure 1. DD is the recreational demand curve for fishing. If there were a price, the quantity demanded would fall as the "price" increases. Thus, the demand curve is downward sloping. Since the price is zero for recreational fishing, anglers "consume" D(1) days fishing. The measure of consumption or production is usually measured in either days or trips for recreation. Trips can be longer than one day in length and correspond to the person-visit concept we discussed earlier.

Consider the area under the DD or demand curve. What we see is that recreational fishermen would be willing to pay P(l) or even P(2) or higher for the right to fish the resource, but because of the common property nature of market, the price is actually zero. Thus, the difference between what recreationalist would be willing to pay and the actual price(i.e., zero) is called ***consumer's surplus***. Such a concept exists with market goods such as oranges, but there is a price above zero. But, there are those that would be willing to pay an even higher price. This difference is conceptually the same and is called consumer's surplus. As we shall see, consumer's surplus derived by recreationalists is actually use value. But, let us consider the market for recreation just a little bit more.

FIGURE 1

THE DEMAND CURVE AND SHIFTS IN THE DEMAND

FOR RECREATIONAL FISHING

PRICE

D(1) D(2) RECREATIONAL DAYS FISHING

We have established that there is a demand curve for recreation indicated by DD in Figure 1. Now, let us introduce the artificial reef as a "recreational aid" in fishing(and diving too). How does the artificial reef influence this market. Remember that our survey respondents in the last section generally felt that artificial reefs increase fishery catch rate or generally improve the recreational experience. The impact of introducing an artificial reef is to shift the demand curve for recreational fishing in Figure 1 upward and to the right. This means that at every level of recreation as measured by days or trips the angler is willing to pay more for the recreational

experience. In a market sense, this shows how the favorable attitude of recreational fishermen manifests itself by an upward shift in the demand curve. Notice that something else happens and that is an increase in consumer’s surplus or use value. The area between the two demand curves is the increase in use value as a result of deploying the artificial reef. In contrast to the discussion in the economic impact sections above, the increase in use value means that by investing in an artificial reef we have increased output in the entire economy. While artificial reefs impact a region, they, in theory, increase national output as well. The distinction between an economic impact and use value is that the former is distributional, while the latter is a rise in national output. By distributional, we mean that if visitors do not spend their money in Bay County, they will spend it elsewhere-- maybe in the Florida Keys.

An indirect way of measuring consumer’s surplus or use value is to ask users a question designed to measure the shift in the recreational demand curve by deploying artificial reef. The following questions was asked respondents in our boating visitor survey:

> "The artificial reef program cost money. Suppose that the government proposed that all newly constructed reefs would be paid for by requiring that the reef user with their own boat either pay for a stamp as part of their fishing license or pay for a decal as part of their boat registration. If you used a rental of any kind, you would probably pay for the operator's stamp or decal in the form of higher fees to cover costs. The money would go into a trust fund that could only be used for the construction of artificial reefs. Would you be willing to pay $_____per year when you renew your fishing or boating license and/or use a rental boat of any kind to fund this construction program?”

In this question, we have phrased it so it conforms to some generally accepted standard. First, there is a statement as background on the question. Second, there is a payment vehicle that is well articulated. Third, there is an assurance that the moneys collected will go into a trust fund designed for the sole purpose of adding new artificial reefs. The respondent is presented with a figure which he or she accepts or rejects. Therefore, we close the question to a potential open-ended ones

where respondents are asked what they would pay with no constraints. This kind of a question leads to numerous biases. To implement the methodology described in this section, there are three general approaches:

MEASUREMENT OF USE VALUE

1. The Turnbull Distribution

From our question discussed above, we relate the YES and NO answers to the payments requested. The payments ran from $1 to $50 per year. As the payments rise, the probability of the respondent answering YES is decreased. The area under the Turnbull distribution gives an approximation of use value of adding additional artificial reefs. This techniques will be further explained in the implementation section.

2. Dichotomous Choice Model

In the question above, the respondent is presented with and either or situation much like a consumer faces in the market where you are presented with a price and you either take it or leave it. This is a dichotomous choice. If we let "l" stand for YES to the payment amount and "0" stand for NO to the payment amount, we can form an equation of the following form:

Pr(l,0)= f {Payment Presented; Socioeconomic Vector; Other Shifters }

The dependent variable or Pr is called a binary variable where only one of two values can appear(i.e., YES and NO). The respondents base their choice on the payment presented. The socioeconomic vector includes income; sex; race; etc. while other shifters contain variables such as boat length; etc. to hold them constant while looking at how the probability of saying YES changes as the payment presented increases. As with the Turnbull distribution, we are look at the area under the J-shaped curve showing the relation between the probability of saying YES and the increasingly higher payment demanded. This will be another estimate of use value.

3. Travel Cost Techniques

This techniques is not based upon the willingness to pay question posed above. It is based upon the distance traveled by the boating visitors. We would expect that as the cost of travel rises, that fewer trips(and days) will be made to Bay County by visitors. The cost of these trips can be estimated and are also given as a response to a question on expenditures in the boating visitor survey. The following equation can be used to formulate the travel cost techniques:

Trips to Escambia County = f {Travel Cost; Socioeconomic Vector;

Other Shifters}

Travel cost is used as a proxy for price since as it rises, trips taken should fall according to travel cost hypothesis. Once this expression is estimated, we may hold the other variables constant and estimate the area under the travel cost demand curve. This will yield another estimate of consumer's surplus or use value.

EMPIRICAL IMPLEMENTATION

The Turnbull Approach

The Turnbull(1976) distribution is non-parametric, maximum likelihood(ML) estimator for interval-censored data which is what we have when presenting payments to respondents and asking whether they would be willing to pay such an amount or not. The Turnbull estimator uses respondents' choices to construct an interval estimate for the latent willingness to pay implied by each respondent's choice. The individual's answer to a single question will distinguish either a lower or an upper bound for his or her WTP. By combining respondents', we obtain estimates for the relative frequency of responses at different WTP levels. The intervals start at zero and end at infinity. In doing our study, we established seven intervals as follows: (1) $0 to $1; (2) $1 to $5; (3) $5 to $10; (4) $10 to $20; (5) $20 to $30; (6) $30 to $50 and (7) $50 to infinity. The interval has an upper and lower bound. It is assumed that the fraction of the sample estimated to be in each interval has a willingness to pay(WTP) value equal to the lower end point of the interval. This is referred to as the lower-bound estimate of willingness to pay and is considered to be a conservative estimate of use value.

Using the WTP question regarding artificial reef discussed

above, we asked for a response from only those using artificial reefs. A prior analysis of the data indicated that the Turnbull distribution technique could not be implemented by county, but was in conformity to a priori theory for fishers from the five counties combined. The theory assumes that as the WTP amount is increased, the percent answering “YES” will decline. That is, the more costly the artificial reef program, the smaller the percent of the users willing to pay for the program. The sample for fishers was 264 responses while those for divers was just 37 responses with many intervals with no answers. Therefore, we were restricted to applying the Turnbull distribution to only those engaged in fishing. Of course, this is the principal use of artificial reefs by visitors to each county. Also, using the whole sample assumes that the WTP does not vary from county to county. Given the geographical proximity of the counties involved, this is not an unreasonable assumption. Furthermore, other techniques employed below will give us the ability to test the influence of each county on the WTP. Table 5.14 shows the results of the application of the Turnbull estimator to our data on the willingness to pay(WTP) for the artificial reef program.

Consider the first interval in Table 5.14(i.e., from $0 to $l). 54 respondents were asked whether they would be willing to pay at least $1.00 as part of their fishing license/ or cost of boat rental over a 12 month period for funding the artificial reef program. 49 respondents or 90.7 percent answered “YES”. This gives us one point on the Turnbull Distribution. We cannot calculate the WTP unless we observe a change from one point on the distribution to another. This is called the change in density. The second interval when compared to the first interval shows how the willingness to pay responds to a progressive rise in the “payment price”. Therefore, we multiply the lower bound of the interval by the change in density to get the incremental willingness to pay. When this is done for all the intervals in Table 5.14, we get the cumulative willingness to pay of $22.17 per year. Respondents responding to the highest interval are assumed to have a maximum willingness to pay of $50. This is not unreasonable when one looks at how rapidly the probability of saying “YES” to the payment drops off as the payment rises in Table 5.14. Since the willingness to pay question was asked of an individual(i.e., not a fishing party), we interpret the $22.17 to be the WTP by one visitor fisher over

a 12 month period for the artificial reef program as contained in the willingness to pay question. Since the data are an aggregation for all counties in the study, this WTP will apply to any fisher in anyone of the five counties. In Escambia County, the typical visitor spends 5 days per trip and visits the county about 2.1 times per year. Therefore, we interpret the $22.17 as the WTP for 10.77 days of boating adjusted for percent fishing and the percent engaged in other boating activities. We estimated above that 60.6 percent of all general boating days are spent fishing on or about artificial reefs. Thus, of the 10.77 days in total fishing, 60.6 percent or 6.53 days are spent per individual on artificial reefs. Taking the annual WTP of $22.17 per fisher, and dividing it by days spent on artificial reefs in Bay County, we have a **WTP/Day of $3.40**. What is this value? It is the interpreted as the incremental recreational value afforded to the average fisher by artificial reefs as a recreational aid on a fishing day. Why is this important? The basic reason is that the expenditures on artificial reefs not only has an economic impact which we have quantified, but increases output in the general economy. That is, since the market does not measure the value of recreational output by many natural resources such as the fishery as discussed above, we have an indirect measure of this value. The **total annual use value of artificial reefs for fishing in Escambia County is equal to about $1.81 million** ($3.40*0.5337 million days spent fishing on artificial reefs in Escambia County). We shall discuss this further after we gave reviewed the two other procedures used to estimate the WTP as discussed above.

TABLE 5.14

APPLICATION OF THE TURNBULL ESTIMATOR TO THE WILLINGNESS TO PAY(WTP) FOR ARTIFICIAL REEFS

(1) Lower Bound for Interval	(2) Upper Bound for Interval	(3) Probability of Paying at at Upper Bound	(4) Change In Density	(6) WTP (1)*(4)	(7) N
$0	$1	.907	.093	0	54
$1	$5	.796	.111	$ .110	49
$5	$10	.804	-.008	-$ .008	46
$10	$20	.600	.204	$2.040	35
$20	$30	.411	.189	$3.780	34
$30	$50	.197	.215	$6.450	46
$50	Infinity	.000	.196	$9.800	N/A

Total Willingness to Pay(Total of Column 6): $22.172

Dichotomous Choice Application

The modeling approach followed here is one originally developed by Bishop and Heberlein (1979). There have been many applications using slightly different specifications of the model and Hanemann (1984) further developed the underlying economic theory behind various model specifications and the formulas for calculating consumer’s surplus or compensating variation. Compensating variation is consumer’s surplus adjusted for the income effects of price changes that would keep the consumer at the same level of total economic well-being as before the change in price. The answers to questions like the ones used in this study to measure the value of artificial reefs are assumed to

yield estimates directly of compensating variation. The general form of the dichotomous choice is as follows:

$$Pr\ (YES) = \alpha - \beta_{BID} * BID + \beta_{SE} * SE + \mu$$

where, Pr (YES)= the probability that the user will be willing to pay the randomly assigned dollar amount (BID).

BID = randomly assigned dollar amounts.

β_{BID} = estimated coefficient on BID.

SE = vector of other socioeconomic variables and/or natural resource attributes.

β_{SE} = estimated coefficients for SE vector.

μ = error term following logistic distribution for logit model and normal distribution for the probit model.

The above model was estimated using both the logistic and normal distribution assumption about μ. The BID variable was included in its linear and logarithmic form (natural logarithm of BID called LBID here). In the SE vector, we include a variety of socioeconomic factors including household income, age, years of experience boating in northwest Florida, race, and sex. Also, included were variables for differentiating charter and party boat mode use from use of the own boat and private rental boat modes. A variable was also entered to indicate artificial reef use and, when fishermen and divers were combined, a variable was entered to differentiate divers from fishermen. However, none of the variables in the SE vector were significant in any model specification. Some have argued that this finding calls into question the validity of the estimated values. We present eight model specifications that include only the bid amount as an explanatory variable (Table 1.15). The models differ by sample of users (e.g. all users versus fishermen only), by assumption about the distribution of the errors (e.g. the logit of probit model), and by specification of the bid amount (e.g. linear BID or log linear or natural logarithm of bid or LBID). The estimated values derived from these models range from $23.92 to $29.83 per user per year. The average of these eight values is $27.02.

The average value derived from the dichotomous choice models is slightly higher than that obtained using the same information

and employing the Turnbull method $27.02 versus $22.17 or about 22 percent higher. The lowest value obtained from the dichotomous choice model is only 7.89 percent higher than that obtained using the Turnbull method ($23.92 versus $22.17). To derive an estimate of the willingness to pay per day, as with the Turnbull estimate above we divide the annual value per person by 6.53 days yielding an estimate of **WTP/day of $4.14** ($27.02/6.53). And, our estimate of total annual value of artificial reef use in Escambia County using the dichotomous choice method is **$2.21 million** ($4.14 * 0.5337 million days of use).

TABLE 5.15

DICHOTOMOUS CHOICE MODELS

FOR ARTIFICIAL REEF USERS

IN NORTHWEST FLORIDA

Model Number	α	β_{BID} or β_{LBID}	BID or LBID	Users	Type of Model	N	WTP for Artificial Reef ($)[1]
1	2.2308 (9.455)*	-.07486 (-8.159)	BID	All	Logit	302	29.80
2	1.3392 (10.309)	-.04490 (-8.778)	BID	All	Probit	302	29.83
3	3.6048 (7.948)	-1.1233 (-7.299)	LBID	All	Logit	302	24.76
4	1.9752 (8.980)	-.6134 (-7.877)	LBID	All	Probit	302	25.03
5	2.1086 (8.448)	-.07167 (-7.551)	BID	Fish	Logit	260	29.42
6	1.2692 (9.145)	-.04305 (-8.104)	BID	Fish	Probit	260	29.48
7	3.3250 (7.187)	-1.0473 (-6.713)	LBID	Fish	Logit	260	23.92
8	1.8367 (8.124)	-.5783 (-7.282)	LBID	Fish	Probit	260	23.95
1-8 Average		27.02					

* t-values in parentheses.

1. For linear model, annual willingness to pay (WTP) is equal to α/β_{BID}, while for the log linear model, WTP is equal to $\exp(\alpha/\beta_{LBID})$.

Travel Cost Demand Model Application

The modeling approach employed here is one that has recently been applied to visitors to the Florida Keys (See Leeworthy and Bowker 1997, and Bowker and Leeworthy 1998). The choice of this modeling approach is based on the similarity of the type of sample data collected that present problems of biased estimation of consumer's surplus. A major source of possible bias in estimating consumer's surplus is when the sample does not include those that do not consume the good or service, here fishing or diving in northwest Florida. Not including people that do not engage in fishing or diving in estimating the demand function can lead to what is called truncation bias. It is called truncation bias because the sample is truncated at one visit to the area or only includes people that made at least one trip to northwest Florida. Samples that are conducted on-site of visitors by definition only include people that have visited the area. This is done because obtaining a random sample of all people (visitors and non-visitors) is too expensive for practical purposes. However, statisticians and economists have developed methods to correct demand estimation with truncated samples and thus avoid the truncation bias.

Another aspect about trips is that one cannot take a fraction of a trip. Trips take on integer values (e.g., 1, 2, 3,…365). Statisticians and economists have also developed methods for estimating models where the dependent variable, like trips, have integer values. The methods are called count data models and include the Poisson model and the negative binomial model. The model we employ here is a special version of the count data models that uses a maximum likelihood method of estimation that also adjusts for truncation bias and are therefore called the truncated Poisson and truncated negative binomial models.

The travel cost model estimated here takes on the following general form:

$$Ln(TRIPS_i)=\beta_0 + \beta_{tc}TC_i + \beta_{se}\ SE_i + \mu_i$$

where, for the ith individual Ln(TRIPS) is the natural logarithm of the quantity of recreation trips, TC is the travel cost per trip, SE represents the vector including other relevant socioeconomic variables and site attributes, the βs' are regression parameters estimated by the model that quantify the relationship between the right-hand side variables to TRIPS, and μ is an error term that is assumed to follow a gamma distribution with mean 1.0 and variance α (Greene, 1995).

Table 5.16 provides definitions of all the variables used in estimating the final model presented here. Several of the variables in Table 5.16 require further explanation. We followed Bowker, English & Donovan (1996), Leeworthy and Bowker (1997) and Bowker and Leeworthy (1998)and defined the dependent variable as a person-trip (NTRIPS). Hence a family of four visiting northwest Florida once per year would account for four person-trips as would an individual visiting northwest Florida four times in one year. However, given the same origins and travel modes, the price per person-trip would differ as the single visit cost for the family of four would be apportioned to four person-trips. While intuitively appealing, this construction of the dependent variable is practical for situations were group travel by car is common. In the boating visitors sample used here, all visitors came by automobile. In addition, the construction of the dependent variable used here helps to avoid the empirical malady of low dispersion of the dependent variable i.e., a clustering around one trip annually.

Travel costs per person-trip (TCOSTPP) is equal to round-trip road mileage times a cost per mile then divided by the number of people in the traveling party. Distance was calculated from the center of the zip code of the person’s home to the center of the zip code of the site in northwest Florida where the person was interviewed. We used a computer program called Prophesy Plus and chose the route that was the fastest (would take the least time). Mileage cost was calculated using $0.14 per mile. This estimate is based on a recent study of travel costs by auto visitors to the Florida Keys (Leeworthy and Bowker 1997). This cost is less than what the Federal government uses to reimburse Federal employees for travel when using their private vehicles (currently $0.31 per mile).

The reason is that the Federal government rate includes overhead costs such as insurance and maintenance as well as the depreciation of the vehicle. The costs used here only include trip related costs such as gasoline, oil, parking fees, and tolls. As discussed above, round-trip travel costs were divided by the number in the traveling party to put costs on a person-trip basis to be consistent with our definition of TRIPS (NTRIPS) or person-trips.

The inclusion of time costs, both in-transit and on-site is subject to considerable debate. Theoretically, Freeman (1993) demonstrates that both kinds of time costs should be included. However, he points out a number of problems which continue to plague applied researchers. One is the inability of a large portion of the population to easily substitute between working increased hours at their normal (or overtime) wage rate and leisure time. Another is the possibility of utility or disutility resulting from work, travel, or on-site time, hence

rendering the full wage rate a potentially poor measure of the shadow cost of time. He points out that while most surveys elicit a pretax income measure, a more realistic wage rate would be derived from after tax income.

Many other researchers have used a percentage of the wage rate, some based on travel studies of the cost of travel congestion, while most use some arbitrary percent of the wage rate. We felt that resolving this issue was beyond the scope of this study and we used a more conservative approach and have not included the value of time.

It is important in travel cost modeling, especially when visitors come from origins of great distance, to control for the length of trip. The variable (STAY) is the length of the interview trip measured in number of days. Length of trip was used extensively in the beginning of the report to estimate the total number of person-trips. It is assumed that all trips over the year are the same length.

We included a host of standard socioeconomic variables including age (AGEH), household income (INCTTH), race/ethnicity (WHITE), years of experience visiting northwest Florida (EXPER), sex (MALE)and whether the person was a member of a fishing or diving club (CLUB). AGEH was scaled in hundreds of years and was used in estimation with it’s squared value (AGESQH). This specification tests if there is a parabolic relationship between the number of person-trips (NTRIPS) and age (AGEH). We will discuss this in more detail below when discussing the results of the estimation. Household income (INCTTH) was scaled to $10,000. Thus a value of one means a household income of $10,000. Household income was actually obtained in intervals (e.g. less than $10,000, $10,000-$19,999, $20,000-$29,999, etc.). We converted this to a continuous variable by setting the value of household income to the mid-point of the interval given by the person interviewed.

The variable (EXPER) is the number of years the person interviewed had been boating in the panhandle of Florida. For race/ethnicity, we created a dummy variable (WHITE) which takes on a value of one (1) if the person interviewed was White, not Hispanic and zero (0) otherwise. There were not enough Black or African American or Hispanic persons in the boating sample to construct separate variables for these groups. The variable (CLUB) is also a dummy variable that takes on a value of one (1) if the person was a member of a fishing or diving club and zero (0) otherwise. In addition, sex was represented as a dummy variable that takes on a value of one (1) if the person interviewed was a male and zero (0) otherwise.

We also constructed a set of intercept and slope dummy variables to test whether those that dive (DIVE), or used the charter boat mode (CHARTER), or used the party boat mode (PARTY), and, most importantly for this study, used an artificial reef (REEF) have different demands. That is, instead of estimating separate demand equations for each group (we don't have enough people in the boating sample to do this), we can employ statistical techniques that allow us to estimate different demands while pooling the data. DIVE, CHARTER, PARTY and REEF are intercept dummies that take on values of one (1)or zero (0) just like variable WHITE, MALE, and CLUB discussed above. Intercept dummies let us test if, on average, different groups take more or less trips (NTRIPS). For example, do divers take more or less trips to northwest Florida for boating activities, holding all other factors constant, than fishermen.

Slope dummies test whether the slope of the demand function is different for different groups. As we will show below, this is important for two reasons. Slope dummies allow us to test whether different groups will respond differently to price. That is, for a given percentage change in price, what will be the percentage change in number of trips to northwest Florida for boating activities by different groups. Economists call this price elasticity. Price inelasticity means for a given percentage change in price their will be a smaller percentage change in number of trips. This has practical importance to local businesses because inelastic demands means that, for a price increase, total revenue will increase. The opposite is true if demand is elastic.

Another important use of slope dummies is in estimating consumer's surplus or use value per trip. As we will show when we discuss later the formula for calculating consumer's surplus or the use value per trip, the calculation depends on the slope of the demand function. So groups with different demand slopes will have different use values per trip. Groups with demands with steeper slopes will have higher use values per trip and vice versa.

We constructed slope dummies for divers (DCOST1), for those that used charter boat mode (CHCOST1), for those that used the party boat mode (PARCOST1), and those that used an artificial reef (REFCOST1). The variables are created by simply multiplying the intercept dummy variable for each group by the travel cost variable (TCOSTPP). An estimated positive coefficient on a slope dummy means that the slope of the demand for boating trips is steeper for that group meaning that groups demand will be more inelastic and will mean that group has a higher use value per trip than the base group. For example, if the coefficient on DCOST1 is positive, it will mean that divers have more inelastic demands than fishermen, holding all other factors constant. It

will also mean that divers have a higher use value per trip than fishermen.

TABLE 5.16

DEFINITIONS OF THE TRAVEL COST MODEL VARIABLES

Variable	Definition
NTRIPS	Annual number of person-trips to northwest Florida for boating activities.
TCOSTPP	Travel cost per person-trip. Round-trip mileage from home to the interview site times $0.14/mile.
STAY	Length of trip measured in number of days.
INCTTH	Household income (in 10,000 of $).
AGEH	Age of the person interviewed (in hundreds of years).
AGESQH	AGEH squared.
EXPER	Number of years have been boating in northwest Florida.
DIVE	Dummy variable (1=participated in diving).
CHARTER	Dummy variable (1=used charter boat mode).
PARTY	Dummy variable (1=used party boat mode).
CLUB	Dummy variable (1=member of a fishing or diving club).
REEF	Dummy variable (1=used artificial reef).
DCOST1	Slope dummy for diving (DIVE*TCOSTPP).
REFCOST1	Slope dummy for use of artificial reef(REEF*TCOSTPP).
CHCOST1	Slope dummy for charter boat mode use. (CHARTER*TCOSTPP).

PARCOST1	Slope dummy for party boat mode use (PARTY*TCOSTPP).
"	overdispersion parameter. A significant parameter indicates the presence of overdispersion and that the Poisson model is rejected in favor or the negative binomial model.

Results of the Travel Cost Demand Model

Truncated Poisson and negative binomial (TNB) models were estimated using LIMDEP Version 7.0 (Greene 1995). Only the TNB model is presented here because the hypothesis of no over dispersion was rejected based on a Wald test equivalent to the asymptotic t-ratio on the estimated dispersion parameter, α (Yen & Adamowicz, 1993). Table 5.17 summarizes the results of the TNB model.

Several variables included in Table 5.16 were dropped from the model because they were not statistically significant. The variables dropped were STAY, DCOST1, and REFCOST1. Length of trip (STAY) was negative but not significant. The slope dummy for diving (DCOST1) was positive but not significant meaning that the price elasticity and consumer's surplus or use value per trip was not different between fishermen and divers. And, most important here, the slope dummy for artificial reef use was positive but not significant meaning that the price elasticity and use value per trip was not different between users and nonusers of artificial reefs.

All the variables included in the final model presented in Table 5.17 are statistically significant, except household income (INCTTH). Because of incomes economic importance we kept it in the model despite it's insignificance. Dropping income from the equation did not significantly change any other estimated model coefficients in our tests of alternative model specifications. All the other variables included in the model were statistically significant with high levels of confidence as expressed in the column labeled, $P[\ |z| \geq z]$. This column contains the significance level for the test of whether the estimated coefficient is significantly different from zero. A value of 0.05 would indicate significance at the 5 percent level or that we are confident at the 95 percent level. Generally, the model variables were all significant at the 0.05 or below meaning these

are fairly strong results.

Price Elasticities

The coefficient on TCOSTPP is negative indicating a downward sloping demand curve as presented in Figure 1. As discussed above, price elasticity of demand measures how the demand for trips (NTRIPS) changes with changes in prices (TCOSTPP), holding all other factors constant. Specifically, price elasticities measure the percentage change in the number of trips (NTRIPS) for a percentage change in price (TCOSTPP).

TABLE 5.17

TRAVEL COST MODEL RESULTS

FOR BOATING VISITORS

TO NORTHWEST FLORIDA

Variable	Coefficient	Standard Error	b/St.Er.	P[|Z|>z]	Mean of X
Constant	4.132307282	.60192811	6.865	.0000	1.00000
TCOSTPP	-.03937839110	.0024047564	-16.375	.0000	36.832241
CHCOST1	.02606125483	.0030188745	8.633	.0000	22.724031
PARCOST1	.01365062332	.0059164162	2.307	.0210	10.808520
INCTTH	.01485993937	.012251925	1.213	.2252	8.0092308
AGEH	-7.413161512	2.9668408	-2.499	.0125	.38021538
AGESQH	10.02846709	3.2960961	3.043	.0023	.15524892
MALE	.2889243810	.15285344	1.890	.0587	.85846154
CLUB	.6819655766	.14803140	4.607	.0000	.067692308
CHARTER	-1.346883501	.11960963	-11.261	.0000	.60923077
PARTY	-1.255882128	.23010332	-5.458	.0000	.20923077
REEF	.2897223689	.10902141	2.657	.0079	.53230769
Overdispersion parameter for negative binomial model					
Alpha	.5272315531	.67047941E-01	7.864	.0000	

NTRIPS (mean) 9.19
Log likelihood function -877.5674
Restricted log likelihood -1607.626
Chi-squared 1460.118

```
Degrees of freedom                    1
Significance level             .0000000
LEFT  Truncated data, at NTRIPS =  0.
N=325
```

In our particular specification of the demand model, price elasticity for those that used the own boat and private rental boat modes is equal to the estimated coefficient on TCOSTPP times TCOSTPP. That is, price elasticity varies with the level of price. At the mean or average travel cost, the price elasticity for the demand by those that used own boat or private rental boat for both fishing and diving was equal to -1.45 (-.0394*36.83 from Table 5.17). Thus the demand for own boat and private rental boat trips for fishing and diving in northwest Florida is considered elastic. That is, for a 10 percent increase in price, demand for trips will decrease by 14.5 percent. This means that price increases for this group would result in decreases in total revenue to local businesses. And, price decreases will result in increases in total revenue.

For fishers and divers that used party and charter boating modes, price elasticities are calculated using the slope dummies we discussed above. For the party boat mode, the price elasticity at the overall sample mean travel cost is equal to -0.9484 [(-.0394+.01365)*36.83]. For a 10 percent increase in the price, party boat mode trips would decrease 9.48 percent. Since this price elasticity is less than -1.0 we say that the demand for party boat mode trips is inelastic. Meaning that for a price increase, total revenues would increase. And, price decreases will result in decreases in total revenue.

For fishers and divers that used the charter boat mode, the price elasticity at the sample mean travel cost is equal to -0.4898 [(-0.0394+.0261)*36.83]. For a ten percent increase in price, charter boat trips would decrease about 4.9 percent. Thus, for the charter boat mode, demand is price inelastic.

Relationship Between Trips and Age

As discussed above, the relationship between NTRIPS and the age of the person interviewed (AGEH) was expected to be parabolic. This was tested by including age squared (AGESQH) in the estimated travel cost demand model. The coefficient on AGEH is negative and the coefficient on AGESQH is positive meaning that as age increases, from age 16, the number of trips (NTRIPS) decreases, reaches a minimum, and then starts increasing with age (a u-shaped parabola). Below is the estimated relationship using our estimated travel cost model. Note that trips reach a minimum at age 35.

NTRIPS	AGE
2.0	16
1.7	25
1.5	35
1.6	45
1.9	55
2.3	65
2.6	70
3.4	80

Relationship Between Trips and Other Factors

For all other factors and trips, the marginal effects are reported here. The marginal effects are the changes in the number of trips for a one unit change in the factor. For intercept dummies, discussed earlier, the calculation shows how many trips, on average, a group makes more than the reference group. Marginal effects are calculated as the mean number of NTRIPS times the estimated coefficient on the factor.

Household income has a relatively small effect on trip taking. An increase of $10,000 in household income would result in only a 0.14 increase in the number of trips (NTRIPS). Males, on average, make 2.65 more trips than females. Members of fishing and diving clubs (CLUB) make, on average, 6.27 more trips than non club members. Charter boat mode users make, on average, 12.38 fewer trips than those that use the own boat and private rental boat modes. Party boat users make, on average, 11.54 fewer trips than those that use the own boat and private rental boat modes. And finally, those that used artificial reefs (REEF) make, on average, 2.66 more trips than non reef users.

User Value of Artificial Reefs

As discussed above, we can use our estimated travel cost model to estimate consumer's surplus or use or user value for artificial reefs. We estimate these values per person-trip, per person-day, and the total annual value for Escambia County. The estimates are presented by boat mode and for fishermen and divers.

For those that used the own boat or private rental boat mode (fishermen and divers), the following formula is used to calculate consumer's surplus per person-trip:

$$CSPT_{own} = (-1/\beta_{TCOSTPP}) * [1/1+(t_{TCOSTPP})^{-2}]$$

where, $CSPT_{own}$ = Consumer's surplus (use value) per person-trip for those that used the own boat or private rental boat modes, including both fishermen and divers.

$\beta_{TCOSTPP}$ = Estimated coefficient on the travel cost variable (TCOSTPP).

$t_{TCOSTPP}$ = Estimated t-value (from column labeled b/st.er. in Table 5.17) for the travel cost variable coefficient.

By substituting the values for the above variables from Table 1.17, we calculate $CSPT_{own}$ = [-1/-.0394] * $[1/1+(16.375)^{-2}]$ = [25.38] * [.9963] = **$25.29**. The above formula has two components. The first is the formula for calculating the area under the estimated travel cost demand model as shown in Figure 1 earlier in the chapter. The second component is an adjustment for bias in consumer's surplus estimates from demand functions. Even though the estimated demand function is unbiased, consumer's surplus estimates are biased (Zellner and Park, 1979). The correction factor is a simple function of the estimated t-value on the travel cost coefficient (Bockstael and Strand, 1987). When the estimated t-value is large, the correction factor for bias will be small.

An important finding from our travel cost demand modeling was that those that used the charter and party boat modes (fishermen and divers) had different price elasticities and different consumer's surpluses per person-trip. The formula for charter boat mode fishermen and divers is as follows:

$$CSPT_{CHARTER} = [-1/(\beta_{TCOSTPP} + \beta_{CHCOST1})] * [1/1+(t_{TCOSTPP})^{-2}] * [1/1+(t_{CHCOST1})^{-2}]$$

where, $CSPT_{CHARTER}$ = Consumer's surplus per person-trip for fishermen and divers that used the charter boat mode.

$\beta_{TCOSTPP}$ = Estimated coefficient on the travel cost variable.

$\beta_{CHCOST1}$ = Estimated coefficient on the slope dummy variable (CHCOST1).

$t_{TCOSTPP}$ = Estimated t-value (from column labeled b/st.er. in Table 5.17) for the travel cost variable coefficient.

$t_{CHCOST1}$= Estimated t-value (from column labeled b/st.er. in Table 5.17) for the slope dummy variable (CHCOST1) coefficient.

By substituting the values for each variable in the above formula from Table 1.17, we calculate $CSPT_{CHARTER}$ = [-1/(-.0394+.0261)] * $[1/1+(16.375)^{-2}]$ * $[1/1+(8.633)^{-2}]$ = [75.19] * [.9963] * [.9868] = **$73.92**. The above calculation is similar to the one for own boat and private rental boat modes except that there are three components to the calculation. The first component adjusts for the change in slope of the demand function for charter boat mode users. The second and third components adjust for the bias in consumer's surplus and account for the bias from both the travel cost coefficient and the slope dummy for charter boat users.

The formula for party boat mode users is as follows:

$$CSPT_{PARTY} = [-1/(\beta_{TCOSTPP} + \beta_{PARCOST1})] * [1/1+(t_{TCOSTPP})^{-2}] * [1/1+(t_{PARCOST1})^{-2}]$$

where, $CSPT_{PARTY}$ = Consumer's surplus per person-trip for fishermen and divers that used the party boat mode.

$\beta_{TCOSTPP}$ = Estimated coefficient on the travel cost variable.

$\beta_{PARCOST1}$ = Estimated coefficient on the slope dummy variable (PARCOST1).

$t_{TCOSTPP}$ = Estimated t-value (from column labeled b/st.er. in Table 5.17) for the travel cost variable coefficient.

$T_{PARCOST1}$= Estimated t-value (from column labeled b/st.er. in Table 5.17) for the slope dummy variable (PARCOST1) coefficient.

By substituting the values for each variable in the above formula from Table 1.17, we calculate $CSPT_{PARTY}$ = [-1/(-.0394+.01365)] * $[1/1+(16.375)^{-2}]$ * $[1/1+(2.307)^{-2}]$ = [38.83] * [.9963] * [.8418] =

$32.57. The above calculation is similar to the one for the charter boat mode.

Using the above estimates of consumer's surplus per person-trip, we can estimate the total annual value of artificial reefs and we can estimate the value on a per person-day value. We do this by referring back to our estimates of person-trips and person-days by boat mode and activity (see Table 5.11). We reproduce those estimates along with our estimates of total annual consumer's surplus and consumer's surplus per person-day in Table 5.18.

Table 5.18 shows the impacts of a variety of factors on total value for artificial reefs. Even though our estimate of consumer's surplus per person-trip was higher for party boat mode users than own boat mode users ($32.57 vs. $25.29), the difference on a per person-day basis is much smaller ($5.96 vs. $5.48). And, even though the own boat mode and private rental mode users had the same value per person-trip ($25.29), private rental boat mode users had a higher value per person-day ($5.48 vs. $5.32). The reason for this difference is the difference in length of trip. Private rental boat mode users had, on average, longer trips than those that used their own boats (5.0 vs.4.61).

Overall, for year 1997-1998, artificial reefs for Escambia County visitors were worth over **$5.49 million**. Fishermen accounted for 97.1 percent of the total value, while divers accounted for 2.9 percent. Visitors that used charter boat fishing services accounted for 72.4 percent of the total value, while fishermen using their own boats accounted for 17.7 percent of the total value.

Comparison of User Values Across Methods

The Turnbull method resulted in an estimate of the value per person-day for artificial reef use of $3.40 compared to $4.14 for the dichotomous choice models, and $9.96 using the travel cost model. Total annual value for the artificial reefs in Escambia County was estimated at $1.81 million using the Turnbull method, $2.1 million using the dichotomous choice models, and $5.49 million using the travel cost model. Because the willingness to pay questions resulted in estimated values that were not explained by differences in any socioeconomic factors, **we conclude that the travel cost model results are the 'best' results for Escambia County.**

TABLE 5.18

ANNUAL AND PER PERSON-DAY USE VALUES
FOR ARTIFICIAL REEFS IN ESCAMBIA COUNTY, FLORIDA

Boat Mode/ Activity	Total Annual Person-Visits on Artificial Reefs (millions)[1]	Total Annual Use Value of Artificial Reefs (millions $)[2]	Person-days User Value on Artificial Reefs (millions)[3]	Per Person-day ($)[4]
Own Boat	**0.0407**	**1.0293**	**0.1877**	**5.48**
Fishing	0.0385	0.9737	0.1775	5.49
Diving	0.0022	0.0556	0.0102	5.45
Charter	**0.0552**	**4.0804**	**0.2991**	**13.64**
Fishing	0.0538	3.9769	0.2915	13.64
Diving	0.0014	0.1035	0.0076	13.62
Party	**0.0115**	**0.3746**	**0.0628**	**5.96**
Fishing	0.0115	0.3746	0.0628	5.96
Private Rental	**0.0004**	**0.0101**	**0.0019**	**5.32**
Fishing	0.0004	0.0101	0.0019	5.32
Total	**0.1078**	**5.4944**	**0.5514**	**9.96**
Fishing	0.1042	5.3353	0.5337	10.00
Diving	0.0036	0.1591	0.0177	8.99

1. See Table 5.11.
2. Total annual consumer's surplus for artificial reefs is equal to the estimated consumer's surplus per person-trip (CSPT) for each boating mode times the number of person-trips on artificial reefs. CSPT for own boat and private rental mode is $25.29, $73.92 for charter boat mode, and $32.57 for the party boat mode.
3. See Table 5.11.
4. Consumer's surplus per person-day for artificial reef use is calculated as total annual consumer's surplus for artificial reef use divided by total person-days on artificial reefs.

PART 2

RESIDENTS OF ESCAMBIA COUNTY

INTRODUCTION

When we consider artificial reefs, we must look at two well defined user groups. These are the visitors to Escambia County which we have extensively analyzed above and the residents of that county. Such coastal residents engage in all forms of boating and also use artificial reefs as a recreational aid. In 1996, the population of Escambia County, Florida was estimated at 286,301 individuals. These individuals took advantage of the coastal environment by registering 16,568 pleasure craft or a little over 17 persons per boat. In the State of Florida, there are over 19 persons per registered boat indicating that Escambia County has a somewhat greater per capita ownership of pleasure craft. A coastal county requires a relatively large infrastructure for boating including piers, boat ramps, and marinas. In addition, we can add artificial reefs are part of this infrastructure.

A inventory taken by the Florida Department of Environmental Protection(1996) in l995 indicated that Escambia County had the following boating infrastructure:

1. Piers: 9 with a length of 10,410 linear feet;

2. Boat Ramps: 26 with a total of 38 boating lanes;

3. Marinas: 28 with 1,383 slips and 515 dry racks.

It is estimated by the DEP, that there are 58 artificial reefs off Escambia County. All of these facilities are available to both visitors and residents for boating use in the Gulf of Mexico.

We shall focus on the registered boats in Escambia County as the universe for resident use of artificial reefs. Of course, residents, as was true of the visitor sector, may avail themselves of party, charter, and other rental boats operating from the county. This will also be treated in our economic analyses. However, we shall start with the registered pleasure boats. For purpose of analyses, these pleasure craft were broken down into three categories based on the length of the vessel as follows:

Class 1: Under 16 Feet	9,031
Class 2: 16 Feet to 39 Feet, 11 inches	7,457
Class 3: Over 40 Feet	80
Total	16,568

The boat registration data were obtained from the Florida Department of Highway Safety and Motor Vehicles. Even though finer class distinctions are available by length, we felt that dealing with the above classes made our study more manageable and targets the Class 2 pleasure crafts as those capable of reaching an artificial reef which we saw in the visitor study above is, on average, over 10 miles from shore. Thus, the decision was made to target those intermediate size pleasure craft that are more likely to use artificial reefs. The third class is relatively small and was included to assure we treated, in some way, all the pleasure craft registered in Escambia County.

RESIDENTS ENGAGED IN BOATING

METHODOLOGY

Residents engaged in boating from Escambia County were divided into two classes: those using their own boats and those using some kind of rental boat such as a party, charter, or other kind of rental boat. Let us consider the “own boat category” first. As discussed above, the universe for this category includes all the registered boats in the county. It is possible that a resident of Escambia County may have registered his or her boat in another county. If this is the case, we made the assumption that the boating activity of that resident took place mainly in the county in which the pleasure craft was registered. This is what is called a simplifying assumption to limit the scope of this study. However, of more concern in a coastal county is those individuals that registered their craft there, but live elsewhere. Such individuals would not be defined as residents of the coastal county. For example, a resident of Alabama may berth his craft in one of the 28 marinas in Escambia County. It would not be unreasonable for such an individual to have registered his boat in Escambia County as a matter of convenience. Therefore, some adjustment must be made to the registered pleasure craft numbers to account for, delete, nonresidents. For each of the Classes established above, the following expression was employed:

$$RESBT = REGBT * \% RES$$

where,

RESBT = Registered resident boats(pleasure craft);
REGBT = Registered boats (pleasure craft) in the county under study;
%RES = Percent of registered boats registered to individuals with homes in the county under study.

Just how %RES(percent local residents) was determined will be discussed under sampling procedure below. Next, registered pleasure craft owned by local residents is merely a stock of boats which may or may not be used for boating or some element of boating such as fishing or diving. In our sampling procedures discussed below, we ascertained, from those owning registered boats, the number of days per year they were used predominately for saltwater fishing. For purposes of this study, we are only interested in fishing and diving since these activities are the primary recreational use of artificial reefs. The following expression may be useful in looking at a fishers use of a pleasure craft:

FPDYO = RESBT* FDPBPYO

where,
FPDYO = Fishing(saltwater) <u>party</u> days per year using own boat;
RESBT = Resident boats(pleasure craft);
FDPBPYO = Fishing(saltwater) days per own boat per year.

This is a rather simple expression which indicated that saltwater fishing days per year is the result of multiplying the number of boats by the average number of fishing days. This turns the stock of boats into a flow of days per year. <u>Each day represents the action of a group of people or party.</u> So, each day can be regarded as a "party day". Such "days" refer to the use of the pleasure craft or boat by a residents of the county under study.

Next, we wish to translate fishing days into expenditures by residents using their boats in Escambia County. To do this, we can use the following expression:

$EXPENDFO = FPDYO * $EPPDO

where,
$EXPENDFO = Total expenditures on saltwater fishing per year using own boat;
FPDYO = Fishing (saltwater) party days per year using own boat;

$EPPDO = Expenditures per party per day using own boat.

Notice that $EPPDO is expenditures by the entire party using a boat or pleasure craft on any given day for saltwater fishing. Such expenditures run from bait and fuel to slip rentals in a marina. Thus, we were able to obtain how much was spent by those residents using their own boat on bait, for example. This will be discussed in some detail below.

$EXPENDFO must be converted into how many job such expenditures support in Escambia County and wages related to such jobs. This can be accomplished by the following expressions:

EMPLOYFO = $EXPENDFO / {($S/E)}

$WAGESO = %WAGES*$EXPENDFO

where,

EMPLOYFO = Number of full and part-time jobs generated by recreational saltwater fishers using own boat in the county;

$S/E = The ratio of sales-to-employment for those industries in which spending for good and services are made for saltwater fishing;

$WAGESO = Wages and salaries generated by own boat spending in industries related to saltwater fishing;

%WAGES = Percent wages are of total sales/expenditures in industries related to saltwater fishing.

The first expression above is used to derive employment by dividing expenditures which are sales by the published ratio of sales-to-employment in those industries related to saltwater fishing. Each of these industries generates wages as a cost of doing business. Therefore, we multiply this published ratio of wages-to-sales or %WAGES by $EXPENDFO to obtain the wages and salaries generated by these expenditures. In both expressions, we need published data that are taken from the U.S. Censuses of Retailing and Services for the county in question. In the case of this chapter, we have published data for Escambia County on all major industries serving the county. Published data are not always available for all the parameter needed for the above expression. In this case, we must turn to sampling which is discussed below in a separate section.

It should be recognized that not all residents use their own boat for saltwater fishing in Escambia County. Rentals such as party and charter boats are readily available and are the

choice of many visitors to the county as discussed in Part 1 in this chapter. How do we obtain the total expenditures by residents on this part of the saltwater fishing sector? Consider the following expression:

$EXPENDFR = ($EXPENDVISITOR/ %VIS) * %RES

where,

$EXPENDFR = Expenditures by county residents on charter, party, and other rental boats for saltwater fishing;
$EXPENDVISITOR = Expenditures by all visitors on charter, party, and other rental boats for saltwater fishing;
%VIS = Percent visitors are of the total demand for charter, party, and other rentals;
%RES = Percent residents are of the total demand for charter, party, and other rental boats.

The right hand side of the above expression has two terms. The first term merely “blows-up” visitor expenditures on all rental boats to total expenditure including, of course, those expenditures made by non-visitors or residents. The second term is merely what percent total expenditures are made by residents of the county in question. The “percents” are based on the number of days that visitors and residents make in connection with the boat rental industry in the county. This is the best measure of demand available from the boat rental industry. This will be discussed below in some detail.

Finally, we would like to estimate the number of person fishing days spent by all residents of Escambia County. The reason we say “person” fishing days is that we wish to derive the total number of fishing days by all persons engaged in saltwater fishing. These days will be used later to estimate the total use value of the recreational experience that was extensively discussed under the visitor’s section above. The following expression can be used to estimate total saltwater person-days:

PDAYSFO = FPDYO * SPO

where,

PDAYSFO = Person days saltwater fishing using own boat;
FPDYO = Fishing(saltwater) party days per year using own boat;
SPO = Size of party engaged in saltwater fishing using

own boat.

Now, we shall turn to the survey techniques used with the residents to obtain some of the parameters of the expressions discussed above.

SAMPLE SURVEY

The researchers obtained a magnetic tape from the Florida Department of Highway Safety and Motor Vehicles (FDHSMV) containing all registered boat owners in the State of Florida. The computer tape was processed to yield only those registered boaters in the five West Florida Counties under study. These five counties contained 60,599 registered boat owners. This defined our universe of resident boaters. The purpose of obtaining the tape was to form the universe for telephone sampling of registered boat owners in each of the five counties. Unfortunately, the FDHSMV does not obtain the phone number of the registered boat owner. To overcome this problem, we obtained a CD-ROM of all listed phone numbers in the United States including Florida. The CD-ROM was interfaced with the magnetic tape of registered both owners to match as many owners with listed phone numbers. For the counties under study, we were able to “match” about 85 percent of the registered boat owns on the tape with phone numbers available on the CD-ROM. The “matched set” of registered boat owners in each county was randomized so they could be sampled. This was a substantial undertaking for the research team plus a graduate student in the Florida State University Statistics Department. But, it did form the basis for the telephone survey.

The random sample size was determined by the county under study and the budget for the project. That is, Bay, Okaloosa, and Escambia Counties contain about 80 percent of the registered boat owners so this is where our sampling was concentrated. Further, the budget for this project limited the size of the sampling even for the larger counties. After the survey instrument was developed for residents, the randomized boat owners were called by telephone in Escambia County during the summer and early fall of 1998. The degree of cooperation by the boat owners called was exceedingly low with only 1 in 10 agreeing to be surveyed. This made the process even more expensive. We have no idea as to why the response rate was so low. In any event, 98 boat owners were completely surveyed in Escambia County by the end of the allotted time for the resident survey. It was our intention to get a least 100 boat owners for the larger counties and this was generally obtained. The survey instrument used for the residents is contained in Appendix 3. for the readers inspection.

ESTIMATION OF SPENDING;EMPLOYMENT; WAGES AND DAYS ON SALTWATER RECREATOINAL FISHING

Table 5.20 contains the necessary parameters to estimate the economic impact model formulated above. For the reader's insight into this process, let us work through an example. Consider size class 1 or own boats under 16 feet as discussed above and included in Table 5.20. Inserting the estimated values from Table 5.20 into the expressions explained above, we have the following:

(1) RESBT = RESBT * %RES = 9.031 * .837 = 7,559 (locally owned boats)

(2) FDPYO= RESBT * FDPBPYO = 7,559 * 11.4 = .086173(Millions party days)

(3) $EXPENDFO = FPDYO *$EPPDO = .086173(Millions) * $62.87
= $5.418 (Million)

(4) EMPLOY = $EXPENDFO/{($S/E)} = $5.418/ ($.1261)= 41 Employees

(5) $WAGESO = %WAGES * $EXPENDFO = .09347 * $5.418 (Million)
= $.5064 (Million)

(6) PDAYSFO = FPDYO * SPO = .86173(million) * 2.46
= .211985(Million person days)

(7) $EXPENDFR = ($EXPENDVISITORS/%VIS) * %RES
= {$49.2(Million)/.77}*.23
= $14.7 (Million)

Summarizing the above analyses, we can state that the individuals in Escambia County owning pleasure craft under 16 feet spent over $5.4 million on saltwater recreational fishing which in term generated over $.51 million in wages which supported 41 jobs in Escambia County. In addition, the local individuals owning the pleasure craft provided over one-fifth of a million person-days of saltwater recreational fishing. Notice that these conclusions were reached using expressions (l) through (6) above. Expression (7) relates to an estimate of total spending of all Escambia County residents on party, charter, and other rentals combined. These individuals either do not own boats or, if they do, choose to kick back and let someone else do the

boating while they concentrate on fishing. Table 5.21 summarizes all the analyses for the three classes and rentals.

Residents of Escambia County, Florida spent nearly $36.6 million on saltwater recreational fishing over the last 12 months (primarily l998). According to summary Table 5.21, this generated about $5.5 million in wages and salaries that supported about 554 full and part-time employees located in Escambia County. In addition to the visitor spending discussed in the first part of this chapter, the residents of Escambia County place considerable pressure on the boating infrastructure of the area. Of great importance, these conclusions only applying to saltwater fishing using a boat mode and does not include fishing from the shore. In addition, fishers spent 828,395 person days over the last 12 months in the pursuit of recreational saltwater fishing. As explained under our discussion of visitors above, the number of person-days is a significant factor in computing the use value of the fishery resource and even recreational aids such as artificial reefs. This brings us, to a direct consideration of that segment of the resident anglers using artificial reefs.

RESIDENTS USING ARTIFICIAL REEFS

As we mentioned above, our telephone survey covered 98 resident boaters in Escambia County, Florida. Much of the information contained in Table 5.20 came from this survey. In addition to this information, we asked resident boaters about there fishing use of artificial reefs which engaged in saltwater recreational fishing. We measure participation in terms of days spent fishing. In fact, the days spent fishing are the driving force behind all our economic impact conclusions discussed above.

In total, the 98 resident boaters sampled spent 2,185 party days per year engaged in saltwater recreational fishing. This was the aggregate fishing effort by all of the three boat length classes discussed above. Respondents were asked to break down their saltwater fishing days into those days spent on or about artificial reefs off Escambia County. Of the total party days, 1,269 party days were spent fishing on artificial reefs. Thus, about 58 percent of all party days spent on saltwater

TABLE 5.20

PARAMETERS ESTIMATED FROM THE SAMPLE
OR TAKEN FROM PUBLISHED DATA TO IMPLEMENT
THE ESCAMBIA RESIDENT ECONOMIC IMPACT MODEL
OF SALTWATER RECREATIONAL FISHING

Parameter	OWN BOAT Class 1	OWN BOAT Class 2	OWN BOAT Class 3	RENTAL All other
RESBT (Registered boats)	9,031	7,457	80	N/A
%RES (Percent live in county)	84	80	64	N/A
FDPBPYO (Days per year/boat)	11.14	23.52	59	N/A
$EPPDO (Expenditures/party/ day)	$62.87	$144.85	$119.13	N/A
$S/E (Millions) (Sales to Employ- ment ratio)	$.1261	$.1084	$.1079	$.041
%WAGES (Percent wages of sales)	.0935	.0892	.1068	.237
SPO (Size of party)	2.46	3.50	5.33	N/A
%VIS (Percent visitors)	N/A	N/A	N/A	77
%RES (Percent residents)	N/A	N/A	N/A	23
$EXPENDVISITORS ($ Spent by visitors using party, charter and other rentals in millions)	N/A	N/A	N/A	$49.20

Source: Florida State University Sample Survey; U.S. Censuses of Retailing and Services, Escambia County, Florida.

TABLE 5.21

ESTIMATED ECONOMIC IMPACT OF RESIDENT SALTWATER FISHING ON ESCAMBIA COUNTY, FLORIDA

ECONOMIC VARIABLE/ INDICATOR	CLASS 1	CLASS 2	CLASS 3	RENTAL	TOTAL
EXPENDITURES (Millions)	$ 5.42	$16.12	$.37	$14.70	$36.59
WAGES (Millions)	$ .51	$ 1.44	$.039	$ 3.48	$ 5.47
EMPLOYMENT	41	149	4	360	554
PERSON DAYS (Millions)	.2120	.4911	.0164	.1089	.8284

Source: Florida State University

recreational fishing targeted artificial reefs as the place to engage in fishing. An independent survey of charter boat operators by the authors indicated that artificial reefs are fished over 47 percent of the fishing days. Therefore, whether one used his own boat or a rental, it would appear that artificial reefs are used over 50 percent of the time devoted to saltwater recreational fishing. Since days fishing is a multiplier to get all the economic impact information, then it follows that 58 percent of the total economic impact is artificial reef related. This is shown in Table 5.23.

For fishers only, they spent over $21,6 million on goods and services in Escambia County, Florida that is artificial reef-related. This expenditure supports 321 full and part-time employees with wages of $3.17 million. These anglers spent 480,469 person-days on artificial reefs over the last 12 months(primarily l998). Lastly, we shall consider divers as a recreational group that uses artificial reefs.

TABLE 5.22

ESTIMATED ECONOMIC IMPACT OF RESIDENTIAL

SALTWATER RECREATIONAL FISHING ON OR ABOUT

ARTIFICIAL REEFS, ESCAMBIA COUNTY, FLORIDA

ECONOMIC VARIABLE / INDICATOR	VALUE
TOTAL EXPENDITURES	$21.23 MILLION
TOTAL WAGES	$ 3.17 MILLION
TOTAL EMPLOYMENT	321 EMPLOYEES
TOTAL PERSON-DAYS	.480469 MILLION

* 58 percent of total economic impact of saltwater recreational fishing by residents attributable to the existence of artificial reefs. See text for a further discussion. Figures in this table are 58 percent of the figures in Table 5.22.

Source: Florida State University

Up to this point, we have not mentioned diving as a recreational use of an artificial reef. From our sample, diving constitutes about 1.9 percent of all the days devoted to fishing and diving by the residents of Escambia County, Florida. For the other counties we shall be reviewing, diving is even less important. To estimate the economic impact of diving, we performed the following procedure:

ADJFACTOR = DAYSDIV/ DAYSFISH

where,

ADJFACTOR = Adjustment factor to economic variables associated with recreational saltwater fishing

to derive estimates of economic variables associated with diving;

DAYSDIV = Days spent diving by residents;

DAYSFISH = Days spent fishing by residents.

The ADJFACTOR is merely multiplied by the economic variables associated with recreational saltwater fishing on artificial reefs to derive an estimate of the economic importance of diving. The implicit assumption is that spending by divers per party per day is about the same as that for fishers. Unfortunately, the sample for divers in Escambia County that use artificial reefs was only 4 responses. When we compared fishing and diving expenditure profiles for the entire sample of northwest Florida boaters, we found no significant differences. So we use the fishing expenditure profiles for divers.

The fishers spent 2,185 days per year from the sample while the divers spent only 42. Therefore, the ADJFACTOR would be .019 (42/2,185). We applied this factor to the results in Table 5.22 to obtain a rough estimate of the economic extent of diving. All of this is summarized in Table 5.23. The combined economic impact of fishers and divers using artificial reefs in Escambia County is reflected in spending of over $21.6 million, supporting 327 jobs and generating $3.23 million in wages and salaries. These two groups spent 489,598 person days on the artificial reefs over the last 12 months.

Next, we shall consider, as we did with visitors, the responses by fishers and divers to questions concerning their evaluation of artificial reefs as a recreational aid.

TABLE 5.23

ESTIMATED ECONOMIC IMPACT OF RESIDENTIAL SALTWATER FISHING AND DIVING ON ARTIFICIAL REEFS IN ESCAMBIA COUNTY, FLORIDA

ECONOMIC VARIABLE/ INDICATOR	FISHERS	DIVERS*	TOTAL
TOTAL EXPENDITUES (MILLIONS)	$21.23	$ .40	$21.63

TOTAL WAGES (MILLIONS)	$ 3.17	$ .06	$ 3.23
TOTAL EMPLOYMENT	321	6	327
TOTAL PERSON-DAYS (MILLIONS)	.4805	.0091	.4896

* Divers derived by multiplying fishers by the adjustment factor(ADJFACTOR) of .019 explained in the text.
Source: Florida State University

EVALUATION OF ARTIFICIAL REEFS BY RESIDENT USERS

METHODOLOGY AND EMPIRICAL RESULTS

As part of the phone survey to resident boat owns in Escambia County, we asked respondents to evaluate the artificial reefs that they used. Such questions were restricted to those that have actually used one or more artificial reefs. We asked respondents the reasons that might be important in their decision to use an artificial reef as a recreational aid in either fishing or diving. Respondents rated each statement from Very Important to Not Important at All. The following results were obtained with the percent that answered either Very or just Important as their evaluation.

TABLE 5.24

Reasons Behind the Choice of an Artificial Reef by Fishers

Reason	Percent Very Important or Important
1. Better Catch Rate	93.1
2. Previous Experience at Site	81.6
3. Site Is Close to Shore	53.5
4. Want to Fish Near Others	7.0
5. Other Fishers Recommended Site	39.8

6. Site Is Easy to Locate	75.9
7. Better Fishing than Natural Reefs	36.1

Source: Florida State University

It would appear that fishing catch rate on artificial reefs was of paramount importance in the decision by fishers to use an artificial reef for a recreational aid. Apparently, artificial reefs raise use value as discussed in Part 1 dealing with visitors. In fact, we found that the travel cost model applied to visitors verified the hypotheses that recreational value is increased when an artificial reef is introduced into the recreational activity of saltwater fishing. A particular artificial reef was rated very important when the individual had previous experience with it. Respondents were evenly divided over the existing distribution of artificial reefs. About 53% of the respondents felt that artificial reefs were close enough to shore. Respondents definitely felt that they wanted to be alone on artificial reefs as only 7 percent wanted to fish near others. A little over one-third of the artificial reef users felt that the recommendations of other fishers regarding a “good” artificial reef was either very or just important. Nearly 76% of the users felt that the artificial reefs that were easy to locate were a definite factor in their use of an artificial reef. Finally, artificial reefs are a good man-made recreational aid; however; only one-third of the users felt that man was better than nature- that is two thirds felt natural reefs yielded “better fishing”.

We asked both fishers and divers to evaluate artificial reefs from somewhat of a different perspective. In the above analyses, the respondents were restricted to fishers only. Table 5.25 shows the results from both users combined. With regard to placement of artificial reefs too far from shore, all users were as the just fishers result evenly divided about this issue. Such strategic placement of artificial reefs is beyond the scope of this inquiry, but important enough to warrant further investigation.

At present, most of the users of artificial reefs do think that they are too crowed (i.e., 67%). However, with the rapid expansion in boating in the Florida Panhandle, it would appear that this may be a larger problem in the immediate future. All users are not convinced that artificial reefs are more productive than natural reefs. This is consistent with the feelings of just fishers. With crowding on artificial reefs appearing to be a problem, none of the users felt that there were too many artificial reefs. There will be two issues arise from this result. First, should the investment in artificial reefs be expanded in the future since crowding may become critical

problem. Second, some regard the expansion in artificial reefs will hasten overfishing of bottom dwelling fish such as red snapper and various groupers. The hypotheses advanced is that artificial reefs do not increase the size of the fishery population, but merely aggregate an existing population on reefs where they can be easily overfished. This view regards artificial reefs as devices to increase the “efficiency” of recreational fishers in catching fish. This debate has been covered lately in Grossman et al and Bohnsack et al (l997).

The consensus(64%) of users feel that artificial reefs should be placed in water less than 150 feet deep. This is understandable since bottom dwelling fish are seldom found no deeper than 150 feet. Finally, to add information to the debate over whether artificial reefs increase fishery population or actually diminish such populations, all users perceive that artificial reefs “increase abundance”. An argument can be made that artificial reefs are man-made habitats that increase fishery stocks and hence abundance. This is an item for further study and is certainly beyond the scope of this report.

TABLE 5.25

EVALUATION OF EXISTING ARTIFICIAL REEFS

BY DIVERS AND FISHERS OFF ESCAMBIA COUNTY, FLORIDA

CRITERIA FOR EVALUATION	PERCENT STRONGLY AGREE OR AGREE
1. Reefs Placed Too Far From Shore	46%
2. Artificial Reefs Too Crowded	67%
3. Artificial Reefs More Productive Than Natural Reefs	85%
4. Too Many Artificial Reefs	0%
5. Artificial Reefs Should Be In Water Less Than 150 Feet	64%
6. Artificial Reefs Increase Abundance of Fish	100%

Source: Florida State University

RESIDENT USE VALUE OF ARTIFICIAL REEFS

METHODOLOGY

We shall not go through an extensive discussion of analytics of use value as we did for the visitors in Part 1. The reader is referred to the section discussing use value in the visitor analyses above. As the reader will remember, use value is the recreational value placed upon a common property resource such as a fishery which does not trade in an organize market. Quite simply, until recently there was no saltwater fishing license required by Florida for fishing in its territorial waters; therefore, the fish were free to anglers for their recreational use. Despite the expenditures of these anglers which is the economic impact, there is an additional value called “use value” that is derived from this natural resource. We have argued and

the survey results would seem to support the hypotheses that the artificial reef is a recreational aid that increases the use value of the fishery or the waters above the artificial reef for divers. Thus, we have basic use value and the incremental use value created by the artificial reef. It is well known that an increase in catch rates will increase use value. See Green(1984) and Leeworthy(1990) for examples. Artificial reef fishers contend that catch rates are indeed better there. Thus, those fishing on an artificial reef should experience increase use value from the saltwater recreational fishing experience. This was confirmed for visitors in Part 1 and has profound implications for a benefit/cost analyses of the artificial reef program. As with the visitors, we asked the residents to respond to the following question, which we shall repeat again for the reader:

> "The artificial reef program cost money. Suppose that the government proposed that all newly constructed reefs would be paid for by requiring that reef users with their own boat either pay for a stamp as part of their fishing license and/or if they used a rental boat probably pay higher fees for the operator's stamp. The money would go into a trust fund that could only be used for the construction of artificial reefs. Would you be willing to pay $_____ per year when you renew your fishing license/ and or use a rental boat of any kind to fund this construction program?"

Notice that this question is directed at fishers only. The reason is that there were too few divers in the sample from all five counties to implement the estimation of use value procedure. To enlarge the sample, we combined all counties where telephone interviews of fishers were completed. A total of 339 responses were obtained among the five counties. On a random basis, the respondents were asked this question which we called "dichotomous choice". That is, the respondent answers YES or NO to the amount or payment presented. The amounts presented were $1; $5; $10; $15;$20;$30 and $50. Remember, a respondent is presented with only one of these "payment vehicles" in the single interview. In this way, we get a segment of the sample answering to each of the assigned values for the payment vehicle.

In the case of the visitors discussed above, we used three procedures to estimate use value. For residents, the travel cost method could not be used because of the short distance traveled to the boat launching site. Therefore, we are restricted to the Turnbull Distribution and the Dichotomous Choice Equation for the estimation of the use value for saltwater recreational fishing on

artificial reefs. We interpret the question stated above to be the incremental use value of expanding the artificial reef program to satisfy the users. In Table 5.25, none of the present reef users felt that there were enough artificial reefs off Escambia County. Therefore, we would expect incremental use value from providing more artificial reefs. Just how many additional reefs was not directly addressed because we would have to get into placement; size and depth of additional reefs. This kind of detail was beyond the scope of this investigation.

APPLICATION OF THE TURNBULL DISTRIBUTION TO RESIDENTS

We shall not get into an extensive discussion of the Turnbull Distribution since this was covered in Part 1 dealing with visitors. We would expect that as the payment amount increased, that fewer and fewer respondents would be willing to pay for the expansion of the artificial reef program. This means that the percentage of respondents for each dollar amount should decline as the dollar amount presented to the fisher increased. Table 5.26 shows the computations using the Turnbull Distribution procedure.

As expected, the percent of fisher respondents willing to pay increasingly higher dollar values declines as the dollar value is raised from $1 to $50. Even at the $50 level, 39.4 percent of that group of fishers said YES that they would be willing to pay that amount. This shows a strong support for the expansion of the artificial reef program even when faced with a higher cost of fishing licenses and/or rental boat fees by residents of all five counties. From the analyses in Table 5.26, it would indicate that the typical fisher using an artificial reef would pay an additional $25.45 per year to support the expansion of the program. Notice that use value and willingness to pay is used interchangeably. In general, they are the same concept. The answer to our dichotomous choice question was given by one individual so the $25.45 refers to the annual individual willingness to pay or the incremental use value of the artificial reef as a recreational aid. This use value is usually expressed on a daily basis. The reason for this is that we have estimated the number of person days connected with the artificial reef usage above. For Escambia County, Florida, the typical boat owner fishes 22.69 days per year. This figures combines classes 1-3 discussed above. Of course, only 58 percent or 13.16 days are spent on artificial reefs as discussed above. Therefore, the resident use value is about $1.93 per day($25.45/13.16 days). The residents use value is substantially less than that found for visitors($3.40/day) using the Turnbull technique. Since residents fish more days than visitors, one might expect diminishing

marginal returns as one fishes more. This form of diminishing marginal utility might be responsible for the disparity between visitors and residents.

If we assume that the marginal willingness to pay is equal to the average willingness to pay, then we can compute total user value per year. Using the number of fishing days on artificial reefs by Escambia County residents over the last 12 months, we can estimate the annual total flow of use value to Escambia County fishers and divers assuming that the diver's use value is about the same as that of fishers. There were 489,600 days spent on artificial reefs by fishers and divers who are residents of Escambia County, Florida. This is shown in Table 5.23. This allows us to make the following statement: Fisher and diver residents of Escambia County derive $944,928 in recreational use value from the use of artificial reefs per year. This is a considerable flow of use value when it is compared to the cost of funding the artificial reef program. This will be considered in some detail when we finish all five of the counties under study.

TABLE 5.26

ESTIMATION OF RECREATIONAL SALTWATER

FISHING USE VALUE FOR ARTIFICIAL REEFS OF NORTHWEST FLORIDA

USING THE TURNBULL DISTRIBUTION

(1) Lower Bound for Interval	(2) Upper Bound For Interval	(3) Probability of Payment at Upper Bound	(4) Change in Density of Distribution	(5) Willingness to Pay (Use Value) (1)*(4) $	(6) Sample Size
$0	$1	.771	.229	0	70
$1	$5	.657	.115	$.115	64
$5	$10	.586	.070	$.350	58
$10	$15	.545	.041	$.410	11
$15	$20	.547	-.002	-$.040	64

$20	$30	.410	.137	$4.11	39
$30	$50	.394	.016	$.800	33
$50	Infinity	0	.394	$19.700	N/A
		Total Use Value(Sum Column 5)		$25.445	

Source: Florida State University

Dichotomous Choice Application

The modeling approach followed here is one originally developed by Bishop and Heberlein (1979). There have been many applications using slightly different specifications of the model and Hanemann (1984) further developed the underlying economic theory behind various model specifications and the formulas for calculating consumer's surplus or compensating variation. Compensating variation is consumer's surplus adjusted for the income effects of price changes that would keep the consumer at the same level of total economic well-being as before the change in price. The answers to questions like the ones used in this study to measure the value of artificial reefs are assumed to yield estimates directly of compensating variation. The general form of the dichotomous choice is as follows:

$$Pr\ (YES) = \alpha - \beta_{BID} * BID + \beta_{SE} * SE + \mu$$

where, Pr (YES)= the probability that the user will be willing to pay the randomly assigned dollar amount (BID).

BID = randomly assigned dollar amounts.

β_{BID} = estimated coefficient on BID.

SE = vector of other socioeconomic variables and/or natural resource attributes.

β_{SE} = estimated coefficients for SE vector.

μ = error term following logistic distribution for logit model and normal distribution for the probit model.

The above model was estimated using both the logistic and normal distribution assumption about μ. The BID variable was included in its linear and logarithmic form (natural logarithm of BID called LBID here). In the SE vector, we include a variety of socioeconomic factors including household income, education level, age, years of experience boating in northwest Florida, race, and sex. Also, included were variables for differentiating charter, party, and private rental boat mode use from use of the own boat. Boat length was also entered as possible explanatory variable. A variable was also entered to indicate artificial reef use and, when fishermen and divers were combined, a variable was entered to differentiate divers from fishermen. Dummy variables were also entered for the counties to test for differences in values by county, holding all other factors constant. Table 5.27 includes the definitions of all the variables used in estimating the dichotomous choice models.

A total of eight models were estimated. The models differ by sample of users (e.g. all users versus fishermen only), by assumption about the distribution of the errors (e.g. the logit of probit model), and by specification of the bid amount (e.g. linear BID or log linear or natural logarithm of bid or LBID). We only present the results of the model we considered the “best” model. Other results are available from the authors on request. Of the variables in Table 5.27, MALE, WHITE, EXPER, AGE, AGESQ, DIVE, and all the county dummy variables were not statistically significant in any model specification. Unlike the results from the visitor model, several variables were significant in explaining the willingness to pay for artificial reefs. Household income (INC) was positive and significant meaning that higher income households were willing to pay more for artificial reefs. All the education dummy variable were positive and significant meaning that those with an education level of high school graduate and above were willing to pay more for artificial reefs than those who had not graduated high school. The coefficients first increase then decline with higher levels of education suggesting a parabolic relationship between education and willingness to pay for artificial reefs. College graduates and those with graduate degrees would be willing to pay slightly less than those that either graduated from high school or had some college or vocational training. Those that own larger boats are willing to pay more as are those that used artificial reefs. Those that belonged to fishing and diving clubs and those that used some form of rental boating were willing to pay less.

The results across the eight models were not significantly different and ranged from $29.23 to $31.57 with an average across the eight models of $30.74. The results presented in Table 2.28 are representative of the eight models and produces a value of $30.58 which is not significantly different from the average

across all eight models.

The value derived from the dichotomous choice model is slightly higher than that obtained using the same information and employing the Turnbull method $25.45 versus $30.58 or about 20 percent higher. The lowest value obtained from the dichotomous choice model is about 15 percent higher than that obtained using the Turnbull method ($29.23 versus $25.45). To derive an estimate of the willingness to pay per day, as with the Turnbull estimate above we divide the annual value per person by 13.16 days yielding an estimate of WTP/day of $2.32 ($30.58/13.16). And, our estimate of total annual value of artificial reef use in Escambia County using the dichotomous choice method is $1,135,867 ($2.32 * 489,598 days of use).

TABLE 5.27

DEFINITIONS OF VARIABLES

USED IN DICHOTOMOUS CHOICE MODELS

FOR RESIDENTS OF NORTHWEST FLORIDA

Variable	Definition
FWP	Dependent Variable, 1=YES 0=NO, for willingness to pay randomly assigned dollar amount. Fishermen only.
WPALL	Dependent Variable, 1=YES 0=NO, for willingness to pay randomly assigned dollar amount. Fishermen and divers combined.
FBID	Randomly assigned dollar amount or bid for fishermen only. Dollar amounts $1, $5, $10, $15, $20, $30, and $50.
LFBID	Natural logarithm of FBID.
BIDALL	Randomly assigned dollar amount or bid for fishermen and divers combined. Dollar amounts $1, $5, $10, $15, $20, $30, and $50.
LBIDALL	Natural logarithm of BIDALL.
AGE	Age of respondent in years.
AGESQ	Age of respondent squared.
INC	Household Income of respondent in thousands of dollars.
EXPER	Years of boating experience in northwest Florida.
BOATLEN	Length of boat owned measured in feet.

SHS	Dummy variable for education level. Some High School.
HSGRAD	Dummy variable for education level. High School Graduate.

TABLE 5.27 (CONTINUED)

Variable	Definition
SCOLLEGE	Dummy variable for education level. Some College or vocational training.
COLLGRAD	Dummy variable for education level. College Graduate.
GRADPROF	Dummy variable for education level. Graduate degree of Professional degree.
RENTAL	Dummy variable for use of charter, party or rental boat services.
REEF	Dummy variable for use of artificial reefs.
CLUB	Dummy variable for membership in fishing or diving club.
DIVE	Dummy variable for diving in northwest Florida.
MALE	Dummy variable for gender of respondent. 1=Male 0=female.
WHITE	Dummy variable for race/ethnicity. 1=White 0=all others.
BAY	Dummy variable for county of residence. 1=Bay County.
WALTON	Dummy variable for county of residence. 1=Walton

	County.
OKA	Dummy variable for county of residence. 1=Okaloosa County.
ESCAM	Dummy variable for county of residence. 1=Escambia County.
SANTA	Dummy variable for county of residence. 1=Santa Rosa County.

TABLE 5.28

RESULTS OF ESTIMATION OF DICHOTOMOUS CHOICE MODEL

Variable (X)	Coefficient(β)	Standard Error (β)	T-value (β)	Prob. T-value	Mean of X
Constant	-1.734013395	.80216741	-2.162	.0306	
LBIDALL	-.2934505106	.06741002	-4.353	.0000	2.1360793
INC	.0105656069	.00392190	2.694	.0071	59.409722
BOATLEN	.0287826639	.01629651	1.766	.0774	21.736111
HSGRAD	1.295912551	.65786491	1.970	.0489	.17708333
SCOLLEGE	1.333626579	.63790874	2.091	.0366	.41666667
COLLGRAD	1.306813660	.64188700	2.036	.0418	.28125000
GRADPROF	1.268269984	.67117464	1.890	.0588	.10763889
RENTAL	-.8063524979	.32159810	-2.507	.0122	.06597222
REEF	.4114559423	.18719732	2.198	.0280	.73611111
CLUB	-.5066315361	.26390973	-1.920	.0549	.10763889

N=288
Chi-Squared 51.816
Degrees of freedom 10
Chi-squared Significance .0000
Percent Correct Predictions 71.18
Mean of Dependent Variable WPALL=.6284
Estimated Consumer's Surplus=$30.58* (Annual per person)

* Of the eight models estimated, the range of estimated consumer's surpluses was from $29.23 to $31.57 with a mean across all eight models of $30.74.

DEMOGRAPHIC AND BOATING CHARACTERISTICS OF RESIDENT FISHERS AND DIVERS

Table 5.29 shows the demographic and boating characteristics of resident fishers and divers from the Escambia County sample of boat owners. The typical respondent was a 50 year old white male with some college as an educational level and having a family income of about $55,000 per year. The demographic profile for all boaters was almost identical to the sub-sample of artificial reef users. There was no statistical difference between the demographic characteristics of general boaters and those using artificial reefs. A comparison of residents to visitors reveals somewhat of a contrast. Visitors tend to be much younger with a

higher family income. See Table 5.7. Thus, the two markets for the two products-fishing and diving - is segmented into residents who are older and most probably living on pensions in comparison to visitors that are much younger and more affluent. This pattern is not unusual for many coastal communities. It does give us a contrast in terms of the constituency for artificial reefs. That is, when visitors are combined with residents, it would appear that artificial reefs are used by a broad spectrum of socioeconomic groups.

With respect to boater profile, the average pleasure craft size in the sample was 22 feet which is slightly larger than the average for the population of registered boats in Escambia County which was a little over 18 feet. Boaters in the Florida Panhandle have been boating, on average, for 25 years. This is attributable to their age and, of course, their living in a coastal community. Only a little over 11% of the boat owners were members of some kind of boater’s club. The targeted species for fishers were very similar as that for visitors to Escambia County in the snappers and mackerels are well represented. As expected, if one fished for those species that “just come along”, then the kind of species is much more diverse ranging from trigger fish to shark.

The daily party catch rates were 21.72 and 8.83 fishing for targeted and non-targeted species respectively. The catch rates were somewhat higher for residents than visitors which is to be expected based upon the difference in experience off fishing of Escambia County (25 vs. 6 years). About 82% of the residents said they used artificial reefs over the last twelve months; however, the fishing days spent on artificial reefs was about 58% of total days as indicated in our discussion above. Residents choose to use over 3 different artificial reefs in a 12 month period and, apparently, they are all off Escambia County indicating a “stay at home preference”. Residents fished on artificial reefs that are about 9-10 miles from shore. Visitors using charter boats were apparently taken further offshore for fishing on artificial reefs (i.e., 19 miles).

TABLE 5.29

DEMOGRAPHIC AND BOATING CHARACTERISTICS OF

RESIDENT BOATERS IN ESCAMBIA COUNTY, FLORIDA

DEMOGRAPHICS:	AVERAGE/OTHER
1. Age	50 Years
2. %Male	89.8%
3. %White	95.6%
4. Family Income	$55,000
5. Education	Some College
BOATING PROFILE:	
1. Average Length of Boat Owned	22 Feet
2. Years Boating in Florida Panhandle	25 Years
3. Percent Members of Boating Club	11.3%
4. Targeted Species:	1. Billfish
	2. Kingfish
	3. Red Snapper
	4. Mackerels
	5. Sea Trout
5. Catch/Party/Day: Targeted Species	21.72 Fish
6. Species That Just Come Along	1. Red Snapper
	2. Catfish
	3. Sea Trout
	4. Bonito
	5. Triggerfish
7. Catch/Party/Day: Non-Targeted Species	8.83 Fish
8. Percent of Sampled Resident Boater Using Artificial Reefs	82%
9. Number of Different Artificial Reefs Used Per Year by Those Using Them	3.2
10. Principal Artificial Reef Used During Year is Off Escambia County (% of Users)	95%
11. Average Distance of Artificial Reef Used from Shore	9.59 Miles
12. Principal Fishing Method Used on Artificial Reef	Bottom Fishing

Source: Florida State University

SUMMARY AND CONCLUSIONS

ECONOMIC IMPACT OF ARTIFICIAL REEF VISITORS:

1. Over the last 12 months(l997-98), it was estimated that slightly over 2.1 million person-visits were made to Escambia County for various forms of recreation and business;

2. The visitors to Escambia County pumped over $.5 billion dollars in spending directly into the local economy supporting nearly 10,342 full and part-time employees and generating over $112 million dollars in wages. Visitors were directly responsible for nearly 2.7% of all wages paid in Escambia County and a 6.6 percent of full and part-time employment in this county;

3. All visitors to Escambia County over the last 12 months(l997-98) spent about 8.7 million days in this county. The need for lodging, eating, and shopping establishments while these visitor days were being spent generated the aggregate economic impact estimated above;

4. Of significance to this study, it was estimated that 10.5% of all visitor days or .91 million days were spent by visitors engaged in saltwater recreational boating off the Gulf Coast of Escambia County. The principal modes of boating chosen by visitors were the use of one’s own boat or the rental of a charter boat which accounted 85% of all boating days. Party or head boats or other kinds of non-captain rentals accounted for the other 15%;

5. Visitor boating accounted for over $106.8 million in spending which supported 2,265 full and part-time employees who received over $22 million in wages. Because boating visitors spend money on fishing supplies and charter rental fees in addition to motels and restaurants as a general visitor would, they tend to spend more money per party than the average visitor. Thus, even though boating visitors account for 10.5% of visitor days, they account for over 20% of all visitor spending in Escambia County. It also follows that boating visitors generated proportionately more direct employment and wages than the “average visitor” to this county;

6. One of the central thrusts of this study is to identify the economic impact of that segment of boating identified with fishing and diving so we could estimate the amount of visitor spending that is related to the existence of artificial reefs off Escambia County. After adjusting for all other uses of

boats(e.g., cruising; water skiing), we estimated that 72% and 2.5% of all saltwater boating days were spent for saltwater fishing and diving respectively. Of the total days estimated to be devoted to fishing and diving, about 60% were spent on artificial reefs principally off Escambia County. This led us to an estimate of the economic impact-related importance of artificial reefs for fishing and diving;

7. Over the last 12 month(l997-98), fishing and diving visitors using their own boat or some kind of rental boat(e.g., charter), spent over $71.58 million in Escambia County on those days they engaged in saltwater fishing and diving on or about artificial reef. This supports 1,614 employees who receive an estimated $15.7 million in wages. This is an artificial reef-related economic impact. The reader should not infer that if artificial reefs did not exist, that Escambia County would loose this economic impact. However, our further inquiry of artificial reef users would tend to support the hypothesis that this “recreational aid” is important to the recreational fishing and diving experience. This is discussed under “use value” below;

8. Boating visitors that use artificial reefs have a demographic profile of that of a white male who is about 38 years of age and was a college graduate as an educational background with an annual family income of $81,000. The typical visitor has a relatively large pleasure craft(23 feet) and has been boating in the Florida Panhandle between 6-7 years. About 43% of the visitors say they use artificial reef, but those that do use them very intensively. All of the artificial reef users that use Escambia County as a base use such reefs directly off the this county. On average, the visitor artificial reef users travel nearly 19 miles out into the Gulf of Mexico to use the public and private artificial reefs for saltwater fishing and diving;

9. Finally, we asked visitors to evaluate the existing artificial reefs off Escambia County. About one-third of the visitors felt that artificial reefs were too crowded while only 5% of the user felt there were too many artificial reefs, indicating a possible need for additional artificial reefs. About 25% of the artificial reef visitors felt that they are too far from shore. Since a large segment of the visitor demand comes via charter boats, this may be, in part, a function of places the charter boat captains take them to optimize catch rates for fishers. Although less than 40% of the visitors felt that artificial reefs were superior to natural reefs, these users did feel that artificial reefs increase the abundance of fish(92%). As argued in the literature, artificial reefs may just redistribute or “collect” fish in one concentrated area rather than increase the fish population. If this is true, it is charged by some that artificial reefs hasten overfishing. This is an area for important future research. Also, two-thirds of the visitors felt that artificial reefs should be

placed in less than 150 feet of water. In summary, it would appear that present visitors that use artificial reefs view them as a definite recreational aid as shown by both their evaluation and their willingness to pay for an expansion in this program which is discussed under “use value” below.

USE VALUE(WILLINGNESS TO PAY) OF ARTIFICIAL REEFS VISITORS:

1. Use value or the willingness to pay is defined as the nonmarket value of a resource that is not openly traded in an organized market. Quite simply, units or day usage of the resource such as a recreational fishery do not have a price for their use or daily rental. Public goods such as artificial reefs fall in the same category since all can use this recreational aid, but government does not place a direct charge on the usage of this resource. The reason the use value or what users would be willing to pay for use of the resource is important is that it is the true value of additional output in the economy that is not counted in Gross Domestic Product or simply the well known GDP. In this study, we used three indirect methods to measure the use value of the artificial reef in conjunction with fishing and diving: (l) the Turnbull Distribution; (2) the Dichotomous Choice Model and finally (3) the Travel Cost Approach. Each approach has general acceptance among economist as a reasonable approach to estimating use value;

2. Using the Turnbull Distribution, it was found that visitors were willing to pay $3.40 per day for recreational saltwater fishing on artificial reefs. On the other hand, the dichotomous choice method yielded $4.14 per day, while the travel cost procedure produced a willingness to pay per day of $9.96 for visitors to Escambia County, Florida.

ECONOMIC IMPACT OF ARTIFICIAL REEF RESIDENTS:

1. We studied three classes of pleasure craft own by residents of Escambia County. These classes were boats under 16 feet, those between 16 and 39 feet, and those over 39 feet. Overall, there were 16,568 registered pleasure craft in the county in l998. In addition to those owning their on pleasure craft, it was estimated that 23% of the demand for charter, party, and other kinds of rental boats in Escambia County as accounted for by local residents. Using owned and rental boats used by residents, it was estimated that that resident saltwater recreational fishermen spent $36.6 million which supported 554 full and part-time employees, earning $5.47 million in wages and salaries;

2. Although residents predominately use their own boat for

saltwater recreational fishing, visitors have a high use of all kinds of rentals(e.g., charter). Even so, we found that residents used about 58 percent of all party days spent on saltwater fishing off Escambia County and targeted artificial reefs as a place to engage in fishing which is slightly lower than the 60% founds for visitors;

3. Diving days accounts for about 1.9% of the days spent saltwater fishing off Escambia County. When we take 58% of the economic impact of saltwater fishing as attributable to artificial reefs and increase this impact by 1.9%, we found that $21.62 million was spent by residents that were related to artificial reefs. This expenditures by divers and fishers generated $3.23 million in wages and salaries and supported 327 full and part-time employees;

4. Compared to visitors, the resident demographic profile was that of an older individual (50 years old) who has been fishing off the Florida Panhandle for 25 years compared to only about 6 years for the visitors to Escambia County. The resident boater is a white male with some college as an educational level and having a family income of $56,000 per year;

5. About one-half of the Escambia County residents felt that artificial reefs were too far from shore while only 1 in 5 visitors held this opinion in their evaluation of artificial reefs. About two- thirds of the residents felt the artificial reefs were too crowded. The perception was much lower for visitors(28%). As with the visitors, not one respondent felt there were too many artificial reefs. Residents and visitors do not share the same opinion about whether artificial reefs are more productive than natural reefs(85% for residents vs. 38% for visitors) However, residents and visitors are in agreement that artificial reefs increase fish abundance. The policy issue connected with abundance vs. overfishing is critical in the area of artificial reefs.

USE VALUE OF RESIDENTS:

1. The definition and explanation of use value was explained above under the visitor section;

2. Using the Turnbull Distribution, it was determined that resident willingness to pay or use value was $1.93 per day for fishers and divers using artificial reefs. This amounts to an annual total flow of recreational value for the residents of Escambia County from the use of artificial reefs in conjunction with fishing and diving of $944,928. The Dichotomous Choice Model yielded a use value per day of $2.32 and this translates into a total annual value of $1,135,872.

5. In the only other study of artificial reefs, Milon(1988) found that resident users of artificial reefs off the coast of Miami, Florida were willing to pay $23.81; $26.07; and $35.07 using the contribution; referendum and bidding methods respectively expressed in l998 dollars. These values were all on an annual basis. Using the Turnbull Distribution, we found a willingness to pay per annum of $25.45 for artificial reef use off the Florida Panhandle. The dichotomous choice model yielded an estimate of $27.02 for visitors and $30.58 for residents. These values would appear to be comparable to the values found by Milon in his earlier study.

COMBINED ECONOMIC IMPACT OF VISITORS AND RESIDENTS:

1. Table 5.30 shows the combined economic impact of visitors and residents that use artificial reefs off Escambia County, Florida. Ignoring indirect or multiplier effects by the visitors, those fishers and divers that used artificial reefs off this county, spent $92.81 million over the last 12 month. This spending generated 1,941 full and part-time jobs in Escambia County with a payroll of $18.93 million. By far, visitors played a greater role in the economic impact of artificial reef-related spending. That is, visitors accounted for almost 77% of the total economic impact, indicating how important boating visitors and especially fishers and divers that use artificial reefs are to the Escambia County economy. Visitors are economically more important because of one reason: when visitors come to the county, they spend several time what residents spend per party day.

2. Relative to the entire economic activity in the county, those visitors and residents using artificial reefs account for .46% of all wages and salaries in the county and 1.23 % of all full and part-time employment in this county. This may not seem overwhelming; however, only very large firms in Escambia County would account for such an impact such as this. It certainly gives the reader some perspective on the targeted artificial reefs for recreational enjoyment by both visitors and residents alike.

Again, we cannot say that if artificial reefs were removed or never were placed in the Gulf of Mexico that this economic impact would not have occurred. However, there is strong feeling among the users that artificial reefs are important recreational aids.

COMBINED USE VALUE OF VISITORS AND RESIDENTS:

1. Visitors and residents spent over 1 million recreational days

on or about artificial reefs off Escambia County Florida. Using the Turnbull Distribution to estimate use value of artificial reefs as a recreational aid, we found that on a daily basis visitors were willing to pay $3.40 while residents were willing to pay only $1.93. One reason for this difference may be that the residents spend twice as many days per person per year than visitors which may produce the law of diminishing marginal utility. Weighted by days, the combined use value of visitors and residents was estimated at $2.70 per day. This produces an annual flow of about $2.81 million of use value for the artificial reefs off Escambia County. The Dichotomous Choice model yielded an estimate of $4.14 per person per day for visitors and $2.32 for residents with a weighted average value of $3.29. this translates into a total annual value of $3.42 million. In the last Chapter of this report, we shall look into the asset value of the artificial reef system using the use value flow from each county relative to the cost of deploying the artificial reefs to get an idea of the benefit/cost ratio related to the artificial reef program managed by the State of Florida.

TABLE 5.30

COMBINED ECONOMIC IMPACT ON ESCAMBIA COUNTY,

FLORIDA OF THOSE FISHERS AND DIVERS USING ARTIFICIAL REEFS

ECONOMIC VARIABLE	VISITORS[1]	RESIDENTS[2]	TOTAL
EXPENDITURES (MILLIONS)	$71.58	$21.23	$92.81
WAGES GENERATED (MILLIONS)	$15.70	$3.23	$18.93
FULL AND PART-TIME EMPLOYMENT	1,614	327	1,941
TOTAL COUNTY WAGES (MILLIONS)			$4,109.6
TOTAL COUNTY EMPLOYMENT			157,659

% ARTIFICIAL REEF RELATED DIRECT WAGES OF TOTAL WAGES IN THE COUNTY	0.46%
% ARTIFICIAL REEF RELATED DIRECT EMPLOYMET OF TOTAL EMPLOYMENT IN THE COUNTY	1.23%

1. Table 5.10
2. Table 5.23

TABLE 5.31

COMBINED RECREATONAL USE VALUE OF

VISITORS AND RESIDENTS FROM ARTIFICIAL REEFS

IN ESCAMBIA COUNTY, FLORIDA

ECONOMIC MEASURE	VISITORS	RESIDENTS	TOTAL
1. TOTAL USER DAYS ON ARTIFICIAL REEFS	551,400	489,598	1,040,998
2. ANNUAL VALUE PER PERSON			
a. Turnbull Method	$22.14	$25.45	$23.80*
b. Dichotomous Choice	$27.02	$30.58	$28.80*
c. Travel Cost	$65.04	N/A	N/A
3. VALUE PER PERSON/ RECREATIONAL DAY			
a. Turnbull Method	$3.40	$1.93	$2.70**
b. Dichotomous Choice	$4.14	$2.32	$3.29**
c. Travel Cost	$9.96	N/A	N/A
4. TOTAL USER VALUE FOR ALL USERS ($MIL)			
a. Turnbull Method	$1.87	$0.94	$2.81
b. Dichotomous Choice	$2.28	$1.14	$3.42
c. Travel cost	$5.49	N/A	N/A

*Simple arithmetic average of visitors and residents;
** Weighted arithmetic average of visitors and residents.

CHAPTER 6

A SUMMARY OF THE ECONOMIC IMPACT AND RECREATIONAL VALUE OF ARTIFICIAL REEFS ON SELECTED COASTAL COUNTIES IN NORTHWEST FLORIDA

INTRODUCTION

There are two economic concepts used in this report. These are “economic impact” and “recreational or use value” to individuals who use a resource. It is critical that the reader understand the difference between these concepts since each is directed at answering a different question. In this study. we have selected five coastal counties in Northwest Florida for study. These are Bay, Walton, Okaloosa, Santa Rosa, and Escambia counties. Off these counties, the Federal, State, and local governments have invested in artificial reefs to provide recreational fishermen and divers with a better recreational experience. We seek to answer the question of what are the economic benefits from this investment in artificial reefs? Such economic benefits may be looked at from two perspectives. First, fishers and divers that use these coastal counties spending money while engaging in recreational fishing and diving in these counties. Such expenditures range from bait and ice to hotel and motel services. These recreational participants should be further divided into visitors and residents and this is what we did in this study. Visitors inject money into the economies of these coastal counties that have a direct economic impact, but also a multiplier impact throughout the regional economic system under study. Resident spending has a direct impact on creating jobs and wages in industries supporting fishers and divers. This is what we term and “economic impact”. It involves the creation of expenditures; employment and wages in a particular area. Our interest is in those fishers and divers that use artificial reefs. Thus, we can say that fishers and divers that use artificial reefs are associated with a specific economic impact on a local community. We cannot say that there is a cause and effect detected, but only that there is an “association”. That is, if these artificial reefs were removed, we cannot predict where fishers and divers would recreate. Although fishers and divers give artificial reefs high marks for improving the recreational experience, we cannot predict their behavior <u>without</u> artificial reefs.

Second, when fishers and divers engage in recreational activities in conjunction with an artificial reef, we would expect that the recreational value of this experience would be enhanced or improved. These is no charge placed upon the users of artificial reefs so it is difficult to measure the dollar value

of this improvement. Economists call this “use value” since they are referring to enhancement of recreational value of using a natural resource. Artificial reefs are alleged to do just that. This is not an economic impact of spending, but an increase in output for the entire economy. In the former, such spending will be made in coastal communities by fishers and divers, or the money can be spent on ordering merchandise from QVC. No new net expenditure is created. In the latter, there is a net increase in fisher and diver consumption/recreation because of the artificial reef system. Each economic event is important, but answers a different question. These two impacts will be summarized below and discussed further.

Use or recreational value is of special interest since it is rarely measured in an organized market. However, few would dispute that fishers and divers derive value from the experience with the coastal fisheries, water, and general ecology off the five counties under study. Fortunately, there are alternative means by which to measure such “ use value” which were employed in this study. Such techniques are called the Turnbull Distribution, Dichotomous Choice, and Travel Cost methods which were explained in each of the preceding five chapters. What we seek to do in all these fairly complicated techniques is to simulated what a market system would do if artificial reefs were owned by a private owners and fishers and divers were charged for their use. As with any other product, there would be an annual flow of economic benefits or use value to those fishers and divers using artificial reefs. This flow of use value would go into perpetuity--go one endlessly for our purposes-- into the future. Such a flow of use value over time would have to be discounted back to the present. Or, an adjustment for the time value of money must be made. When this is done, one can arrive at the asset value of the artificial reef to the community of fishers and divers. Why is this important? This is critical since the asset(i.e., artificial reefs) created by both the government and even privately by others should be compared to its cost to see if the cost or investment in artificial reefs is less or substantially less than the benefits. Thus, the asset value (benefits) of the artificial reef system divided by the investment(cost) in the construction and deployment of artificial reefs forms the basis for a benefit/cost analysis of the artificial reef program.

ECONOMIC IMPACT ASSOCIATED WITH ARTIFICIAL REEFS

As discussed above, fishers and divers can be divided into visitors and residents of the five coastal county area in Northwest Florida. During 1998, we conducted two surveys of

visitors to these coastal counties. The first survey was an on site contact with 548 visitors to all of the five counties. This survey was termed the “general visitor survey” since we were interested in all visitors to each of the counties for whatever purpose they made their visits over the last 12 month or l997-98. The number of visitors and their economic activities were estimated by what is called a Capacity Utilization Model which was explained in great detail in each of the chapters and will not be discussed in the summary. As part of the general visitor survey, we ascertained what percent of the total visitor days spent in each county was related to saltwater recreational boating. Thus, we established a linkage between all visitors and those that visited for purpose of recreational boating. Boating spanned all modes from the hiring of a charter boat in, for example, Bay County to the trailering of your own boat to a boat ramp in Escambia County.

The second survey of visitors was limited to those individuals that were fishers and/or divers that engaged in their recreational activities using the coastal counties in Northwest Florida under study. In all, 336 fishers and divers were interviewed in the five coastal counties to ascertain how much they spent while in these counties, but also the extent that they used artificial reefs in conjunction with fishing and diving in the Gulf of Mexico. When linked to the general visitor survey, we were able to estimate gross expenditures and the employment generated by these expenditures, plus the associated wages paid to employee working in industries serving fishers and divers. Of great importance, this second survey enabled us to estimate the economic impact associated with that percent of fishers and divers using artificial reefs off the coasts of the five counties. A detailed summary of the findings is shown in Table 6.1. As measured by gross expenditures in each of the five counties, fishers and divers from outside the five county area spent the most in Bay County and least in Walton County. Employment and wages generated by this spending is also shown in Table 6.1 by county. These estimated statistics naturally followed the expenditure pattern from county to county. The reader may inspect Table 6.1 for details on each county. One point is quite evident: fishing occupies a little over 97% of all spending associated with the use of artificial reefs by visitors among all the counties. With respect to visitors and divers from <u>outside</u> the five counties, we can conclude the following from our analyses:

1. <u>VISITORS SPENT NARLY $358 MILLION WHICH WERE ASSOCIATED WITH FISHING AND DIVING ON OR ABOUT ARTIFICIAL REEFS OFF THE FIVE COASTAL COUNTIES IN NORTHWEST FLORIDA OVER THE LAST 12 MONTHS;</u>

2. THESE EXPENDITURES GENERATED 7,468 FULL AND PART-TIME JOBS IN THE FIVE COUNTIES ASSOCIATED WITH FISHING AND DIVING ON OR ABOUT ARTIFICIAL REEFS;

3. TO SUPPORT THE CREATED EMPLOYMENT, OVER $76 MILLION WERE GENERATED IN WAGES AND SALARIES IN THE FIVE COUNTIES ASSOCIATED WITH FISHING AND DIVING ON OR ABOUT ARTIFICIAL REEFS OVER THE LAST 12 MONTHS.

These conclusions can be found at the bottom of Table 6.1 along with a breakdown of spending by fishers and divers. Fishers accounted for 97% of the spending that was directly related to artificial reefs. Of note, we did not include the multiplier effect of an injection of money by visitors who were fishers and/or divers using artificial reefs. We wished to be conservative so the estimated numbers in Table 6.1 is a low estimate of the economic impact. Also, including multiplier effects along with resident spending leads to double counting since visitors spending is received by residents, in the form of wages, salaries, and profits, and in-turn a portion of resident's income is spent locally on fishing and diving. So there is a danger of counting multiplier effects twice.

The third survey was quite different from the first two. We obtained a tape from the Florida Department of Highway Safety and Motor Vehicles which contained every pleasure craft registered in all of the five counties under study. This tape contains 60,599 names and addresses of those owning pleasure craft in the five coastal counties in Northwest Florida. This formed our universe for resident spending on goods and services that were associated with artificial reefs. The resident survey was by phone to 378 pleasure craft owners in the five county area. Questions were restricted to fishing and diving activities on and off artificial reefs in the Gulf of Mexico. The second part of Table 6.1 contains the results of our analyses or the following:

1. RESIDENTS SPENT OVER $57 MILLION WHICH WERE ASSOCIATED WITH FISHING AND DIVING ON OR ABOUT ARTIFICIAL REEFS OFF THE FIVE COASTAL COUNTIES IN NORTHWEST FLORIDA OVER THE LAST 12 MONTHS;

2. THESE EXPENDITURES GENERATED 695 FULL AND PART-TIME JOBS IN THE FIVE COUNTIES ASSOCIATED WITH FISHING AND DIVING ON OR ABOUT ARTIFICIAL REEFS;

3. TO SUPPORT THE CREATED EMPLOYMENT, OVER $7.4 MILLION WERE GENERATED IN WAGES AND SALARIES IN THE FIVE COUNTIES ASSOCIATED WITH FISHING AND DIVING ON OR ABOUT ARTIFICIAL

REEFS OVER THE LAST 12 MONTHS.

When the combined economic impact of visitors and residents are considered in Table 6.1, we can conclude that the direct economic impact of artificial reef associated spending is considerable for the five county area. Our estimate is as follows:

VISITORS AND RESIDENTS SPENT OVER $414 MILLION ON GOODS AND SERVICES WHICH WERE ASSOCIATED WITH THE USE OF ARTIFICIAL REEFS BY FISHERS AND DIVERS OFF THE FIVE COUNTY AREA. THIS SPENDING GENERATED 8,163 FULL AND PART-TIME JOBS WITH WAGES AND SALARIES OF NEARLY $84 MILLION. THIS ECONOMIC IMPACT OCCURED OVER THE LAST 12 MONTHS OR 1997-98.

TABLE 6.1

A SUMMARY OF THE DIRECT ECONOMIC IMPACT OF OF ARTIFICIAL REEF RELATED RECREATIONAL FISHING AND DIVING ON SELECTED COUNTIES IN THE NORTHWEST FLORIDA (12 MONTHS OR 1997-98)

COUNTY	EXPENDITURES GENERATED (MIL $)	WAGES GENERATED (MIL $)	EMPLOYMENT
BAY (TOTAL)	**$149.49**	**$26.42**	**2,890**
VISITORS (TOTAL)	**130.96**	**24.69**	**2,727**
FISHERS	126.88	24.07	2,658
DIVERS	4.08	.62	69
RESIDENTS(TOTAL)	**18.53**	**1.73**	**163**
FISHERS	16.74	1.56	148
DIVERS	1.79	.17	15
WALTON(TOTAL)	**$19.71**	**$3.64**	**395**
VISITORS(TOTAL)	**18.24**	**3.47**	**382**
FISHERS	17.62	3.38	372
DIVERS	.62	.09	10
RESIDENTS(TOTAL)	**1.47**	**.17**	**13**
FISHERS	1.37	.16	12
DIVERS	.10	.01	1

OKALOOSA(TOTAL)	**$125.94**	**$28.89**	**2,419**
VISITORS(TOTAL)	**116.23**	**27.16**	**2,278**
FISHERS	113.61	26.67	2,232
DIVERS	2.62	.49	46
RESIDENTS(TOTAL)	**9.71**	**1.73**	**141**
FISHERS	9.17	1.64	133
DIVERS	.54	.09	8

TABLE 6.1 (CONTINUED)

COUNTY	EXPENDITURES GENERATED (MIL$)	WAGES GENERATED (MIL$)	EMPLOYMENT
SANTA ROSA(TOTAL)	**$26.73**	**$5.78**	**516**
VISITORS(TOTAL)	**20.97**	**5.23**	**467**
FISHERS	20.54	5.15	459
DIVERS	.43	.08	8
RESIDENTS(TOTAL)	**5.77**	**.55**	**51**
FISHERS	5.61	.54	49
DIVERS	.16	.01	2
ESCAMBIA(TOTAL)	**$92.81**	**$18.93**	**1,941**
VISITORS(TOTAL)	**71.58**	**15.70**	**1,614**
FISHERS	70.23	15.48	1,591
DIVERS	1.35	.22	23
RESIDENTS(TOTAL)	**21.63**	**3.23**	**327**
FISHERS	21.23	3.17	321
DIVERS	.40	.06	6
NORTHWEST FLORIDA*	**$415.09**	**$83.66**	**8,163**
VISITORS(TOTAL)	**$357.98**	**$76.25**	**7,468**
FISHERS	348.88	74.75	7,312
DIVERS	9.10	1.50	156
RESIDENTS(TOTAL)	**$57.11**	**$7.41**	**695**
FISHERS	54.12	7.08	663
DIVERS	2.99	.33	32

* Northwest Florida consists of BAY, WALTON, OKALOOSA SANTA ROSA, and ESCAMBIA counties.

RECREATIONAL VALUE ASSOCIATED WITH ARTIFICIAL REEFS

TURNBULL DISTRIBUTION

As discussed above under the economic impact section, we conducted three surveys encompassing visitors and residents. In

additions to obtaining expenditure data on the visitor and resident surveys of just fishers and divers, we also asked questions concerning the respondent's willingness to pay for expansion in the artificial reef program. We ask individuals to respond to an annual payment via an increase in the cost of their fishing license or an increase in the rental cost of charter or party boats they might use while using an artificial reef. As explained in great detail in each of the chapters, this was a way of simulating the behavior of a market for artificial reefs even though one does not exist. In effect, the fishers and divers were showing their response to progressively higher annual cost of fishing or diving on an artificial reef. The data from this experiment were used in a format called the Turnbull Distribution to arrive at the recreational or use value of the artificial reef in conjunction with fish, water, or the general ecology of the area. Using the sample of visitors from all the five counties, we found that visitors were willing to pay $22.17 per year to support an expansion in the artificial reef program. That is, for the typical or average person using an artificial reef and requiring a fishing license, he or she would be willing to pay this amount per year for the use of an artificial reef. This would be in addition to all the present cost of a fishing or diving trip. Applying the Turnbull Distribution to the sample of residents, we found that residents were willing to pay $25.45 per year to support the same expansion in the artificial reef program. As discussed in great detail in each of the chapters, these results are a measure of the increase in economic benefits or recreational value accruing from incremental increase in the artificial reef program. Such use value economic benefits may also be used as an approximation to the average benefits presently accruing to those fishers and divers using artificial reefs off the five counties under study. Of course, visitors and residents do not fish or dive the same number of days per year. When the annual willingness to pay calculated above is placed on daily willingness to pay basis, the values range from between $3.40-$6.97/day for visitors and $1.80-$4.10/day for residents. The higher value for visitors is most probably attributable to a higher utility obtained from just a few days a year on a vacation as opposed to a larger number of days for residents that do not regard the recreational experience as highly, but like bowling or playing tennis a few miles from their house. This is certainly an area for future research.

Table 6.2 shows the result of the application of the Turnbull Distribution method in terms of total annual flow of recreational value to fishers and divers using artificial reefs. This is contained in section (A). The first column is shows the total days spent by fishers and divers by county. For example, over 1.68 million days were spent in Bay County by visitors and

residents combined on artificial reefs. Since the per day use values differ between visitors and residents, the weighted average value per day turned out to be $5.66 for Bay County. When the first column(days) was multiplied by the second column (value/day), we obtained the total annual use value flow of economic benefits to those that recreated on artificial reefs. For Bay County as an example, this turned out to be $9.54 million. Repeating this procedure for all five counties, we can conclude that all fishers and divers that used artificial reefs off Northwest Florida spent over 4.3 million days with a user value of $4.52/day which amounted to an annual flow of almost $20 million dollars. As with the economic impact discussed above, Bay County yielded the largest use value, while Walton County yielded the least. Thus, the investment in artificial reefs in Northwest Florida yielded an annual use value flow of about $20 million dollars. This flow would be expected to increase over time due to the increase in population and hence more fishers and divers who will be both visitors and residents.

The second part of Table 6.2 is the estimated asset value of the artificial reef system. The idea here is that the annual use value flow of nearly $20 million is a constant(although it could be increasing) into perpetuity as discussed above. Using a real discount rate(r) of 3%, we can find out the asset value by using the following formula:

ASSET VALUE OF ARTIFICIAL REEF SYSTEM = ANNUAL USE VALUE/ r

Thus, we have $19.68 million/.03 or $656 million as the asset value of the artificial reef system off the counties designated as Northwest Florida. Put another way, the $656 million is what someone would be willing to pay for the system <u>if</u> they could charge fishers and divers for the right to use the artificial reefs in question. For public policy issues, the asset value embodies the economic benefits from deploying the artificial reef system. This figure can be used to calculate a benefit/cost ratio of this public works project- deploying a recreational aid for fishing and diving. To accomplish this, we can specify the benefit/cost ratio as the following:

BENEFIT/COST RATIO FOR
ARTIFICIAL REEF PROGRAM = ASSET VALUE/ INVESTMENT IN PROGRAM
= $656 MILLION/ $5 MILLION
= 131

Thus, for every one dollar invested in the construction and deployment of artificial reefs, it has returned $131 in recreational value to fishers and divers. This program is an especially high returns one since a B/C for dams and other water

related programs is considered high if it ranges between 5-10. Lastly, we shall turn to the demographic and boater profile of those fishers and divers using artificial reefs in Northwest Florida.

TABLE 6.2

A SUMMARY OF THE ANNUAL FLOW OF RECREATIONAL OR USE VALUE OF ARTIFICIAL REEFS AND ESTIMATES OF THE ASSET VALUE OF ARTIFICIAL REEFS IN NORTHWEST FLORIDA USING THE TURNBULL DISTRBUTION METHOD RESULTS
(12 MONTHS, 1997-98)

(A) RECREATIONAL VALUE PER YEAR

COUNTY	RECREATIONAL DAYS FOR DIVERS AND FISHERS PER YEAR (MIL)	VALUE/DAY* ($)	TOTAL ANNUAL USE VALUE (MIL $)
BAY	1.684	$5.66	$9.54
WALTON	0.216	$4.40	$0.95
OKALOOSA	1.021	$4.95	$5.05
SANTA ROSA	0.387	$3.44	$1.33
ESCAMBIA	1.041	$2.70	$2.81
TOTAL	**4.349**	**$4.53**	**$19.68**

(B) ESTIMATED ASSET VALUE OF ARTIFICIAL REEFS**

	ANNUAL VALUE (MIL $)	DISCOUNT RATE (r)	ASSET VALUE (MIL$)
BAY	$9.54	.03	$318.00
WALTON	$0.95	.03	$31.67
OKALOOSA	$5.05	.03	$168.33
SANTA ROSA	$1.33	.03	$44.33
ESCAMBIA	$2.81	.03	$93.67
TOTAL	**$19.68**	**.03**	**$656.00**

* Estimation of recreational or use value per day is based on the Turnbull Distribution. The asset value of the artificial reef system off Northwest Florida is based

upon a discount rate of 3%. See the text for a summary.

DICHOTOMOUS CHOICE

The Dichotomous Choice Method uses the same data as was used in applying the Turnbull Distribution Method. The difference is with the dichotomous choice method, models are estimated relating the yes/no answers to the dollar bid amounts and other socioeconomic variables that might explain the choice to pay the amount or not pay the amount offered. For both residents and visitors, we estimated eight models using various model specifications. For visitors, the dollar bid amount was the only statistically significant factor explaining the yes/no response. For residents a variety of factors were statistically significant in explaining the yes/no response. On an annual basis, the average visitor was willing to pay $27.02, while the average resident was willing to pay $30.58. We converted these values to estimated values per person per day. Visitors the per person per day values ranged from $4.08-$8.50, while the resident values ranged from $2.16-4.92. Santa Rosa County was the only county in which residents had a higher per person per day value than visitors ($4.17 versus $4.08). The weighted average values per person per day of visitors and residents ranged from $3.29-$6.96. These latter values are summarized in Table 6.3.

Following the same procedures as for the Turnbull Distribution Method, we multiply the weighted average values per person per day for each county by the annual person-days of artificial reef use in the county to obtain estimates of the total annual value. The total annual values ranged from a low of $1.16 million in Walton County to a high of $11.72 million in Bay County. The total annual user value for artificial reefs in northwest Florida using the dichotomous choice models is over $24 million. This estimate is about 22 percent higher than that obtained using the Turnbull Distribution Method.

As discussed above, we can use the estimates of the annual user value to calculate the asset value of artificial reefs. Asset values ranged from $38.67 million in Walton County to a high of $390.67 million in Bay County. The total asset value of artificial reefs for all or northwest Florida is estimated at over $801 million using the Dichotomous Choice Method. Again, this estimate is about 22 percent higher than that obtained using the Turnbull Distribution Method. If we repeat the benefit/cost analysis above using the dichotomous choice method results, we get and benefit/cost ratio of 160.

TABLE 6.3

A SUMMARY OF THE ANNUAL FLOW OF RECREATIONAL OR USE VALUE OF ARTIFICIAL REEFS AND ESTIMATES OF THE ASSET VALUE OF ARTIFICIAL REEFS IN NORTHWEST FLORIDA USING THE DICOTOMOUS CHOICE MODEL RESULTS
(12 MONTHS, 1997-98)

(A) RECREATIONAL VALUE PER YEAR

COUNTY	RECREATIONAL DAYS FOR DIVERS AND FISHERS PER YEAR (MIL)	VALUE/DAY* ($)	TOTAL ANNUAL USE VALUE (MIL $)
BAY	1.684	$6.96	$11.72
WALTON	0.216	$5.37	$1.16
OKALOOSA	1.021	$6.01	$6.14
SANTA ROSA	0.387	$4.13	$1.60
ESCAMBIA	1.041	$3.29	$3.42
TOTAL	**4.349**	**$5.53**	**$24.04**

(B) ESTIMATED ASSET VALUE OF ARTIFICIAL REEFS**

	ANNUAL VALUE (MIL $)	DISCOUNT RATE (r)	ASSET VALUE (MIL$)
BAY	$11.72	.03	$390.67
WALTON	$1.16	.03	$38.67
OKALOOSA	$6.14	.03	$204.67
SANTA ROSA	$1.60	.03	$53.33
ESCAMBIA	$3.42	.03	$114.00
TOTAL	**$24.04**	**.03**	**$801.34**

* Estimation of recreational or use value per day is based on the Turnbull Distribution. The asset value of the artificial reef system off Northwest Florida is based upon a discount rate of 3%.

See the text for a summary.

TRAVEL COST METHOD

The Travel Cost Model was estimated for visitors to Northwest Florida only. We could not estimate a travel cost model for residents because of the typically short distances traveled. However, we feel that our travel cost model for visitors performed quite well. We were able to estimate separate values per person-trip for those that used their own boats or private rental boats, charter boats, and party boats. Charter boat users had the highest per trip values, followed by party boat users and then own boat/private rental boat users. With the travel cost model, we were also able to calculate demand price elasticities which allow for estimating what will happen to local business total sales revenue with price increases or decreases. The details of these results are discussed in each of the first five Chapters of this report.

The Travel Cost Model produced the highest value for visitors compared to the Turnbull Distribution and Dichotomous Choice Methods. As with the other two methods presented in Tables 6.2 and 6.3, we use the travel cost model results converted to estimates per person per day and multiply by the total number of person-days. Here, however, we only use the days for visitors. The travel cost model estimates on a per person per day basis ranged from $9.01 to $11.32 with a weighted average across all counties of $10.23. Total annual use value ranged from a low of $1.56 million in Walton County to a high of $12.15 million in Bay County. The total annual value for all of Northwest Florida was estimated at over $31 million. Even just counting visitor values, the travel cost model results are 59 percent higher than our Turnbull Distribution Method estimates and 30 percent higher than our Dichotomous Choice Model estimates. When we add the residents annual values using the dichotomous choice method to the visitors annual value using the travel cost method, we get an estimate of over $35 million for artificial reefs in Northwest Florida. This estimate is 78 percent higher than that obtained using the Turnbull Distribution Method and 46 percent higher than that obtained using the Dichotomous Choice Models for both visitors and residents. Table 6.4 shows our calculations using the travel cost model for visitors and the dichotomous choice results for residents.

As with the other above methods, we also calculated the asset value of artificial reefs. Asset values using the travel cost model results for visitors and the dichotomous choice model results for residents ranged from $57 million for Walton County to $439 million for Bay County. Across all five counties in Northwest Florida, this method yielded an estimate of over $1 billion. Repeating the benefit/cost analysis using this estimate

yields and benefit/cost ratio of almost 234.

TABLE 6.4

A SUMMARY OF THE ANNUAL FLOW OF RECREATIONAL OR USE VALUE OF ARTIFICIAL REEFS AND ESTIMATES OF THE ASSET VALUE OF ARTIFICIAL REEFS IN NORTHWEST FLORIDA USING THE TRAVEL COST MODEL RESULTS
(12 MONTHS, 1997-98)

(A) RECREATIONAL VALUE PER YEAR

COUNTY	RECREATIONAL DAYS FOR DIVERS AND FISHERS PER YEAR (MIL)	VALUE/DAY* ($)	TOTAL ANNUAL USE VALUE (MIL $)
BAY	1.684	$9.65	$12.15
WALTON	0.216	$9.01	$1.56
OKALOOSA	1.021	$11.23	$10.13
SANTA ROSA	0.387	$11.32	$1.91
ESCAMBIA	1.041	$9.96	$5.49
TOTAL	**4.349**	**$7.18**	**$31.24**

(B) ESTIMATED ASSET VALUE OF ARTIFICIAL REEFS**

	ANNUAL VALUE (MIL $)**	DISCOUNT RATE (r)	ASSET VALUE (MIL$)
BAY	$12.15+$1.02= $13.17	.03	$439.00
WALTON	$1.56+$0.15= $1.71	.03	$57.00
OKALOOSA	$10.13+$0.58= $10.71	.03	$357.00
SANTA ROSA	$1.91+$0.91= $2.82	.03	$94.00
ESCAMBIA	$5.49+$1.14= $6.63	.03	$221.00
TOTAL	**$31.24+$3.80= $35.04**	**.03**	**$1,168.00**

* Estimation of recreational or use value per day is based on visitors only, since we could not estimate the travel

cost model for residents.
** Annual value for residents is from the dichotomous choice models.

DEMOGRAPHIC AND BOATER PROFILE OF REEF USERS

VISITORS

Visitors to the five counties that constitute Northwest Florida for purposes of this report tend to have somewhat different socioeconomic characteristics than local residents.

For those fishers and divers that visit this area and use artificial reefs, they can be described as white males(80% or more) between 32 and 38 years of age. These visitors have a family income of about $65,000 and typically have some college as their level of education.

Visitors using artificial reefs own a boat of about 25-27 feet which is stored at a local marina or trailored to a boat ramp. These fishers and divers have been using artificial reefs in Northwest Florida for 4-7 years while a small minority (under 5%)are members of boating clubs. These visitors target red snapper, grouper, king and Spanish mackerel, and sea trout on artificial reefs. Visitors usually use artificial reefs that are about 10 miles from shore. During their visits to the coastal counties under consideration in this study, visitors use 3-6 different artificial reefs over a period of a year. About one-third to 50% of all fishers and divers that visit Northwest Florida use artificial reefs.

RESIDENTS

As with visitors, resident fishers and divers who use artificial reefs tent to be overwhelmingly white male, however, residents are between 50 and 54 years of age reflecting the coastal area as a retirement Mecca as well attracting visitors for outdoor recreation. Family income of resident fishers and divers is about $10,000 less($55,000) than visitors to the area who are fishers and divers using artificial reefs. Both residents and visitors have typically had some college in their educational background.

Residents average boat size is between 20 to 24 feet or about 3-5 feet smaller than visitors. Because of greater age of residents when compared to visitors, they have been engaging in fishing and diving for 20-28 years in Northwest Florida. As with visitors, a small percentage are members of boat clubs. Residents target about the same kind of fish on artificial reefs as visitors, but usually travel shorter distances to get to an artificial reef such as 5-9 miles. About three-quarters of resident fishers and divers have used artificial reefs off their

counties in the last 12 months. The reader is advised to see the detailed table in each of the chapters on the socioeconomic characteristics of both visitors and residents.

VISITOR AND RESIDENT EVALUATION OF ARTIFICIAL REEFS

For fishers and divers who used artificial reefs, we asked them to evaluate the performance of these artificial reef systems. The performance was measured in terms of placement of the artificial reef and its role in enhancing the recreational experience. We did not find much difference between visitors and residents in evaluating artificial reefs. In general, respondents felt that artificial reefs were not placed too far from shore.

Fishers and divers felt that reef systems were presently not too crowded with other users, but obviously perceived that this may be a problem in the future. That is, fishers and divers did not feel there were presently too many artificial reefs. These users overwhelmingly agreed that artificial reefs increase the abundance of fish, thereby leading to higher catch rate on artificial reefs. We have discussed the issue facing artificial reefs as to whether they hasten fishing by merely redistributing an existing population of fish rather than increasing the size of the biomass. This remains an unanswered question. Few anglers felt that artificial reefs were more productive than natural reef system. Finally, fishers and divers agreed that artificial reefs should be in water less than 150 feet. In general, it would appear that fishers and divers are well satisfied with the present artificial reef program, but feel it should be expanded to accommodate the perceived increase in demand for this recreational aid. The use value alone indicates a considerable support for increased funding to provide more artificial reefs of the Northwest coast of Florida. The reader should see each chapter for a detailed discussion of fisher and diver evaluations for each county.

Definitions and Formulas for Economic Impact Calculations

Included here are the definitions of the rows and columns of the spreadsheets used to calculate direct economic impact from visitor and resident spending and the definitions of variables used for calculating party days and person-visits. In addition, the formulas for calculation are presented.

Row Definitions

B.FUEL = BOAT FUEL EXPENDITURES
TACKLE = FISHING TACKLE EXPENDITURES
BAIT = BAIT EXPENDITURES
ICE = EXPENDITURES ON ICE
RAM FEE = BOAT RAMP FEES
LODG = LODGING EXPENDITURES
CAM FEE = CAMPING FEES
F.STORE = EXPENDITURES FOR FOOD AND BEVERAGES AT STORES
F.PREP = EXPENDITURES FOR FOOD AND BEVERAGES AT RESTAURANTS
A.GAS = EXPENDITURES ON GASOLINE FOR AUTOMOBILE
BO.RENT = BOAT RENTAL EXPENDITURES (INCLUDES CHARTER AND PARTY FEES)
EQ.RENT = EXPENDITURES ON EQUIPMENT RENTAL (OTHER THAN BOAT)
TOTAL = COLUMN TOTALS

Column Definitions

$EPPD = AVERAGE EXPENDITURES PER PARTY PER DAY (IN DOLLARS)
$EXPEND MILLIONS = TOTAL EXPENDITURES IN MILLIONS OF DOLLARS
$S/E MILLIONS = SALES-TO-EMPLOYMENT RATIO (MILLIONS OF $ SALES PER EMPLOYEE)
EMPLOY = NUMBER OF EMPLOYEES
%WAGE = PERCENT WAGES ARE OF SALES (OR WAGES-TO-SALES RATIO)
$WAGE = WAGES (IN MILLIONS OF DOLLARS)
SIC = STANDARD INDUSTRIAL CLASSIFICATION

Variable Definitions for Calculation of Party days and Person-visits

Visitors

TBDO = TOTAL BOATING DAYS OWN BOAT MODE (IN MILLIONS)
SPO = AVERAGE SIZE OF PARTY OWN BOAT MODE
TBPDO = TOTAL BOATING PARTY DAYS OWN BOAT MODE (IN MILLIONS)
LSO = AVERAGE LENGTH OF STAY OWN BOAT MODE (DAYS)
VO = PERSON-VISITS OWN BOAT MODE (IN MILLIONS)
TBDC = TOTAL BOATING DAYS CHARTER BOAT MODE (IN MILLIONS)
SPC = AVERAGE SIZE OF PARTY CHARTER BOAT MODE
TBPDC = TOTAL BOATING PARTY DAYS CHARTER BOAT MODE (IN MILLIONS)
LSC= AVERAGE LENGTH OF STAY CHARTER BOAT MODE (DAYS)
VC = PERSON-VISITS CHARTER BOAT MODE (IN MILLIONS)
TBDP= TOTAL BOATING DAYS PARTY BOAT MODE (IN MILLIONS)
SPP = AVERAGE SIZE OF PARTY FOR PARTY BOAT MODE
TBPDP = TOTAL BOATING PARTY DAYS PARTY BOAT MODE (IN MILLIONS)
LSP= AVERAGE LENGTH OF STAY PARTY BOAT MODE (DAYS)
VP = PERSON-VISITS PARTY BOAT MODE (IN MILLIONS)

Visitors (continued)

TBDR= TOTAL BOATING DAYS PRIVATE/RENTAL BOAT MODE (IN MILLIONS)
SPR = AVERAGE SIZE OF PARTY FOR PRIVATE/RENTAL BOAT MODE
TBPDR = TOTAL BOATING PARTY DAYS PRIVATE/RENTAL BOAT MODE (IN MILLIONS)
LSR= AVERAGE LENGTH OF STAY PRIVATE/RENTAL BOAT MODE (DAYS)
VR = PERSON-VISITS PRIVATE/RENTAL BOAT MODE (IN MILLIONS)
%F = PERCENT OF ALL BOATING DAYS SPENT FISHING
%D = PERCENT OF ALL BOATING DAYS SPENT DIVING
%T = PERCENT OF FISHING OR DIVING DAY SPENT FISHING OR DIVING
%AR = PERCENT OF ALL FISHING OR DIVING DAYS SPENT ON ARTIFICIAL REEFS

Residents

BT.REG = REGISTERED BOATS IN COUNTY (PLEASURE CRAFT)
RESBT = REGISTERD RESIDENT BOATS IN COUNTY (PLEASURE CRAFT)
%RES = PERCENT OF REGISTERED BOATS IN COUNTY REGISTERED TO INDIVIDUALS WITH HOMES IN THE COUNTY
FDPBPYO = AVERAGE FISHING DAYS PER BOAT PER YEAR OWN BOAT
FPDYO = TOTAL FISHING PARTY DAYS PER YEAR OWN BOAT (IN MILLIONS)
SPO = AVERAGE SIZE OF PARTY FISHING USING OWN BOAT
PDAYSFO = TOTAL PERSON-DAYS OF FISHING FROM OWN BOAT (IN MILLIONS)

Definitions for Variables Used for Resident Expenditure Impact for Rental Boats and Diving

TOTAL EXPEND = TOTAL EXPENDITURES BY COUNTY RESIDENTS FOR CHARTER, PARTY, AND OTHER RENTAL BOATS FOR FISHING (IN MILLIONS OF DOLLARS)
$VISITOR EXPEND = TOTAL EXPENDITURES BY ALL VISITORS TO THE COUNTY ON CHARTER, PARTY AND OTHER RENTAL BOATS FOR FISHING (MILLIONS OF DOLLARS)
% VISITS = PERCENT OF TOTAL DAYS OF CHARTER, PARTY, AND OTHER RENTAL BOATS IN COUNTY BY VISITORS
%RESIDENTS = PERCENT OF TOTAL DAYS OF CHARTER, PARTY, AND OTHER RENTAL BOATS IN COUNTY BY RESIDENTS OF COUNTY
TOTAL EMPLOYMENT = TOTAL EMPLOYMENT FROM BOAT RENTAL EXPENDITURES
TOTAL WAGES = TOTAL WAGES FROM BOAT RENTAL EXPENDITURES
TOTAL DAYS = TOTAL RESIDENT DAYS FOR BOAT RENTAL MODE
DIV = DAYS SPENT DIVING BY RESIDENTS OF COUNTY
FISH = DAYS SPENT FISHING BY RESIDENTS OF COUNTY
DIV/FISH = RATIO OF DAYS SPENT DIVING TO DAYS SPENT FISHING
AMT.DIV = TOTAL AMOUNT FOR DIVING (COLUMN HEADING)
AMT.FISH = TOTAL AMOUNT FOR FISHING (COLUMN HEADING)
%ART.R = PERCENT OF FISHING DAYS ON ARTIFICIAL REEFS (COLUMN HEADING)
$SP.A.R. = TOTAL AMOUNT RELATED TO ARTIFICIAL REEF USE (COLUMN HEADING)

Formulas for Visitors

Party Days = Total Boating Days / Average Party Size (FOR EACH BOAT MODE)
Example Own Boat: TBDPO = TBDO / SPO
Person-visits = Total Boating Person-days / Average Length of Stay (FOR EACH BOAT MODE)
Example Own boat: VO = TBDO / LSO
$EXPEND = $EXPPD * Party Days
EMPLOY = $EXPEND / $S/E
$WAGES MILLIONS = $EXPEND * %WAGES

Formulas for Residents

OWN BOATS

RESBT = BT.REG * %RES (FOR EACH BOAT CLASS)
Party Days = RESBT * FDPBPY (FOR EACH BOAT CLASS)
$EXPEND = $EXPPD * Party Days
EMPLOY = $EXPEND / $S/E
$WAGE MILLIONS = $EXPEND * %WAGES

RENTAL BOATS

TOTAL EXPEND = ($VISITOR EXPEND / %VISITS) * (%RESIDENTS)
TOTAL EMPLOYMENT = TOTAL EXPEND / $S/E
TOTAL WAGES = %WAGES * TOTAL EXPEND
TOTAL DAYS = (VISITOR DAYS / %VISITS) * (%RESIDENTS)

FISHING ON ARTIFICIAL REEFS

$SP.A.R = VALUE * %ART.R (COLUMN HEADINGS)

ROWS

$SPEND = $ OF EXPENDITURES FOR OWN PLUS RENTAL BOAT MODES
EMPLOY = EMPLOYMENT ACROSS ALL BOAT MODES
$WAGES = WAGES ACROSS ALL BOAT MODES
DAYS = DAYS ACROSS ALL BOAT MODES

DIVING AND DIVING PLUS FISHING TOTALS ON ARTIFICIAL REEFS

AMT.DIV = VALUE / (DIV/FISH)
TOTAL = AMT.DIV + AMT.FISH

Appendix A: Spreadsheets for Visitors and Residents In Bay County

1998 BAY COUNTY VISITOR ANALYSES

HOTEL AND MOTEL CATEGORY

MULTIPLIER: VISITS*(LS/SP) = 1.874558(3.8/4.07)= 1.750202 MILLIONS VISITORS 1874558
304041(2.02/2.37)=

CATEG	$EPPD	$EXPEND MILLIONS	$S/E MILLIONS	EMPLOY	%WAGES	$WAGES MILLIONS
LODG	82.79	144.8992	0.040771	3553.978	0.228	33.03702
PRE.FD	75	131.2652	0.029889	4391.754	0.268	35.17906
NPR.FD	10	17.50202	0.153865	113.7492	0.079	1.38266
SP.FEES	16.89	29.56091	0.050545	584.8434	0.241	7.12418
EV.FEES	3.84	6.720776	0.050545	132.9662	0.241	1.619707
ATT.ADM	11.63	20.35485	0.050545	402.7075	0.241	4.905519
EV.ENT	12.57	22.00004	0.050545	435.2565	0.241	5.302009
GD.TRAN	7.22	12.63646	0.125976	100.3085	0.14	1.769104
SHOP	50.11	87.70262	0.077958	1124.998	0.2	17.54052
OTHER	2.62	4.585529	0.077958	58.82051	0.2	0.917106
TOTAL	272.67	477.2276		10899.38		108.7769

OTHER CATEGORY

MULTIPLIER:VISITS*(LS/SP)= 3.21935*(4.87/4.73)= 3.314637 MILLION VISITORS 3219350

CATEG	$EPPD	$EXPEND MILLIONS	$S/E MILLIONS	EMPLOY	%WAGES	$WAGES MILLIONS
LODG	95	314.8905	0.040771	7723.394	0.228	71.79504
PRE.FD	65	215.4514	0.029889	7208.385	0.268	57.74098
NPR.FD	23	76.23665	0.153865	495.4775	0.079	6.022695
SP.FEES	17.09	56.64715	0.050545	1120.727	0.241	13.65196
EV.FEES	3.49	11.56808	0.050545	228.867	0.241	2.787908
ATT.ADM	8.62	28.57217	0.050545	565.2818	0.241	6.885893
EV.ENT	19.54	64.76801	0.050545	1281.393	0.241	15.60909
GD.TRAN	5.57	18.46253	0.125976	146.5559	0.14	2.584754
SHOP	48.73	161.5223	0.077958	2071.914	0.2	32.30445
OTHER	5.76	19.09231	0.077958	244.9051	0.2	3.818462
TOTAL	291.8	967.2111		21086.9		213.2012

HOTEL/MOTEL PLUS ALL OTHER ACCOMMODATION CATEGORIES

CATEG	$EXPEND MILLIONS	EMPLOY	%WAGES MILLIONS	TOTAL VISITORS	5093908
LODG	459.7897	11277.37	104.8321	7	24
PRE.FD.	346.7166	11600.14	92.92004	8	25
NPR.FD.	93.73867	609.2267	7.405355	9	26
SP.FEES	86.20806	1705.57	20.77614	10	27
EV.FEES	18.28886	361.8332	4.407615	11	28
ATT.ADM	48.92702	967.9893	11.79141	12	29
EV.ENT	86.76805	1716.649	20.9111	13	30
GD.TRAN	31.09899	246.8644	4.353858	14	31
SHOP	249.2249	3196.912	49.84498	15	32
OTHER	23.67784	303.7256	4.735568	16	33
TOTAL	1444.439	31986.28	321.9781	17	34

BAY: BOATERS SPENDING; WAGES AND EMPLOYMENT BY MODE

MULTIPLIER= TBDO/SPO= 1.5824/4.37 0.3621

OWN BOAT MODE SCENARIO (O)

CATEG	$EPPD	$EXPEND MILLIONS	$S/E MILLIONS	EMPLOY	%WAGE	$WAGES MILLIONS	SIC DESIGN	TBDO=
B.FUEL	76.52	27.70789	0.200065	138.4944	0.051	1.413102	554	1.5824
TACKLE	27.83	10.07724	0.098775	102.0222	0.135	1.360428	5941	MILLION
BAIT	18.45	6.680745	0.098775	67.63599	0.135	0.901901	5941	
ICE	10.48	3.794808	0.15307	24.79132	0.081	0.307379	54	
RAM FEE	1.21	0.438141	0.036962	11.85382	0.246	0.107783	79	
LODG	28.85	10.44659	0.040771	256.2259	0.228	2.381821	70	
CAM FEE	0	0	0.079989	0	0.186	0	703	
F. STORE	66.55	24.09776	0.15307	157.4296	0.079	1.903723	54	
F.PREP	98.45	35.64875	0.029889	1192.705	0.268	9.553864	58	
A.GAS	24.17	8.751957	0.200065	43.74557	0.051	0.44635	554	
BO RENT	0	0	0.036962	0	0.246	0	79	
EQ.RENT	0	0	0.036962	0	0.246	0	79	
TOTAL	352.51	127.6439		1994.903		18.37635		

MULTIPLIER=TBDC/SPC= .6179/4.38= 0.1411

CHARTER BOAT MODE SCENARIO RIO (C)

CATEG	$EPPD	$EXPEND MILLIONS	EMPLOY	$WAGES MILLIIONS		TBDC=
B.FUEL	0	0	0	0	6	0.6179
TACKLE	0	0	0	0	7	MILLION
BAIT	0	0	0	0	8	
ICE	0	0	0	0	9	
RAM FEE	0	0	0	0	10	
LODG	108.36	15.2896	375.0116	3.486028	11	
CAM FEE	1.08	0.152388	1.905112	0.028344	12	
F. STORE	32.02	4.518022	29.51605	0.356924	13	
F.PREP	90.3	12.74133	426.2883	3.414676	14	
A.GAS	30.75	4.338825	21.68708	0.22128	15	
BO.RENT	357.95	50.50675	1366.451	12.42466	16	
EQ.RENT	10	1.411	38.17434	0.347106	17	
TOTAL	630.46	88.95791	2259.033	20.27902		

MULTIPLIER=TBDP/SPP= .0616/2.58= 0.0239

PARTYBOAT MODE SCENARIO (P)

CATEG	$EPPD	$EXPEND	EMPLOY	$WAGES		TBDP=
B.FUEL	0	0	0	0	6	0.0616
TACKLE	0	0	0	0	7	MILLION
BAIT	0	0	0	0	8	
ICE	0	0	0	0	9	
RAM FEE	0	0	0	0	10	
LODG	125.8	3.00662	73.74408	0.685509	11	
CAM FEE	0.66	0.015774	0.197202	0.002934	12	
F.STORE	26.84	0.641476	4.190736	0.050677	13	
F.PREP	70.26	1.679214	56.18167	0.450029	14	
A.GAS	11.35	0.271265	1.355884	0.013835	15	
BO.RENT	115.97	2.771683	74.98737	0.681834	16	
EQ.RENT	0.66	0.015774	0.426763	0.00388	17	

TOTAL	351.54	8.401806	211.0837	1.888698		

MULTIPLIER=TBDR/SPR= .01824/3.67= 0.00497

PRIVATE RENTAL MODE SCENARIO (PR)

CATEG	$EPPD	$EXPEND	EMPLOY	$WAGES		TBDP=
B.FUEL	96.67	0.48045	2.401469	0.024503	6	0.01824
TACKLE	25	0.12425	1.257909	0.016774	7	MILLION
BAIT	20	0.0994	1.006328	0.013419	8	
ICE	10.17	0.050545	0.330208	0.004094	9	
RAM FEE	0	0	0	0	10	
LODG	97.25	0.483333	11.85481	0.1102	11	
CAM FEE	0	0	0	0	12	
F.STORE	56.67	0.28165	1.840007	0.02225	13	
F.PREP	103.33	0.51355	17.18191	0.137631	14	
A.GAS	2.33	0.01158	0.057882	0.000591	15	
BO.RENT	116.94	0.581192	15.72404	0.142973	16	
EQ.RENT	0	0	0	0	17	
TOTAL	528.36	2.625949	51.65456	0.472435		

TOTAL EXPENDITURES FOR ALL MODES: 227.6295 MILLION

TOTAL EMPLOYMENT FOR ALL MODES: 4516.675

TOTAL WAGES FOR ALL MODES: 41.0165 MILLION

TOTAL BOATING DAYS FOR ALL MODES 2.28014 MILLION

BAY-R BOATER SPENDING;WAGES;JOBS;DAYS;VISITS BY MODE-FISHING ONLY

MULTIPLIER=(TBDO/SPO)*%F*%T*%R M= 0.162478 W/REEF VISITORS

OWN BOAT MODE SCENARIO (O) REEF%= 0.6232

CATEG	$EPPD	$EXPEND MILLIONS	$S/E MILLIONS	EMPLOY	%WAGE	$WAGES MILLIONS	SIC DESIGN	OTHER TBDO=
B.FUEL	76.52	12.43282	0.200065	62.14392	0.051	0.634074	554	0.710029
TACKLE	27.83	4.521765	0.098775	45.77844	0.135	0.610438	5941	MILLION
BAIT	18.45	2.997721	0.098775	30.34898	0.135	0.404692	5941	
ICE	10.48	1.70277	0.15307	11.12413	0.081	0.137924	54	VO=
RAM FEE	1.21	0.196598	0.036962	5.318935	0.246	0.048363	79	TBDO/
LODG	28.85	4.687493	0.040771	114.9712	0.228	1.068748	70	LS0
CAM FEE	0	0	0.079989	0	0.186	0	703	0.710029
F. STORE	66.55	10.81292	0.15307	70.64034	0.079	0.85422	54	3.87=
F.PREP	98.45	15.99597	0.029889	535.1791	0.268	4.286919	58	0.18347
A.GAS	24.17	3.927095	0.200065	19.6291	0.051	0.200282	554	
BO RENT	0	0	0.036962	0	0.246	0	79	
EQ.RENT	0	0	0.036962	0	0.246	0	79	
TOTAL	352.51	57.27515		895.1341		8.245662		

MULTIPLIER=(TBDC/SPC)*%F*%T*%R M= 0.099817 W/REEF

CHARTER BOAT MODE SCENARIO RIO (C) REEF%= 0.85 VISITORS

CATEG	$EPPD	$EXPEND MILLIONS	EMPLOY	$WAGES MILLIIONS		OTHER TBDC=
B.FUEL	0	0	0	0	6	0.437198
TACKLE	0	0	0	0	7	MILLION
BAIT	0	0	0	0	8	
ICE	0	0	0	0	9	VC=
RAM FEE	0	0	0	0	10	TBDC/
LODG	108.36	10.81617	265.2907	2.466086	11	LSC
CAM FEE	1.08	0.107802	1.347714	0.020051	12	0.437198
F. STORE	32.02	3.19614	20.88025	0.252495	13	4.85=
F.PREP	90.3	9.013473	301.5649	2.415611	14	0.090144
A.GAS	30.75	3.069372	15.34187	0.156538	15	MILLION
BO.RENT	357.95	35.72949	966.6546	8.789454	16	
EQ.RENT	10	0.99817	27.0053	0.24555	17	
TOTAL	630.46	62.93061	1598.085	14.34578		

MULTIPLIER=(TBDP/SPP)*%F*%T*%R M= 0.017282 W/REEF VISITORS

PARTYBOAT MODE SCENARIO (P) REEF%= 0.909 OTHER

CATEG	$EPPD	$EXPEND MILLIONS	EMPLOY	$WAGES		TBDP=
B.FUEL	0	0	0	0	6	0.055994
TACKLE	0	0	0	0	7	MILLION
BAIT	0	0	0	0	8	
ICE	0	0	0	0	9	VP=
RAM FEE	0	0	0	0	10	TBDP/
LODG	125.8	2.174104	53.32475	0.495696	11	LSP
CAM FEE	0.66	0.011406	0.142598	0.002122	12	0.055994
F.STORE	26.84	0.463855	3.030345	0.036645	13	5.0=
F.PREP	70.26	1.214249	40.62528	0.325419	14	0.011199
A.GAS	11.35	0.196153	0.980447	0.010004	15	
BO.RENT	115.97	2.004219	54.22378	0.493038	16	
EQ.RENT	0.66	0.011406	0.308594	0.002806	17	
TOTAL	351.54	6.075392	152.6358	1.365728		

MULTIPLIER=(TBDR/SPR)*%F*%T*%R M= 0.00113 W/REEF VISITORS

PRIVATE RENTAL MODE SCENARIO (PR) REEF%= 0.3158 OTHER

CATEG	$EPPD	$EXPEND	EMPLOY	$WAGES			TBDR=
B.FUEL	96.67	0.109243	0.546039	0.005571	6		0.004147
TACKLE	25	0.028252	0.28602	0.003814	7		MILLION
BAIT	20.83	0.023539	0.238312	0.003178	8		
ICE	10.17	0.011493	0.075082	0.000931	9		VR=
RAM FEE	0	0	0	0	10		TBDR/
LODG	97.25	0.109899	2.695514	0.025057	11		LSR
CAM FEE	0	0	0	0	12		0.004147
F.STORE	56.67	0.064041	0.418376	0.005059	13		3.0=
F.PREP	103.33	0.11677	3.906775	0.031294	14		0.001382
A.GAS	2.33	0.002633	0.013161	0.000134	15		
BO.RENT	116.94	0.13215	3.575288	0.032509	16		
EQ.RENT	0	0	0	0	17		
TOTAL	529.19	0.598019	11.75457	0.107548			

	FISHING	DIVING
TOTAL EXPENDITURES FOR ALL MODES:	126.8792	4.081139
	$MILLION	MILLION
TOTAL EMPLOYMENT FOR ALL MODES:	2657.61	68.46595
TOTAL WAGES FOR ALL MODES:	24.06472	0.628372
	$MILLION	MILLION
TOTAL BOATING DAYS FOR ALL MODES	1.207369	0.051164
	MILLION	MILLION
TOTAL PERSON VISITS FOR ALL MODES	0.286195	0.012523
	MILLION	MILLION

GRAND TOTAL: FISHING AND DIVING

TOTAL EXPENDITURES FOR ALL MODES:	130.9603
	$MILLION
TOTAL EMPLOYMENT FOR ALL MODES:	2726.076
TOTAL WAGES FOR ALL MODES:	24.69309
	$MILLION
TOTAL BOATING DAYS FOR ALL MODES	1.258533
	MILLION
TOTAL PERSON VISITS FOR ALL MODES	0.298718
	MILLION

BAY BOATER SPENDING;WAGES;JOBS;DAYS;VISITS BY MODE-DIVING ONLY

MULTIPLIER=(TBDO/SPO)*%D*%T*%R 0.011119 W/REEF VISITORS

OWN BOAT MODE SCENARIO (O) REEF%= 0.9556

CATEG	$EPPD	$EXPEND MILLIONS	$S/E MILLIONS	EMPLOY	%WAGE	$WAGES MILLIONS	SIC DESIGN	OTHER TBDO=
B.FUEL	78.75	0.875597	0.200065	4.376561	0.051	0.044655	554	0.037804
AIR REF	27.5	0.305764	0.098775	3.09556	0.135	0.041278	5941	MILLION
BAIT	0	0	0.098775	0	0.135	0	5941	
ICE	7.5	0.08339	0.15307	0.544784	0.081	0.006755	54	VO=
RAM FEE	7.5	0.08339	0.036962	2.256105	0.246	0.020514	79	TBDO/
LODG	35	0.389154	0.040771	9.544874	0.228	0.088727	70	LS0
CAM FEE	0	0	0.079989	0	0.186	0	703	.037804/
F. STORE	52.5	0.583731	0.15307	3.813491	0.079	0.046115	54	3.87=
F.PREP	62.5	0.694918	0.029889	23.24996	0.268	0.186238	58	0.009768
A.GAS	17.5	0.194577	0.200065	0.972569	0.051	0.009923	554	MILLION
BO RENT	0	0	0.036962	0	0.246	0	79	
EQ.RENT	12.5	0	0.036962	0	0.246	0	79	
TOTAL	301.25	3.210521		47.8539		0.444205		

M=[(TBDC/4.75)*.17*.25*.50] + [(TBDR/4.75)*.1*.25*.50] 0.002813 W/REEF VISITORS

CHARTER/OTHER RENTAL BOAT MODE RIO (C) REEF%= 0.5
SCENARIO

CATEG	$EPPD	$EXPEND MILLIONS	EMPLOY	$WAGES MILLIIONS		OTHER TBDC=
B.FUEL	0	0	0	0	6	0.01336
AIR.REF	0	0	0	0	7	MILLION
BAIT	0	0	0	0	8	
ICE	0	0	0	0	9	VC=
RAM FEE	0	0	0	0	10	TBDC/
LODG	113.94	0.32048	7.860495	0.073069	11	LSC
CAM FEE	0	0	0	0	12	.01336/
F. STORE	26.38	0.074199	0.484741	0.005862	13	4.85=
F.PREP	66.33	0.186567	6.241998	0.05	14	0.002755
A.GAS	29.08	0.081794	0.408835	0.004171	15	MILLION
BO.RENT	73.8	0.207578	5.615985	0.051064	16	
EQ.RENT	0	0	0	0	17	
TOTAL	309.53	0.870618	20.61205	0.184167		

MULTILIER:(TBDP/SPF)*%D*%T =(.0616/2.58)*.0*0 0

PARTYBOAT MODE SCENARIO (P) VISITORS OTHER

CATEG	$EPPD	$EXPEND	EMPLOY	$WAGES		TBDP=
B.FUEL	0	0	0	0	6	0
AIR REF	0	0	0	0	7	MILLION
BAIT	0	0	0	0	8	
ICE	0	0	0	0	9	VP=
RAM FEE	0	0	0	0	10	TBDP/
LODG	0	0	0	0	11	LSP
CAM FEE	0	0	0	0	12	0/
F.STORE	0	0	0	0	13	5.0=
F.PREP	0	0	0	0	14	0
A.GAS	0	0	0	0	15	
BO.RENT	0	0	0	0	16	
EQ.RENT	0.00	0	0	0	17	
TOTAL	0	0	0	0		

MULTIPLIER=(TBDR/SPR)*%D*%F OR (.0184/3.29)*.1*.25= 0.000037 W/REEF

PRIVATE RENTAL MODE SCENARIO (PR) REEF%= 0.263 OTHER

CATEG	$EPPD	$EXPEND	EMPLOY	$WAGES			TBDR=	
B.FUEL	0	0	0	0	6			0
AIR REF	0	0	0	0	7		MILLION	
BAIT	0	0	0	0	8			
ICE	0	0	0	0	9		VR=	
RAM FEE	0	0	0	0	10		TBDR/	
LODG	0	0	0	0	11		LSR	
CAM FEE	0	0	0	0	12		.00012/	
F.STORE	0	0	0	0	13		3.0=	
F.PREP	0	0	0	0	14			0
A.GAS	0	0	0	0	15			
BO.RENT	0	0	0	0	16			
EQ.RENT	0	0	0	0	17			
TOTAL	0	0	0	0				

	DIVING
TOTAL EXPENDITURES FOR ALL MODES:	4.081139
	$MILLION
TOTAL EMPLOYMENT FOR ALL MODES:	68.46595
TOTAL WAGES FOR ALL MODES:	0.628372
	$MILLION
TOTAL BOATING DAYS FOR ALL MODES	0.051164
	MILLION
TOTAL PERSON VISITS FOR ALL MODES	0.012523
	MILLION

BAY RESIDENT-SPENDING;WAGES; JOBS AND DAYS-FISHING ONLY

SIZE CLASS 1 (UNDER 16 FT) BT.REG* %RES= 9182 0.93 8539.26

PARTY DAYS: RESBT*FDPBPY= 0.00854 15.25 0.130235 2.6

CATEG	$EPPD	$EXPEND MILLIONS	$S/E MILLIONS	EMPLOY	%WAGE	$WAGE MILLIONS	P.SIZE SIC
B.FUEL	23.6	3.073546	0.200065	15.36274	0.051	0.156751	554
TACKLE	11	1.432585	0.098775	14.50352	0.135	0.193399	5941
BAIT	9.2	1.198162	0.098775	12.13022	0.135	0.161752	5941
ICE	10	1.30235	0.15307	8.508199	0.081	0.10549	54
RAM FEE	0	0	0.036962	0	0.246	0	79
LODG	0	0	0.040771	0	0.228	0	70
CAM FEE	0	0	0.079989	0	0.186	0	703
F.STORE	0.4	0.052094	0.15307	0.340328	0.079	0.004115	54
F.PREP	0	0	0.029889	0	0.268	0	58
A.GAS	10.8	1.406538	0.200065	7.030405	0.051	0.071733	554
BO.RENT	0	0	0.036962	0	0.246	0	79
EQ.RENT	2	0.26047	0.036962	7.046967	0.246	0.064076	79
TOTAL	67	8.725745		64.92237		0.757317	

SIZE CLASS 2(16' TO 39'11'') BT.REG*%RES= 6284 0.8787 5521.751

PARTY DAYS: RESBT*FDPBPY= 0.005522 25.82 0.142578 3.26

CATEG	$EPPD	$EXPEND MILLIONS	$S/E MILLIONS	EMPLOY	%WAGE	$WAGE MILLIONS	P.SIZE
B.FUEL	86.79	12.37435	0.200065	61.85164	0.051	0.631092	
TACKLE	7.11	1.01373	0.098775	10.26302	0.135	0.136854	
BAIT	16.17	2.305487	0.098775	23.34079	0.135	0.311241	
ICE	4.72	0.672968	0.15307	4.396474	0.081	0.05451	
RAM FEE	0	0	0.036962	0	0.246	0	
LODG	0	0	0.040771	0	0.228	0	
CAM FEE	0	0	0.079989	0	0.186	0	
F.STORE	15.61	2.225643	0.15307	14.54004	0.079	0.175826	
F.PREP	0.75	0.106934	0.029889	3.577688	0.268	0.028658	
A.GAS	10.88	1.551249	0.200065	7.753725	0.051	0.079114	
BT SLIP	7.67	1.093574	0.036962	29.58643	0.246	0.269019	
EQ.RENT	0.58	0.082695	0.036962	2.237305	0.246	0.020343	
TOTAL	150.28	21.42663		157.5471		1.706656	

SIZE CLASS 3(OVER 39') BT.REG*%RES= 121 0.66 79.86

PARTY DAYS: RESBT*FDPBPY= 0.00008 100 0.008 3.5

CATE	$EPPD	$EXPEND	$S/E	EMPLOY	%WAGE	$WAGE	P.SIZE
B.FUEL	36	0.288	0.200065	1.439532	0.051	0.014688	
TACKLE	0.75	0.006	0.098775	0.060744	0.135	0.00081	
BAIT	12.5	0.1	0.098775	1.012402	0.135	0.0135	
ICE	5	0.04	0.15307	0.261318	0.081	0.00324	
RAM FEE	0	0	0.036962	0	0.246	0	
LODG	0	0	0.040771	0	0.228	0	
CAM FEE	0	0	0.079989	0	0.186	0	
F.STORE	16.75	0.134	0.15307	0.875416	0.079	0.010586	
F.PREP	0	0	0.029889	0	0.268	0	
A.GAS	3.5	0.028	0.200065	0.139955	0.051	0.001428	
BT SLIP	16.67	0	0.036962	0	0.246	0	
EQ.RENT	0	0	0.036962	0	0.246	0	
TOTAL	91.17	0.596		3.789368		0.044252	

RESIDENT RENTALS(CHARTER;PARTY AND OTHER)

TOTAL EXPEND = ($VISITOR EXPEND/ % VISITS)(% RESIDENTS)

	$MILL	$MIL		$MIL	
	2.739167	65.74	0.96	68.47917	0.04

TOTAL EMPLOYMENT = TOTAL EXPEND/$S/E

		$MIL	
	68.47917	2.739167	0.04

TOTAL WAGES = % WAGES* TOTAL EXPEND

	$MILL		$MIL
	0.616313	0.225	2.739167

TOTAL DAYS=(VISITOR DAYS/%VIS)*%RES

	MILL	MILL			
	0.020209	0.48502	0.96	0.505229	0.04

TOTAL EXPEND; EMPLOY; WAGES AND DAYS FOR DAYS- ALL CLASSES & RENT
ALL CLASSES AND RENTALS

	CLASS 1	CLASS 2	CLASS 3	RENTAL	TOTAL
	$MILL	$MILL	$MILL	$MILL	$MILL
$EXPEND	8.725745	21.42663	0.596	2.739167	33.48754
	18	35	51		
EMPLOY	64.92237	157.5471	3.789368	68.47917	294.738
	$MILL	$MILL	$MILL	$MILL	$MILL
$WAGES	0.757317	1.706656	0.044252	0.616313	3.124537
	MILL	MILL	MILL	MILL	MILL
PERSON	0.338611	0.464804	0.028	0.020209	0.851625
DAYS	MILL	MILL	MILL	MILL	MILL

TOTAL EXPEND;EMPLOY; WAGES AND DAYS FOR THOSE
USING ARTIFICIAL REEFS - FISHING ONLY

CATEG	VALUE	%ART.R	EQUALS	$SP.A.R
$SPEND	33.48754	0.5		16.74377
	MILL			MILL
EMPLOY	294.738	0.5		147.369
$WAGES	3.124537	0.5		1.562269
	MILL			MILL
DAYS	0.851625	0.5		0.425812

TOTAL EXPEND;EMPLOY;WAGES AND DAYS FOR THOSE
USING ARTIFICIAL REEFS-DIVING PLUS FISH

		DAYS			
CATEG	VALUE	DIV/FISH	AMT.DIV	AMT.FISH	TOTAL
$SPEND	16.74377	0.107	1.791583	16.74377	18.53535
	MILL		MILL	MILL	MILL
EMPLOY	147.369	0.107	15.76848	147.369	163.1375
$WAGES	1.562269	0.107	0.167163	1.562269	1.729431
	MILL		MILL	MILL	MILL
DAYS	0.425812	0.107	0.045562	0.425812	0.471374
	MILL		MILL	MILL	MILL

Appendix B: Spreadsheets for Visitors and Residents In Walton County

1998 WALTON COUNTY VISITOR ANALYSES

HOTEL AND MOTEL CATEGORY

MULTIPLIER: VISITS*(LS/SP) = .167406*(3.8/3.27) 0.194539 MILLIONS VISITORS 167406
304041(2.02/2.37)=

CATEG	$EPPD	$EXPEND MILLIONS	$S/E MILLIONS	EMPLOY	%WAGES	$WAGES MILLIONS
LODG	82.79	16.10589	0.040771	395.033	0.228	3.672143
PRE.FD	60	11.67235	0.029889	390.5231	0.268	3.128189
NPR.FD	21	4.085321	0.153865	26.55133	0.079	0.32274
SP.FEES	13.33	2.593206	0.050545	51.3049	0.241	0.624963
EV.FEES	3.33	0.647815	0.050545	12.8166	0.241	0.156123
ATT.ADM	8.33	1.620511	0.050545	32.06075	0.241	0.390543
EV.ENT	40	7.781564	0.050545	153.9532	0.241	1.875357
GD.TRAN	16.07	3.126243	0.125976	24.81618	0.14	0.437674
SHOP	37	7.197947	0.080388	89.54006	0.186	1.338818
OTHER	11	2.13993	0.080388	26.62002	0.186	0.398027
TOTAL	292.85	56.97078		1203.219		12.34458

OTHER CATEGORY

MULTIPLIER:VISITS*(LS/SP)= .419984(4.0/4.0) 0.419984 MILLION VISITORS 419984

CATEG	$EPPD	$EXPEND MILLIONS	$S/E MILLIONS	EMPLOY	%WAGES	$WAGES MILLIONS
LODG	95	39.89848	0.040771	978.5995	0.228	9.096853
PRE.FD	100	41.9984	0.029889	1405.146	0.268	11.25557
NPR.FD	47.05	19.76025	0.153865	128.4259	0.079	1.56106
SP.FEES	13.03	5.472392	0.050545	108.2677	0.241	1.318846
EV.FEES	5.3	2.225915	0.050545	44.03829	0.241	0.536446
ATT.ADM	12.17	5.111205	0.050545	101.1219	0.241	1.2318
EV.ENT	16.69	7.009533	0.050545	138.6791	0.241	1.689297
GD.TRAN	6.15	2.582902	0.125976	20.50312	0.14	0.361606
SHOP	50	20.9992	0.080388	261.2231	0.186	3.905851
OTHER	10.64	4.46863	0.080388	55.58827	0.186	0.831165
TOTAL	356.03	149.5269		3241.592		31.7885

CATEG	$EXPEND MILLIONS	EMPLOY	%WAGES MILLIONS	TOTAL VISITORS	587390
LODG	56.00437	1373.633	12.769	7	24
PRE.FD.	53.67075	1795.669	14.38376	8	25
NPR.FD.	23.84557	154.9772	1.8838	9	26
SP.FEES	8.065598	159.5726	1.943809	10	27
EV.FEES	2.87373	56.85489	0.692569	11	28
ATT.ADM	6.731716	133.1826	1.622344	12	29
EV.ENT	14.7911	292.6322	3.564654	13	30
GD.TRAN	5.709145	45.31931	0.79928	14	31
SHOP	28.19715	350.7631	5.244669	15	32
OTHER	6.60856	82.20829	1.229192	16	33
TOTAL	206.4977	4444.812	44.13307	17	34

WALTON: BOATERS SPENDING; WAGES AND EMPLOYMENT BY MODE

MULTIPLIER= TBDO/SPO= .2397/4.17= 0.0575

OWN BOAT MODE SCENARIO (O)

CATEG	$EPPD	$EXPEND MILLIONS	$S/E MILLIONS	EMPLOY	%WAGE	$WAGES MILLIONS	SIC DESIGN	TBDO=
B.FUEL	61.11	3.513825	0.200065	17.56342	0.051	0.179205	554	0.2397
TACKLE	24.58	1.41335	0.098775	14.30878	0.135	0.190802	5941	MILLION
BAIT	17.69	1.017175	0.098775	10.2979	0.135	0.137319	5941	
ICE	9.81	0.564075	0.15307	3.685079	0.081	0.04569	54	
RAM FEE	1.14	0.06555	0.036962	1.773443	0.246	0.016125	79	
LODG	26.38	1.51685	0.040771	37.20414	0.228	0.345842	70	
CAM FEE	0	0	0.079989	0	0.186	0	703	
F. STORE	61.39	3.529925	0.15307	23.06085	0.079	0.278864	54	
F.PREP	82.92	4.7679	0.029889	159.5202	0.268	1.277797	58	
A.GAS	20.39	1.172425	0.200065	5.86022	0.051	0.059794	554	
BO RENT	0	0	0.036962	0	0.246	0	79	
EQ.RENT	0.29	0	0.036962	0	0.246	0	79	
TOTAL	305.7	17.56108		273.2741		2.531438		

MULTIPLIER=TBDC/SPC= .0802/4.73= 0.016956

CHARTER BOAT MODE SCENARIO RIO (C)

CATEG	$EPPD	$EXPEND MILLIONS	EMPLOY	$WAGES MILLIIONS		TBDC=
B.FUEL	0	0	0	0	6	0.0802
TACKLE	0	0	0	0	7	MILLION
BAIT	0	0	0	0	8	
ICE	0	0	0	0	9	
RAM FEE	0	0	0	0	10	
LODG	102.75	1.742188	42.73106	0.397219	11	
CAM FEE	1.08	0.018312	0.228932	0.003406	12	
F. STORE	31.85	0.540036	3.528033	0.042663	13	
F.PREP	91.79	1.556355	52.07116	0.417103	14	
A.GAS	28.26	0.479165	2.395048	0.024437	15	
BO.RENT	335.87	5.694878	154.0739	1.40094	16	
EQ.RENT	12.33	0.209063	5.656149	0.051429	17	
TOTAL	603.93	10.24	260.6842	2.337198		

MULTIPLIER=TBDP/SPP= .008/3.24 = 0.002469

PARTYBOAT MODE SCENARIO (P)

CATEG	$EPPD	$EXPEND	EMPLOY	$WAGES		TBDP=
B.FUEL	0	0	0	0	6	0.008
TACKLE	0	0	0	0	7	MILLION
BAIT	0	0	0	0	8	
ICE	0	0	0	0	9	
RAM FEE	0	0	0	0	10	
LODG	125.8	0.310617	7.618584	0.070821	11	
CAM FEE	0.66	0.00163	0.020373	0.000303	12	
F.STORE	26.84	0.066272	0.43295	0.005235	13	
F.PREP	70.26	0.173481	5.804192	0.046493	14	
A.GAS	11.35	0.028025	0.140078	0.001429	15	
BO.RENT	115.97	0.286346	7.747029	0.070441	16	
EQ.RENT	0.66	0.00163	0.044089	0.000401	17	
TOTAL	351.54	0.868	21.80729	0.195124		

MULTIPLIER=TBDR/SPR= .0195/3.67= 0.005313

PRIVATE RENTAL MODE SCENARIO (PR)

CATEG	$EPPD	$EXPEND	EMPLOY	$WAGES		TBDP=
B.FUEL	96.67	0.513642	2.567374	0.026196	6	0.0195
TACKLE	25	0.132834	1.344812	0.017933	7	MILLION
BAIT	20.83	0.110677	1.120497	0.014941	8	
ICE	10.17	0.054037	0.35302	0.004377	9	
RAM FEE	0	0	0	0	10	
LODG	97.25	0.516723	12.6738	0.117813	11	
CAM FEE	0	0	0	0	12	
F.STORE	56.67	0.301108	1.967124	0.023788	13	
F.PREP	103.33	0.549029	18.36892	0.14714	14	
A.GAS	2.33	0.01238	0.06188	0.000631	15	
BO.RENT	116.94	0.621343	16.81033	0.15285	16	
EQ.RENT	0	0	0	0	17	
TOTAL	529.19	2.811772	55.26775	0.505669		

TOTAL EXPENDITURES FOR ALL MODES: 31.48084 MILLION

TOTAL EMPLOYMENT FOR ALL MODES: 611.0334

TOTAL WAGES FOR ALL MODES: 5.569428 MILLION

TOTAL BOATING DAYS FOR ALL MODES 0.3474 MILLION

WALTON: BOATER SPENDING;WAGES;JOBS;DAYS;VISITS BY MODE-FISHING ONLY

MULTIPLIER:(TBDO/SPO)*%F*%T*%R 0.023505 W/REEF VISITORS

OWN BOAT MODE SCENARIO (O) REEF%= 0.5802

CATEG	$EPPD	$EXPEND MILLIONS	$S/E MILLIONS	EMPLOY	%WAGE	$WAGES MILLIONS	SIC DESIGN	OTHER TBDO=
B.FUEL	71.97	1.691688	0.200065	8.45569	0.051	0.086276	554	0.100133
TACKLE	35.52	0.834914	0.098775	8.452683	0.135	0.112713	5941	MILLION
BAIT	14.61	0.343415	0.098775	3.476737	0.135	0.046361	5941	
ICE	9.04	0.212489	0.15307	1.388184	0.081	0.017212	54	VO=
RAM FEE	1.22	0.028677	0.036962	0.775842	0.246	0.007054	79	TBDO/
LODG	25.31	0.594923	0.040771	14.59182	0.228	0.135642	70	LSO
CAM FEE	0.85	0.01998	0.079989	0	0.186	0.003716	703	0.100133
F. STORE	52.32	1.229805	0.15307	8.034268	0.079	0.097155	54	4.3=
F.PREP	90.7	2.131945	0.029889	71.32874	0.268	0.571361	58	0.023287
A.GAS	16.69	0.392306	0.200065	1.960893	0.051	0.020008	554	MILLION
BO RENT	0	0	0.036962	0	0.246	0	79	
EQ.RENT	3.74	0	0.036962	0	0.246	0	79	
TOTAL	321.97	7.480141		118.4649		1.097499		

MULTIPLIER=(TBDC/SPC)*%F*%T*%R 0.011988 W/REEF VISITORS

CHARTER BOAT MODE SCENARIO RIO (C) REEF%= 0.85

CATEG	$EPPD	$EXPEND MILLIONS	EMPLOY	$WAGES MILLIIONS		OTHER TBDC=
B.FUEL	0	0	0	0	6	0.056581
TACKLE	0	0	0	0	7	MILLION
BAIT	0	0	0	0	8	
ICE	0	0	0	0	9	VC=
RAM FEE	0	0	0	0	10	TBDC/
LODG	140.31	1.681969	41.25406	0.383489	11	LSC
CAM FEE	0.92	0.011029	0.137875	0.002051	12	0.056581
F. STORE	44.81	0.537161	3.50925	0.042436	13	5=
F.PREP	91.22	1.093502	36.58542	0.293058	14	0.011316
A.GAS	27.63	0.331215	1.655538	0.016892	15	MILLION
BO.RENT	442.04	5.298964	143.3625	1.303545	16	
EQ.RENT	9.55	0.114481	3.097257	0.028162	17	
TOTAL	756.48	9.06832	229.6019	2.069634		

MULTIPLIER=(TBDP/SPP)*%F*%T*%R 0.001235 VISITORS

PARTYBOAT MODE SCENARIO (P) REEF%= 0.5 OTHER

CATEG	$EPPD	$EXPEND MILLIONS	EMPLOY	$WAGES		TBDP=
B.FUEL	0	0	0	0	6	0.004
TACKLE	0	0	0	0	7	MILLION
BAIT	0	0	0	0	8	
ICE	0	0	0	0	9	VP=
RAM FEE	0	0	0	0	10	TBDP/
LODG	125.8	0.155309	3.809292	0.03541	11	LSP
CAM FEE	0.66	0.000815	0.010187	0.000152	12	
F.STORE	26.84	0.033136	0.216475	0.002618	13	5=
F.PREP	70.26	0.086741	2.902096	0.023247	14	0.0008
A.GAS	11.35	0.014012	0.070039	0.000715	15	MILLION
BO.RENT	115.97	0.143173	3.873514	0.035221	16	
EQ.RENT	0.66	0.000815	0.022045	0.0002	17	
TOTAL	351.54	0.434	10.90365	0.097562		

MULTILIER=(TBDR/SPR)*%F*%T*%R 0.001208 VISITORS

PRIVATE RENTAL MODE SCENARIO (PR) REEF%= 0.3158 OTHER

CATEG	$EPPD	$EXPEND	EMPLOY	$WAGES		
B.FUEL	96.67	0.11679	0.583759	0.005956	6	
TACKLE	25	0.030203	0.305778	0.004077	7	
BAIT	20.83	0.025165	0.254774	0.003397	8	
ICE	10.17	0.012287	0.080268	0.000995	9	
RAM FEE	0	0	0	0	10	
LODG	97.25	0.117491	2.881718	0.026788	11	
CAM FEE	0	0	0	0	12	
F.STORE	56.67	0.068465	0.447277	0.005409	13	
F.PREP	103.33	0.124836	4.176651	0.033456	14	
A.GAS	2.33	0.002815	0.01407	0.000144	15	
BO.RENT	116.94	0.141279	3.822265	0.034755	16	
EQ.RENT	0	0	0	0	17	
TOTAL	529.19	0.63933	12.56656	0.114977		

TBDR=
0.004434
MILLION

VR=
TBDR/
LSR
.004434/
3.0=
0.001478

	FISHING	DIVING
TOTAL EXPENDITURES FOR ALL MODES:	17.62179	0.6133
	$MILLION	$MILLION
TOTAL EMPLOYMENT FOR ALL MODES:	371.5369	10
TOTAL WAGES FOR ALL MODES:	3.379671	0.0941
	$MILLION	$MILLION
TOTAL BOATING DAYS FOR ALL MODES	0.165148	0.00767
	MILLION	MILLION
TOTAL PERSON VISITS FOR ALL MODES	0.036881	0.001881

GRAND TOTAL: FISHING AND DIVING REEFS

TOTAL EXPENDITURES FOR ALL MODES:	18.23509
	$MILLION
TOTAL EMPLYMENT FOR ALL MODES:	381.5369
TOTAL WAGES FOR ALL MODES:	3.473771
	$MILLION
TOTAL BOATING DAYS FOR ALL MODES:	0.172818
	MILLLION
TOTAL PERSON VISITS FOR ALL MODES:	0.038762

WALTON BOATER SPENDING;WAGES;JOBS;DAYS;VISITS BY MODE-DIVING ONLY

MULTIPLIER=(TBDO/SPO)*%F*%T*%R 0.001684 W/REEF VISITORS

OWN BOAT MODE SCENARIO (O) REEF%= 0.9556

CATEG	$EPPD	$EXPEND MILLIONS	$S/E MILLIONS	EMPLOY	%WAGE	$WAGES MILLIONS	SIC DESIGN	OTHER TBDO=
B.FUEL	78.75	0.132634	0.200065	0.662956	0.051	0.006764	554	0.005726
AIR REF	27.5	0.046317	0.098775	0.468912	0.135	0.006253	5941	MILLION
BAIT	0	0	0.098775	0	0.135	0	5941	
ICE	7.5	0.012632	0.15307	0.082523	0.081	0.001023	54	VO=
RAM FEE	7.5	0.012632	0.036962	0.341752	0.246	0.003107	79	TBDO/
LODG	35	0.058949	0.040771	1.445846	0.228	0.01344	70	LS0
CAM FEE	0	0	0.079989	0	0.186	0	703	.005726/
F. STORE	52.5	0.088423	0.15307	0.577663	0.079	0.006985	54	3.87=
F.PREP	62.5	0.105265	0.029889	3.521875	0.268	0.028211	58	0.00148
A.GAS	17.5	0.029474	0.200065	0.147324	0.051	0.001503	554	MILLION
BO RENT	0	0	0.036962	0	0.246	0	79	
EQ.RENT	12.5	0	0.036962	0	0.246	0	79	
TOTAL	301.25	0.486326		7.24885		0.067288		

M=((TBDC/SPC)*.17*.25*.5)+((TBDR/SPR)*.1*.25*.5)= 0.00041 W/REEF VISITORS

CHARTER BOAT MODE SCENARIO RIO (C) REEF%= 0.5

CATEG	$EPPD	$EXPEND MILLIONS	EMPLOY	$WAGES MILLIIONS		OTHER TBDC=
B.FUEL	0	0	0	0	6	0.001948
AIR.REF	0	0	0	0	7	MILLION
BAIT	0	0	0	0	8	
ICE	0	0	0	0	9	VC=
RAM FEE	0	0	0	0	10	TBDC/
LODG	113.94	0.046727	1.146094	0.010654	11	LSC
CAM FEE	0	0	0	0	12	.001948/
F. STORE	26.38	0.010819	0.070677	0.000855	13	4.85=
F.PREP	66.33	0.027202	0.91011	0.00729	14	0.000402
A.GAS	29.08	0.011926	0.05961	0.000608	15	MILLION
BO.RENT	73.8	0.030266	0.818835	0.007445	16	
EQ.RENT	0	0	0	0	17	
TOTAL	309.53	0.12694	3.005326	0.026852		

MULTILIER:(TBDP/SPF)*%D*%T =(.0616/2.58)*.0*0 0

PARTYBOAT MODE SCENARIO (P) VISITORS

CATEG	$EPPD	$EXPEND	EMPLOY	$WAGES		OTHER TBDP=
B.FUEL	0	0	0	0	6	0
AIR REF	0	0	0	0	7	MILLION
BAIT	0	0	0	0	8	
ICE	0	0	0	0	9	VP=
RAM FEE	0	0	0	0	10	TBDP/
LODG	0	0	0	0	11	LSP
CAM FEE	0	0	0	0	12	0/
F.STORE	0	0	0	0	13	5.0=
F.PREP	0	0	0	0	14	0
A.GAS	0	0	0	0	15	
BO.RENT	0	0	0	0	16	
EQ.RENT	0.00	0	0	0	17	
TOTAL	0	0	0	0		

MULTIPLIER=(TBDR/SPR)*%F*%T OR (.0195/3.29)*.1*.25= 0.000039 W/REEF

PRIVATE RENTAL MODE SCENARIO (PR) REEF%= 0.263 OTHER

CATEG	$EPPD	$EXPEND	EMPLOY	$WAGES			TBDR=
B.FUEL	0	0	0	0	6		0
AIR REF	0	0	0	0	7		MILLION
BAIT	0	0	0	0	8		
ICE	0	0	0	0	9		VR=
RAM FEE	0	0	0	0	10		TBDR/
LODG	0	0	0	0	11		LSR
CAM FEE	0	0	0	0	12		.000128/
F.STORE	0	0	0	0	13		3.0=
F.PREP	0	0	0	0	14		0
A.GAS	0	0	0	0	15		
BO.RENT	0	0	0	0	16		
EQ.RENT	0	0	0	0	17		
TOTAL	0	0	0	0			

	DIVING
TOTAL EXPENDITURES FOR ALL MODES:	0.613266
	$MILLION
TOTAL EMPLOYMENT FOR ALL MODES:	10.25418
TOTAL WAGES FOR ALL MODES:	0.09414
	$MILLION
TOTAL BOATING DAYS FOR ALL MODES	0.007674
	MILLION
TOTAL PERSON VISITS FOR ALL MODES	0.001881
	MILLION

WALTON RESIDENT-SPENDING;WAGES; JOBS AND DAYS-FISHING ONLY 1998

SIZE CLASS 1 (UNDER 16 FT) BT.REG* %RES= 2311 0.74 1710.14

PARTY DAYS:RESBT*FDPBPY= 0.001711 6 0.010266 2 0.020532

CATEG	$EPPD	$EXPEND MILLIONS	$S/E MILLIONS	EMPLOY	%WAGE	$WAGE MILLIONS	SIC	MILLIONS
B.FUEL	23.6	0.242278	0.200065	1.210994	0.051	0.012356	554	
TACKLE	11	0.112926	0.098775	1.143265	0.135	0.015245	5941	
BAIT	9.2	0.094447	0.098775	0.956185	0.135	0.01275	5941	
ICE	10	0.10266	0.15307	0.670674	0.081	0.008315	54	
RAM FEE	0	0	0.036962	0	0.246	0	79	
LODG	0	0	0.040771	0	0.228	0	70	
CAM FEE	0	0	0.079989	-	0.186	0	703	
F.STORE	0.4	0.004106	0.15307	0.026827	0.079	0.000324	54	
F.PREP	0	0	0.029889	0	0.268	0	58	
A.GAS	10.8	0.110873	0.200065	0.554184	0.051	0.005655	554	
BO.RENT	0	0	0.036962	0	0.246	0	79	
EQ.RENT	2	0.020532	0.036962	0.555489	0.246	0.005051	79	
TOTAL	67	0.687822		1.1365		0.059697		

SIZE CLASS 2(16' TO 39'11'') BT.REG*%RES= 792 0.7384 584.8128

PARTY DAYS:RESBT*FDPBPY= 0.000585 47.32 0.027682 3.36 0.093012

CATEG	$EPPD	$EXPEND MILLIONS	$S/E MILLIONS	EMPLOY	%WAGE	$WAGE MILLIONS	MILLIONS
B.FUEL	43.59	1.206667	0.200065	6.031375	0.051	0.06154	
TACKLE	16.82	0.465615	0.098775	4.713891	0.135	0.062858	
BAIT	14	0.387551	0.098775	3.923572	0.135	0.062858	
ICE	3.36	0.093012	0.15307	0.607645	0.081	0.007534	
RAM FEE	0	0	0.036962	0	0.246	0	
LODG	4.55	0	0.040771	0	0.228	0	
CAM FEE	0.64	0.017717	0.079989	0.221488	0.186	0.003295	
F.STORE	9.66	0.26741	0.15307	1.746979	0.079	0.021125	
F.PREP	1.59	0.044015	0.029889	1.472605	0.268	0.011796	
A.GAS	5.68	0.157235	0.200065	0.785919	0.051	0.008019	
BT.SLIP	7.67	0.212322	0.036962	5.744345	0.246	0.052231	
EQ.RENT	0	0	0.036962	0	0.246	0	
TOTAL	107.56	2.851543		25.24782		0.291257	

SIZE CLASS 3(OVER 39') BT.REG*%RES= 9 0.75 6.75

PARTY DAYS:RESBT*FDPBPY= 0.000007 70.5 0.000494 5.33 0.00263

CATE	$EPPD	$EXPEND MILLIONS	$S/E MILLIONS	EMPLOY	%WAGE	$WAGE	MILLIONS
B.FUEL	36	0.017766	0.200065	0.088801	0.051	0.000906	
TACKLE	0.75	0.00037	0.098775	0.003747	0.135	5E-05	
BAIT	12.5	0.006169	0.098775	0.062453	0.135	0.000833	
ICE	5	0.002468	0.15307	0.01612	0.081	0.0002	
RAM FEE	0	0	0.036962	0	0.246	0	
LODG	0	0	0.040771	0	0.228	0	
CAM FEE	0	0	0.079989	0	0.186	0	
F.STORE	16.75	0.008266	0.15307	0.054002	0.079	0.000653	
F.PREP	0	0	0.029889	0	0.268	0	
A.GAS	3.5	0.001727	0.200065	0.008633	0.051	8.81E-05	
BT.SLIP	16.67	0.008227	0.036962	0.22257	0.246	0.002024	
EQ.RENT	0	0	0.036962	0	0.246	0	
TOTAL	91.17	0.044992		0.456327		0.004754	

```
RESIDENT RENTAL(CHARTER;PARTY;OTHER)

TOTAL EXPEND=(VISITOR EXPEND/%VISITS)(% RESIDENTS)
          $MILL      $MILL
            0.414246     9.9419       0.96   10.35615       0.04
TOTAL EMPLOYMENT=TOTAL EXPEND/$S/E
                     $MILL
            8.757844   0.414246     0.0473
TOTAL WAGES=%WAGES*TOTAL EXPEND
          $MILL                 $MILL
            0.089601     0.2163   0.414246
TOTAL DAYS=(VISITOR DAYS/%VIS)*%RES
          MILL       MILL
            0.003137   0.075293       0.96    0.07843       0.04
TOT.EXPEND;EMPLOY;WAGES AND DAYS-ALL CLASS & RENT
          CLASS 1    CLASS 2    CLASS 3    RENTAL     TOTAL
          $MILL      $MILL      $MILL      $MILL      $MILL
$EXPEND     0.687822   2.851543   0.044992   0.414246   4.043596

EMPLOY        1.1365   25.24782   0.456327   8.757844   35.59849
          $MILL      $MILL      $MILL      $MILL      $MILL
$WAGES      0.059697   0.291257   0.004754   0.089601   0.445309
          MILL       MILL       MILL       MILL       MILL
PERSON      0.020532   0.093012    0.00263   0.003137   0.119312
DAYS
TOTAL EXPEND;EMPLOY;WAGES AND DAYS FOR THOSE
               USING ARTIFICIAL REEFS-FISHING ONLY
                     DAYS
CATEG     VALUE      %ART.R     EQUALS     $SP.A.R.
$SPEND      4.043596       0.34             1.374823
          $MILL                           $MILL
EMPLOY      35.59849       0.34             12.10349

$WAGES      0.445309       0.34             0.151405
          $MILL                           $MILL
DAYS        0.119312       0.34             0.040566
          MILL                            MILL
TOTAL EXPEND;EMPLOY;WAGES AND DAYS FOR THOSE
          USING ARTIFICIAL REEFS-DIVING PLUS FISHING
                     DAYS
CATEG     VALUE      DIV/FISH   AMT.DIV    AMT.FISH   TOTAL
$SPEND      1.374823      0.071   0.097612   1.374823   1.472435
          $MILL                 $MILL      $MILL      $MILL
EMPLOY      12.10349      0.071   0.859348   12.10349   12.96283

$WAGES      0.151405      0.071    0.01075   0.151405   0.162155
          $MILL                 $MILL      $MILL      $MILL
DAYS        0.040566      0.071    0.00288   0.040566   0.043446
          MILL                  MILL       MILL       MILL
```

Appendix C: Spreadsheets for Visitors and Residents In Okaloosa County

1998 OKALOOSA COUNTY VISITOR ANALYSES

HOTEL AND MOTEL CATEGORY

MULTIPLIER: VISITS*(LS/SP) = 1.177713(3.8/3.3)= 1.35437 MILLIONS VISITORS 1177713
304041(2.02/2.37)=

CATEG	$EPPD	$EXPEND MILLIONS	$S/E MILLIONS	EMPLOY	%WAGES	$WAGES MILLIONS
LODG	82	111.0583	0.044474	2497.152	0.283	31.42951
PRE.FD	58.5	79.23065	0.030703	2580.551	0.275	21.78843
NPR.FD	51.49	69.73651	0.132681	525.5953	0.084	5.857867
SP.FEES	11.67	15.8055	0.051726	305.562	0.231	3.65107
EV.FEES	4.17	5.647723	0.051726	109.1854	0.231	1.304624
ATT.ADM	6.5	8.803405	0.051726	170.193	0.231	2.033587
EV.ENT	20	27.0874	0.051726	523.6709	0.231	6.257189
GD.TRAN	2.53	3.426556	0.1438	23.82862	0.1	0.342656
SHOP	39.58	53.60596	0.084201	636.6428	0.203	10.88201
OTHER	1.8	2.437866	0.084201	28.95293	0.203	0.494887
TOTAL	278.24	376.8399		7401.334		84.04183

OTHER CATEGORY

MULTIPLIER:VISITS*(LS/SP)= 2.954613(5.16/4.4) 3.464955 MILLION VISITORS 2954613

CATEG	$EPPD	$EXPEND MILLIONS	$S/E MILLIONS	EMPLOY	%WAGES	$WAGES MILLIONS
LODG	90	311.846	0.044474	7011.871	0.283	88.25241
PRE.FD	75	259.8716	0.030703	8464.047	0.275	71.4647
NPR.FD	40	138.5982	0.132681	1044.597	0.084	11.64225
SP.FEES	15.01	52.00898	0.051726	1005.471	0.231	12.01407
EV.FEES	0.61	2.113623	0.051726	40.8619	0.231	0.488247
ATT.ADM	9.14	31.66969	0.051726	612.2586	0.231	7.315699
EV.ENT	17.17	59.49328	0.051726	1150.162	0.231	13.74295
GD.TRAN	2.53	8.766337	0.1438	60.96201	0.1	0.876634
SHOP	73.74	255.5058	0.084201	3034.475	0.203	51.86768
OTHER	1.81	6.271569	0.084201	74.48331	0.203	1.273128
TOTAL	325.01	1126.145		22499.19		258.9378

CATEG	$EXPEND MILLIONS	EMPLOY	%WAGES MILLIONS	TOTAL VISITORS	4132326
LODG	422.9043	9509.023	119.6819	7	24
PRE.FD.	339.1023	11044.6	93.25313	8	25
NPR.FD.	208.3347	1570.193	17.50012	9	26
SP.FEES	67.81448	1311.033	15.66514	10	27
EV.FEES	7.761346	150.0473	1.792871	11	28
ATT.ADM	40.4731	782.4517	9.349285	12	29
EV.ENT	86.58068	1673.833	20.00014	13	30
GD.TRAN	12.19289	84.79063	1.219289	14	31
SHOP	309.1118	3671.117	62.74969	15	32
OTHER	8.709435	103.4362	1.768015	16	33
TOTAL	1502.985	29900.52	342.9796	17	34

OKALOO: BOATERS SPENDING; WAGES AND EMPLOYMENT BY MODE

MULTIPLIER= TBDO/SPO= .7679/3.8 3 0.2005

OWN BOAT MODE SCENARIO (O)

CATEG	$EPPD	$EXPEND MILLIONS	$S/E MILLIONS	EMPLOY	%WAGE	$WAGES MILLIONS	SIC DESIGN	TBDO=
B.FUEL	71.67	14.36984	0.18258	78.70432	0.056	0.804711	554	0.7679
TACKLE	15	3.0075	0.093923	32.02091	0.138	0.415035	5941	MILLION
BAIT	20	4.01	0.093923	42.69455	0.138	0.55338	5941	
ICE	3.67	0.735835	0.126908	5.798177	0.087	0.064018	54	
RAM FEE	1.25	0.250625	0.049603	5.052618	0.273	0.068421	79	
LODG	30	6.015	0.044474	135.2476	0.283	1.702245	70	
CAM FEE	0	0	0.079989	0	0.186	0	703	
F. STORE	33.33	6.682665	0.126908	52.65756	0.087	0.581392	54	
F.PREP	53.33	10.69267	0.030703	348.2612	0.275	2.940483	58	
A.GAS	8	1.604	0.18258	8.78519	0.056	0.089824	554	
BO RENT	0	0	0.049603	0	0.273	0	79	
EQ.RENT	10	0	0.049603	0	0.273	0	79	
TOTAL	246.25	47.36813		709.2221		7.219508		

MULTIPLIER=TBDC/SPC= .7505/4.9 = 0.153163

CHARTER BOAT MODE SCENARIO RIO (C)

CATEG	$EPPD	$EXPEND MILLIONS	EMPLOY	$WAGES MILLIIONS		TBDC=
B.FUEL	0	0	0	0	6	0.7505
TACKLE	0	0	0	0	7	MILLION
BAIT	0	0	0	0	8	
ICE	0	0	0	0	9	
RAM FEE	0	0	0	0	10	
LODG	90	13.78469	309.9495	3.901068	11	
CAM FEE	1.79	0.274162	3.427499	0.050994	12	
F. STORE	54.91	8.410195	66.27001	0.731687	13	
F.PREP	80.54	12.33577	401.7773	3.392337	14	
A.GAS	22.84	3.498249	19.16009	0.195902	15	
BO.RENT	440.34	67.44391	1359.674	18.41219	16	
EQ.RENT	10.27	1.572987	31.71152	0.429425	17	
TOTAL	700.69	107.32	2191.97	27.1136		

MULTIPLIER=TBDP/SPP= .0348/3.24= 0.010741

PARTYBOAT MODE SCENARIO (P)

CATEG	$EPPD	$EXPEND	EMPLOY	$WAGES		TBDP=
B.FUEL	0	0	0	0	6	0.0348
TACKLE	0	0	0	0	7	MILLION
BAIT	0	0	0	0	8	
ICE	0	0	0	0	9	
RAM FEE	0	0	0	0	10	
LODG	125.8	1.351185	30.38146	0.382385	11	
CAM FEE	0.66	0.007089	0.088623	0.001319	12	
F.STORE	26.84	0.288281	2.271578	0.02508	13	
F.PREP	70.26	0.754644	24.57885	0.207527	14	
A.GAS	11.35	0.121907	0.667693	0.006827	15	
BO.RENT	115.97	1.245604	25.11146	0.34005	16	
EQ.RENT	0.66	0.007089	0.142913	0.001935	17	

TOTAL	351.54	3.7758	83.24258	0.965124		

MULTIPLIER=TBDR/SPR= .0269/3.67= 0.00733

PRIVATE RENTAL MODE SCENARIO (PR)

CATEG	$EPPD	$EXPEND	EMPLOY	$WAGES		TBDP=
B.FUEL	96.67	0.708562	3.880831	0.039679	6	0.0269
TACKLE	25	0.183243	1.950987	0.025287	7	MILLION
BAIT	20.83	0.152678	1.625562	0.02107	8	
ICE	10.17	0.074543	0.587379	0.006485	9	
RAM FEE	0	0	0	0	10	
LODG	97.25	0.712813	16.02764	0.201726	11	
CAM FEE	0	0	0	0	12	
F.STORE	56.67	0.415374	3.273033	0.036138	13	
F.PREP	103.33	0.757378	24.66788	0.208279	14	
A.GAS	2.33	0.017078	0.093538	0.000956	15	
BO.RENT	116.94	0.857135	17.27991	0.233998	16	
EQ.RENT	0	0	0	0	17	
TOTAL	529.19	3.878804	69.38676	0.773619		

TOTAL EXPENDITURES FOR ALL MODES: 162.3427 MILLION

TOTAL EMPLOYMENT FOR ALL MODES: 3053.821

TOTAL WAGES FOR ALL MODES: 36.07185 MILLION

TOTAL BOATING DAYS FOR ALL MODES 1.5801 MILLION

OKALOO BOATER SPENDING;WAGES;JOBS;DAYS;VISITS BY MODE-FISHING ONLY

MULTIPLIER=(TBDO/SPO)*%F*%T*%R 0.075302 VISITORS

OWN BOAT MODE SCENARIO (O) REEF%= 0.5802

CATEG	$EPPD	$EXPEND MILLIONS	$S/E MILLIONS	EMPLOY	%WAGE	$WAGES MILLIONS	SIC DESIGN	OTHER TBDO=
B.FUEL	71.97	5.41947	0.18258	29.68271	0.056	0.30349	554	0.320786
TACKLE	35.52	2.67472	0.093923	28.47779	0.138	0.369111	5941	MILLION
BAIT	14.61	1.100159	0.09323	11.80048	0.138	0.151822	5941	
ICE	9.04	0.680728	0.126908	5.36395	0.087	0.059223	54	VO=
RAM FEE	1.22	0.091868	0.049603	1.852069	0.273	0.02508	79	TBDO/
LODG	25.31	1.905888	0.044474	42.85399	0.283	0.539366	70	LSO
CAM FEE	0.85	0.064007	0.079989	0	0.186	0.011905	703	0.320786
F. STORE	52.32	3.93979	0.126908	31.04445	0.087	0.342762	54	4.3=
F.PREP	90.7	6.829872	0.030703	222.4497	0.275	1.878215	58	0.074601
A.GAS	16.69	1.256787	0.18258	6.883486	0.056	0.07038	554	MILLION
BO RENT	0	0	0.049603	0	0.273	0	79	
EQ.RENT	3.74	0	0.049603	0	0.273	0	79	
TOTAL	321.97	23.96329		380.4086		3.751355		

MULTIPLIER=(TBDC/SPC)*%F*%T*%R 0.106568 VISITORS

CHARTER BOAT MODE SCENARIO RIO (C) REEF%= 0.43

CATEG	$EPPD	$EXPEND MILLIONS	EMPLOY	$WAGES MILLIIONS		OTHER TBDC=
B.FUEL	0	0	0	0	6	0.523249
TACKLE	0	0	0	0	7	MILLION
BAIT	0	0	0	0	8	
ICE	0	0	0	0	9	VC=
RAM FEE	0	0	0	0	10	TBDC/
LODG	174.46	18.59184	418.0385	5.261492	11	LSC
CAM FEE	1.82	0.193954	2.424754	0.036075	12	0.523249
F. STORE	55.91	5.958214	46.94908	0.518365	13	5=
F.PREP	83.82	8.932525	290.9333	2.456444	14	0.10465
A.GAS	23.34	2.487296	13.62305	0.139289	15	MILLION
BO.RENT	467.25	49.79387	1003.848	13.59373	16	
EQ.RENT	8.64	0.920747	18.56233	0.251364	17	
TOTAL	815.24	86.87845	1794.379	22.25676		

MULTIPLIER=(TBDP/SPP)*%F*%T*%R 0.00537 VISITORS

PARTYBOAT MODE SCENARIO (P) REEF%= 0.5 OTHER

CATEG	$EPPD	$EXPEND MILLIONS	EMPLOY	$WAGES MILLIIONS		TBDP=
B.FUEL	0	0	0	0	6	0.0174
TACKLE	0	0	0	0	7	MILLION
BAIT	0	0	0	0	8	
ICE	0	0	0	0	9	VP=
RAM FEE	0	0	0	0	10	TBDP/
LODG	125.8	0.675593	15.19073	0.191193	11	LSP
CAM FEE	0.66	0.003544	0.044312	0.000659	12	.0174/
F.STORE	26.84	0.144141	1.135789	0.01254	13	5=
F.PREP	70.26	0.377322	12.28943	0.103764	14	0.00348
A.GAS	11.35	0.060954	0.333847	0.003413	15	MILLION
BO.RENT	115.97	0.622802	12.55573	0.170025	16	
EQ.RENT	0.66	0.003544	0.071456	0.000968	17	
TOTAL	351.54	1.8879	41.62129	0.482562		

MULTIPLIER:(TBDR/SPR)*%F*%T*%R 0.001667 VISITORS

PRIVATE RENTAL MODE SCENARIO (PR) REEF%= 0.3158 OTHER

CATEG	$EPPD	$EXPEND	EMPLOY	$WAGES			
B.FUEL	96.67	0.16111	0.882408	0.009022	6		TBDR=
TACKLE	25	0.041665	0.443608	0.00575	7		0.006116
BAIT	20.83	0.034715	0.372361	0.004791	8		MILLION
ICE	10.17	0.016949	0.133556	0.001475	9		VR=
RAM FEE	0	0	0	0	10		TBDR/
LODG	97.25	0.162077	3.644301	0.045868	11		LSR
CAM FEE	0	0	0	0	12		0.006116
F.STORE	56.67	0.094446	0.744209	0.008217	13		3.0=
F.PREP	103.33	0.17221	5.608884	0.047358	14		0.002039
A.GAS	2.33	0.003883	0.021268	0.000217	15		
BO.RENT	116.94	0.194892	3.929036	0.053206	16		
EQ.RENT	0	0	0	0	17		
TOTAL	529.19	0.881947	15.77963	0.175902			

	FISHING	DIVING
TOTAL EXPENDITURES FOR ALL MODES:	113.6116	2.619146
	$MILLION	$MILLION
TOTAL EMPLOYMENT FOR ALL MODES:	2232.188	45.56952
TOTAL WAGES FOR ALL MODES:	26.66657	0.490555
	$MILLION	$MILLION
TOTAL BOATING DAYS FOR ALL MODES	0.867551	0.03463
	MILLION	MILLION
TOTAL PERSON VISITS FOR ALL MODES	0.18477	0.007523

GRAND TOTAL: FISHING AND DIVING

TOTAL EXPENDITURES FOR ALL MODES:	116.2307
	$MILLION
TOTAL EMPLYMENT FOR ALL MODES:	2277.758
TOTAL WAGES FOR ALL MODES:	27.15713
	$MILLION
TOTAL BOATING DAYS FOR ALL MODES:	0.902181
	MILLLION
TOTAL PERSON VISITS FOR ALL MODES:	0.192293

OKALOO BOATER SPENDING;WAGES;JOBS;DAYS;VISITS BY MODE-DIVING ONLY

M=[(TBDO/SPO)*.10*.25*.9556] 0.005396 VISITORS

OWN BOAT MODE SCENARIO (O) REEF%= 0.9556

CATEG	$EPPD	$EXPEND MILLIONS	$S/E MILLIONS	EMPLOY	%WAGE	$WAGES MILLIONS	SIC DESIGN	OTHER TBDO=
B.FUEL	78.75	0.424906	0.18258	2.32723	0.056	0.023795	554	0.018345
AIR REF	27.5	0.14838	0.093923	1.579802	0.138	0.020476	5941	MILLION
BAIT	0	0	0.09323	0	0.138	0	5941	
ICE	7.5	0.040467	0.126908	0.31887	0.087	0.003521	54	VO=
RAM FEE	7.5	0.040467	0.049603	0.815822	0.273	0.011048	79	TBDO/
LODG	35	0.188847	0.044474	4.246232	0.283	0.053444	70	LSO
CAM FEE	0	0	0.079989	0	0.186	0	703	.018345/
F. STORE	52.5	0.28327	0.126908	2.232093	0.087	0.024645	54	4.3=
F.PREP	62.5	0.337227	0.030703	10.98351	0.275	0.092737	58	0.004266
A.GAS	17.5	0.094423	0.18258	0.517162	0.056	0.005288	554	MILLION
BO RENT	0	0	0.049603	0	0.273	0	79	
EQ.RENT	12.5	0	0.049603	0	0.273	0	79	
TOTAL	301.25	1.557987		23.02072		0.234953		

M=[(TBDC/SPC)*.17*.25*.5]+[(TBDR/SPR)*.1*.25*.5]= 0.003428 VISITORS

CHARTER BOAT/OTHER RENTAL MODE SCENARIO REEF%= 0.5

CATEG	$EPPD	$EXPEND MILLIONS	EMPLOY	$WAGES MILLIIONS		OTHER TBDC=
B.FUEL	0	0	0	0	6	0.016284
AIR REF	26	0	0	0	7	MILLION
BAIT	0	0	0	0	8	
ICE	0	0	0	0	9	VC=
RAM FEE	0	0	0	0	10	TBDC/
LODG	113.94	0.390619	8.783094	0.110545	11	LSC
CAM FEE	0	0	0	0	12	.016284/
F. STORE	26.38	0.090438	0.712629	0.007868	13	5=
F.PREP	66.33	0.227398	7.406392	0.062535	14	0.003257
A.GAS	29.08	0.099695	0.546033	0.005583	15	MILLION
BO.RENT	73.8	0.253008	5.100654	0.069071	16	
EQ.RENT	0	0	0	0	17	
TOTAL	335.53	1.061158	22.5488	0.255602		

MULTIPLIER=(TBDC/SPC)*%D*%T OR (.0348/3.4)*0*0 0

PARTYBOAT MODE SCENARIO (P) VISITORS

CATEG	$EPPD	$EXPEND	EMPLOY	$WAGES		OTHER TBDP=
B.FUEL	0	0	0	0	6	0
TACKLE	0	0	0	0	7	MILLION
BAIT	0	0	0	0	8	
ICE	0	0	0	0	9	VP=
RAM FEE	0	0	0	0	10	TBDP/
LODG	0	0	0	0	11	LSP
CAM FEE	0	0	0	0	12	0/
F.STORE	0	0	0	0	13	5=
F.PREP	0	0	0	0	14	0
A.GAS	0	0	0	0	15	MILLION
BO.RENT	0	0	0	0	16	
EQ.RENT	0.00	0	0	0	17	
TOTAL	0	0	0	0		

MULTIPLIER=(TBDR/SPR)*%D*%T OR (.0269/3)*.1*.25= 0.0006 VISITORS

PRIVATE RENTAL MODE SCENARIO (PR) REEF%= 0.263 OTHER

CATEG	$EPPD	$EXPEND	EMPLOY	$WAGES			TBDR=
B.FUEL	0	0	0	0	6		0
AIR REF	0	0	0	0	7		MILLION
BAIT	0	0	0	0	8		
ICE	0	0	0	0	9		VR=
RAM FEE	0	0	0	0	10		TBDR/
LODG	0	0	0	0	11		LSR
CAM FEE	0	0	0	0	12		.00017/
F.STORE	0	0	0	0	13		3.0=
F.PREP	0	0	0	0	14		0
A.GAS	0	0	0	0	15		
BO.RENT	0	0	0	0	16		
EQ.RENT	0	0	0	0	17		
TOTAL	0	0	0	0			

DIVING

TOTAL EXPENDITURES FOR ALL MODES: 2.619146

$MILLION

TOTAL EMPLOYMENT FOR ALL MODES: 45.56952

TOTAL WAGES FOR ALL MODES: 0.490555

$MILLION

TOTAL BOATING DAYS FOR ALL MODES 0.03463

MILLION

TOTAL PERSON VISITS FOR ALL MODES 0.007523

OKALOO RESIDENT-SPENDING;WAGES; JOBS AND DAYS-FISHING ONLY 1998

SIZE CLASS 1 (UNDER 16 FT) BT.REG* %RES= 7734 0.8691 6721.619

PARTY DAYS:RESBT*FDPBPY= 0.006722 8.75 0.058818 2.75 0.161748

CATEG	$EPPD	$EXPEND MILLIONS	$S/E MILLIONS	EMPLOY	%WAGE	$WAGE MILLIONS	P.SIZE SIC	MILLIONS PERSON DAYS
B.FUEL	13.75	0.808741	0.18258	4.429514	0.056	0.045289	554	
TACKLE	3.75	0.220566	0.093923	2.348366	0.138	0.030438	5941	
BAIT	6.25	0.367609	0.093923	3.913944	0.138	0.05073	5941	
ICE	2.25	0.132339	0.126908	1.042798	0.087	0.011514	54	
RAM FEE	1.25	0.073522	0.049603	1.482206	0.273	0.020071	79	
LODG	0	0	0.044474	0	0.283	0	70	
CAM FEE	0	0	0.079989	0	0.186	0	703	
F.STORE	8.75	0.514653	0.126908	4.055325	0.087	0.044775	54	
F.PREP	7.5	0.441131	0.030703	14.36769	0.275	0.121311	58	
A.GAS	7.75	0.455836	0.18258	2.496635	0.056	0.024703	554	
BT SLIP	0	0	0.049603	0	0.273	0	79	
EQ.RENT	0	0	0.049603	0	0.273	0	79	
TOTAL	51.25	3.014397		34.13648		0.348832		

SIZE CLASS 2(16' TO 39'11'') BT.REG*%RES= 8003 0.7722 6179.917

PARTY DAYS:RESBT*FDPBPY= 0.00618 15.78 0.09752 2.24 0.043536

CATEG	$EPPD	$EXPEND MILLIONS	$S/E MILLIONS	EMPLOY	%WAGE	$WAGE MILLIONS	P. SIZE	MILLIONS PERSON DAYS
B.FUEL	45.09	4.397195	0.18258	24.08366	0.056	0.246243		
TACKLE	8.87	0.865006	0.093923	9.209735	0.138	0.119371		
BAIT	14.27	1.391616	0.093923	14.81656	0.138	0.192043		
ICE	2.36	0.230148	0.126908	1.813504	0.087	0.020023		
RAM FEE	0.91	0.088744	0.049603	1.789077	0.273	0.024227		
LODG	0	0	0.044474	0	0.283	0		
CAM FEE	0	0	0.079989	0	0.186	0		
F.STORE	11.56	1.127336	0.126908	8.883095	0.087	0.098078		
F.PREP	4.57	0.445668	0.18258	2.440948	0.275	0.122559		
A.GAS	2.96	0.28866	0.200065	1.442833	0.056	0.016165		
BT SLIP	7.33	0.714825	0.049603	14.41091	0.273	0.195147		
EQ.RENT	0	0	0.049603	0	0.273	0		
TOTAL	97.92	9.549198		78.89033		1.033856		

SIZE CLASS 3(OVER 39') BT.REG*%RES= 130 0.6399 83.187

PARTY DAYS:RESBT*FDPBPY= 0.000084 63.5 0.005334 3 0.016002

CATE	$EPPD	$EXPEND	$S/E	EMPLOY	%WAGE	$WAGE
B.FUEL	36.67	0.195598	0.18258	1.071299	0.056	0.010953
TACKLE	8.33	0.044432	0.093923	0.473071	0.138	0.006132
BAIT	10	0.05334	0.093923	0.567912	0.138	0.007361
ICE	6.67	0.035578	0.126908	0.280343	0.087	0.003095
RAM FEE	0	0	0.049603	0	0.273	0
LODG	0	0	0.044474	0	0.283	0
CAM FEE	0	0	0.079989	0	0.186	0
F.STORE	3.33	0.017762	0.126908	0.139961	0.087	0.001545
F.PREP	0	0	0.200065	0	0.275	0
A.GAS	2.33	0.012428	0.200065	0.062121	0.056	0.000696
BT SLIP	20	0.10668	0.049603	2.150676	0.273	0.029124
EQ.RENT	0	0	0.049603	0	0.273	0
TOTAL	87.33	0.465818		4.745384		0.058906

RESIDENT RENTALS(CHARTER;PARTY AND OTHER

TOTAL EXPEND = ($VISITOR EXPEND/%VISIT)*%RES

	$MILL	$MILL		$MILL	
	12.43233	76.37	0.86	88.80233	0.14

TOTAL EMPLOYMENT = TOTAL EXPEND/($S/E)

		$MILL
252.177	12.43233	0.0493

TOTAL WAGES=%WAGES*TOTAL EXPEND

$MILL	%	$MILL
3.108081	0.25	12.43233

TOTAL DAYS = (VISITORS DAYS/%VIS)*%RES

	MILL	MILL			
	0.089942	0.5525	0.86	0.642442	0.14

	CLASS 1	CLASS 2	CLASS 3	RENTAL	TOTAL
	$MILL	$MILL	$MILL	$MILL	$MILL
$EXPEND	3.014397	9.549198	0.465818	12.43233	25.46174
EMPLOY	34.13648	78.89033	4.745384	252.177	369.9492
	$MILL	$MILL	$MILL	$MILL	$MILL
$WAGES	0.348832	1.033856	0.058906	3.108081	4.549675
	MILL	MILL	MILL	MILL	MILL
PERSON DAYS	0.161748	0.043536	0.016002	0.089942	0.311228

TOTAL EXPEND;EMPLOY;WAGES AND DAYS FOR THOSE
USING ARTIFICIAL REEFS-FISHING ONLY

CATEG	VALUE	%ART.R	EQUALS	$SP.A.R.
$SPEND	25.46174	0.36		9.166226
	$MILL			
EMPLOY	369.9492	0.36		133.1817
$WAGES	4.549675	0.36		1.637883
	$MILL			
DAYS	0.311228	0.36		0.112042
	MILL			

TOTAL EXPEND;EMPLOY;WAGES AND DAYS FOR THOSE
USING ARTIFICIAL REEFS-DIVING PLUS FISHING

CATEG	VALUE	DAYS DIV/FISH	AMT.DIV	AMT.FISH	TOTAL
$EXPEND	9.166226	0.059	0.540807	9.166226	9.707033
	$MILL		$MILL	$MILL	$MILL
EMPLOY	133.1817	0.059	7.857721	133.1817	141.0394
$WAGES	1.637883	0.059	0.096635	1.637883	1.734518
	$MIL		MILL	MILL	MILL
DAYS	0.112042	0.059	0.00661	0.112042	0.118653
	MILL		MILL	MILL	MILL

Appendix D: Spreadsheets for Visitors and Residents In Santa Rosa County

1998 SANTA ROSA VISITOR ANALYSES

HOTEL AND MOTEL CATEGORY

MULTIPLIER: VISITS*(LS/SP) = .348674(3.71/4.07) 0.317833 MILLIONS VISITORS 348674
304041(2.02/2.37)=

CATEG	$EPPD	$EXPEND MILLIONS	$S/E MILLIONS	EMPLOY	%WAGES	$WAGES MILLIONS
LODG	74.64	23.72306	0.029649	800.13	0.325	7.709993
PRE.FD	58.11	18.46928	0.031757	581.5812	0.238	4.395688
NPR.FD	50	15.89165	0.128146	124.0121	0.083	1.319007
SP.FEES	13	4.131829	0.047603	86.79766	0.273	1.127989
EV.FEES	0.45	0.143025	0.047603	3.004534	0.273	0.039046
ATT.ADM	2.5	0.794583	0.047603	16.69186	0.273	0.216921
EV.ENT	8.21	2.609409	0.047603	54.81606	0.273	0.712369
GD.TRAN	10.11	3.213292	0.1438	22.34556	0.1	0.321329
SHOP	50	15.89165	0.086375	183.9844	0.174	2.765147
OTHER	3.13	0.994817	0.086375	11.51742	0.174	0.173098
TOTAL	270.15	85.86258		1884.881		18.78059

OTHER CATEGORY

MULTIPLIER:VISITS*(LS/SP)= .698395(5/5.3)= 0.658863 MILLION VISITORS 698395

CATEG	$EPPD	$EXPEND MILLIONS	$S/E MILLIONS	EMPLOY	%WAGES	$WAGES MILLIONS
LODG	96.7	63.71207	0.029649	2148.878	0.325	20.70642
PRE.FD	58.11	38.28654	0.031757	1205.609	0.238	9.112197
NPR.FD	50	32.94316	0.128146	257.0752	0.083	2.734282
SP.FEES	13	8.565222	0.047603	179.9303	0.273	2.338305
EV.FEES	0.45	0.296488	0.047603	6.228356	0.273	0.080941
ATT.ADM	2.5	1.647158	0.047603	34.60198	0.273	0.449674
EV.ENT	8.21	5.409267	0.047603	113.6329	0.273	1.47673
GD.TRAN	10.11	6.661107	0.1438	46.32202	0.1	0.666111
SHOP	89.35	58.86943	0.086375	681.5563	0.174	10.24328
OTHER	2.13	1.403379	0.086375	16.24751	0.174	0.244188
TOTAL	330.56	217.7938		4690.082		48.05213

CATEG	$EXPEND MILLIONS	EMPLOY	%WAGES MILLIONS	TOTAL VISITORS	1047069
LODG	87.43513	2949.008	28.41642	7	24
PRE.FD.	56.75582	1787.191	13.50788	8	25
NPR.FD.	48.83481	381.0873	4.053289	9	26
SP.FEES	12.69705	266.7279	3.466295	10	27
EV.FEES	0.439513	9.232891	0.119987	11	28
ATT.ADM	2.441741	51.29384	0.666595	12	29
EV.ENT	8.018676	168.449	2.189098	13	30
GD.TRAN	9.874399	68.66758	0.98744	14	31
SHOP	74.76108	865.5407	13.00843	15	32
OTHER	2.398196	27.76493	0.417286	16	33
TOTAL	303.6564	6574.962	66.83272	17	34

S.ROSA BOATERS SPENDING; WAGES AND EMPLOYMENT BY MODE

MULTIPLIER= TBDO/SPO= .1334/4.22= 0.0316

OWN BOAT MODE SCENARIO (O)

CATEG	$EPPD	$EXPEND MILLIONS	$S/E MILLIONS	EMPLOY	%WAGE	$WAGES MILLIONS	SIC DESIGN	TBDO=
B.FUEL	58.8	1.85808	0.173144	10.73141	0.054	0.100336	554	0.1334
TACKLE	11.67	0.368772	0.121176	3.043276	0.121	0.044621	5941	MILLION
BAIT	7.22	0.228152	0.121176	1.882815	0.121	0.027606	5941	
ICE	12.78	0.403848	0.126872	3.183114	0.083	0.033519	54	
RAM FEE	0.11	0.003476	0.046118	0.075372	0.306	0.001064	79	
LODG	13.89	0.438924	0.029649	14.80401	0.325	0.14265	70	
CAM FEE	5.56	0.175696	0.079989	0	0.186	0.032679	703	
F. STORE	45.56	1.439696	0.126872	11.34763	0.083	0.119495	54	
F.PREP	100	3.16	0.031757	99.50562	0.238	0.75208	58	
A.GAS	22.22	0.702152	0.173144	4.055307	0.054	0.037916	554	
BO RENT	0	0	0.046118	0	0.306	0	79	
EQ.RENT	22.22	0	0.046118	0	0.306	0	79	
TOTAL	300.03	8.778796		148.6286		1.291968		

MULTIPLIER=TBDC/SPC= .1082/4.83= 0.0224

CHARTER BOAT MODE SCENARIO RIO (C)

CATEG	$EPPD	$EXPEND MILLIONS	EMPLOY	$WAGES MILLIIONS		TBDC=
B.FUEL	0	0	0	0	6	0.1082
TACKLE	0	0	0	0	7	MILLION
BAIT	0	0	0	0	8	
ICE	0	0	0	0	9	
RAM FEE	0	0	0	0	10	
LODG	75	1.68	56.66296	0.546	11	
CAM FEE	0	0	0	0	12	
F. STORE	50	1.12	8.827795	0.09296	13	
F.PREP	116.67	2.613408	82.29392	0.621991	14	
A.GAS	21.67	0.485408	2.803493	0.026212	15	
BO.RENT	391.67	8.773408	190.2383	2.684663	16	
EQ.RENT	0	0	0	0	17	
TOTAL	655.01	14.67222	340.8264	3.971826		

MULTIPLIER=TBDP/SPP= .0334/3.81= 0.0088

PARTYBOAT MODE SCENARIO (P)

CATEG	$EPPD	$EXPEND	EMPLOY	$WAGES		TBDP=
B.FUEL	0	0	0	0	6	0.0334
TACKLE	0	0	0	0	7	MILLION
BAIT	0	0	0	0	8	
ICE	0	0	0	0	9	
RAM FEE	0	0	0	0	10	
LODG	96.7	0.85096	28.70114	0.276562	11	
CAM FEE	0	0	0	0	12	
F.STORE	25	0.22	1.734031	0.01826	13	
F.PREP	60	0.528	16.62626	0.125664	14	
A.GAS	5	0.044	0.254124	0.002376	15	
BO.RENT	150.22	1.321936	28.66421	0.404512	16	
EQ.RENT	0.00	0	0	0	17	
TOTAL	336.92	2.964896	75.97976	0.827374		

MULTIPLIER=TBDR/SPR= .0053/3.0 0.0018
=

PRIVATE RENTAL MODE SCENARIO (PR)

CATEG	$EPPD	$EXPEND	EMPLOY	$WAGES		TBDP=
B.FUEL	100	0.18	1.039597	0.00972	6	0.0053
TACKLE	35	0.063	0.519905	0.007623	7	MILLION
BAIT	30	0.054	0.445633	0.006534	8	
ICE	10	0.018	0.141875	0.001494	9	
RAM FEE	0	0	0	0	10	
LODG	90	0.162	5.463928	0.05265	11	
CAM FEE	0	0	0	0	12	
F.STORE	100	0.18	1.418753	0.01494	13	
F.PREP	125	0.225	7.085052	0.05355	14	
A.GAS	10	0.018	0.10396	0.000972	15	
BO.RENT	45	0.081	1.756364	0.024786	16	
EQ.RENT	0	0	0	0	17	
TOTAL	545	0.981	17.97507	0.172269		

TOTAL EXPENDITURES FOR ALL MODES: 27.39692
MILLION

TOTAL EMPLOYMENT FOR ALL MODES: 583.4098

TOTAL WAGES FOR ALL MODES: 6.263437
MILLION

TOTAL BOATING DAYS FOR ALL MODES 0.2803
MILLION

S.ROSA BOATER SPENDING;WAGES;JOBS;DAYS; VISITS BY MODE- FISHING ONLY

MULTIPLIER=(TBDO/SPO)*%F*%T*%R %T OR (.1334/4.24)*.9*.8= 0.013081 VISITORS

OWN BOAT MODE SCENARIO (O) REEF%= 0.5802

CATEG	$EPPD	$EXPEND MILLIONS	$S/E MILLIONS	EMPLOY	%WAGE	$WAGES MILLIONS	SIC DESIGN	OTHER TBDO=
B.FUEL	71.97	0.941473	0.173144	5.437515	0.054	0.05084	554	0.055727
TACKLE	35.52	0.464654	0.121176	3.834536	0.121	0.056223	5941	MILLION
BAIT	14.61	0.19112	0.121176	1.577212	0.121	0.023126	5941	
ICE	9.04	0.118256	0.126872	0.932093	0.083	0.009815	54	VO=
RAM FEE	1.22	0.015959	0.046118	0.346056	0.306	0.004884	79	TBDO/
LODG	25.31	0.331092	0.029649	11.16705	0.325	0.107605	70	LSO
CAM FEE	0.85	0.011119	0.079989	0	0.186	0.002068	703	0.055727
F. STORE	52.32	0.684422	0.126872	5.394589	0.083	0.056807	54	5.13=
F.PREP	90.7	1.186489	0.031757	37.3615	0.238	0.282384	58	0.010863
A.GAS	16.69	0.21833	0.173144	1.260972	0.054	0.01179	554	MILLION
BO RENT	0	0	0.046118	0	0.306	0	79	
EQ.RENT	3.74	0	0.046118	0	0.306	0	79	
TOTAL	321.97	4.162915		67.31152		0.605541		

MULTIPLIER=(TBDC/SPC)*%F*%T*%R 0.019027 VISITORS

CHARTER BOAT MODE SCENARIO RIO (C) REEF%= 1

CATEG	$EPPD	$EXPEND MILLIONS	EMPLOY	$WAGES MILLIIONS		OTHER TBDC=
B.FUEL	0	0	0	0	6	0.089806
TACKLE	0	0	0	0	7	MILLION
BAIT	0	0	0	0	8	
ICE	0	0	0	0	9	VC=
RAM FEE	0	0	0	0	10	TBDC/
LODG	140.31	2.669636	90.04134	0.867632	11	LSC
CAM FEE	0.92	0.017505	0.218837	0.003256	12	0.089806
F. STORE	44.81	0.852586	6.72005	0.070765	13	4.5=
F.PREP	91.22	1.735615	54.65299	0.413076	14	0.019957
A.GAS	27.63	0.525708	3.036245	0.028388	15	MILLION
BO.RENT	442.04	8.41056	182.3704	2.573631	16	
EQ.RENT	9.55	0.181705	3.94	0.055602	17	
TOTAL	756.48	14.39331	340.9799	4.01235		

MULTIPLIER=(TBDP/SPP)*%F*%T*%R 0.005154 VISITORS

PARTYBOAT MODE SCENARIO (P) REEF%= 0.5 OTHER

CATEG	$EPPD	$EXPEND MILLIONS	EMPLOY	$WAGES		TBDP=
B.FUEL	0	0	0	0	6	0.0167
TACKLE	0	0	0	0	7	MILLION
BAIT	0	0	0	0	8	
ICE	0	0	0	0	9	VP=
RAM FEE	0	0	0	0	10	TBDP/
LODG	125.8	0.648414	21.86966	0.210734	11	LSP
CAM FEE	0.66	0.003402	0.042529	0.000633	12	0.0167
F.STORE	26.84	0.138342	1.090406	0.011482	13	5.45=
F.PREP	70.26	0.362143	11.40355	0.08619	14	0.003064
A.GAS	11.35	0.058502	0.337878	0.003159	15	MILLION
BO.RENT	115.97	0.597747	12.96124	0.18291	16	
EQ.RENT	0.66	0.003402	0.073764	0.001041	17	
TOTAL	351.54	1.81195	47.77903	0.49615		

MULTIPLIER=(TBDR/SPR)*%F*%T*%R 0.000328 VISITORS

PRIVATE RENTAL MODE SCENARIO (PR) REEF%= 0.3158 OTHER

CATEG	$EPPD	$EXPEND	EMPLOY	$WAGES			TBDR=
B.FUEL	96.67	0.031743	0.183332	0.001714	6		0.001205
TACKLE	25	0.008209	0.067745	0.000993	7		MILLION
BAIT	20.83	0.00684	0.056445	0.000828	8		
ICE	10.17	0.003339	0.026321	0.000277	9		VR=
RAM FEE	0	0	0	0	10		TBDR/
LODG	97.25	0.031933	1.077045	0.010378	11		LSR
CAM FEE	0	0	0	0	12		.001205/
F.STORE	56.67	0.018608	0.14667	0.001544	13		5=
F.PREP	103.33	0.03393	1.068418	0.008075	14		0.000241
A.GAS	2.33	0.000765	0.004419	4.13E-05	15		MILLION
BO.RENT	116.94	0.038399	0.83262	0.01175	16		
EQ.RENT	0	0	0	0	17		
TOTAL	529.19	0.173767	3.463017	0.035602			

	FISHING	DIVING
TOTAL EXPENDITURES FOR ALL MODES:	20.54195	0.4248
	$MILLION	$MILLION
TOTAL EMPLOYMENT FOR ALL MODES:	459.5335	8.21879
TOTAL WAGES FOR ALL MODES:	5.149643	0.078836
	$MILLION	$MILLION
TOTAL BOATING DAYS FOR ALL MODES	0.163438	0.005552
	MILLION	MILLION
TOTAL PERSON VISITS FOR ALL MODES	0.034125	0.001147
	MILLION	MILLION

GRAND TOTAL:FISHING AND DIVING

	TOTAL
TOTAL EXPENDITURES FOR ALL MODES:	20.96675
	$MILLION
TOTAL EMPLOYMENT FOR ALL MODES:	467.7523
TOTAL WAGES FOR ALL MODES:	5.228479
	$MILLION
TOTAL BOATING DAYS FOR ALL MODES:	0.16899
	MILLION
TOTAL PERSON VISITS FOR ALL MODES:	0.035272
	MILLION

S.ROSA BOATER SPENDING;WAGES;JOBS;DAYS;VISITS BY MODE-DIVING ONLY

MULTIPLIER=(TBDO/SPO)*%D*%T*%R= 0.000937 VISITORS

OWN BOAT MODE SCENARIO (O) REEF%= 0.9556

CATEG	$EPPD	$EXPEND MILLIONS	$S/E MILLIONS	EMPLOY	%WAGE	$WAGES MILLIONS	SIC DESIGN	OTHER TBDO=
B.FUEL	78.75	0.073815	0.173144	0.42632	0.054	0.003986	554	0.003187
AIR REF	27.5	0.025777	0.121176	0.21272	0.121	0.003119	5941	MILLION
BAIT	0	0	0.121176	0	0.121	0	5941	
ICE	7.5	0.00703	0.126872	0.05541	0.083	0.000583	54	VO=
RAM FEE	7.5	0.00703	0.046118	0.152435	0.306	0.002151	79	TBDO/
LODG	35	0.032807	0.029649	1.106499	0.325	0.010662	70	LSO
CAM FEE	0	0	0.079989	0	0.186	0	703	.003187/
F. STORE	52.5	0.04921	0.126872	0.38787	0.083	0.004084	54	5.13=
F.PREP	62.5	0.058583	0.031757	1.844733	0.238	0.013943	58	0.000621
A.GAS	17.5	0.016403	0.173144	0.094738	0.054	0.000886	554	MILLION
BO RENT	0	0	0.046118	0	0.306	0	79	
EQ.RENT	12.5	0	0.046118	0	0.306	0	79	
TOTAL	301.25	0.270654		4.280726		0.039415		

M=((TBDC/SPC)*.17*.25*.5)+((TBDR/SPR)*.1*.25*.5)= 0.000498

CHARTER BOAT/OTHER RENTAL MODE SCENARIO REEF%= 0.5 VISITORS

CATEG	$EPPD	$EXPEND MILLIONS	EMPLOY	$WAGES MILLIIONS		OTHER TBDC=
B.FUEL	0	0	0	0	6	0.002366
AIR REF	0	0	0	0	7	MILLION
BAIT	0	0	0	0	8	
ICE	0	0	0	0	9	VC=
RAM FEE	0	0	0	0	10	TBDC/
LODG	113.94	0.056742	1.913795	0.018441	11	LSC
CAM FEE	0	0	0	0	12	.002366/
F. STORE	26.38	0.013137	0.103547	0.00109	13	4.5=
F.PREP	66.33	0.033032	1.040159	0.007862	14	0.000526
A.GAS	29.08	0.014482	0.08364	0.000782	15	MILLION
BO.RENT	73.8	0.036752	0.796921	0.011246	16	
EQ.RENT	0	0	0	0	17	
TOTAL	309.53	0.154146	3.938063	0.039422		

MULTIPLIER=(TBDP/SPP)*%D*%T OR (.0334/3.81)*0*0= 0

PARTYBOAT MODE SCENARIO (P) VISITORS

CATEG	$EPPD	$EXPEND	EMPLOY	$WAGES		OTHER TBDP=
B.FUEL	0	0	0	0	6	0
AIR REF	0	0	0	0	7	MILLION
BAIT	0	0	0	0	8	
ICE	0	0	0	0	9	VP=
RAM FEE	0	0	0	0	10	TBDP/
LODG	0	0	0	0	11	LSP
CAM FEE	0	0	0	0	12	0/
F.STORE	0	0	0	0	13	5.45=
F.PREP	0	0	0	0	14	0
A.GAS	0	0	0	0	15	MILLION
BO.RENT	0	0	0	0	16	
EQ.RENT	0.00	0	0	0	17	
TOTAL	0	0	0	0		

```
MULTIPLIER=(TBDR/SPR)*%D*%T OR (.0053/3.0)*.1*.25=                0.000009          VISITORS
          PRIVATE RENTAL MODE SCENARIO              (PR)         1.19E-05     0.263 OTHER
CATEG     $EPPD      $EXPEND    EMPLOY     $WAGES                                    TBDR=
B.FUEL             0          0          0          0          6                             0
AIR REF            0          0          0          0          7                     MILLION
BAIT               0          0          0          0          8
ICE                0          0          0          0          9                     VR=
RAM FEE            0          0          0          0         10                     TBDR/
LODG               0          0          0          0         11                     LSR
CAM FEE            0          0          0          0         12                     .00035/
F.STORE            0          0          0          0         13                     5=
F.PREP             0          0          0          0         14                             0
A.GAS              0          0          0          0         15                     MILLION
BO.RENT            0          0          0          0         16
EQ.RENT            0          0          0          0         17
TOTAL              0          0          0          0

TOTAL EXPENDITURES FOR ALL MODES:                       0.4248
                                                     $MILLION
TOTAL EMPLOYMENT FOR ALL MODES:                       8.21879

TOTAL WAGES FOR ALL MODES:                           0.078836
                                                     $MILLION
TOTAL BOATING DAYS FOR ALL MODES                     0.005552
                                                     MILLION
TOTAL PERSON VISITS FOR ALL MODES                    0.001147
                                                     MILLION
```

S.ROSA RESIDENT-SPENDING;WAGES; JOBS AND DAYS-FISHING ONLY 1998

SIZE CLASS 1 (UNDER 16 FT) BT.REG* %RES= 5563 0.914 5084.582

PARTY DAYS:RESBT*FDPBPY= 0.005085 15 0.076275 2 0.15255

CATEG	$EPPD	$EXPEND MILLIONS	$S/E MILLIONS	EMPLOY	%WAGE	$WAGE MILLIONS	P. SIZE SIZE	MILLIONS PERSON DAYS
B.FUEL	24.86	1.896197	0.173144	10.95156	0.054	0.102394611	554	
TACKLE	9.29	0.708595	0.121176	5.847649	0.121	0.085739965	5941	
BAIT	5.93	0.452311	0.121176	3.732676	0.121	0.054729601	5941	
ICE	2.5	0.190688	0.126872	1.502991	0.083	0.015827063	54	
RAM FEE	0.71	0.054155	0.046118	1.174276	0.306	0.016571507	79	
LODG	0	0	0.029649	0	0.325	0	70	
CAM FEE	0	0	0.079989	0	0.186	0	703	
F.STORE	10.43	0.795548	0.126872	6.270479	0.083	0.066030505	54	
F.PREP	2.15	0.163991	0.031757	5.16394	0.238	0.039029918	58	
A.GAS	6.29	0.47977	0.173144	2.770929	0.054	0.025907567	554	
BO.RENT	0	0	0.046118	0	0.306	0	79	
EQ.RENT	0.71	0.054155	0.046118	1.174276	0.306	0.016571507	79	
TOTAL	62.87	4.795409		38.58877		0.422802241		

SIZE CLASS 2(16' TO 39'11'') BT.REG*%RES= 3871 0.8755 3389.061

PARTY DAYS:RESBT*FDPBPY= 0.00339 24.49 0.0830211 3.83 0.317971

CATEG	$EPPD	$EXPEND MILLIONS	$S/E MILLIONS	EMPLOY	%WAGE	$WAGE MILLIONS	P. SIZE	MILLIONS PERSON DAYS
B.FUEL	64.25	5.334106	0.173144	30.80734	0.054	0.288041706		
TACKLE	3.5	0.290574	0.121176	2.397949	0.121	0.035159436		
BAIT	13.75	1.14154	0.121176	9.420513	0.121	0.138126355		
ICE	5	0.415106	0.126872	3.271845	0.083	0.034453757		
RAM FEE	0	0	0.046118	0	0.306	0		
LODG	0	0	0.029649	0	0.325	0		
CAM FEE	0	0	0.079989	0	0.186	0		
F.STORE	10	0.830211	0.126872	6.54369	0.083	0.068907513		
F.PREP	0	0	0.031757	0	0.238	0		
A.GAS	2.63	0.218345	0.173144	1.261063	0.054	0.011790657		
BT SLIP	7.33	0.608545	0.046118	13.19538	0.306	0.186214667		
EQ.RENT	0	0	0.046118	0	0.306	0		
TOTAL	106.46	8.838426		66.89778		0.76269409		

SIZE CLASS 3(OVER 39') BT.REG*%RES= 30 0.9 27

PARTY DAYS:RESBT*FDPBPY= 0.000027 16 0.000432 4.5 0.001944

CATE	$EPPD	$EXPEND MILLIONS	$S/E MILLIONS	EMPLOY	%WAGE	$WAGE MILLIONS	P. SIZE	MILLIONS PERSON DAYS
B.FUEL	1.5	0.000648	0.173144	0.003743	0.054	0.000034992		
TACKLE	14	0.006048	0.121176	0.049911	0.121	0.000731808		
BAIT	27.5	0.01188	0.121176	0.098039	0.121	0.00143748		
ICE	20	0.00864	0.126872	0.0681	0.083	0.00071712		
RAM FEE	0	0	0.046118	0	0.306	0		
LODG	0	0	0.029649	0	0.325	0		
CAM FEE	0	0	0.079989	0	0.186	0		
F.STORE	13.33	0.005759	0.126872	0.045389	0.083	0.00047796		
F.PREP	0	0	0.031757	0	0.238	0		
A.GAS	4.2	0.001814	0.173144	0.010479	0.054	9.79776E-05		
BT SLIP	20	0.00864	0.046118	0.187346	0.306	0.00264384		
EQ.RENT	0	0	0.046118	0	0.306	0		
TOTAL	100.53	0.043429		0.463006		0.006141178		

RESIDENT RENTALS(CHARTER;PARTY AND OTHER)

TOTAL EXPEND= (VISITOR EXPEND/ %VISITORS)(% RESIDENTS)

	$MILL	$MILL		MILL	
	0.701699	4.6142	0.868	5.315899	0.132

TOTAL EMPLOYMENT =TOTAL EXPEND/ ($S/E)

		$MILL	
	16.74698	0.701699	0.0419

TOTAL WAGES = %WAGES*TOTAL EXPEND

	$MILL	%	$MILL
	0.189248	0.2697	0.701699

TOTAL DAYS = (VISITOR DAYS/%VISITORS)(%RESIDENTS)

	MILL	MILL		MILL	
	0.071849	0.472465	0.868	0.544314	0.132

TOTAL EXPEND; EMPLOY;WAGES;AND DAYS-ALL CLASSES PLUS RENT

CATEG	CLASS 1	CLASS 2	CLASS 3	RENT	TOTAL
	$MILL	$MILL	$MILL	$MILL	$MILL
$EXPEND	4.795409	8.838426	0.043429	0.701699	14.37896
EMPLOY	38.58877	66.89778	0.463006	16.74698	122.6965
	$MILL	$MILL	$MILL	$MILL	$MILL
$WAGES	0.422802	0.762694	0.006141	0.189248	1.380886
	MILL	MILL	MILL	MILL	MILL
PERSON	0.15255	0.317971	0.001944	0.071849	0.544314
DAYS					

TOTAL EXPEND;EMPLOY;WAGES AND DAYS FOR THOSE
USING ARTIFICIAL REEFS-FISHING ONLY

CATEG	VALUE	%ART.R	EQUALS	$SP.A.R.
$SPEND	14.37896	0.39		5.607796
	MILL			
EMPLOY	122.6965	0.39		47.85165
$WAGES	1.380886	0.39		0.538545
	$MILL			MILL
DAYS	0.544314	0.39		0.212283
	MILL			

TOTAL EXPEND;EMPLOY;WAGES AND DAYS FOR THOSE
USING ARTIFICIAL REEFS-DIVING PLUS FISHING

CATEG	VALUE	DAYS DIV/FISH	AMT.DIV	AMT.FISH	TOTAL
$SPEND	5.607796	0.028	0.157018	5.607796	5.764814
	$MILL		$MILL	$MILL	$MILL
EMPLOY	47.85165	0.028	1.339846	47.85165	49.1915
$WAGES	0.538545	0.028	0.015079	0.538545	0.553625
	$MILL		$MILL	$MILL	$MILL
DAYS	0.212283	0.028	0.005944	0.212283	0.218226
	MILL		MILL	MILL	MILL

Appendix E: Spreadsheets for Visitors and Residents In Escambia County

1998 ESCAMBIA COUNTY VISITOR ANALYSES

HOTEL AND MOTEL CATEGORY

MULTIPLIER: VISITS*(LS/SP) = 1.083289(3/2.95)= 1.104955 MILLIONS VISITORS 1083289
304041(2.02/2.37)=

CATEG	$EPPD	$EXPEND MILLIONS	$S/E MILLIONS	EMPLOY	%WAGES	$WAGES MILLIONS
LODG	53.24	58.8278	0.048395	1215.576	0.225	13.23626
PRE.FD	69.63	76.93802	0.031972	2406.419	0.255	19.61919
NPR.FD	12.96	14.32022	0.159468	89.79994	0.079	1.131297
SP.FEES	5.87	6.486086	0.039096	165.9015	0.236	1.530716
EV.FEES	1.86	2.055216	0.039096	52.56845	0.236	0.485031
ATT.ADM	0.56	0.618775	0.039096	15.82706	0.236	0.146031
EV.ENT	16.96	18.74004	0.039096	479.3339	0.236	4.422649
GD.TRAN	15.6	17.2373	0.1438	119.8699	0.1	1.72373
SHOP	48.24	53.30303	0.087477	609.3376	0.21	11.19364
OTHER	3.35	3.701599	0.087477	42.31511	0.21	0.777336
TOTAL	228.27	252.2281		5196.948		54.26588

OTHER CATEGORY

MULTIPLIER:VISITS*(LS/SP)= 1.062048(5.0/4.27)= 1.243616 MILLION VISITORS 1083289

CATEG	$EPPD	$EXPEND MILLIONS	$S/E MILLIONS	EMPLOY	%WAGES	$WAGES MILLIONS
LODG	33.18	41.26318	0.048395	852.6331	0.225	9.284215
PRE.FD	55	68.39888	0.031972	2139.337	0.255	17.44171
NPR.FD	25.05	31.15258	0.159468	195.3532	0.079	2.461054
SP.FEES	1.65	2.051966	0.039096	52.48533	0.236	0.484264
EV.FEES	3.15	3.91739	0.039096	100.1993	0.236	0.924504
ATT.ADM	1.83	2.275817	0.039096	58.211	0.236	0.537093
EV.ENT	17.49	21.75084	0.039096	556.3445	0.236	5.133199
GD.TRAN	5.04	6.267825	0.1438	43.5871	0.1	0.626782
SHOP	75.71	94.15417	0.087477	1076.331	0.21	19.77238
OTHER	5.02	6.242952	0.087477	71.36679	0.21	1.31102
TOTAL	223.12	277.4756		5145.848		57.97622

CATEG	$EXPEND MILLIONS	EMPLOY	%WAGES MILLIONS	TOTAL VISITORS	2166578
LODG	100.091	2068.209	22.52047	7	24
PRE.FD.	145.3369	4545.756	37.06091	8	25
NPR.FD.	45.4728	285.1531	3.592351	9	26
SP.FEES	8.538052	218.3868	2.01498	10	27
EV.FEES	5.972607	152.7677	1.409535	11	28
ATT.ADM	2.894592	74.03806	0.683124	12	29
EV.ENT	40.49088	1035.678	9.555848	13	30
GD.TRAN	23.50512	163.457	2.350512	14	31
SHOP	147.4572	1685.668	30.96601	15	32
OTHER	9.944552	113.6819	2.088356	16	33
TOTAL	529.7037	10342.8	112.2421	17	34

ESCAMB: BOATERS SPENDING; WAGES AND EMPLOYMENT BY MODE

MULTIPLIER= TBDO/SPO= .4249/4.4 = 0.0966

OWN BOAT MODE SCENARIO (O)

CATEG	$EPPD	$EXPEND MILLIONS	$S/E MILLIONS	EMPLOY	%WAGE	$WAGES MILLIONS	SIC DESIGN	TBDO=
B.FUEL	90.69	8.760654	0.232325	37.70862	0.056	0.490597	554	0.4249
TACKLE	79.56	7.685496	0.102991	74.62299	0.141	1.083655	5941	MILLION
BAIT	11.38	1.099308	0.102991	10.67383	0.141	0.155002	5941	
ICE	7.89	0.762174	0.151281	5.038134	0.082	0.062498	54	
RAM FEE	2.05	0.19803	0.036371	5.444722	0.266	0.052676	79	
LODG	31.67	3.059322	0.048395	63.21566	0.225	0.688347	70	
CAM FEE	0.57	0.055062	0.079989	0	0.186	0.010242	703	
F. STORE	48.16	4.652256	0.151281	30.75241	0.082	0.381485	54	
F.PREP	121.94	11.7794	0.031972	368.4288	0.255	3.003748	58	
A.GAS	9.63	0.930258	0.232325	4.004124	0.056	0.052094	554	
BO RENT	0	0	0.036371	0	0.266	0	79	
EQ.RENT	0	0	0.036371	0	0.266	0	79	
TOTAL	403.54	38.98196		599.8892		5.980345		

MULTIPLIER=TBDC/SPC= .3512/4.81= 0.073

CHARTER BOAT MODE SCENARIO RIO (C)

CATEG	$EPPD	$EXPEND MILLIONS	EMPLOY	$WAGES MILLIIONS		TBDC=
B.FUEL	0	0	0	0	6	0.3512
TACKLE	0	0	0	0	7	MILLION
BAIT	0	0	0	0	8	
ICE	0	0	0	0	9	
RAM FEE	0	0	0	0	10	
LODG	100	7.3	150.842	1.6425	11	
CAM FEE	0.15	0.01095	0.136894	0.002037	12	
F. STORE	43.67	3.18791	21.07277	0.261409	13	
F.PREP	90.51	6.60723	206.6568	1.684844	14	
A.GAS	29.83	2.17759	9.373033	0.121945	15	
BO.RENT	471.16	34.39468	945.6622	9.148985	16	
EQ.RENT	8.7	0.6351	17.46171	0.168937	17	
TOTAL	744.02	54.31346	1351.205	13.03066		

MULTIPLIER=TBDP/SPP= .1256/3.81= 0.033

PARTYBOAT MODE SCENARIO (P)

CATEG	$EPPD	$EXPEND	EMPLOY	$WAGES		TBDP=
B.FUEL	0	0	0	0	6	0.1256
TACKLE	0	0	0	0	7	MILLION
BAIT	0	0	0	0	8	
ICE	0	0	0	0	9	
RAM FEE	0	0	0	0	10	
LODG	125	4.125	85.23608	0.928125	11	
CAM FEE	0	0	0	0	12	
F.STORE	25	0.825	5.453428	0.06765	13	
F.PREP	60	1.98	61.92919	0.5049	14	
A.GAS	5	0.165	0.710212	0.00924	15	
BO.RENT	150.22	4.95726	136.297	1.318631	16	
EQ.RENT	0.00	0	0	0	17	
TOTAL	365.22	12.05226	289.626	2.828546		

MULTIPLIER=TBDR/SPR= .0082/3.0 = 0.0027

PRIVATE RENTAL MODE SCENARIO (PR)

CATEG	$EPPD	$EXPEND	EMPLOY	$WAGES		TBDP=
B.FUEL	100	0.27	1.162165	0.01512	6	0.0082
TACKLE	35	0.0945	0.917556	0.013325	7	MILLION
BAIT	30	0.081	0.786476	0.011421	8	
ICE	10	0.027	0.178476	0.002214	9	
RAM FEE	0	0	0	0	10	
LODG	90	0.243	5.02118	0.054675	11	
CAM FEE	0	0	0	0	12	
F.STORE	100	0.27	1.784758	0.02214	13	
F.PREP	125	0.3375	10.55611	0.086063	14	
A.GAS	10	0.027	0.116217	0.001512	15	
BO.RENT	45	0.1215	3.340574	0.032319	16	
EQ.RENT	0	0	0	0	17	
TOTAL	545	1.4715	23.86351	0.238788		

TOTAL EXPENDITURES FOR ALL MODES: 106.8192 MILLION

TOTAL EMPLOYMENT FOR ALL MODES: 2264.584

TOTAL WAGES FOR ALL MODES: 22.07833 MILLION

TOTAL BOATING DAYS FOR ALL MODES 0.9099 MILLION

ESCAMB: BOATER SPENDING;WAGES;JOBS;DAYS;VISITS BY MODE-FISHING ONLY

MULTIPLIER=(TBDO/SPO)*%F*%T*%R 0.041667 VISITORS

OWN BOAT MODE SCENARIO (O) REEF%= 0.5802

CATEG	$EPPD	$EXPEND MILLIONS	$S/E MILLIONS	EMPLOY	%WAGE	$WAGES MILLIONS	SIC DESIGN	OTHER TBDO=
B.FUEL	71.97	2.99874	0.232325	12.90752	0.056	0.167929	554	0.177499
TACKLE	35.52	1.479995	0.102991	14.37014	0.141	0.208679	5941	MILLION
BAIT	14.61	0.608748	0.102991	5.910692	0.141	0.085833	5941	
ICE	9.04	0.376665	0.151281	2.48984	0.082	0.030887	54	VO=
RAM FEE	1.22	0.050833	0.036371	1.397629	0.266	0.013522	79	TBDO/
LODG	25.31	1.05458	0.048395	21.79109	0.225	0.23728	70	LSO
CAM FEE	0.85	0.035417	0.079989	0	0.186	0.006587	703	.177499/
F. STORE	52.32	2.179993	0.151281	14.41022	0.082	0.178759	54	4.61=
F.PREP	90.7	3.779154	0.031972	118.202	0.255	0.963684	58	0.038503
A.GAS	16.69	0.695414	0.232325	2.993283	0.056	0.038943	554	MILLION
BO RENT	0	0	0.036371	0	0.266	0	79	
EQ.RENT	3.74	0	0.036371	0	0.266	0	79	
TOTAL	321.97	13.25954		194.4724		1.932105		

MULTIPLIER=(TBDC/SPC)*%F*%T*%R 0.060728 VISITORS

CHARTER BOAT MODE SCENARIO RIO (C) REEF%= 1

CATEG	$EPPD	$EXPEND MILLIONS	EMPLOY	$WAGES MILLIIONS		OTHER TBDC=
B.FUEL	0	0	0	0	6	0.291496
TACKLE	0	0	0	0	7	MILLION
BAIT	0	0	0	0	8	
ICE	0	0	0	0	9	VC=
RAM FEE	0	0	0	0	10	TBDC/
LODG	146.58	8.901559	183.9355	2.002851	11	LSC
CAM FEE	0.14	0.008502	0.106289	0.001581	12	0.291496
F. STORE	47.4	2.878523	19.02766	0.236039	13	5.42=
F.PREP	95.07	5.773443	180.5781	1.472228	14	0.053782
A.GAS	28.72	1.744118	7.507232	0.097671	15	MILLION
BO.RENT	495.21	30.07328	826.8477	7.999492	16	
EQ.RENT	8.33	0.505867	13.90853	0.134561	17	
TOTAL	821.45	49.88529	1231.911	11.94442		

MULTIPLIER=(TBDP/SPP)*%F*%T*%R 0.019383 VISITORS

PARTYBOAT MODE SCENARIO (P) REEF%= 0.5 OTHER

CATEG	$EPPD	$EXPEND MILLIONS	EMPLOY	$WAGES		TBDP=
B.FUEL	0	0	0	0	6	0.0628
TACKLE	0	0	0	0	7	MILLION
BAIT	0	0	0	0	8	
ICE	0	0	0	0	9	VP=
RAM FEE	0	0	0	0	10	TBDP/
LODG	125.8	2.438346	50.38425	0.548628	11	LSP
CAM FEE	0.66	0.012793	0.159929	0.002379	12	0.0628
F.STORE	26.84	0.520232	3.438846	0.042659	13	5.45=
F.PREP	70.26	1.36183	42.59445	0.347267	14	0.011523
A.GAS	11.35	0.219994	0.946923	0.01232	15	MILLION
BO.RENT	115.97	2.247814	61.80236	0.597918	16	
EQ.RENT	0.66	0.012793	0.351725	0.003403	17	
TOTAL	351.54	6.8138	159.6785	1.554574		

MULTIPLIER=(TBDR/SPR)*%F*%T*%R 0.000508 VISITORS

PRIVATE RENTAL MODE SCENARIO (PR) REEF%= 0.3158 OTHER

CATEG	$EPPD	$EXPEND	EMPLOY	$WAGES		
B.FUEL	96.67	0.049112	0.211392	0.00275	6	
TACKLE	25	0.012701	0.12332	0.001791	7	
BAIT	20.83	0.010582	0.10275	0.001492	8	
ICE	10.17	0.005167	0.034153	0.000424	9	
RAM FEE	0	0	0	0	10	
LODG	97.25	0.049406	1.020896	0.011116	11	
CAM FEE	0	0	0	0	12	
F.STORE	56.67	0.02879	0.19031	0.002361	13	
F.PREP	103.33	0.052495	1.641909	0.013386	14	
A.GAS	2.33	0.001184	0.005095	6.63E-05	15	
BO.RENT	116.94	0.059409	1.633429	0.015803	16	
EQ.RENT	0	0	0	0	17	
TOTAL	529.19	0.268846	4.963254	0.04919		

TBDR=
0.001864
MILLION

VR=
TBDR/
LSR
0.001864/
5=
0.000373
MILLION

	FISHING	DIVING
TOTAL EXPENDITURES FOR ALL MODES:	70.22748	1.355077
	$MILLION	$MILLION
TOTAL EMPLOYMENT FOR ALL MODES:	1591.025	22.5924
TOTAL WAGES FOR ALL MODES:	15.48029	0.224485
	$MILLION	$MILLION
TOTAL BOATING DAYS FOR ALL MODES	0.53366	0.017716
	MILLION	MILLION
TOTAL PERSON VISITS FOR ALL MODES	0.10418	0.003598
	MILLION	MILLION

GRAND TOTAL:FISHING AND DIVING

TOTAL EXPENDITURES FOR ALL MODES:	71.58255
	$MILLION
TOTAL EMPLOYMENT FOR ALL MODES:	1613.618
TOTAL WAGES FOR ALL MODES:	15.70478
	$MILLION
TOTAL BOATING DAYS FOR ALL MODES:	0.551376
	MILLION
TOTAL PERSON VISITS FOR ALL MODES:	0.107778
	MILLION

ESCAMB: BOATER SPENDING;WAGES;JOBS;DAYS;VISITS BY MODE-DIVING ONLY

MULTIPLIER=(TBDO/SPO)*%D*%T *%R 0.002986 VISITORS

OWN BOAT MODE SCENARIO (O) REEF%= 0.9556

CATEG	$EPPD	$EXPEND MILLIONS	$S/E MILLIONS	EMPLOY	%WAGE	$WAGES MILLIONS	SIC DESIGN	OTHER TBDO=
B.FUEL	78.75	0.235112	0.232325	1.011995	0.056	0.013166	554	0.010151
AIR REF	27.5	0.082103	0.102991	0.797182	0.141	0.011576	5941	MILLION
BAIT	0	0	0.102991	0	0.141	0	5941	
ICE	7.5	0.022392	0.151281	0.148013	0.082	0.001836	54	VO=
RAM FEE	7.5	0.022392	0.036371	0.615644	0.266	0.005956	79	TBDO/
LODG	35	0.104494	0.048395	2.159193	0.225	0.023511	70	LSO
CAM FEE	0	0	0.079989	0	0.186	0	703	0.010151/
F. STORE	52.5	0.156741	0.151281	1.036093	0.082	0.012853	54	4.61=
F.PREP	62.5	0.186597	0.031972	5.836254	0.255	0.047582	58	0.002202
A.GAS	17.5	0.052247	0.232325	0.224888	0.056	0.002926	554	MILLION
BO RENT	0	0	0.036371	0	0.266	0	79	
EQ.RENT	12.5	0	0.036371	0	0.266	0	79	
TOTAL	301.25	0.862077		11.82926		0.119407		

M=[(TBDC/SPC)*.17*.25*.50]+[(TBDR/SPR)*.1*.25*.50]= 0.001593 VISITORS

CHARTER/OTHER RENTAL BOAT MODE SCENARIO REEF%= 0.5

CATEG	$EPPD	$EXPEND MILLIONS	EMPLOY	$WAGES MILLIIONS		OTHER TBDC=
B.FUEL	0	0	0	0	6	0.007566
AIR REF	0	0	0	0	7	MILLION
BAIT	0	0	0	0	8	
ICE	0	0	0	0	9	VC=
RAM FEE	0	0	0	0	10	TBDC/
LODG	113.94	0.181476	3.749901	0.040832	11	LSC
CAM FEE	0	0	0	0	12	.007566/
F. STORE	26.38	0.042016	0.277737	0.003445	13	5.42=
F.PREP	66.33	0.105646	3.304336	0.02694	14	0.001396
A.GAS	29.08	0.046317	0.199362	0.002594	15	MILLION
BO.RENT	73.8	0.117544	3.231805	0.031267	16	
EQ.RENT	0	0	0	0	17	
TOTAL	309.53	0.493	10.76314	0.105078		

MULTIPLIER=(TBDP/SPP)*%D*%T OR (.1256/3.81)*0*0 0

PARTYBOAT MODE SCENARIO (P) VISITORS

CATEG	$EPPD	$EXPEND	EMPLOY	$WAGES		OTHER TBDP=
B.FUEL	0	0	0	0	6	0
AIR REF	0	0	0	0	7	MILLION
BAIT	0	0	0	0	8	
ICE	0	0	0	0	9	VP=
RAM FEE	0	0	0	0	10	TBDP/
LODG	0	0	0	0	11	LSP
CAM FEE	0	0	0	0	12	.1256/
F.STORE	0	0	0	0	13	5.45=
F.PREP	0	0	0	0	14	0
A.GAS	0	0	0	0	15	MILLION
BO.RENT	0	0	0	0	16	
EQ.RENT	0.00	0	0	0	17	
TOTAL	0	0	0	0		

```
MULTIPLIER=(TBDR/SPR)*%D*%T OR (.0082/3.0)*.1*.25                0.00002          VISITORS
          PRIVATE RENTAL MODE SCENARIO              (PR)       REEF%=         0.263 OTHER
CATEG     $EPPD      $EXPEND    EMPLOY     $WAGES                                   TBDR=
B.FUEL             0          0          0          0          6                            0
AIR REF            0          0          0          0          7                      MILLION
BAIT               0          0          0          0          8
ICE                0          0          0          0          9                      VR=
RAM FEE            0          0          0          0         10                      TBDR/
LODG               0          0          0          0         11                      LSR
CAM FEE            0          0          0          0         12                      .00054/
F.STORE            0          0          0          0         13                      5=
F.PREP             0          0          0          0         14                            0
A.GAS              0          0          0          0         15                      MILLION
BO.RENT            0          0          0          0         16
EQ.RENT            0          0          0          0         17
TOTAL              0          0          0          0

TOTAL EXPENDITURES FOR ALL MODES:                     1.355077
                                                     $MILLION
TOTAL EMPLOYMENT FOR ALL MODES:                        22.5924

TOTAL WAGES FOR ALL MODES:                            0.224485
                                                     $MILLION
TOTAL BOATING DAYS FOR ALL MODES                      0.017716
                                                     MILLION
TOTAL PERSON VISITS FOR ALL MODES                     0.003598
                                                     MILLION
```

ESCAM RESIDENT-SPENDING;WAGES; JOBS AND DAYS-FISHING ONLY 1998

SIZE CLASS 1 (UNDER 16 FT) BT.REG* %RES= 9031 0.837 7558.947

PARTY DAYS:RESBT*FDPBPY= 0.007559 11.4 0.086173 2.46 0.211985

CATEG	$EPPD	$EXPEND MILLIONS	$S/E MILLIONS	EMPLOY	%WAGE	$WAGE MILLIONS	P. SIZE SIC	MILLIONS PERSON DAYS
B.FUEL	24.86	2.142251	0.232325	9.220923	0.056	0.119966	554	
TACKLE	9.29	0.800543	0.102991	7.772946	0.141	0.112877	5941	
BAIT	5.93	0.511004	0.102991	4.961633	0.141	0.072051	5941	
ICE	2.5	0.215432	0.151281	1.424049	0.082	0.017665	54	
RAM FEE	0.71	0.061183	0.036371	1.682179	0.266	0.016275	79	
LODG	0	0	0.048395	0	0.225	0	70	
CAM FEE	0	0	0.079989	0	0.186	0	703	
F.STORE	10.43	0.89878	0.151281	5.941131	0.082	0.0737	54	
F.PREP	2.15	0.185271	0.031972	5.794792	0.255	0.047244	58	
A.GAS	6.29	0.542026	0.232325	2.333049	0.056	0.030353	554	
BT.SLIP	0	0	0.036371	0	0.266	0	79	
EQ.RENT	0.71	0.061183	0.036371	1.682179	0.266	0.016275	79	
TOTAL	62.87	5.417671		40.81288		0.506406		

SIZE CLASS 2(16' TO 39'11'') BT.REG*%RES= 7457 0.8 5965.6

PARTY DAYS:RESBT*FDPBPY= 0.005966 23.52 0.14032 3.5 0.491121

CATEG	$EPPD	$EXPEND MILLIONS	$S/E MILLIONS	EMPLOY	%WAGE	$WAGE MILLIONS	P. SIZE	MILLIONS PERSON DAYS
B.FUEL	59.34	8.326608	0.232325	35.84034	0.056	0.46629		
TACKLE	5.17	0.725456	0.102991	7.043878	0.141	0.102289		
BAIT	16.64	2.33493	0.102991	22.67121	0.141	0.329225		
ICE	4.2	0.589345	0.151281	22.67121	0.082	0.048326		
RAM FEE	1.09	0.152949	0.036371	16.20372	0.266	0.040684		
LODG	0	0	0.048395	0	0.225	0		
CAM FEE	0	0	0.079989	0	0.186	0		
F.STORE	17.08	2.396671	0.151281	15.84251	0.082	0.196527		
F.PREP	4.73	0.663715	0.031972	20.75926	0.255	0.169247		
A.GAS	5.49	0.770359	0.232325	3.315866	0.056	0.04314		
SLIP REN	30	0	0.036371	0	0.266	0		
EQ.RENT	1.11	0.155756	0.036371	4.282411	0.266	0.041431		
TOTAL	144.85	16.11579		148.6304		1.437161		

SIZE CLASS 3(OVER 39') BT.REG*%RES= 80 0.639 51.12

PARTY DAYS:RESBT*FDPBPY= 0.000052 59 0.003068 5.33 0.016352

CATE	$EPPD	$EXPEND MILLIONS	$S/E MILLIONS	EMPLOY	%WAGE	$WAGE MILLIONS	P. SIZE	MILLIONS PERSON DAYS
B.FUEL	64.25	0.197119	0.232325	0.848462	0.056	0.011039		
TACKLE	3.5	0.010738	0.102991	0.104262	0.141	0.001514		
BAIT	13.75	0.042185	0.102991	0.409599	0.141	0.005948		
ICE	5	0.01534	0.151281	0.101401	0.082	0.001258		
RAM FEE	0	0	0.031972	0	0.266	0		
LODG	0	0	0.048395	0	0.225	0		
CAM FEE	0	0	0.079989	0	0.186	0		
F.STORE	10	0.03068	0.151281	0.202801	0.082	0.002516		
F.PREP	0	0	0.031972	0	0.255	0		
A.GAS	2.63	0.008069	0.232325	0.034731	0.056	0.000452		
SLIP REN	20	0.06136	0.036371	1.687058	0.266	0.016322		
EQ.RENT	0	0	0.036371	0	0.266	0		
TOTAL	119.13	0.365491		3.388314		0.039048		

```
RESIDENT RENTAL(CHARTER;PARTY; OTHER)

TOTAL EXPEND=($VISITOR EXPEND/%VIS)(%RES)
          $MILL      $MILL                $MILL
             14.6961       49.2       0.77    63.8961       0.23
TOTAL EXMPLOYMENT= (TOTAL EXPEND/($S/E)
                     $MILL
            359.7576    14.6961    0.04085
TOTAL WAGES=%WAGES*TOTAL EXPEND
          $MILL           0.237 $MILL
            3.482977      0.237    14.6961
TOTAL DAYS=(VISITOR DAYS/%VIS)*%VIS
          MILL       MILL                 MILL
            0.108936     0.3647       0.77   0.473636       0.23
TOTAL EXPEND;EMPLOY;WAGES AND DAYS-ALL CLASSES AND RENT
          CLASS 1    CLASS 2    CLASS3     RENTAL     TOTAL
          $MILL      $MILL      $MILL      $MILL      $MILL
$SPEND      5.417671   16.11579   0.365491    14.6961   36.59505

EMPLOY      40.81288   148.6304   3.388314   359.7576   552.5892
          $MILL      $MILL      $MILL      $MILL      $MILL
$WAGES      0.506406   1.437161   0.039048   3.482977   5.465592
          MILL       MILL       MILL       MILL       MILL
PERSON      0.211985   0.491121   0.016352   0.108936   0.828395
DAYS
TOTAL EXPEND;EMPLOY;WAGES AND DAYS FOR THOSE
          USING ARTIFICIAL REEFS-FISHING ONLY

CATEG     VALUE      %ART.R     EQUALS     $SP.A.R
$SPEND      36.59505       0.58             21.22513
          $MILL                            $MILL
EMPLOY      552.5892       0.58             320.5018

$WAGES      5.465592       0.58             3.170043
          MILL                             MILL
DAYS        0.828395       0.58             0.480469

TOTAL EXPEND;EMPLOY; WAGES AND DAYS FOR THOSE
          USING ARTIFICIAL REEFS-DIVING PLUS FISHING
                     DAYS
CATEG     VALUE      DIV/FISH   AMT.DIV    AMT.FISH   TOTAL
$SPEND      21.22513      0.019   0.403278   21.22513   21.62841
          $MILL                 $MILL      $MILL      $MILL
EMPLOY      320.5018      0.019   6.089533   320.5018   326.5913

$WAGES      3.170043      0.019   0.060231   3.170043   3.230274
          $MILL                 $MILL      $MILL      $MILL
DAYS        0.480469      0.019   0.009129   0.480469   0.489598
          MILL                  MILL       MILL       MILL
```

Appendix F: Survey Instruments for Visitors and Residents

GENERAL TOURIST SURVEY INSTRUMENT
FLORIDA BIG BEND COUNTIES
l998

Interviewers Initials: _____
Coastal County of Interview: B W O S E
Date Interviewed: _____
Survey Site: _____

Welcome _____County Visitors

Would you please do us a favor? Please take a few minutes and complete the following questionnaire. It will help us better understand those activities and services visitors seek. Your responses will be handled in strict confidence.

Thank you in advance for your cooperation. Please return your completed survey to the field representative who selected you as a participant for this on-going survey or please just give me your answer orally.

Have a wonderful time in our area.

Ql How many nights are you spending on this trip?
NUMBER OF NIGHTS:_____

Q2 Including yourself, how many people are in your travel party?
SIZE OF PARTY:_____

Q3 How many in your party live outside this particular county?
NUMBER LIVE OUTSIDE COUNTY:_____

Q4 When you come to this county as a visitor, where does your party stay overnight?

1=Hotel/Motel
2=Home of family/friend
3=Campground
4=Condominium
5=No overnights in this county, staying elsewhere

Q5 Over the last 12 months, did you engage in any kind of boating when visiting this specific county?
l= YES, go to Q6; 2=NO, go to Q7

Q6 What kind of boating did your party engage in and how many days did your party spend on each over the last 12 months?

Kind (circle numbers)	Days Over Last 12 Months (indicate number of days)
1=Private	_____Days
2=Charter	_____Days
3=Party/Head Boat	_____Days

Q7-16

During the past 24 hours, what has your travel party spent for each of the following categories?

Q7 $_____Lodging Accommodations
Q8 $_____Food and Beverages (Prepared,ie.,restaurants)
Q9 $_____Groceries/Convenience Stores
Q10$_____Sport Activities
Qll$_____Admission to Events
Q12$_____Admission to Attractions
Q13$_____Evening Entertainment
Q14$_____Ground Transportation
Q15$_____Shopping
Q16$_____All Other

Q17 What is your ZIP code? _____

Q18 When were your born? l9_____

Q19 What is your total household income?

l= Under $20,000
2=$20,000-29,999
3=$30,000-39,999
4=$40,000-49,999
5=$50,000-74,999
6=$75,000+

Thank you for your time !

1998 FLORIDA BIG BEND COUNTIES
ARTIFICIAL REEF STUDY
OF BOATING AND DIVING VISITORS

Interviewer Initials:_____
Coastal County Area of Interview: B W O S E
Date Interviewed:_____
Survey Site:_____

B=Bay; W=Walton; O=Okaloosa; S=Santa Rosa; E=Escambia

Good AM/afternoon: We are talking to visitors to _____ County today about their boating activities. Are you a resident of this county? If NO, continue. If YES, end interview.

1.SCREEN BOATING FROM NON-BOATING VISITORS

Ql In the last 12 months, have you done any private; party or charter boating while visiting this county? If YES, go to next question. If NO, discontinue interview.

2. KINDS OF BOATING ACTIVITIES SCREEN

This survey is being conducted for the Florida Department of Environmental Protection with the intent of improving recreational boating activities and especially artificial reefs. The survey should take about 10-12 minutes. We are interested in visitors that come from other counties in Florida and out-of-state to this County as a launching point for your boat or place of boat rental. But first, I have some general questions.

Q2 What was your main purpose for your trip to this County?

A. Vacation/ Leisure Outing
B. Visit friends and relatives
C. Company or government business
D. Other (SPECIFY)
_____

Q3 On a average trip to this County, how many nights do

you and your party stay? Number of nights:_____

Q4 Over the last twelve months, did you use your boat or some kind of rental boat (individual rental; party boat or charter boat) in each of the following activities in this county

A. NUMBER OF DAYS SALTWATER FISHING _____DAYS

B. NUMBER OF DAYS SKIN AND SCUBA DIVING _____DAYS

If Q4(A) and Q4(B) are zero, end interview.

Q5 For the number of days in each of the categories in Question 4, would you break down the days into whether you used your own boat or used some kind of a rental?

	DAYS		OWN/FRIENDS RELATIVES BOAT		CHARTER		PARTY/ HEAD		PRIVATE RENTAL/NO CAPTAIN
A. Of	_____	=	_____	+	_____	+	_____	+	_____
B. Of	_____	=	_____	+	_____	+	_____	+	_____

If Q4(A) is zero, skip to Section 4.

3. SALTWATER RECREATIONAL FISHING IN GENERAL AND ARIFICIAL REEFS IN PARTICULAR (A)

Q6 While using your own; charter; party or other rental boat, what is the average size of the party including yourself?

Kind of Boat	Size of Party	
OWN	_____	GO to Q7
PRIVATE RENTAL/NO CAPTAIN	_____	Go to Q7
CHARTER	_____	GO to Q8
PARTY/HEAD	_____	GO to Q9

If respondent uses more than one kind of boat in Q6, go to question indicated and then return until cycle or process is completed.

Q7 On the most recent saltwater fishing day using your own boat/private rental approximately how much does your party spend on the following items:

	OWN	PRIVATE RENTAL/NO CAPTAIN
Boat Fuel	$ _____	$_____Per Party/Day
Tackle	$_____	$_____Per Party/Day
Bait	$_____	$_____Per Party/Day
Ice	$_____	$_____Per Party/Day
Ramp Fees	$_____	$_____Per Party/Day
Lodging(MO/HO)	$_____	$_____Per Party/Day
Camping Fees	$_____	$_____Per Party/Day
Food&Bev-Stores	$_____	$_____Per Party/Day
Food&Bev-Rest/Bar	$_____	$_____Per Party/Day
Auto Gas to and from site*	$_____	$_____Per Party/Day
Auto Rentals	$_____	$_____Per Party/Day
Equipment Rental	$_____	$_____Per Party/Day

Q8 If you rent a charter boat, how much did your party pay on their most recent fishing day for the following?

Charter Rental	$_____Per Party/Day
Lodging(MO/HO)	$_____Per Party/Day
Camping Fees	$_____Per Party/Day
Food&Bev-Stores	$_____Per Party/Day
Food&Bev-Rest/Bars	$_____Per Party/Day
Auto Gas to and from Site*	$_____Per Party/Day
Auto Rentals	$_____Per Party/Day
Equipment Rentals	$_____Per Party/Day

Q9 If you pay for a party/head boat, how much did your party pay on their most recent fishing day for the following:

Party Rental	$_____Per Party/Day
Lodging(MO/HO)	$_____Per Party/Day
Camping Fees	$_____Per Party/Day
Food&Bev-Stores	$_____Per Party/Day
Food&Bev-Rest/Bars	$_____Per Party/Day
Auto Gas to and from Site*	$_____Per Party/Day
Auto Rentals	$_____Per Party/Day
Equipment Rentals	$_____Per Party/Day

Q10 When you and your party engage in saltwater fishing using

yours own or a rental boat, do you target a certain kinds of fish or just what comes along? Name the top four fish please. (Interviewer: See attached list of fish)

Targeted:(l)_____(2)_____(3)_____(4)_____OR

What Comes Along:(l)_____(2)_____(3)_____(4)_____

*If arrived by plane, put origin and arrival in margin.

Q11 On an average day of saltwater recreational fishing, how many fish of all the fish you just gave me does your party catch daily. If discarded, etc., include all?

Targeted Fish: Catch Per/Party/ Day_____OR

What Comes Along: Catch Per/Party/ Day_____

Q12 You said that you and your party make _____ saltwater fishing days(Q5) per year using your own boat or some form of rental boat. On how many of these saltwater fishing days do you fish on artificial reefs(Count the day if you only spend part of the day on an artificial reef).If zero and Q3(B) is non-zero, Go to Section 4.

Kind of Boat	Total Days Q5(A) Per Year	Days Spent on Artificial Reef
OWN	_____	_____
CHARTER	_____	_____
PARTY/HEAD	_____	_____
RENTAL/NO CAPTAIN	_____	_____

Q13 How many different artificial reefs do you fish in a year:___

Q14 What are the names, if any, of the artificial reefs you fish?

l._____2_____3_____4_____

Q15 Are all the artificial reefs you have fished over the last twelve months in the Gulf of Mexico? Yes_____No____
If no, where else are they located?

Location(Atlantic Ocean, ETC) Country State County

_____ _____ _____ _____

Q16 Of the fish you targeted/just came along, what kind did you and your party catch on an artificial reef(s)?

SAME AS ABOVE_____If not, what were they

DIFFERENT:Targeted:(l)_____(2)_____(3)_____(4)_____

WHAT COMES ALONG: (l)_____(2)_____(3)_____(4)_____

And as asked above, what is the catch per party per day for

TARGETED: Catch Per/Party/Day:_____OR

WHAT COMES ALONG:Catch Per/Party/Day:_____

Q17 Off what county in Florida is the principal artificial reef that you and your party used located?

County:_____

Q18 How far is this artificial reef from shore?_____Miles.

Q19 What fishing method did you use when you and your party fished at your principal artificial reef site?

(a) Bottom Fishing
(b) Deep Trolling
(c) Surface Trolling
(d) Drift Fishing
(e) Surface Casting
(f) Spear Fishing

Q20 I shall read off a list of reasons that might be important in your decision to fish at an artificial reef site. Please stop me as you rate the statement. 1=Very Important; 2= Important; 3=Somewhat Important; 4=Not Very Important; 5= No Opinion/DK.

	Very IMP	Important IMP	Somewhat	Not Very	No/IMP
(a) Better Chance of Catching Fish.	1	2	3	4	5
(b) Previous Fishing Success at Site	1	2	3	4	5
(c) Sites Are Close to Shore	1	2	3	4	5
(d) Want to Fish Near Other Boats	1	2	3	4	5
(e) Other Fishermen Recommended	1	2	3	4	5
(f) Sites Are Easy to Locate	1	2	3	4	5
(g) Better Fishing Than Natural Reefs	l	2	3	4	5
(h) Other(Specify) _____	1	2	3	4	5

Q21 At what location do you usually depart from when using an artificial reef?

County_____City_____Other Sites_____

4. SKIN AND SCUBA DIVING IN GENERAL AND ARTIFICIAL REEFS IN PARTICULAR (B)

Q22 While on an average day of diving, what is the size of your party including yourself? Party Size:_____

Q23 You said that you and your party make_____diving days per year using your own boat or some form of rental. How many of these diving days are made on artificial reefs? If zero, go to Section 6.

Kind of Boat	Total Days Q5(B) Per Year	Days Spent on an Artificial Reef
Own	_____	_____
Rental	_____	_____

If Own, go to Q24. If Rental only, skip to Q25.

Q24 On an average diving day where you used your own boat, how much do you spend on the following items?

Boat Fuel	$_____	Per Party/Day
Air Refills	$_____	Per Party/Day
Ice	$_____	Per Party/Day
Ramp Fees	$_____	Per Party/Day
Equipment	$_____	Per Party/Day
Equipment Rentals	$_____	Per Party/Day
Lodging(HO&MO)	$_____	Per Party/Day
Food&Bev-Stores	$_____	Per Party/Day
Food&Bev-Rest/Bars	$_____	Per Party/Day
Auto Gas to and from Site*	$_____	Per Party/Day

Q25 On an average diving day where you used a rental boat, how much do you spend on the following items?
CHARTER/OTHER RENTALS

Boat Rental Fee	$_____	Per Party/Day
Lodging(HO&MO)	$_____	Per Party/Day
Food&Bev-Stores	$_____	Per Party/Day
Food&Bev-Rest/Bar	$_____	Per Party/Day
Auto Gas to and from Site*	$_____	Per Party/Day

*If arrival by air, put origin and destination in margin.

Q26 How many different artificial reefs did you use for diving in the last twelve months?
Number Used:_____

Q27 When diving on an artificial reef, what county did you depart to the reef from? County:_____

5. EVALUATION OF ARIFICIAL REEFS:FISHERS & DIVERS

Q28 You experience with artificial reefs is important in evaluating this government program. How do you feel personally about each of the statements I shall read in terms of 1=Strongly agree; 2=Agree; 3=Disagree; 4=Strongly disagree and 5=No opinion.

	Strongly Agree	Agree	Disagree	Strongly Disagree	N/O
(a)Artificial reefs too far from shore	1	2	3	4	5
(b)Artificial reefs too crowded	1	2	3	4	5
(c)Artificial reefs more					

productive than natural reefs	1	2	3	4	5
(d)Too many artificial reefs	1	2	3	4	5
(e)Artificial reefs should be in water less than 150 feet	1	2	3	4	5
(f)Artificial reefs increase abundance of fish	1	2	3	4	5

Interviewer: A. If respondent uses artificial reefs for fishing only,{Q12>0;while Q23=0}, ask questions Q29 &Q30. B.If respondend uses artificial reef for diving only, ask Q31 &32{Q12=0;while Q23>0}. If respondent uses artificial reefs for both fishing and diving, ask Q33 and Q34.

(FISHING ONLY)

Q29 Artificial reef programs cost money. Suppose that the government proposed that all newly constructed reefs would be paid for by requiring that reef users with their own boat pay for a stamp as part of their fishing licenses and/or if they use a rental boat probably pay higher fees for the operator's stamp. The money would go into a trust fund that could only be used for the construction of artificial reefs. Would you be willing to pay $_____per year when you renew your fishing license and/or use a rental boat of any kind to fund this construction program? If YES, go to Section 6.
If NO, go to Q30.

Q30 Which one of the following statements best explains the reason for your answer?

(a) A contribution of $_____is more than a new artificial reef is worth to me.
(b) I don't really know how much an artificial reef is worth to me.
(c) There are enough artificial reefs already.
(d) No enough information to form a decision.
(e) I don't understand or like the question.
(f) The government should fund the reef program out of general revenue and not a specific tax or fee.
(g) Already pay too much to government.
(h) Government waste should be reduced to fund reefs.
(i) Other Reasons(Please Specify)_____

(DIVING ONLY)

Q31 The artificial reef program cost money. Suppose that the government proposed that all newly constructed reefs would

be paid for by requiring that reef users with their own boat pay for a boat decal and/or if they use a rental probably pay higher fees to cover the operator's decal. The money would go into a trust fund that could only be used for the construction of artificial reefs. would you be willing to pay $_____per year when renewing your boat registration and/or using a rental boat of any kind to fund this construction.

If YES, go to Section 6. If NO_____,go to Q32

Q32 Which one of the following statements best explains your answer:

(a) A contribution of $_____is more that a new artificial reef is actually worth.
(b) I don't really know how much an artificial reef is worth to me.
(c) There are enough artificial reefs already.
(d) No enough information to form a decision.
(e) I don't understand or like the question.
(f) The government should fund the reef program out of general revenue and not a specific tax or fee.
(g) Already pay too much to government.
(h) Government waste should be reduced to fund reefs.
(i) Other Reason(Please Specify)_____

(FISHERS AND DIVERS)

Q33 The artificial reef program cost money. Supposed that the government proposed that all newly constructed reefs would be paid for by requiring that reef users with their own boat either pay for a stamp as part of their fishing license or pay for a decal as part of their boat registration. If you used a rental of any kind,you would probably would pay for the operator's stamp or decal in the form of higher fees to cover costs. The money would go into a trust fund that could only be used for the construction of artificial reef. Would you be willing to pay $_____ per year when you renew your fishing or boating license and/or use a rental boat of any kind to to fund this construction program?

If yes, go to Section 6. If No, go to Q33.

Q34 Which one of the following statements best explains your answer?

(a) A contribution of $_____is more than a new artificial reef is actually worth

(b) I don't know how much an artificial reef is worth to me.

(c) There are enough artificial reefs already.
(d) Not enough information to form a decision.
(e) I don't understand or like the question.
(f) The government should fund the reef program out of general tax revenue and not a specific tax or fee.
(g) Already pay too much to government.
(h) Government waste should be reduced to fund reefs.
(I) Other Reasons(Please Specify)_____

6.DEMOGRAPHICS

Q35 I would like to ask you some questions about your background to help us know more about the boaters that use artificial reefs and insure that all boaters are fairly represented in this study. I want to emphasize that all answers are strictly confidential. Finally, the accuracy of this study depends upon your answering all the questions.

Q36 How long have you been boating in the pandhandle of Florida? Years:_____.

Q37If you own a boat, what is its length? _____FT. Don't____
If yes, where is it registered? County_____State_____

Q38 Are you a member of a fishing or diving club? Yes___No

Q39 In what year were you born? Year of birth l9____

Q40 What is your ZIP code? _____

Q41 Male(M) or Female(F)_____

Q42 How would you describe your racial or ethnic background?

(a) White, NOT Hispanic
(b) Black or African American

(c) Hispanic
(d) Other(Please Specify)_____

Q43 Which of the income categories best describes your household's total family income before taxes?

(a)Less than $10,000
(b)$10,000 - $19,999
(c)$20,000 - $29,999
(d)$30,000 - $39,999
(e)$40,000 - $49,999
(f) $50,000 - $59,999
(g) $60,000 - $69,999
(h) $70,000 - $79,999
(i) $80,000 - $89,999
(j) $90,000 or more

Q42 Finally, which of the following best describes your formal education.
(a) Grades 1-9
(b) Some High School
(c) High School Graduate
(d) Some College/Vocational School
(e) College Graduates
(f) Graduate or Professional Degree.

Q43 If you stayed overnight in _____County, where do you stay?

(a) No Overnights Spent in this County___
(b) Hotel/Motel_____
(c) Condominium_____
(d) Campground/RV Park_____
(e) Private Home of Friends/Relatives___

FLORIDA BIG BEND COUNTIES
ARTIFICIAL REEF STUDY
CHARTER BOATS

CIRCLE COUNTY:1=BAY;2=WALTON;3=OKALOOSA;4=SANTA ROSA;5=ESCAMBIA

Instructions: To the best of your knowledge, please answer all

of the following questions regarding your charter boat business. If you do not have firm numbers, please give us an intelligent estimate.

A. KIND AND USE OF VESSEL

Ql: Length in Feet: _____Ft.
Q2: Maximum Number of Paying Persons the Vessel will accommodate: _____Persons.
Q3: Over the last year(l997), how many total trips(both half day/full day) did you make with your boat?Trips:_____
Q4: Over the last year(l997), how many total paying passengers (both half/full day) did you take out to fish? Number of Paying Passengers:_____
Q5: About what percent of your customers come from outside your county of operation? Percent:_____
Q6: Number of employees including the captain per trip:_____

B. RECEIPTS PER YEAR AND CATEGORIES OF RECEIPTS

Q7: Over the last year(1997), what were your total receipts you received from all your paying passengers?$_____
Q8: Please break these receipts down into the following categories:(l)Charter Boat Fees:$_____(2)Drinks/Food $_____(3)Bait/Fishing Equipment Rentals:$_____ (4)Other(Specify)(_____)_____

C. USE OF ARTIFICIAL REEFS

Q9: In question 3 above, you said that you provided so many days per year to your customers for charter boat use. How many of these trips involved fishing in part or totally on some kind of artificial reef in the Gulf of Mexico? You can answer below.

Days Fishing on Artificial Reefs
Public Reef:_____Trips; Name(s) of Reefs_____
Private Reef:_____Trips; Name(s) of Reefs_____

10: As the captain or owner of a charter boat, do you or your employee target certain species of fish or just fish that come along? (l)Target_____(2) Just Come Along:_____

Q11: If you target, name the top four fish (If No, go to Q10) (l)_____(2)_____(3)_____(4)_____

Q12: Please name the top four fish your customers catch.

(l)_____(2)_____(3)_____(4)_____

Q13: Over the last 12 months of operations, how many different artificial reefs have you fished on? Number of Reefs:_____

Q14: If you use an artificial reef in your business, please rate the characteristics of this resource with respect to its importance to your customers (IMP: IMPORTANT)(CIRCLE)

Importance of reef to Customers	Very IMP	Important	Somewhat IMP	Not Very IMP	Not IMP
l.Better Chance to Catch Fish	1	2	3	4	5
2.Previous Success at Reef	1	2	3	4	5
3.Reef Close to Shore	1	2	3	4	5
4.Fish Near Other Boats	1	2	3	4	5
5.Sites Are Easy to Locate	1	2	3	4	5
6.Better Fishing than Natural Reefs	1	2	3	4	5

Q15: How important is the State of Florida's artificial reef program to your business? On a scale of 1(Lowest) to 10 (Highest), please rate the importance of the artificial reef program to your charter boat business. Rating:_____

Q16: Using the same rating system as in Question 15, how important is it to your business that the State of Florida provide ADDITIONAL artificial reefs in the area where customers fish? Rating:_____

Q17: On average, how far is the artificial reef or reefs that you use from shore? _____Miles

Q18: Please give the port or city from which you launch your charter boat. Port/City:_____County:_____

Q19: What is the name of your vessel:_____

1998 FLORIDA BIG BEND COUNTIES ARTIFICIAL REEF STUDY OF BOATING AND DIVING BY COASTAL RESIDENTS

Interviewer Initials:_____
Coastal County Area of Interview: B W O S E
Date Interviewed:_____

B=Bay; W=Walton; O=Okaloosa; S=Santa Rosa; E=Escambia

Good AM/afternoon/evening. I am calling long distance for a survey being conducted for the Florida Department of Environmental Protection. We're surveying recreational use of artificial reefs in counties in Northwest Florida. Your name was selected at random from the boaters' registration list. This survey should take 10-12 minutes and is intended to improve recreational boating in your area. We are interested in your boating habits as they pertain to artificial reefs of this county. Please note that the information you provide is confidential and will only be used for the purpose of this study.

1.SCREEN BOATING FROM NON-BOATING RESIDENTS

Ql In the last 12 months, have you done any private; party or charter boating of this county? If YES, go to next question. If NO, discontinue interview and say "Thank you for your time".

Yes_____ No_____

2. KINDS OF BOATING ACTIVITIES SCREEN

Q2 Over these twelve months, how many days did you use your boat or some kind of rental (charter or party) in the following boating activities I shall read you off this county.

A. NUMBER OF DAYS MAINLY SALTWATER FISHING_____DAYS

B. NUMBER OF DAYS MAINLY SKIN AND SCUBA DIVING_____DAYS

If Q2(A) and Q2(B) are zero, terminate interview.

Q3 For the number of days in each of the categories in Question

2, would you break down the days into whether you used your own boat or used some kind of a rental?

Q2 DAYS	OWN/FRIENDS RELATIVES BOAT	CHARTER	PARTY/ HEAD	PRIVATE RENTAL/NO CAPTAIN
A. Of _____=	_____ +	_____+	_____+	_____
B. Of _____=	_____+	_____+	_____+	_____

If Q3(A) is zero,but Q3(B) is not zero, skip to Section 4.

3. SALTWATER RECREATIONAL FISHING IN GENERAL AND ARIFICIAL REEFS IN PARTICULAR (A)

Q4 While using your own; charter; party or other rental boat, what is the average size of the party including yourself and the number in the party from outside this county.

Kind of Boat	Size of Party	# Outside County	
OWN/FRIENDS & RELATIVES	_____	_____	GO to Q5
PRIVATE RENTAL/NO CAPTAIN	_____	_____	Go to Q5
CHARTER	_____	_____	GO to Q6
PARTY/HEAD	_____	_____	GO to Q7

If respondent uses more than one kind of boat in Q4, go to question indicated and then return until cycle or process is completed.

Q5 On the most recent saltwater fishing day using your own boat/private rental approximately how much does your party spend on the following items:

	OWN	PRIVATE RENTAL/NO CAPTAIN	
Boat Fuel	$ _____	$_____	Per Party/Day
Tackle	$_____	$_____	Per Party/Day
Bait	$_____	$_____	Per Party/Day
Ice	$_____	$_____	Per Party/Day
Ramp Fees	$_____	$_____	Per Party/Day
Lodging(MO/HO)	$_____	$_____	Per Party/Day
Camping Fees	$_____	$_____	Per Party/Day

Food&Bev-Stores $_____$_____Per Party/Day
Food&Bev-Rest/Bar$_____$_____Per Party/Day
Auto Gas to and
from site $_____$_____Per Party/Day
Auto Rentals $_____$_____Per Party/Day
Equipment Rental $_____$_____Per Party/Day

Q6 If you rent a charter boat, how much did your party pay on their most recent fishing day for the following?
Charter Rental $_____Per Party/Day
Lodging(MO/HO) $_____Per Party/Day
Camping Fees $_____Per Party/Day
Food&Bev-Stores $_____Per Party/Day
Food&Bev-Rest/Bars $_____Per Party/Day
Auto Gas to and from Site$_____Per Party/Day
Auto Rentals $_____Per Party/Day
Equipment Rentals $_____Per Party/Day

Q7 If you pay for a party/head boat, how much did your party pay on their most recent fishing day for the following:
Party Rental $_____Per Party/Day
Lodging(MO/HO) $_____Per Party/Day
Camping Fees $_____Per Party/Day
Food&Bev-Stores $_____Per Party/Day
Food&Bev-Rest/Bars $_____Per Party/Day
Auto Gas to and from Site$_____Per Party/Day
Auto Rentals $_____Per Party/Day
Equipment Rentals $_____Per Party/Day

Q8 When you and your party engage in saltwater fishing using your own or a rental boat, do you target a certain kinds of fish or just what comes along? Name the top four fish please.

Targeted:(l)_____(2)_____(3)_____(4)_____OR

What Comes Along:(l)_____(2)_____(3)_____(4)_____

Q9 On the most recent day of saltwater recreational fishing, how many fish of all the fish you just gave me does your party's daily catch. If discarded, etc., include all?

Targeted Fish: Catch Per/Party/ Day_____OR
What Comes Along: Catch Per/Party/ Day_____

Q10 You said that you and your party make _____ saltwater fishing days(Q3) per year using your own boat or some form of rental boat. On how many of these saltwater fishing

days do you fish on artificial reefs(Count the day if you only spend part of the day on an artificial reef).If zero and Q3(B) is non-zero, Go to Section 4.

Kind of Boat	Total Days Q3(A) Per Year	Days Spent on Artificial Reef
OWN/Friends	_____	_____
CHARTER	_____	_____
PARTY/HEAD	_____	_____
RENTAL/NO CAPTAIN	_____	_____

Q11 On the last trip, how many artificial reefs did you fish?____

Q12 What are the names, if any, of the artificial reefs you fish?

l._____2_____3_____4_____

Q13 Are all the artificial reefs you have fished over the last twelve months in the Gulf of Mexico? Yes_____No____
If no, where else are they located?

Location(Atlantic Ocean, ETC)	Country	State	County
_____	_____	_____	_____

Q14 Of the fish you targeted/just came along, what kind did you and your party catch on an artificial reef(s)?

SAME AS ABOVE_____If not, what were they

DIFFERENT:Targeted:(l)_____(2)_____(3)_____(4)_____
WHAT COMES ALONG: (l)_____(2)_____(3)_____(4)_____

And as asked above, what is the catch per party per day for

TARGETED: Catch Per/Party/Day:_____OR

WHAT COMES ALONG:Catch Per/Party/Day:_____

Q15 Off what county in Florida is the principal artificial reef that you and your party used located?

County:_____

Q16 How far is this artificial reef from shore?_____Miles.

Q17 What fishing method did you use when you and your party fished at your principal artificial reef site?

(a) Bottom Fishing
(b) Deep Trolling
(c) Surface Trolling
(d) Drift Fishing
(e) Surface Casting
(f) Spear Fishing

Q18 I shall read off a list of reasons that might be important in your decision to fish at an artificial reef site. Please stop me as you rate the statement. 1=Very Important; 2= Important; 3=Somewhat Important; 4=Not Very Important; 5= No Opinion/DK. (CONTINUED ON NEXT PAGE)

	Very IMP	Important IMP	Somewhat	Not Very	No/IMP
(a) Better Chance of Catching Fish.	1	2	3	4	5
(b) Previous Fishing Success at Site	1	2	3	4	5
(c) Sites Are Close to Shore	1	2	3	4	5
(d) Want to Fish Near Other Boats	1	2	3	4	5
(e) Other Fishermen Recommended	1	2	3	4	5
(f) Sites Are Easy to Locate	1	2	3	4	5
(g) Better Fishing Than Natural Reefs	l	2	3	4	5
(h) Other(Specify) _____	1	2	3	4	5

Q19 At what location do you usually depart from when using an artificial reef?

County_____City_____Other Sites_____

4. SKIN AND SCUBA DIVING IN GENERAL AND ARTIFICIAL REEFS IN PARTICULAR (B)

Q20 While on an average day of diving, what is the size of your party including yourself? Party Size:_____

Q21 You said that you and your party make_____diving days{Q3(B)} per year using your own boat or some form of rental. How many of these diving days are made on artificial reefs? If zero, go to Section 6.

Kind of Boat	Total Days Q4(B) Per Year	Days Spent on an Artificial Reef
OWN	_____	_____
RENTAL	_____	_____

If OWN, go to Q22. If RENTAL only, skip to Q23.

Q22 On an average diving day where you used your own boat, how much do you spend on the following items?

Boat Fuel	$_____Per Party/Day
Air Refills	$_____Per Party/Day
Ice	$_____Per Party/Day
Ramp Fees	$_____Per Party/Day
Equipment	$_____Per Party/Day
Equipment Rentals	$_____Per Party/Day
Lodging(HO&MO)	$_____Per Party/Day
Food&Bev-Stores	$_____Per Party/Day
Food&Bev-Rest/Bars	$_____Per Party/Day
Auto Gas to and from Site	$_____Per Party/Day

Q23 On an average diving day where you used a rental boat, how much do you spend on the following items?
CHARTER/OTHER RENTALS

Boat Rental Fee	$_____Per Party/Day
Lodging(HO&MO)	$_____Per Party/Day
Food&Bev-Stores	$_____Per Party/Day
Food&Bev-Rest/Bar	$_____Per Party/Day
Auto Gas to and from Site	$_____Per Party/Day

Q24 How many different artificial reefs did you use for diving in the last twelve months?
Number Used:_____

Q25 When diving on an artificial reef, what county did you depart to the reef from? County:_____

5. EVALUATION OF ARIFICIAL REEFS:FISHERS & DIVERS

Q26 You experience with artificial reefs is important in evaluating this government program. How do you feel personally about each of the statements I shall read in terms of 1=Strongly agree; 2=Agree; 3=Disagree; 4=Strongly disagree and 5=No opinion

	Strongly Agree	Agree	Disagree	Strongly Disagree	N/O
(a)Artificial reefs too far from shore	1	2	3	4	5
(b)Artificial reefs too crowded	1	2	3	4	5
(c)Artificial reefs more productive than natural reefs	1	2	3	4	5

(CONTINUED ON NEXT PAGE)

(d)Too many artificial reefs	1	2	3	4	5
(e)Artificial reefs should be in water less than 150 feet	1	2	3	4	5
(f)Artificial reefs increase abundance of fish	1	2	3	4	5

Interviewer: A. If respondent uses artificial reefs for fishing only,{Q10>0;while Q21=0}, ask questions Q27 &Q28. B.If respond-end uses artificial reef for diving only, ask Q29 &30{Q10=0;while Q21>0}. If respondent uses artificial reefs for both fishing and diving, ask Q31 and Q32.

(FISHING ONLY)

Q27 Artificial reef programs cost money. Suppose that the government proposed that all newly constructed reefs would be paid for by requiring that reef users with their own boat pay for a stamp as part of their fishing licenses and/or if they use a rental boat probably pay higher fees for the operator's stamp. The money would go into a trust fund that could only be used for the construction of artificial reefs. Would you be willing to pay $_____per year when you renew your fishing license and/or use a rental boat of any kind to fund this

construction program? If YES, go to Section 6.
If NO, go to Q28.

Q28 Which one of the following statements best explains the reason for your answer?

(a) A contribution of $_____is more than a new artificial reef is worth to me.
(b) I don't really know how much an artificial reef is worth to me.
(c) There are enough artificial reefs already.
(d) No enough information to form a decision.
(e) I don't understand or like the question.
(f) The government should fund the reef program out of general revenue and not a specific tax or fee.
(g) Already pay too much to government.
(h) Government waste should be reduced to fund reefs.
(i) Other Reasons(Please Specify)_____

(DIVING ONLY)

Q29 The artificial reef program cost money. Suppose that the government proposed that all newly constructed reefs would be paid for by requiring that reef users with their own boat pay for a boat decal and/or if they use a rental probably pay higher fees to cover the operator's decal. The money would go into a trust fund that could only be used for the construction of artificial reefs. would you be willing to pay $_____per year when renewing your boat registration and/or using a rental boat of any kind to fund this construction.

If YES, go to Section 6. If NO_____,go to Q30

Q30 Which one of the following statements best explains your answer:

(a) A contribution of $_____is more that a new artificial reef is actually worth.
(b) I don't really know how much an artificial reef is worth to me.
(c) There are enough artificial reefs already.
(d) No enough information to form a decision.
(e) I don't understand or like the question.
(f) The government should fund the reef program out of general revenue and not a specific tax or fee.
(g) Already pay too much to government.
(h) Government waste should be reduced to fund reefs.
(i) Other Reason(Please Specify)_____

(FISHERS AND DIVERS)

Q31 The artificial reef program cost money. Supposed that the government proposed that all newly constructed reefs would be paid for by requiring that reef users with their own boat either pay for a stamp as part of their fishing license or pay for a decal as part of their boat registration. If you used a rental of any kind,you would probably would pay for the operator's stamp or decal in the form of higher fees to cover costs. The money would go into a trust fund that could only be used for the construction of artificial reef. Would you be willing to pay $_____ per year when you renew your fishing or boating license and/or use a rental boat of any kind to to fund this construction program?

If yes, go to Section 6. If No, go to Q32.

Q32 Which one of the following statements best explains your answer?

(a) A contribution of $_____is more than a new artificial reef is actually worth
(b) I don't know how much an artificial reef is worth to me.
(c) There are enough artificial reefs already.
(d) Not enough information to form a decision.
(e) I don't understand or like the question.
(f) The government should fund the reef program out of general tax revenue and not a specific tax or fee.
(g) Already pay too much to government.
(h) Government waste should be reduced to fund reefs.
(I) Other Reasons(Please Specify)_____

6.DEMOGRAPHICS

I would like to ask you some questions about your background to help us know more about the boaters that use artificial reefs and insure that all boaters are fairly represented in this study. I want to emphasize that all answers are strictly confidential. Finally, the accuracy of this study depends upon your answering all the questions.

Q33 How long have you been boating in the pandhandle of Florida? Years:_____.

Q34 What is the length of your own boat? _____FT. Don't____
Where is it registered? County_____State_____

Q35 Are you a member of a fishing or diving club? Yes___No

Q36 In what year were you born? Year of birth l9____

Q37 What is your ZIP code? _____

Q38 Male(M) or Female(F)_____(Fill-in by voice ID)

Q39 How would you describe your racial or ethnic background?

(a) White, NOT Hispanic
(b) Black or African American
(c) Hispanic
(d) Other(Please Specify)_____

Q40 Which of the income categories best describes your household's total family income before taxes?

(a)Less than $10,000
(b)$10,000 - $19,999
(c)$20,000 - $29,999
(d)$30,000 - $39,999
(e)$40,000 - $49,999
(f) $50,000 - $59,999
(g) $60,000 - $69,999
(h) $70,000 - $79,999
(i) $80,000 - $89,999
(j) $90,000 or more

Q41 Finally, which of the following best describes your formal education.
(a) Grades 1-9
(b) Some High School
(c) High School Graduate
(d) Some College/Vocational School
(e) College Graduates
(f) Graduate or Professional Degree.