BANKING ON NATURE 2002:

The Economic Benefits to Local Communities of National Wildlife Refuge Visitation

In a world where money counts, the land needs value to give it a voice.
-- Frances Cairncross, Costing the Earth

Updated from the 1997 report prepared by

Andrew Laughland, Ph.D.
and
James Caudill, Ph.D.

Update prepared by

James Caudill, Ph.D.
and
Erin Henderson

Division of Economics
U.S. Fish and Wildlife Service
Washington, DC

September 2003

Table of Contents

EXECUTIVE SUMMARY

Banking on Nature: The Economic Benefits of National Wildlife Refuge Visitation to Local Communities

An enormous molten ball shoulders its way up over the edge of the sea, illuminating a golden pathway from the horizon to a lonely beach. The only witnesses are a young couple with an infant who have come to gaze in awe at a piece of the world that still looks much as it did 10,000 years ago. In a small pond behind the sand dunes, a great blue heron patiently stalks a small green frog. A mile inland, two waterfowlers tense in their thatched blind as a small band of surf scoters appear in the distance. And at the opposite end of the sprawling salt marsh, a group of students and teachers gather for a class on wetlands ecology.

National wildlife refuges enrich people in a great variety of ways. Some benefits are relatively easy to quantify--to attach a value to--and some are not. How much does that young couple value their beachfront sunrise? Or the duck hunters their excitement? Can a dollar figure--a price tag, if you will--be attached to people's dawning understanding of the marvelous workings of the natural world? What's it worth to maintain and preserve the habitat vital to the survival of the endangered jaguarundi, or any of the other endangered or threatened creatures nurtured by refuges?

In today's increasingly complex society, it is important to be able to discover and clearly express the economic values of things, even such things as human experiences and "existence values" that benefit society as a whole. For that reason, the U.S. Fish and Wildlife Service has updated *Banking on Nature: The Economic Benefits of National Wildlife Refuges Visitation to Local Communities* to determine the impact of national wildlife refuges on their local economies.

This report focuses on the income and employment effects recreational visitors to refuges have on the economies of local regions. In addition to the economic effects of refuge hunting and fishing programs in local communities, it measures the economic impact of "ecotourism," the relatively recent phenomenon of large numbers of people traveling substantial distances to take part in non-consumptive uses of the natural environment.

Ecotourism is one method to derive economic benefits from the conservation of wildlife and habitat. Many refuges were established to protect waterfowl-hunting opportunities, but as public interests have expanded beyond consuming wildlife to emphasize watching and photographing wildlife, the role of refuges has also evolved. The economic effects of ecotourism are determined to assist refuge planning and to facilitate the interaction of refuges and local communities.

This report has four main sections. An Introduction details the study's overall rationale, outlines its economic concepts, and describes the methods and data sources used. The second section presents 15 sample refuge descriptions, highlighting the recreational activities enjoyed at each refuge, analyzing the regional economic factors involved, and putting the results of this analysis into perspective. A National View section discusses the overall results for the sample refuges and extrapolates them to a nationwide estimate. Finally, Appendices provide background detail on the economic models used for the refuge estimates and the nationwide aggregation.

One way to understand the economics of national wildlife refuges is to ask the questions: "If a given refuge did not exist, what would the region's economy be like? What would *life* there be like?" The answers involve how people come to acquire things they need or want. For the purposes of this study, those needs/wants are recreational opportunities. There are two elements in the value of any commodity: what you pay for it and the additional benefit you derive from it over and above what you pay for it. Surveys show people are almost always willing to pay more for recreation than they actually spend. Economists call this additional value consumer surplus.

Refuge visitors pay for recreation through entrance fees, lodging near the refuge, and purchases from local businesses for items to pursue their recreational experience. This spending generates economic activity throughout the local economy. Some of that money "leaks" out of the local area (thus called "leakage"), and some is recycled through the local economy (the "multiplier effect"). Spending by non-residents must be separated from spending by local refuge visitors. In this study, total visitor spending is evaluated to show its significance to the local economy.

There are two major sources for the information presented in this report: the Fish and Wildlife Service's National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (NSFHWR), and the Division of Refuge's Refuge Management Information System (RMIS). Combining data from these sources creates a profile of refuge visitors' spending in local communities.

Daily visitor expenditures for both residents and non-residents were developed in four categories (food, lodging, transportation, and other expenses) for six activities (freshwater fishing, saltwater fishing, migratory bird hunting, small game hunting, big game hunting, and non-consumptive activities). Visitor days were factored in, and the total expenditures by category of spending for each activity were determined. These expenditures were allocated to industries, and IMPLAN calculated the final effects of these expenditures on the local economies.

For the original report published in 1997, a technique called cluster analysis was applied to sort groups of refuges with recognizably similar characteristics. Per the request by the National Wildlife Refuge System, this updated report uses the same 15 sample refuges. While visitation has changed slightly, we will be able to develop individual refuge trends to document visitation and economic impacts between 1995 and 2002. The results of the analysis for these 15 refuges are expanded to the other refuges to develop national estimates.

This report spotlights each of the sample refuges, detailing its physical landscape, main mission, wildlife, uses, and activity levels. The economy of the local surrounding area is evaluated in such categories as population growth, major industries, and per-capita income. A Regional Economic Analysis section presents findings of 1) Visitor Recreation-Related Expenditures, 2) Economic Effects Associated with Refuge Visitation, and 3) Summary of Economic Effects of Refuge Visitation.

The National View section concludes by examining how the findings for the 15 sample refuges apply to six of seven U.S. Fish and Wildlife Service geographical regions (Alaska and Hawaii are excluded from this study). The economic analysis of the 15 sample refuges facilitates a look at the big picture: an estimate of the national impact of wildlife refuges on their regional economies. Regression analysis is used to progress from 15 individual refuges to their national implications. It is a statistical procedure that depicts relationships among characteristics of data points. In any group of

people, for example, there is a relationship between their heights and their weights. If you know someone's height, you can use a regression equation to estimate or predict his or her weight. Using the 15 refuges as data points, and factoring in visitation information, refuge location, and other variables, regression analysis yields equations that predict total final demand for all goods, employment income, and jobs generated by visits to each refuge. Many variables affect a refuge's impact on its local economy. Some relate to the refuge and its public-use program, others to the size of the region's economy. This report's National View section reviews the detailed refuge case studies to highlight the differences among the sample refuges.

So, in the final analysis, how important is wildlife refuge-based recreation in the mix of federal outdoor opportunities? The following are some of this study's findings:

* **Recreational visits to national wildlife refuges generate substantial economic activity.** In FY 2002, people visited refuges more than **35.5 million times** for recreation and environmental education. Their spending generated **$809.2 million of sales in regional economies.** As this spending flowed through the economy, **nearly 19,000 people were employed and $315.2 million in employment income was generated.**

* In some areas, **refuge visitors are major stimuli to the local economy.** Visitors to Chincoteague National Wildlife Refuge, for example, generate almost 3 percent of Accomack County, Virginia's earned income. Within the Chincoteague zip code, more than one-third of the jobs are attributable to refuge visitation.

* **Non-consumptive use of wildlife at refuges generated about 30 percent more economic activity than hunting and fishing.** Although non-consumptive wildlife users usually stay for shorter periods of time, their numbers at many refuges far exceed those of hunters and anglers.

* Surveys show refuge visitors would have been willing to pay more for their visit than it actually cost them. The difference between what they were willing to pay and what they actually paid is their net economic value or consumer surplus. **Visitors enjoyed a consumer surplus of more than $792 million in FY 2002.** Over $497 million of this amount accrued to non-consumptive visitors.

The above results include refuge visitation in the contiguous United States. The case-study results were expanded to encompass the Refuge System in 48 states. Spending and employment by the refuges themselves, payments in lieu of taxes, commercial activities on refuges, and many other economic effects of refuges on local economies were not considered in this analysis.

Introduction

National wildlife refuges provide many services to people. A complete economic analysis of the refuge system would include not only the value of all the forms of recreation enjoyed but also the payrolls of refuge employees and the values of maintaining endangered species, preserving wetlands, educating future generations, and adding stability to our ecosystem. All of these services are of value to society, whether or not they result in some form of market transaction. To understand the economics of refuges, we need to ask not only "What would a region's economy be like if the refuge did not exist?" but also "What would *life* be like if the refuge did not exist?"

The last question refers to many aspects of wildlife refuges. As land is preserved in its natural state, a refuge provides services to the ecosystem of which it is a part. Wetlands mitigate flooding, improve water quality, and provide nursery habitat. Trees provide nesting and roosting sites for birds. Many refuges maintain habitat critical for the survival of endangered species. An economic value may be placed on these ecosystem services by considering the cost of providing substitutes for them, such as building diversion dams, artificial settling ponds, and nest sites. However, such an approach can provide only a partial value assessment because it does not account for the value people place on the ecosystem in its natural state. Endangered species are especially valued because of the possibility of their permanent loss. Some people gain value simply from knowing that wild places and unique species still exist. These existence values are difficult to measure empirically.

This report focuses on only one of the values generated by national wildlife refuges: how recreational visitors impact local income and employment. Travel to participate in non-consumptive uses of the natural environment has been called "ecotourism." It has been promoted as a way to derive economic benefits from the preservation of wildlife and habitat. Many refuges were established to protect waterfowl-hunting opportunities. Ecotourism broadens the mission of refuges.

Because natural sites are drawing increasingly more recreationists, there has been a growing interest in quantifying their impact. Such information can help in refuge planning and decision-making, and facilitate the interaction between refuges and local communities. However, refuge benefits other than recreation also exist (such as habitat preservation) and are more relevant to the National Wildlife Refuge System's mission. It would be a mistake, for example, to increase recreational opportunities at a refuge at the expense of resource preservation goals just because the added benefits could be measured by the methods used here. This analysis should be seen as only one part of the benefits that the National Wildlife Refuge System provides.

This part of the larger study analyzes the visitation records of 15 sample refuges around the country to estimate the economic role that refuge visitors play in regional economies. The sample refuges are also used to estimate the impact of refuge visitors on regional economies nationwide. Readers interested in a particular refuge not among the samples should be able to find one of these 15 case studies that is comparable to their favorite.

The next section of this Introduction explains some of the economic theory behind benefit estimation and regional impact analysis. The concepts of consumer surplus, household production, leakage, and multipliers are addressed in plain English. Also, a Glossary is included at the end of the Introduction.

The following section of the Introduction explains the details of how data were collected for this study. It covers selection of sample refuges, gathering of visitation information, data cleaning, and expenditure estimation.

The last section explains how the data are combined to generate estimates of economic activity. The assumptions and limitations of the results are emphasized.

Following the Introduction are 15 Sample Refuge Descriptions, highlighting the activities enjoyed at each one, analyzing the regional economic factors involved, and putting the results of this analysis into perspective. The report's final section, titled National View, describes how the results for the sample refuges may be used to estimate nationwide effects from refuge visitation and discusses the nationwide estimates. Technical appendices are available that provide background detail on the economic models used for the refuge estimates and the nationwide aggregation.

Recreational Economics

Recreation as a Good

Economics is about the distribution of resources. How do people come to acquire the things they need or want? Be it World Cup soccer tickets or a new species for their life lists of birds, anything people desire can be characterized economically with a dollar value. By knowing the economic cost and value of things, we can compare individuals' choices in one area with their choices in another. Knowing the cost of a home-cooked meal (cost of ingredients, preparation time, etc.) may help explain how to price restaurant meals. Knowing how much people spend on home-cooked meals also tells us about choices in the community. What will people do if food prices rise? If restaurants must pay the minimum wage, what will happen to meal prices, and how high can prices increase before people will choose to eat at home instead? It might be interesting to know the amount of economic activity in a community generated by home cooking. The same can be said about other things such as wildlife refuge recreation.

There are two components to the value of any commodity--what you pay for the commodity and the additional benefit you derive over and above what you paid. If there were no additional benefit, you would most likely not buy it since you could spend your money on an alternative good that would give some additional benefit. Surveys of the general population bear this out: Almost always, respondents are willing to pay more than they are currently paying for recreational opportunities. Economists call the additional benefit *consumer surplus* (or *net economic value*) and illustrate it with an individual's demand curve, as shown in Figure 1. The curve shows the price a person would pay for an additional unit of a given good. The person would be willing to pay price R for the first unit of the commodity. Once he has one unit, he would probably be willing to pay somewhat less for the second unit, even less for the third, etc. If he were able to actually buy the good at price P, the person would save the amount R-P--the difference between what he'd have been *willing to* pay and what he *actually* paid for the first unit. R-P is his consumer surplus for the first unit. Figure 1 shows that at price P, the person would buy 4 units of this good, and would have to pay 4 times P dollars. P times 4 is the area of rectangle A. The commodity's benefit that the person *does not pay for* is represented by stepped triangle C. Triangle C is the total consumer surplus for this good.

The ultimate good consumed is produced by individuals combining their time with purchased inputs to produce something else. A home-cooked meal, for example, requires food bought at the grocery store, gas for the stove, kitchen space, and time. The economic cost of the meal includes all of these inputs to its production. This is called the household production approach. To find the total cost of a meal, an economist must add up the price times the quantity of each input. For inputs that are not traded in markets, such as the time needed to prepare the meal, prices are not available. Prices paid for similar inputs, like a hired maid, may be substituted, or the price for the next best use of the unpriced input (the opportunity cost), like the wage the homemaker could have earned outside the home, can be used to approximate the unknown price.

Recreation is a special kind of good. Recreationists at a refuge pay for their recreation not only in entrance fees but in the costs of traveling and staying near the refuge and taking time away from other activities. In Figure 1, all of the recreationist's costs to obtain recreation compose rectangle A. His recreational enjoyment that is over and above what he pays is triangle C, his consumer surplus.

Time is an unusual good. Spending it, outside of paid work, does not result in a flow of money from one person to another. No one pays you to watch television, for example. Similarly, refuge visitors' opportunity cost of time, although it is an important component in the cost of recreation, has little to do with the impact of recreation on the local economy. For this reason, the costs of time will be not be estimated in this analysis.

Visitors' spending generates economic activity throughout the local economy. This is only a small part of the benefits visitors receive from traveling to a given area, but it is relatively easy to quantify and important to the regional economy. This analysis will also estimate the consumer surplus derived from refuge recreation to find the total benefits derived from visits to the refuge.

Expenditures and the Regional Economy

It is hard to do anything without spending money and thereby affecting economic activity. Whether it is gas to drive somewhere, feathers with which to tie flies, shotgun ammunition, or movie tickets, something is purchased to pursue the recreational experience. For the regional economy, it matters where the spending comes from. If the expenditure is from outside the region, it generates increased economic activity. If it is from within the region and would have occurred in the region anyway, it does not increase economic activity but is important for local businesses. To illustrate this idea, imagine a town consisting of one store and one citizen, an employee of the store. All of the store's expenses involve buying stock from an out-of-town wholesaler and paying the lone employee. When the employee is paid he buys his groceries at the store. Part of the purchase price goes to buy more stock, and the rest goes to the employee's

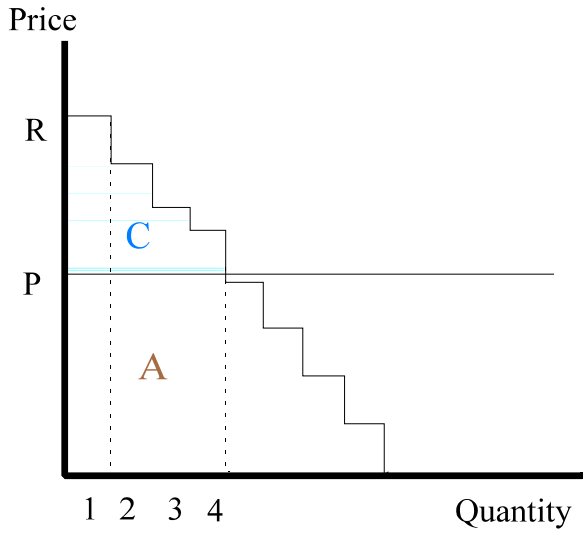


Figure 1. Individual Demand Curve

next paycheck. For the employee ever to get back more than he spent someone from out of town must buy something at the store. The real workings of a modern, interconnected regional economy are far more complex, but the concept still holds that the regional economy can't grow without importing some income from outside the region.

Thus it is important to separate spending by people from outside the refuge's economic region from spending by those who live locally. Local residents would probably have spent their recreation money in the local economy with or without the refuge. If they couldn't go birding, they might go bowling. In contrast, non-residents may have been attracted to the area by the refuge. They would have gone elsewhere except for its presence, *and* their spending is a stimulus to the economy. Non-resident spending generates new income and new jobs. It has an economic *impact* on the region. We evaluate it to show the gain to the region from having the refuge. We evaluate total spending, by both residents and non-residents, to show the *significance* of the refuge to the local economy. Significance shows how large a part of the local economy is connected to refuge activities but should not be interpreted as income that would be lost if the refuge were not there.

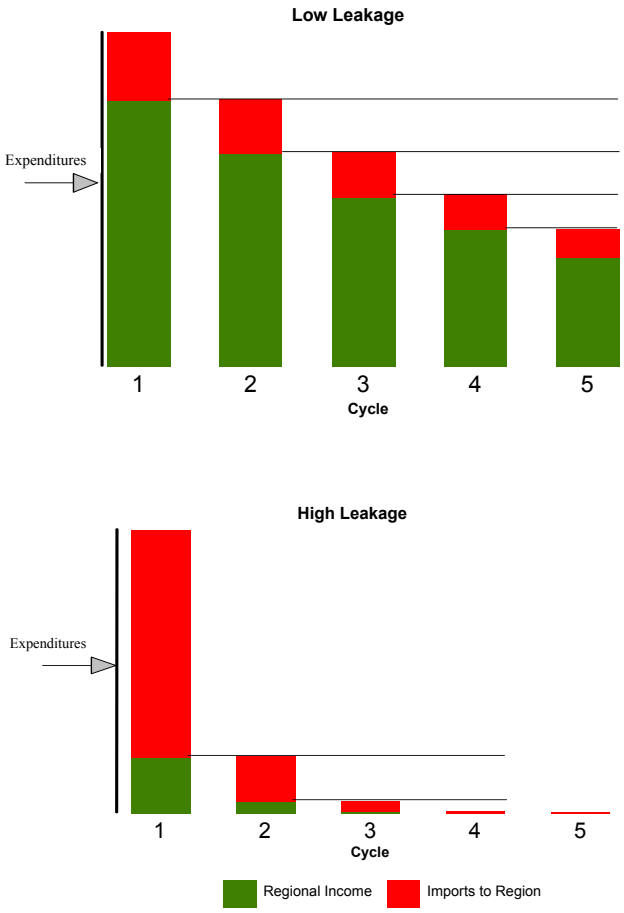


Figure 2. High and Low Leakage

Leakage and Multipliers

The one-store town also illustrates the idea of "multipliers" and "leakage" from a regional economy. Each time the employee is paid and spends his income, new income is generated. Whatever the amount of the first purchase, the subsequent purchases add to the employee's income again. To the employee, it seem like his income is several times his income from the first purchase. This recycling through the local economy is called "the multiplier effect." The multiplier is the sum of the employee's income stream divided by his income from the original purchase. In Figure 2, the multiplier is then the total area of the green "Regional Income" rectangles in cycle 2 and later, divided by the area of the Regional Income rectangle in cycle 1. It shows how much local income each dollar of new spending generates as it circulates through the economy.

Leakage is the local spending that leaves, or leaks out of, the region. In the example, the stock bought from an out-of-town wholesaler is a leakage from the region's economy. Less leakage implies that more spending stays in the local economy. If there were no leakage at all, the economy would be self-perpetuating and could stay in a steady-state forever. Let's say the cost of restocking the store in the example was only 1 percent of sales. From $100 in sales, the employee would receive $99. He could spend his income and receive about $98 in wages from his second round of purchases. The

original $100 purchase would recycle many times before it all left the economy. Alternatively, say the leakage is large and restocking costs 80 percent of sales. The employee would receive only $20 from the first-round purchase and only $4 in the second round. The multiplier would be very small. Figure 2 illustrates high and low leakage processes.

Leakage and the size of the multiplier depend on the degree to which the local economy provides for its own needs. Different industries have different needs, and so they import varying amounts of inputs from other regions. Thus it is important to identify the commodities that new spending will buy and know where they are manufactured. Most small or rural regions import many products and so have a great deal of leakage and small multipliers.

Economists use statistics on employment, production, and earnings in the region, as well as information about flows of goods between industries nationwide, to develop estimates of the degree of integration of a regional economy. County-level data is used in this report. Information on larger regions can be assembled by aggregating data from several counties.

Data and Assumptions

Data Sources

Data for this study are compiled from the FWS National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (NSFHWR) and the FWS Refuge Management Information System (RMIS). By combining information from these two sources, a profile of refuge visitors' spending in local communities may be developed. The data are further enhanced with information from refuge staff, regional tourism agencies, and other recreation providers. Refuge officials estimated the average lengths of stay from the activities available and the typical behavior pattern of visitors. This information is used to tally the number of hours visitors spend on a given refuge (usually expressed in recreation visitor days or RVDs) and on the activities in which they participate.

Every 5 years the Fish and Wildlife Service conducts the NSFHWR, which gathers nationwide information about recreationists, their activities, and their expenses. This Survey is the data source for daily visitor expenditures, which are generated for four categories: food, lodging, transportation, and other expenses (including guide fees, land-use fees, equipment rental, etc.). An input-output computer model called IMPLAN was used to generate the effect of visitors' spending on the sample 15 refuges' local economies. (For purposes of this study, a region is defined as the area within 30 miles of a refuge.)

The National Wildlife Refuge System maintains extensive data on public visitation. Nearly all the visitation data used in this study is derived from the RMIS information, which is reported by personnel at each refuge and varies with each refuge's unique situation. The methods used to collect data vary with each refuge's unique situation, location, and activities offered. For example, many refuges have tightly controlled hunts. At Las Vegas NWR, for example, goose hunters must register when they arrive and check out when they leave their assigned pit blind. Some refuges collect fees at main entrances. There is only one road into Chincoteague NWR, for example, so virtually everyone who enters can be counted and included in the RMIS data. Refuges with multiple access points or highways through refuge lands cannot count each visitor, so other methods must be adopted to

estimate the number of visitors. Three common methods are car counts, foot counts, and parking-lot audits.

Car counts involve counting automobiles that pass some point on refuge roadways. A pneumatic tube attached to a counting device is placed across the road. Sophisticated counters record the time each vehicle crosses, and information is saved in a computer file to be downloaded later. This system facilitates analysis of the time of day of refuge use. Other counters simply record the number of axles crossing the tube and must be read periodically. It is easy to derive the number of vehicles crossing the tube. Observations at each refuge allow estimates to be made of the number of people entering. If a car counter is installed on an auto tour route, clear estimates can be made of the number of people using the route. If the car counter is placed at a foot-trail parking lot, the estimate may represent trail users. If several uses are available at the site, some observation of how many people do each activity may allow the refuge staff to estimate visitation for each use. Foot counters follow the same idea as car counters. Usually they record the number of times a light beam is blocked. These devices are often used at visitors centers and may be used at trail heads.

Many refuges are accessible from public highways. Often visitors simply pull off the roadway to enter the refuge. Refuge personnel know the favorite pull-off points in their area and the activities people may pursue from that location. In hunting season, for example, hunters park along the side of Route 49 at Horicon NWR. Counting these cars and knowing that hunters usually visit in pairs or threes allows the public-use officers to estimate the number of hunters on the refuge. Anglers also have favorite parking spots around the refuge and usually fish alone or in pairs.

Although these methods are somewhat ad hoc they provide the best visitation information available without extensive additional data collection. The raw RMIS figures may provide the only estimate available of total refuge visitation. Because of collection efforts used, the data are not an exact count. However, we believe data-collection bias is small and have used several techniques to generate the most conservative estimates possible.

Sample Selection

The Division of Economics does not have the resources to thoroughly study all 542 refuges. Instead, the Fiscal Year 2002 RMIS data and professional judgment were used to select 15 refuges for detailed analysis. Per the National Wildlife Refuge System's request, the 15 sample refuges used in this analysis are the same as those used in the initial 1997 report. The sample refuges were originally chosen based upon their representation of nine clusters[1] (high use for non-consumptive, high use fishing, high use hunting, medium use fishing, medium use non-consumptive, more than 50,000 visitation, and low visitation). While these sample refuges may no longer be representative of these groups, they were chosen for this updated report to create individual refuge trends. Table 1 shows the sample refuges and their original categories.

[1]Refer to Appendix 4 in the 1997 report for details on the original cluster analysis.

Table 1. Study Sites for Economic Benefits of Refuge Visitation

Name	Cluster	FY 2002 Visits
Chincoteague, VA	High Use - Visitor Center/Non-Consumptive	1,554.0
National Elk Refuge, WY	High Use - Visitor Center/Non-Consumptive	854.5
Crab Orchard, IL	High Use - Fishing	995.1
Eufaula, AL	High Use - Fishing	371.3
Charles M. Russell, MT	High Use - Hunting	247.0
Umatilla, OR	Medium Use - Hunting	68.5
Quivira, KS	Medium Use - Hunting	223.3
Mattamuskeet, NC	Medium Use - Fishing	66.5
Upper Souris, ND	Medium Use - Fishing	64.1
San Francisco Bay, CA	Medium Use - Non-consumptive	498.2
Laguna Atascosa, TX	Medium Use - Non-consumptive	182.7
Horicon, WI	More Than 50,000 Visitation	572.5
Las Vegas, NM	More Than 50,000 Visitation	43.6
Tule Lake, CA	More Than 50,000 Visitation	175.7
Tensas River, LA	Low Visitation	95.3

RMIS Data Adjustments

Because RMIS visitor counts are based on several different counting methods, one visitor may be counted several times. If he drives an auto tour route, he may be counted by a car counter. If he stops to walk a trail, a trail counter may count him again. If he goes into the visitor center, a third counter may count him yet again. It is useful for management to understand how many people are using each refuge service, but for economic purposes we would do not want to overestimate a visitor's impact to the local economy. Thus, each visitor should be counted only once for his or her primary activity.

People pursue many different activities while traveling. Their visit to a national wildlife refuge may be part of a longer trip or just a stop on their way to somewhere else. Urban refuges, such as Don Edwards San Francisco Bay NWR, and refuges along major tourist routes, such as the National Elk Refuge, are particularly likely to have many visitors spending short periods of time on the refuge. Counting these brief visits as full recreation days would vastly overestimate the visitor spending attributable to the refuge. In this study, a full recreational day is considered as eight hours[2]. Thus, a visitor who spends 4 hours at a refuge has spent half of an RVD, and half of their expenditures for the

[2]The U.S. Forest Service considers a recreation day as 12 hours long. However, unlike National Forest activities, almost all refuge uses are daylight activities.

day will be attributed to the refuge. The average length of time visitors participate in each activity is used to determine the number of RVDs for that activity. If a typical non-consumptive wildlife use day is 4 hours at a particular refuge, the number of RVDs for the refuge would be the number of non-consumptive use visits multiplied by 4/8. Refuge public-use officers estimate the average lengths of stay for each activity available on the refuge and the typical behavior pattern of visitors.

Expenditure and Consumer Surplus Data

Daily expenditure information for this study was extracted from the NSFHWR trip expenditure database (U.S. Department of the Interior et al. 2002). Each respondent who said she or he had participated in an activity was asked about the trips she had taken to pursue the activity in the reporting period. A migratory bird hunter, for example, would be asked in what states he had hunted. For each state a series of questions would reveal how many days he had hunted chiefly for migratory birds and how much he had spent or his share of spending during those days in that state. Respondents were asked to determine expenditures in nine categories which were then aggregated to four categories for analysis. To convert this individual state total to expenditures per day per trip, the total was divided by the number of days the respondent said he had pursued chiefly that activity.

Four Categories

Food:

- Food, drink, and refreshments

Lodging:

- At motels, cabins, lodges, or campgrounds

Transportation:

- Public transportation, including airplanes, buses, and car rentals
- Round-trip cost of transportation by private vehicle

Other:

- Guide fees
- Pack trip or package fees
- Public land-use or access fees
- Private land-use or access fees, not including leases
- Equipment rental

Respondents were classified as non-residents if their state of residence differed from the state where the activity occurred. Average daily expenditures were calculated for each Fish and Wildlife Service region. Smaller geographic breakdowns left too few respondents in some categories for reliable averages. These expenditure estimates are shown in Appendix 3.

Lodging expenditures appear very low in this data, ranging from $0.32 per day for resident small game hunters in Region 3 to $35.10 per day for non-resident non-consumptive in Region 1. Often, lodging expenditures are only a few dollars per day. In the NSFHWR, a trip does not necessarily begin at the respondent's residence. If someone were visiting relatives, for example, and spent a day of that visit hunting at a refuge, only the expenditures related to the time spent hunting is included. The trip would be a one day trip from the relatives' home and would have no lodging costs associated with it, even though the hunter had made an extensive trip away from his home. Hunting would be the primary purpose of the side trip but not of the entire trip away from home. Many people also camp or own

recreational vehicles or own hunting cabins and so have minimal lodging costs that may be spread among several individuals.

Estimating the benefits people derive from recreation over and above what they spend--called consumer surplus or net economic value, area C in Figure 1 --is very difficult. Consumer surplus estimates were derived from a valuation question in the NSFHWR. Bass anglers, for example, were asked this question: "Fishing expenses change over time. For example, gas prices rose dramatically during the 1970s, fell somewhat during the early 1980s, and rose again in the late 1980s. Would you have taken any trips to fish primarily for bass during 1991 if your total bass fishing costs were X dollars more than the amount you just reported?" X was a different random amount for different respondents. The responses were analyzed statistically to estimate values. Though controversial, such methods are often used to derive individuals' willingness to pay for some good that, as explained above, is the heart of consumers' surplus. The aggregate consumer surplus estimates for this study were derived by multiplying the number of RVDs for each activity by the net economic value per day found by the NSFHWR for that activity. (Aiken and LaRouche, 2003).

Economic Modeling

Input-Output

Input-output modeling is a statistically and arithmetically demanding task that was not routinely undertaken before the wide availability of computers. In addition to balancing and inverting matrices of numbers, the basic statistics for each area of analysis must be discovered and made consistent. Regional impact analysis has been greatly facilitated by the development of integrated modeling software that contains both consistent databases and appropriate generalized algorithms for computing multipliers and impacts. One of these software tools is IMPLAN (Minnesota IMPLAN Group, Inc., 1998). IMPLAN was developed for the U.S. Forest Service by the University of Minnesota to aid in the forest planning process. It uses regional information to modify a standard input-output framework of the U. S., developed by the Department of Commerce, Bureau of Economic Analysis, to describe local conditions. This study uses IMPLAN to generate the local economic effects from visitors' spending.

A region (and its economy) is defined as the area within 30 miles of a refuge. IMPLAN is based on county data, so the region is stretched or shrunk to fit the available data. It is important that the region include most of the day-to-day economic activities of nearby residents and likely shopping places of refuge visitors. With the counties to be included defined, IMPLAN can calculate the multipliers for each industry.

From the NSFHWR data, daily expenditures were developed in four object categories for six activities for residents and non-residents in each Fish and Wildlife Service region. That provides 12 separate budgets for each region. (These budgets are shown in Appendix 3). Multiplying each budget by the number of visitor days for that activity from the adjusted RMIS data yields the total expenditures by category of spending for each activity. These are totaled and the expenditures are allocated to industries. Food, for example, is allocated 35 percent to restaurants and 65 percent to grocery stores for residents, and 65 percent to restaurants and 35 percent to groceries for non-residents. Transportation is allocated to gas and oil, car repairs, and airline tickets. Total expenditure for each

commodity is the input to the IMPLAN model. IMPLAN then works out the amount of leakage and the implied multipliers, direct expenditures, earnings, employment, and output. IMPLAN calculates the direct, indirect, and induced effects of the new expenditure. Direct effects are a measure of leakage--the net amount of the expenditure that stays in the region after the first round of spending. Indirect effects estimate the impact of the expenditures as they cycle through the local economy. Induced effects are a result of changes in employment, population, and income from the new spending. These effects can be summed to show the total effect. In each refuge summary in this study, we report the total effects on final demand, jobs, and job income in thousands of 1995 dollars.

"Final demand" is simply the total spending by the final consumers of all goods. The amount reported is the change in spending by all final consumers in the region attributable to refuge visitation.

IMPLAN's definition of "jobs" is very broad. For each industry, there is some proportion of output that goes to employee earnings (i.e., job income). In turn, there is some amount of earnings that represents one job. Dividing earnings by the job-cost constant yields an estimate of the number of jobs stimulated by visitors' spending. In the restaurant industry, for example, 75 percent of sales may go to employee earnings and $15,000 may be equivalent to one job. So $20,000 in sales implies $15,000 in job income, and one job. IMPLAN counts full-time, part-time, temporary, and seasonal jobs equally. Therefore, job income is a better indicator of the employment effects of new spending than the jobs figure IMPLAN generates.

Generating National Estimates

Economic Significance

One goal of this research is to generate estimates of the national impact of refuges on their regional economies. Ideally, an IMPLAN model and the necessary visitation information would be developed for each refuge and the results summed to produce a national estimate. Such a process would be prohibitively expensive. As an alternative, the IMPLAN results from the 15 case studies can be treated as data points. Regression analysis is a statistical procedure that depicts relationships among characteristics of data points. Taking individual people as data points, for example, there is a relationship between their height and their weight. Regression analysis finds an equation that quantifies such relationships. If you know someone's height, you can use the regression equation to predict his or her weight. Using the 15 sample refuges as data points, and factoring in visitation information and characteristics of the refuge location, regression analysis yields equations that predict (1) final demand, (2) employment income, and (3) jobs generated by visits to each refuge. The total of these refuge estimates is a national estimate. The process is explained in more detail in Appendix 2.

Several adjustments were made to the data to ensure consistency. The regression equation did not adequately handle refuges that had low visitation or were far from urban areas. To avoid adding these errors to the national results, all refuges with fewer than 1,500 visits and those not located in the continental U.S. were deleted from the calculations. This eliminated about 180 refuges but relatively few visits.

The regression technique produced estimates of final demand, employment income, and jobs created by all visitor spending. Just as predicting someone's weight from his or her height may not be very

reliable, comparison of these predictions with the case-study results showed that the estimates could be very wide of the mark. However, the predicted values were both too high and too low, so it appeared that the deviations would balance each other when applied to groups of refuges. For this reason, only regional and national aggregates are reported.

Consumer Surplus

Consumer surplus was estimated for the sample refuges by multiplying recreational visitor days by the consumer surplus value for that activity in that state. Essentially the same process was followed for the refuges outside the sample. Outside the sample, detailed information was not available on the amount of time spent in each activity on a refuge. This was not a problem for hunting and fishing, as it had been assumed that these were full-day activities for the most part. Non-consumptive use was adjusted to recreational visitor days using the average length of time such visitors stayed at the sample refuges--about 3.8 hours. For states with too few observations to measure the net economic value, the national mean was substituted.

The national estimates and refuge case studies provide a rough scale of the economic significance of refuge recreation to local communities. Whenever other studies were available, we compared those results with our results. In general, our results agree with previous estimates fairly well. These results are broadly descriptive. They are not intended to provide policy direction or performance measures. Refuge management is an imperfect balancing of multiple goals. This report highlights only one component.

Glossary

Activity: What visitors do at a refuge. In this study, visitor activities are grouped into hunting, fishing, and non-consumptive uses.

Consumer Surplus: The difference between the total value people receive from the consumption of a particular good and the total amount they pay for the good.

Employment Income (see Job Income)

Final Consumers: The people who finally use the product. Contrast final consumers with intermediate consumers who buy goods in order to sell them again.

Final Demand: The total spending by final consumers on all goods. The amount reported in this study is the change in spending by final consumers in the region attributable to refuge visitation. Final demand includes spending by people who earn income from refuge visitors' activities as well as spending by refuge visitors themselves.

FWS: U.S. Fish and Wildlife Service

Impact: The new economic activity generated in a region as a refuge attracts non-residents to the area. This figure represents economic activity that would be lost if the refuge were not there.

IMPLAN: An economic modeling software package that applies input-output analysis techniques to regional economies.

Job Income: Income to households from labor including wages and salaries. Job income excludes returns to property and proprietorship income.

Leakage: Money lost from a regional economy by payments to suppliers outside the region.

Multiplier: Multipliers show the regional economic effects resulting from changes in final demand for a commodity or group of commodities.

Net Economic Value (see Consumer Surplus)

Non-Consumptive Use: Recreational activities that enjoy wildlife without consuming it, such as birding, photography, picnicking, etc. Non-consumptive use contrasts with consumptive uses such as hunting, trapping, and fishing.

NSFHWR: National Survey of Fishing, Hunting, and Wildlife-Associated Recreation

NWR: National Wildlife Refuge

Recreational Visitor Day: A unit of measure equal to 1 person spending 1 full day (in this study, 8 hours) recreating at a particular site. RVDs allow comparisons between visitors who stay for only short periods of time and those who stay longer.

Resident/Non-Resident: People living more than 30 miles from the refuges were considered non-residents for this study.

RMIS: Refuge Management Information System

Significance: The total economic activity in a region that is related to a refuge. Significance shows a refuge's role in the regional economy. The portion of this activity attributable to residents most likely would have occurred in the region anyway and so does not represent an incremental contribution to the regional economy. Contrast **significance** with **impact.**

Chincoteague National Wildlife Refuge

Description

Chincoteague NWR is a 14,014-acre refuge on the Maryland-Virginia border. It encompasses the southern end of Assateague Island, a mid-Atlantic, coastal barrier island, and includes several other units on other islands in the vicinity. The refuge was established in 1943 to provide wintering and migration habitat for migratory birds. Its mission now includes preservation of endangered species, maintenance of indigenous species, and wildlife-oriented public use. The area is a popular tourist destination for birding, wildlife, sandy beaches, and wild horses like those featured in the "Misty" books. It is within a short drive of the Baltimore-Washington metro area and several beach resorts. It is one of the most heavily used refuges in the system with 1.5 million visits a year.

The refuge encompasses ocean beach, dune, maritime forest, tidal marsh, and freshwater moist soil habitats. Its diverse biota presents unique management challenges. Over 1 million visitors come to enjoy the beach and its wildlands aspects. The National Park Service operates the recreational beach section of the refuge. An auto route is closed to automobiles part of each day to permit use by bicyclists and pedestrians. Several nature trails are available. Off-road vehicles are tightly restricted but are permitted on parts of the beach in some seasons. Surf casting is a popular activity and freshwater fishing is permitted in a refuge impoundment. Limited hunts for sika (a small, oriental elk species introduced to the island) and waterfowl occur in the fall and winter.

Area Economy

The town of Chincoteague, in Accomack County, Virginia, is the gateway to the refuge. Like many Atlantic seaside towns, it has outgrown its Main Street in recent years. The road to the refuge is lined with restaurants, motels, and gift shops. The town's economy is dominated by tourism and so is highly seasonal. Away from the oceanside, the region is largely agricultural, with the exception of N.A.S.A.'s Wallops Island Flight Center. Table 1 shows a summary of the area economy for 2001. Accomack County's population has grown by 10 percent since 1995 while the population of neighboring Worcester County, Maryland, has increased by 16.1 percent. Overall, the area population increased by 13.4 percent from 1995 to 2001. During the same time period, area employment increased by 9 percent , lagging slightly behind employment gains in Maryland and Virginia. Per capita income in the area remained steady from 1995 to 2001, showing a slight increase of 2.7 percent. This compares with a 13.9 percent increase for Maryland, a 15 percent increase for Virginia and a 12.5 increase for the nation as a whole.

Table 1. Chincoteague NWR: Summary of Area Economy, 2001.
(Population and Employment in '000's; Per Capita Income in 2002 dollars)

	Population		Employment		Per Capita Income	
County	2001	Percent change 1995-2001	2001	Percent change 1995-2001	2001	Percent change 1995-2001
Worchester MD	47.8	7.2%	32.7	13.1%	$27,767	5.2%
Accomack VA	38.6	10.3%	17.3	2.0%	$18,624	-0.8%
Area Total	86.4	13.4%	50.1	9.0%	$23,195	2.7%
MD	5,386.1	6.2%	3,128.4	11.9%	$35,836	13.9%
VA	7,196.8	7.9%	4,445.1	12.7%	$32,849	15.0%
	285,317.6	7.2%	167,535.6	12.2%	$30,894	12.5%

Source: U.S. Department of Commerce 2003.

Activity Levels

Since the late 1980s visitation to Chincoteague has been level, with approximately 1.5 million visits each year. More than half of these visitors come during June, July, and August; less than a tenth during December, January, and February. For the purposes of this analysis, non-consumptive visits are converted to refuge visitor days, defined as 8 hours of recreation activity per day. In summer, most visitors come from more than 30 miles away. This is balanced by more local visitation during the winter months. Refuge staff estimates that 90 percent of non-consumptive visitors are non-residents.

Hunting comprises a fairly small portion of refuge use. Migratory birds accounted for 242 visits and big game hunting accounted for 759 visits. About 70 percent of all hunters are non-resident.

Surf fishing is very popular in the area. Recreational clamming is also popular. Ninety percent of saltwater fishing visitation is estimated to be by non-residents. All fishing is assumed to use a whole recreational day.

Regional Economic Analysis

Table 2 shows visitor recreation expenditures for FY 2002. Non-consumptive-use visitors to Chincoteague spent over $32 million in the region. Saltwater anglers spent an additional $8 million. Hunters' spending was a relatively modest $39,000. Clearly, non-consumptive users are major contributors to the regional economy.

Table 2. Chincoteague NWR: Visitor Recreation-related Expenditures (2002 $,000)			
Activity	**Resident**	**Non-Resident**	**Total**
Non-consumptive	$638.6	$31,658.1	$32,296.7
Hunting			$0.0
Big game	$2.7	$24.5	$27.2
Small game	$0.0	$0.0	$0.0
Migratory waterfowl	$0.6	$11.1	$11.7
total hunting	$3.3	$35.6	$38.9
Fishing	$602.8	$7,385.3	$7,988.1
Total	**$1,248.0**	**$39,114.6**	**$40,362.6**

Because of the area's isolation, less than half of the total amount stayed in the local economy. Table 3 summarizes the total economic impacts associated with refuge visitor spending. The high leakage led to a comparatively low multiplier effect; only $27.2 million in total final demand was generated through recycling non-resident spending in the economy. This is the total monetary value of economic activity generated in the area by non-resident refuge visitor spending. Nevertheless, this meant more than $12 million in new employee compensation and 590 new jobs (full-time, part-time, and seasonal).

Table 3. Chincoteague NWR: Economic Effects Associated with Refuge Visitation (2002 $,000)		
	Non-Residents	**Total**
Final Demand	$27,158.8	$28,227.2
Jobs	590	617
Job Income	$12,033.2	$12,485.5

Residents add only another $1.2 million in spending to the total. So Chincoteague's visitation is highly important to the local economy.

Table 4 shows total economic effects (total final demand plus net economic value) compared with the refuge budget for FY 2002. The Fish and Wildlife Service spent $2.4 million to operate Chincoteague during FY 2002. (Budget data are from the RMIS database and include 1260 staff funding, 1260 nonstaff funding, and other staff funding.) This spending provides additional jobs and income to area businesses. Visitors also derive value from their activity at the refuge. The figure for net economic value shown in Table 4 is derived by multiplying net economic values for hunting, fishing, and non-consumptive recreation use per day by estimated refuge visitor days for that activity. The net economic value is $31.9 million, more than $24 million of which was attributable to non-consumptive users. This figure is combined with the estimate of total final demand and divided by the refuge budget

for FY 2002. The overall ratio of economic effects per dollar of budget expenditures is very high, reflecting intensive public use and highly accessible natural amenities. The ratio is overstated to some extent because the budget figure does not include National Park Service operations at the recreational beach. This ratio is provided only for the purpose of broadly comparing the magnitude of the economic effects resulting from refuge visitation to total budget expenditures and should not be interpreted as a benefit-cost ratio.

Table 4. Chincoteague NWR: Summary of Economic Effects of Refuge Visitation (2002 $,000)

	FY 2002 Budget	Final Demand	Net Economic Value	Economic effects per $1 budget expenditure
Chincoteague NWR	$2,382.8	$28,227.2	$31,895.2	$25.23

Crab Orchard National Wildlife Refuge

Description

Crab Orchard NWR is a 43,500 acre, highly developed national wildlife refuge in southern Illinois. Though much of it is closed to public use to provide wildlife habitat, the balance of the refuge supports campgrounds, marinas, agriculture, and industry. Three lakes provide wetlands habitat and premier bass fishing opportunities. Bald eagles nest in the area. The refuge is a major stopover point on the Mississippi flyway.

Munitions plants were built in the town of Marion during World War II. When the land was converted to a national wildlife refuge in 1947, the munitions plants continued to operate. Today military ammunition is both made and recycled on refuge land. Other industries have also moved into the industrial space available on the refuge. Over 700 people are employed by private industries on leased refuge land. The refuge also has an active cemetery. A sewage-treatment plant on the refuge serves the Marion federal prison and refuge industries.

As a result of the industrial development, polychlorinated biphenyls (PCBs) have polluted soil on the refuge. Announcement of the PCB contamination and related fishing advisories discouraged use of Crab Orchard Lake for some time. Only the lowest level of advisories, applying to pregnant women and nursing mothers, is in effect at this time. Planned heat treatment of the affected soils is a controversial topic in the area.

The refuge is traversed by two state highways--Route 13, a major commercial thoroughfare between Marion and Carbondale, and Route 148, a commuter route. The refuge visitor center and observation tower are directly along Route 148. Interstate 57 lies on the eastern edge of the refuge. These routes and several county roads provide many access points to the refuge, so visitor counts are subject to some inaccuracies. Employees of refuge industries are removed from visitor counts.

Area Economy

The Crab Orchard region has a stable population and a diversified rural economy. Carbondale is home to the University of Southern Illinois. Marion has an active airport, a Veterans Administration hospital, a federal prison, and an industrial park. Much of the surrounding land is agricultural or forested. The Williamson County Tourism Bureau is co-located with the refuge visitor center and promotes the refuge's fishing and hunting opportunities at regional sportsmen's shows. Concessionaires operate refuge marinas and campgrounds and also promote tourism in the area.

Table 5 shows a summary of the area economy for 2001. Population in the five-county area declined from 1995 to 2001 by 0.5 percent. However, both employment and per capita income increased; employment by 7.2 percent and per capita income by 9.5 percent.

Table 5. Crab Orchard NWR: Summary of Area Economy, 2001.
(Population and Employment in '000's; Per Capita Income in 2002 dollars)

	Population		Employment		Per Capita Income	
County	2001	Percent change 1995-2001	2001	Percent change 1995-2001	2,001	Percent change 1995-2001
Williamson	61.4	1.9%	31.4	9.9%	$23,753	8.1%
Union	18.2	0.1%	8.3	4.8%	$21,185	7.3%
Jackson	59.3	-2.9%	38.9	6.6%	$23,062	15.6%
Johnson	13.0	5.3%	4.7	22.1%	$16,862	9.9%
Franklin	38.9	-2.8%	15.2	0.8%	$20,237	6.5%
Total	191.0	-0.5%	98.5	7.2%	$21,020	9.5%
IL	12,520.2	4.3%	7,403.5	8.3%	$33,511	11.9%
U.S.	285,317.6	7.2%	167,535.6	12.2%	$30,894	12.5%

Source: U.S. Department of Commerce 2003.

Activity Levels

Crab Orchard volunteers conduct a weekly survey of public use. Visitation estimates are derived from car and trail counters, parking-lot counts, and boat counts. The capacity and utilization of the marinas and boat ramps are known, so it is simple to derive accurate estimates of fishing visits. More than 169,000 fishing days were recorded in the refuge in FY 2002.

Deer and goose hunting are tightly controlled on most of the refuge. Estimates of this use have been added in to the RMIS data. About 12,000 visitors hunted deer and upland game; most of the deer hunters are non-residents while upland game hunters are mostly residents. More than 20,000 visitors hunted waterfowl. The refuge's goose hunting is actively promoted in the Chicago area and other Midwest markets. About 60 percent of goose hunters are from the local area.

Non-consumptive use is very difficult to measure because of Crab Orchard's many access points and industries. The RMIS figure was proportioned to compare with other uses, and it was assumed that non-consumptive use visitors spent an average of 5 hours on the refuge. More than 995,000 visitors were recorded on the refuge in FY 2002. Crab Orchard is one of the most heavily visited sites in the refuge system.

Regional Economic Analysis

Crab Orchard NWR lies in the southwest corner of Williamson County. It borders Union and Jackson counties and is only a few miles from Johnson and Franklin counties. Most services are available in the cities of Carbondale (Jackson County) and Marion (Williamson County). So the local economic area is considered to be all 5 counties.

Table 6 shows visitor recreation expenditures for the refuge during FY 2002. Non-residents' spending was 57 percent of the total. Non-residents spent two-thirds of the non-consumptive and hunting dollars and 40 percent of the fishing dollars but only 15 percent of the hunting dollars.

Table 6. Crab Orchard NWR: Visitor Recreation-related Expenditures (2002 $,000)

Activity	Resident	Non-Resident	Total
Non-consumptive	$2,273.0	$4,671.6	$6,944.6
Hunting			
Big game	$43.5	$328.3	$371.8
Small game	$25.3	$18.5	$43.8
Migratory bird	$261.5	$239.4	$500.9
total hunting	$330.3	$586.2	$916.5
Fishing	$2,347.5	$1,471.2	$3,818.7
Total	**$4,950.8**	**$6,729.0**	**$11,679.8**

Table 7 summarizes the total economic impacts associated with refuge visitor spending. Total final demand associated with visitor spending is $12 million. Non-resident visitor spending provided a $6.5 million stimulus to the Marion region's economy.

Table 7. Crab Orchard NWR: Economic Effects Associated with Refuge Visitation (2002 $,000)

	Non-Residents	Total
Final Demand	$6,462.3	$11,979.1
Jobs	132	245
Job Income	$2,317.5	$4,239.3

The refuge is a significant player in the regional economy. All visitors' recreational spending of $11.7 million meant $4.2 million to regional payrolls.

Table 8 shows total economic effects (total final demand plus net economic value) compared with the refuge budget for FY 2002. (Budget data are from the RMIS database and include 1260 staff funding,

1260 nonstaff funding, and other staff funding.) In addition, visitors derive consumer surplus benefits from their recreation on the refuge. These net economic values were $21.9 million in FY 2002.

Table 8. Crab Orchard NWR: Summary of Economic Effects of Refuge Visitation (2002 $,000)

	FY 2002 Budget	Final Demand	Net Economic Value	Economic effects per $1 budget expenditure
Crab Orchard NWR	$2,308.4	$11,979.1	$21,957.9	$14.70

National Elk Refuge

Description

The National Elk Refuge lies in the Jackson Hole area of northwestern Wyoming. On August 10, 1912, Congress established the refuge to acquire, preserve, and manage lands for wintering elk. The refuge is within Teton County and is bounded on the north by Grand Teton National Park, on the east by Bridger-Teton National Forest, and on the south by the town of Jackson.

Much of the refuge consists of grassy meadows and marshes on the valley floor; sedges, bluegrasses, and brome grass are important components of the habitat. The refuge provides critical winter range for an elk herd of about 8,500. Elk are supplementally fed about 75 days most winters when natural forage is not available. Shiras moose, mule deer, bighorn sheep, pronghorn antelope, bison, and coyotes also roam the refuge. Nearly 175 species of birds have been observed. Two major streams, the Gros Ventre River and Flat Creek, flow through the refuge and fly fishing for the native Snake River cutthroat trout is especially popular.

Area Economy

Table 9 shows a summary of the area economy for 2001. The area's economy is centered around the city of Jackson (population 8,647) in Teton County. In 2001, the county population was 18,500 an increase of 24 percent from 1995. Teton is one of the most affluent counties in the state and the nation as well. Per-capita income in 2001 was $57,308, compared with $30,054 for the state of Wyoming and $30,894 for the nation. Adjusted for inflation, per-capita income in 2001 showed an increase of 20 percent from 1995. Total employment in the county increased by 27 percent from 1995 to 2001.

Table 9. National Elk Refuge: Summary of Area Economy, 2001.
(Population and Employment in '000's; Per Capita Income in 2002 dollars)

	Population		Employment		Per Capita Income	
County	2001	Percent change 1995-2001	2001	Percent change 1995-2001	2001	Percent change 1995-2001
Teton	18.5	24.1%	23.6	27.2%	$57,308	19.9%
WY	493.8	1.8%	335.8	10.8%	$30,054	20.0%
U.S.	28,531.6	7.2%	167,535.6	12.2%	$30,894	12.5%

Source: U.S. Department of Commerce 2003.

Activity Levels

The refuge recorded 854,535 visitors during FY 2002. Most of them came for nature interpretation and observation–755616 visits, including 294,687 stops at the visitor center and 427,000 visitors using wildlife-observation facilities such as towers, platforms, and auto turnouts. A significant portion of these visits occurred on paved turnouts on the west side of the refuge along U.S. Highway 26 leading to Grand Teton and Yellowstone National Parks. Other non-consumptive recreation activities such as picnicking and hiking accounted for 91,526 visitors. Fishing visits, primarily for trout, totaled 3,500 and big-game hunting, primarily for elk, accounted for 2,193 visits.

Refuge staff estimated that 75 percent of non-consumptive visitors were non-residents (defined as living more than 30 miles from the refuge). Residents accounted for 90 percent of the anglers and 85 percent of the hunters. The typical non-consumptive visitor spent an average of 45 minutes per day per visit on the refuge.

For the purposes of this analysis, non-consumptive visits are converted to refuge visitor days, defined as 8 hours of non-consumptive recreation activity per day. Non-consumptive refuge visitor days totaled 15,390 for residents and 46,169 for non-residents.

Regional Economic Analysis

The economic base area for the refuge is defined as Teton County. It is assumed that refuge visitor expenditures occur primarily in this county.

Table 10 shows visitor recreation expenditures for the refuge during FY 2002. Total expenditures were $4.5 million, with non-residents accounting for more than 90 percent of the total. Non-consumptive recreation expenditures were 95 percent of the total.

Table 10. National Elk Refuge: Visitor Recreation-related Expenditures (2002 $,000)

Activity	Resident	Non-Resident	Total
Non-consumptive	$267.0	$4,066.8	$4,333.8
Hunting			
Big game	$49.9	$45.0	$94.9
Small Game	$0.0	$0.0	$0.0
Migratory bird	$0.0	$0.0	$0.0
total hunting	$49.9	$45.0	$94.9
Fishing	$64.6	$24.8	$89.4
Total	**$381.5**	**$4,136.6**	**$4,518.1**

Table 11 summarizes the total economic impacts associated with refuge visitor spending. Total final demand associated with visitor spending was $4.5 million. This is the total monetary value of economic activity generated in Teton County by refuge visitor spending. In turn, this final demand generated 64 jobs (both full and part-time) with a total employment income of $1.2 million.

Table 11. National Elk Refuge: Economic Effects Associated with Refuge Visitation (2002 $,000)

	Non-Residents	Total
Final Demand	$4,136.6	$4,518.0
Jobs	58	64
Job Income	$1,110.9	$1,212.1

Table 12 shows total economic effects (total final demand plus net economic value) compared with the refuge budget for FY 2002. For an individual, net economic value is that person's total willingness to pay for a particular recreation activity minus his or her actual expenditures for that activity. The figure for Net Economic Value is derived by multiplying net economic values for hunting, fishing, and non-consumptive recreation use (on a per-day basis) by estimated refuge visitor days for that activity. This is combined with the estimate of total final demand and divided by the refuge budget for FY 2002. (Budget data are from the RMIS database and include 1260 staff funding, 1260 nonstaff funding, and other staff funding.) The $3.75 means that for every $1 of budget expenditures, $3.75 of total economic effects are generated. This ratio is provided only for the purpose of broadly comparing the magnitude of the economic effects resulting from refuge visitation to total budget expenditures and should not be interpreted as a benefit-cost ratio.

Table 12. National Elk Refuge: Summary of Economic Effects of Refuge Visitation (2002 $,000)

	FY 2002 Budget	Final Demand	Net Economic Value	Economic effects per $1 budget expenditure
National Elk Refuge	$1,940.0	$4,518.0	$2,746.8	$3.75

Eufaula National Wildlife Refuge

Description

Eufaula NWR was established in 1964 on the Walter F. George Reservoir (Lake Eufaula) in cooperation with the U.S. Army Corps of Engineers. The reservoir resulted from the impoundment of the Chattahoochee River as it runs between Alabama and Georgia. The 11,184 acres of the refuge were once heavily forested, but past land-use practices changed the land cover and habitat. The refuge is 40 percent open water, with bordering wetlands and upland timberland and cropland. An intensive management program has been established at the refuge to meet the needs of migrating waterfowl, wintering ducks and geese, and nesting wood ducks. The native vegetation in some upland areas is being restored, in contrast to surrounding industrial woodlands and agricultural lands.

The George Reservoir is a popular recreation area. The Corps of Engineers maintains boat ramps to the lake, and two state parks border the refuge. Many visitors combine a visit to the refuge with activities at these other facilities. A large number approach the refuge by boat. Fishing for bass, crappie, bream, and catfish is popular in refuge waters, but alligators must be avoided. On the landward side, the refuge maintains a wildlife drive and several foot trails. Controlled hunting for deer, dove, rabbit, and waterfowl is permitted on the refuge. The nearby state park provides swimming, camping, and similar activities.

Area Economy

The refuge has lands in four counties, Barbour and Russell in Alabama, and Stewart and Quitman in Georgia. Columbus, Georgia, the nearest large city, provides most services to the region. The local economy is dominated by nearby Fort Benning; the largest industries are durable-goods manufacturing followed by state and local government. Table 13 shows a summary of the area economy for 2001. The area population has been has been stable from 1995 to 2001, increasing by only 0.1 percent compared with a 4.0 percent increase for Alabama and a 14.7 percent increase for Georgia. Area employment increased by 10.4 percent compared with a 6.5 percent increase for Alabama and a 16.4 percent increase for Georgia. Per Capita income in the area showed a 15.8 percent increase. During the same period, statewide per capita income increased by 7.9 percent in Alabama and 12.6 percent for Georgia. Nationwide, per capita income increased by 12.5 percent.

Table 13. Eufaula NWR: Summary of Area Economy, 2001.
(Population and Employment in '000's; Per Capita Income in 2002 dollars)

	Population		Employment		Per Capita Income	
County	2001	Percent change 1995-2001	2001	Percent change 1995-2001	2001	Percent change 1995-2001
Barbour AL	29.0	4.1%	15.1	16.2%	$21,381	12.4%
Russell AL	49.5	-3.5%	17.6	2.7%	$20,935	11.4%
Quitman GA	2.6	7.3%	0.5	28.6%	$18,775	8.0%
Stewart GA	5.1	-4.1%	1.6	-7.4%	$21,549	19.0%
Chattahoochee GA	15.3	2.9%	17.5	30.1%	$28,223	24.5%
Muscogee GA	186.3	0.1%	118.6	8.7%	$27,199	16.8%
Total	287.8	0.1%	171.0	10.4%	$23,010	15.8%
AL	4,468.9	4.0%	2,409.7	6.5%	$24,864	7.9%
GA	8,405.7	14.7%	4,921.4	16.4%	$28,974	12.6%
U.S.	285,317.6	7.2%	167,535.6	12.2%	$30,894	12.5%

Source: U.S. Department of Commerce 2003.

Activity Levels

The Refuge Management Information System (RMIS) showed 371,251 visits to Eufaula NWR during FY 2002. Fishing and nature observation were the most popular activities with 129,959 and 101,190 visits, respectively. Most anglers were not local residents. The refuge is an active participant in the "Hooked on Fishing" program and hosts several fishing derbies a year.

A far smaller number of visitors, 8,700 hunted, mostly for deer. Most were from outside the local area.

The auto tour route attracted 35,974 motorists, a small majority of them from outside the local area. A small proportion of these people walked the nature trails or used the observation platform. These visits are relatively short.

Regional Economic Analysis

Table 14 shows visitor recreation expenditures in the refuge region during FY 2002. The local region was defined broadly to include the cities of Eufaula and Columbus. Non-resident visitors to the refuge spent $6.2 million in the local area in FY 2002.

Table 14. Eufaula NWR: Visitor Recreation-related Expenditures (2002 $,000)			
Activity	**Resident**	**Non-Resident**	**Total**
Non-consumptive	$80.6	$1,364.2	$1,444.8
Hunting			
big game	$40.1	$229.8	$269.9
small game	$0.0	$0.8	$0.8
migratory bird	$1.2	$51.1	$52.3
total hunting	$41.3	$281.7	$323.0
Fishing	$721.1	$4,574.9	$5,296.0
Total	**$843.0**	**$6,220.8**	**$7,063.8**

Table 15 summarizes the total economic impacts associated with refuge visitor spending. Non-resident visitor spending generated $6.2 million in new final demand, $2.0 million in new earnings, and 105 new jobs as it flowed through the local economy.

Table 15. Eufaula NWR: Economic Effects Associated with Refuge Visitation (1995 $,000)		
	Non-Residents	**Total**
Final Demand	$6,220.9	$7,063.8
Jobs	105	125
Job Income	$2,004.2	$2,360.6

Total spending by all refuge visitors related to their refuge recreation was $7.0 million. This resulted in $5.6 million in local final demand, $2.4 million in earnings, and 125 jobs attributable to refuge visitation.

Table 16 shows total economic effects (total final demand plus net economic value) compared with the refuge budget for FY 2002. Refuge visitors derived consumer surplus benefits of $7.4 million. Government expenditures to operate Eufaula NWR were approximately $676,000 in FY 2002. (Budget data are from the RMIS database.) Eufaula is a significant component in the region's recreational opportunities. It provides many benefits at a very low cost in government resources.

Table 16. Eufaula NWR: Summary of Economic Effects of Refuge Visitation (2002 $,000)				
	FY 2002 Budget	**Final Demand**	**Net Economic Value**	**Economic effects per $1 budget expenditure**
Eufaula NWR	$675.6	$7,063.8	$7,433.7	$21.5

Don Edwards San Francisco Bay National Wildlife Refuge

Description

The Don Edwards San Francisco Bay National Wildlife Refuge was established in 1972 to preserve and protect critical habitat and associated wildlife, to aid migratory waterfowl, and to provide an opportunity for wildlife-oriented recreation and nature study. The refuge currently encompasses 19,000 acres in San Mateo, Alameda, and Santa Clara counties at the southern end of San Francisco Bay in northern California. It is surrounded by an urban population of over 7 million people, making it the largest urban wildlife refuge in the world. The refuge has an extensive environmental education outreach, with a variety of programs geared toward school children, teacher education, and the general public.

The refuge is comprised of a variety of habitats including mudflats, salt marshes, open water, and salt ponds. This range of habitat supports a large variety of wildlife including five endangered species. The refuge provides major habitat for the endangered California clapper rail and salt- marsh harvest mouse. San Francisco Bay is a key wintering area for diving ducks along the Pacific Flyway; the south bay is used primarily by scaup, surf scoters, and ruddy ducks. The south bay wetlands support hundreds of thousands of shorebirds along with the largest wading-bird rookery in San Francisco Bay.

The refuge has a visitor center at its administrative headquarters in the city of Fremont, and an environmental education center in Alviso on the southeastern edge of the refuge. Boating is a popular activity on the Bay, and a number of launch facilities are adjacent to the refuge. Hiking trails are numerous throughout the refuge. Wildlife observation, fishing, and waterfowl hunting are popular activities.

Area Economy

Table 17 shows a summary for the area economy in 2001. The refuge is spread out across three counties, San Mateo, Santa Clara, and Alameda, which had a total population of slightly over 3.8 million in 2001, a 7.6 percent increase from 1995.

The area is highly urbanized and affluent. Total wage and salary employment totaled 2.6 million people in 2001, an increase of 17.4 percent from 1995. Per capita income increased by 33.1 percent during the same period. The per-capita income for the area is substantially greater than state and national averages. Alameda County has a per-capita income of $39,228 in 2001; San Mateo and Santa Clara county incomes were $58,821 and $52,394 respectively. This compares with the state average of $33,171 and the national average of $30,894.

Table 17. Don Edwards San Francisco Bay NWR: Summary of Area Economy, 2001.
(Population and Employment in '000's; Per Capita Income in 2002 dollars)

	Population		Employment		Per Capita Income	
County	2001	Percent change 1995-2001	2001	Percent change 1995-2001	2001	Percent change 1995-2001
Santa Clara	1,696.0	7.3%	1,263.6	18.5%	$52,394	36.6%
San Mateo	708.7	4.3%	497.8	21.1%	$58,821	38.2%
Alameda	1,475.3	9.6%	907.4	14.0%	$39,228	22.1%
Total	3,880.1	7.6%	2,668.8	17.4%	$50,148	33.1%
CA	34,600.5	9.2%	19,833.6	16.0%	$33,171	15.5%
U.S.	285,317.6	7.2%	167,535.6	12.2%	$30,894	12.5%

Source: U.S. Department of Commerce 2003.

Activity Levels

The refuge recorded 498,200 visitors during FY 2002. Of this number, 332,900 used the nature trails, 41,400 used photo blinds and observation platforms, 27,600 used the visitor center, 500 fished, and 3,900 hunted waterfowl.

The refuge staff estimated that about 85 percent of refuge visitors were non-residents (defined as living more than 30 miles from the refuge). Most came from the three-county area, but a substantial number came from across the United States and overseas. The refuge is adjacent or relatively close to (20 miles or less) a number of major cities, including San Jose, San Francisco, Berkeley, Oakland, and Hayward. Major access highways include Interstate 880 northeast of the refuge, connecting San Jose and Oakland, and Highway 101 southwest of the refuge, running from San Jose to San Francisco.

For the purposes of this analysis, non-consumptive visits are converted to refuge visitor days**,** defined as 8 hours of non-consumptive recreation activity per day. Non-consumptive refuge visitor days totaled 93,625. This finding is based on an average of 2 hours per visit for non-consumptive recreation activities.

Regional Economic Analysis

The economic area for the refuge is defined as the counties of Santa Clara, Alameda, and San Mateo. It is assumed that refuge visitor expenditures occur primarily within this three-county area.

Table 18 shows visitor recreation expenditures for the refuge for FY 2002. Total expenditures were $3.4 million, with residents accounting for $1.7 million. Non-consumptive use recreation visits

accounted for $3.2 million in spending (including both residents and non-residents) while hunting and fishing accounted for about $184,000.

Table 18. Don Edwards San Francisco Bay NWR: Visitor Recreation-related Expenditures (2002 $,000)

Activity	Resident	Non-Resident	Total
Non-consumptive	$1,650.7	$1,517.6	$3,168.3
Hunting			
big game	$0.0	$0.0	$0.0
small game	$0.0	$0.0	$0.0
migratory bird	$94.0	$90.2	$184.2
total hunting	$94.0	$90.2	$184.2
Fishing	$20.5	$5.9	$26.4
Total	**$1,765.2**	**$1,613.7**	**$3,378.9**

Table 19 summarizes the total economic impacts associated with refuge visitor spending. Total final demand associated with visitor spending was almost $3.4 million. This is the total monetary value of economic activity generated in the three-county area by refuge visitor spending. In turn, this final demand generated 65 jobs (both full-time and part-time) with total employment income of $1.8 million.

Table 19. Don Edwards San Francisco Bay NWR: Economic Effects Associated with Refuge Visitation (2002 $,000)

	Non-Residents	Total
Final Demand	$1,613.7	$3,378.9
Jobs	25	65
Job Income	$745.6	$1,771.9

Table 20 shows total economic effects (total final demand plus net economic value) compared with the refuge budget for FY 2002. For an individual, net economic value is that person's total willingness to pay for a particular recreation activity minus his or her actual expenditures for that activity. The figure for net economic value is derived by multiplying net economic values for hunting, fishing, and non-consumptive recreation use (on a per-day basis) by estimated refuge visitor days for that activity. This is combined with the estimate of total final demand and divided by the refuge budget for FY 2002. (Refuge budget data are from the RMIS database.) The $2.10 means that for every $1 of budget expenditures, $2.10 of total economic effects are generated. This ratio is provided only for the purpose of broadly comparing the magnitude of the economic effects resulting from refuge visitation to total budget expenditures and should not be interpreted as a benefit-cost ratio.

Table 20. Don Edwards San Francisco Bay NWR: Summary of Economic Effects of Refuge Visitation (2002 $,000)

	FY 2002 Budget	Final Demand	Net Economic Value	Economic effects per $1 budget expenditure
SF Bay NWR	$2,394.9	$1,771.9	$3,271.2	$2.1

Tule Lake National Wildlife Refuge

Description

Established in 1928, the Tule Lake National Wildlife Refuge is located in Modoc and Siskiyou counties in extreme northern California approximately 6 miles west of Tule Lake, California. Klamath Falls, Oregon, is 15 miles northwest of the refuge. The refuge, one of six within the Klamath Basin NWR complex, encompasses 39,116 acres. It is a varied mix of shallow marshes, open water, and croplands used by marsh birds and waterfowl.

The Tule Lake Refuge, as part of the Klamath Basin complex of refuges, is internationally famous for its abundance and diversity of wildlife. Over 400 species occur there. Large concentrations of waterfowl occur during spring and fall migration periods. The area is also host to one of the largest concentrations of wintering bald eagles in the contiguous United States, with over 500 typically present in January and February.

Tule Lake is the most popular of the six refuges in the complex. The vast majority of its recreational use is associated with wildlife observation. The refuge has a 14-mile auto tour and a two-mile canoe tour. Wildlife photography, birding, and waterfowl hunting are popular activities.

Area Economy

Although Tule Lake Refuge is located in Siskiyou and Modoc counties in northern California. Klamath Falls in Klamath County, Oregon, is the economic center of the area. Table 21 shows a summary of the area economy for 2001. The three-county area had a population of 117,000 in 2001, over half of it in Klamath County. The area's population has remained relatively stable, increasing 1.6 percent from 1995 to 2001.

Total employment was 60,100 in 2001, an increase of 5.8 percent over 1995. In 2001, per-capita income was $22,259 in Klamath County, a 4.3 percent increase from 1995 (adjusted for inflation); $22,998 in Siskiyou County (8.5 percent increase from 1995); and $21,611 in Modoc County (4.5 percent increase from 1995). Average 2001 per-capita income was $28,518 for Oregon, $33,171 for California and $30,894 for the United States as a whole.

Table 21. Tule Lake NWR: Summary of Area Economy, 2001.
(Population and Employment in '000's; Per Capita Income in 2002 dollars)

	Population		Employment		Per Capita Income	
County	2001	Percent change 1995-2001	2001	Percent change 1995-2001	2001	Percent change 1995-2001
Klamath OR	64.2	5.1%	33.2	7.2%	$22,259	4.3%
Modoc CA	9.3	-4.6%	4.8	11.3%	$21,611	4.5%
Siskiyou CA	44.0	-1.7%	22.1	2.7%	$22,998	8.5%
Total	117.6	1.6%	60.1	5.8%	$66,868	5.8%
CA	34,600.5	9.2%	19,833.6	16.0%	$33,171	15.5%
OR	3,473.4	9.1%	2,108.3	13.3%	$28,518	8.0%
U.S.	28,531.6	7.2%	167,535.6	12.2%	$30,894	12.5%

Source: U.S. Department of Commerce 2003.

Activity Levels

The Tule Lake Refuge recorded 175,720 visitors in FY 2002. Of this number, 17,206 used the nature trails including the auto tour, 3,222 hunted migratory waterfowl, and 168,309 engaged in various types of wildlife observation activities. Visitation during the year is fairly spread out, with the spring and fall seasons getting a substantial amount of use. Non-consumptive users are estimated to spend about an hour on the refuge per visit; hunters spend about 4 hours per day per visit.

The refuge staff estimated that about 70 percent of all hunters are non-residents (defined as living more than 30 miles from the refuge). About 70 percent of non-consumptive users come from outside the local area. Klamath Falls is 60 miles east of Interstate 5, the major north-south highway on the Pacific coast. A significant number of visitors come from the San Francisco, Portland, and Seattle areas. Travel along Highway 395 in eastern California and eastern Oregon also provides some refuge visits. Lava Lands National Monument is only 12 miles south of the refuge. A significant number of refuge visitors also visit the Monument.

For the purposes of this analysis, non-consumptive visits are converted to refuge visitor days, defined as 8 hours of non-consumptive recreation activity per day. Non-consumptive refuge visitor days totaled 20,456 in FY 2002.

Regional Economic Analysis

The economic area for the refuge is defined as the counties of Klamath, Modoc, and Siskiyou. Though Klamath Falls in Klamath County is the economic hub of the area, smaller towns in Modoc and Siskiyou counties are also affected by refuge visitation and associated spending.

Table 22 shows visitor recreation expenditures for the Tule Lake Refuge for FY 2002. Total expenditures were over $2 million with non-resident expenditures accounting for $1.9 million. Non-consumptive spending accounted for over 80 percent of total expenditures.

Table 22. Tule Lake NWR: Visitor Recreation-related Expenditures (2002 $,000)

Activity	Resident	Non-Resident	Total
Non-consumptive	$127.3	$1,523.3	$1,650.6
Hunting			
big game	$0.0	$0.0	$0.0
small game	$1.7	$12.2	$13.9
migratory bird	$27.4	$347.6	$375.0
total hunting	$29.1	$359.8	$388.9
Fishing	$0.0	$0.0	$0.0
Total	**$156.4**	**$1,883.1**	**$2,039.5**

Table 23 summarizes the total economic impacts associated with refuge visitor spending. Total final demand associated with visitor spending was $2.0 million. This is the total monetary value of economic activity generated in the three-county area by refuge visitor spending. In turn, this final demand generated 47 jobs (both full and part time) with total employment income of $797,600.

Table 23. Tule Lake NWR: Economic Effects Associated with Refuge Visitation (2002 $,000)

	Non-Residents	Total
Final Demand	$1,883.1	$2,039.5
Jobs	44	47
Job Income	$618.2	$797.6

Table 24 shows total economic effects (total final demand plus net economic value) compared with the refuge budget for FY 2002. For an individual, net economic value is that person's total willingness to pay for a particular recreation activity minus his or her actual expenditures for that activity. The figure

for net economic value is derived by multiplying net economic values for hunting and non-consumptive recreation use (on a per-day basis) by estimated refuge visitor days for that activity. This is combined with the estimate of total final demand and divided by the refuge budget for FY 2002. (Refuge budget data are from the RMIS database and include 1260 staff funding, 1260 nonstaff funding, and other staff funding.) The $3.44 means that for every $1 of budget expenditures, $3.44 of total economic effects are generated. This ratio is provided only for the purpose of broadly comparing the magnitude of the economic effects resulting from refuge visitation to total budget expenditures and should not be interpreted as a benefit-cost ratio.

Table 24. Tule Lake NWR: Summary of Economic Effects of Refuge Visitation (2002 $,000)

	FY 2002 Budget	Final Demand	Net Economic value	Total Economic effects per $1 budget expenditure
Tule Lake NWR	$838.0	$2,039.5	$847.0	$3.44

Mattamuskeet National Wildlife Refuge

Description

Mattamuskeet NWR encompasses 50,180 acres of Hyde County in coastal North Carolina. The landscape is dominated by 40,000-acre Lake Mattamuskeet, the largest natural lake in the state. Other habitats include marsh, timber, and croplands. Mattamuskeet lies in the middle of the Atlantic Flyway and provides staging and wintering areas for migratory birds. It hosts one-third to one-half of the flyway's tundra swan population each winter. The refuge is managed primarily to support waterfowl. The complex of diverse habitats provides for over 240 avian species and a variety of mammals, reptiles, and amphibians.

Most visitors to the refuge drive the 6-mile wildlife road, which provides outstanding wildlife viewing, especially in winter. Several points along State Highway 94 also provide excellent waterfowl-watching opportunities. Waterfowl hunting is permitted on the refuge. Although the lake is only 2 to 2.5 feet deep, fishing is a popular activity from March to November. Bass and white perch are the most common quarries.

Area Economy

Table 25 shows a summary of the area economy for 2001. Hyde, Beaufort and Tyrell counties are considered the economic center for the Refuge. Area population increased by 3.9 percent from 1995 to 2001. This compares with an 11.7 increase for North Carolina and a 7.2 percent increase nationwide. Area employment increased by 1.0 percent from 1995 to 2001, compared with an 11.6 increase statewide and a 12.2 percent increase for the nation as a whole. Per capita income in the area increased by 10.2 percent, which is comparable to increases both state and nationwide.

Table 25. Mattamuskeet NWR: Summary of Area Economy, 2001.
(Population and Employment in '000's; Per Capita Income in 2002 dollars)

	Population		Employment		Per Capita Income	
County	2001	Percent change 1995-2001	2001	Percent change 1995-2001	2001	Percent change 1995-2001
Hyde	5.7	6.6%	3.2	9.6%	$20,803	11.0%
Beaufort	45.3	3.1%	23.2	-0.7%	$22,949	11.1%
Tyrell	4.2	8.3%	1.6	9.6%	$18,782	8.4%
Total	55.2	3.9%	28.0	1.0%	$20,845	10.2%
NC	8,206.1	11.7%	4,901.7	11.6%	$27,739	9.5%
U.S.	28,531.6	7.2%	167,535.6	12.2%	$30,894	12.5%

Source: U.S. Department of Commerce 2003.

Activity Levels

RMIS reports 66,500 visitors to Mattamuskeet during FY 2002. The refuge is mostly water, so there are relatively few opportunities for land-based recreation. Most visitors spend about an hour driving the auto tour route. As a result, only one-eighth of a visitor day's expenditures are attributable to the refuge. This limits the economic impact of refuge visitors. The refuge is a 1.5 to 2-hour drive from the popular Outer Banks. Unfortunately, it is most impressive during the winter months, when relatively few tourists are on the islands. A "Swan Days" celebration at the refuge in December has drawn some visitors but has yet to become a major attraction. Most non-consumptive wildlife users are non-residents.

The most commonly bagged species are northern pintail, green-winged teal, and black duck. Most waterfowl hunters are not residents of the region. About 11,150 visitors fish in the refuge lake and canals. The culverts along Route 94 are popular spots for local residents to stop and fish for short periods. Saltwater fishing on the refuge accounts for 2,350 visits.

Regional Economic Analysis

Table 26 shows visitor recreation expenditures for the refuge during FY 2002. Non-resident spending at Mattamuskeet is primarily associated with non-consumptive recreation and fishing. Hunting is primarily a non-resident activity. Residents account for 60 percent of fishing expenditures.

Table 26. Mattamuskeet NWR: Visitor Recreation-related Expenditures (2002 $,000)

Activity	Resident	Non-Resident	Total
Non-consumptive	$45.0	$380.8	$425.8
Hunting			
big game	$1.4	$3.3	$4.7
small game	$0.0	$0.0	$0.0
migratory bird	$0.8	$0.4	$1.2
total hunting	$2.2	$3.7	$5.9
Fishing	$151.3	$102.9	$254.2
Total	**$198.5**	**$487.4**	**$685.9**

Table 27 summarizes the total economic impacts associated with refuge visitor spending. Non-resident visitors spent $487,400 while visiting Mattamuskeet. Because of leakage, this added only $315,500 to final demand and $126,000 to regional payrolls. It supported eight new jobs.

Table 27. Mattamuskeet NWR: Economic Effects Associated With Refuge Visitation (2002 $,000)		
	Non-Resident	**Total**
Final Demand	$315.5	$448.7
Jobs	8	11
Job Income	$126.0	$177.1

Factoring in resident spending of almost $200,000 adds $133,200 to final demand and three more jobs.

Table 28 shows total economic effects (total final demand plus net economic value) compared with the refuge budget for FY 2002. The net economic value people derive from recreating on the refuge amounted to $770,400. So the total economic activity from refuge recreation is $1,456,300. The Fish and Wildlife Service spent $1.1 million to operate and maintain Mattamuskeet in FY 2002. (Budget data include 1260 staff funding, 1260 nonstaff funding, and other staff funding.) Although small by global standards, ecotourism at Mattamuskeet has the potential to attract visitors from nearby vacation centers and contribute to improving the region's economic condition.

Table 28. Mattamuskeet NWR: Summary of Economic Effects of Refuge Visitation (2002 $,000)				
	FY 2002 Budget	**Final Demand**	**Net Economic Value**	**Economic effects per $1 Budget Expenditure**
Mattamuskeet NWR	$1,140.6	$685.9	$770.4	$1.3

Horicon National Wildlife Refuge

Description

Horicon NWR encompasses the northern two-thirds of Horicon Marsh, a 32,000-acre internationally recognized wetland in central Wisconsin. Sometimes called the "Everglades of the North," Horicon Marsh is the largest freshwater cattail marsh in the United States. The refuge includes 16,956 acres of wetlands and 4,309 acres of upland habitat. It is managed to provide habitat for nesting and migrating waterfowl.

The primary recreational activity on the refuge is wildlife watching. The refuge has several miles of hiking trails, a floating boardwalk, and a 3.2-mile auto tour route. Most visitors come in the fall to see the vast flocks of migrating waterfowl and the changing foliage. Public use facilities are designed to handle this peak flow of visitors. Large parking lots are easily accessible from state highways, and hiking trails are well marked. Visitation information is collected by car counters on the two major parking lots and foot-traffic counters on the major trails.

Fishing, as well as deer and small-game hunting, are permitted in some areas. Hunting areas are accessible from many small parking lots off local roads. Vehicle counts at these lots during hunting season are the source for hunting visitation data. Waterfowl hunting is not permitted on the refuge, but the southern third of the marsh, which is managed by the Wisconsin Department of Natural Resources, is a premier waterfowl hunting area. Horicon NWR was selected for this study because it is representative of refuges with moderate levels of public use and some fishing and hunting in the north-central states.

Area Economy

The population of Dodge and Fond du Lac counties has been stable over the last 30 years. The economy of the region is highly diversified. Much of the land is devoted to dairy farming for cheese production, but there is also a strong industrial and government services base. Mayville hosts several metal fabrication plants. Horicon is the home of John Deere's lawn tractor factory. Waupun houses several prisons. In addition, the area is an hour away from Milwaukee and Madison, so many people commute to work in these cities and their suburbs. Tourism is promoted by the Dodge County Tourism Council; wildlife and antiques are major selling points. Several small businesses serve ecotourists, including a boat tour operator and a private nature center.

Table 29 shows a summary of the area economy for 2001. The area showed a population increase of 5.4 percent from 1995 to 2001, compared with increases of 4.3 and 7.2 percent respectively, for Wisconsin and the U.S. Employment increased by 10.6 percent and per capita income increased by 10.5 percent, both similar to increases experienced state and nationwide.

Table 29. Horicon NWR: Summary of Area Economy, 2001.
(Population and Employment in '000's; Per Capita Income in 2002 dollars)

	Population		Employment		Per Capita Income	
County	2001	Percent change 1995-2001	2001	Percent change 1995-2001	2001	Percent change 1995-2001
Dodge	86.4	7.8%	47.9	15.3%	$24,249	11.6%
Fond du Lac	97.7	3.4%	61.3	7.3%	$29,102	9.7%
Total	184.1	5.4%	109.2	10.6%	$26,676	10.5%
WI	5,405.9	4.3%	3,429.7	9.0%	$29,657	12.3%
U.S.	285,317.6	7.2%	167,535.6	12.2%	$30,894	12.5%

Source: U.S. Department of Commerce 2003.

Activity Levels

The Refuge Management Information System (RMIS) recorded 527,547 visitors during FY 2002. Of this number, 232,607 used the nature trails, 3,055 hunted, and 5,180 fished. More than half of this use occurred in September. Non-consumptive users and anglers were estimated to average 3 hours per visit. Hunters were estimated to average 6 hours on the refuge and fishing 3 hours per visit.

Refuge staff estimate that 75 percent of non-consumptive use visitors live more than 30 miles from the refuge, many of them in the cities of Milwaukee and Madison, which are within a 1-hour drive. Little public hunting land is available in this area of Wisconsin, so hunters travel some distance to reach the refuge. The refuge staff estimate that 80 percent of hunters are local residents. About 95 percent of the fish harvested on the refuge are small bullheads, which are popular with local anglers but probably do not attract non-resident anglers from other sites in the area. Eighty percent of all anglers are assumed to be local residents.

Regional Economic Analysis

The refuge lies on the border of Dodge and Fond du Lac counties. The cities of Fond du Lac, Beaver Dam, and Waupun within the two counties provide basic retail, business, and health care services for the local population. So for this analysis the local economic region is defined as Dodge and Fond du Lac counties.

The fall influx of non-resident, non-consumptive visitors generates most of the spending from Horicon visitation. Table 30 shows visitor recreation expenditures for the refuge during FY 2002.

Table 30. Horicon NWR: Visitor Recreation-related Expenditures (2002 $,000)			
Activity	**Resident**	**Non-Resident**	**Total**
Non-consumptive	$366.5	$6,779.9	$7,146.4
Hunting			
big game	$22.8	$18.4	$41.2
small game	$8.7	$14.3	$23.0
migratory bird	$0.1	$0.0	$0.1
total hunting	$31.6	$32.7	$64.3
Fishing	$71.8	$45.0	$116.8
Total	**$469.9**	**$6,857.6**	**$7,327.5**

Non-resident refuge visitors spent about $6.8 million in the region. When all of the spending had cycled though the economy, the refuge generated $5.9 million in final demand, $2.4 million in employee compensation, and 144 jobs.

Table 31. Horicon NWR: Economic Effects Associated with Refuge Visitation (2002 $,000)		
	Non-Residents	**Total**
Final Demand	$5,476.5	$5,917.7
Jobs	132	144
Job Income	$2,206.3	$2,385.4

Table 32 shows total economic effects (total final demand plus net economic value) compared with the refuge budget for FY 2002. Fish and Wildlife Service spending for1260 staff funding, 1260 nonstaff funding, and other staff funding for Horicon was $939,000 in FY 2002. This spending is an additional stimulus to the local economy that was not included in the impact calculations. In addition to their spending, visitors derive other benefits from visiting the refuge. These consumer-surplus rewards, as determined from information about Wisconsin wildlife users, are valued at $6.4 million. Clearly, each dollar spent to maintain public recreation at Horicon generates a large multiple in benefits.

Table 32. Horicon NWR: Summary of Economic Effects of Refuge Visitation (2002 $,000)				
	FY 2002 Budget	**Final Demand**	**Net Economic Value**	**Economic effects per $1 budget expenditure**
Horicon NWR	$939.0	$7,327.6	$6,368.4	$14.6

Charles M. Russell National Wildlife Refuge

Description

Located in north-central Montana, Charles M. Russell NWR is a 1.1-million-acre refuge that contains native prairies, forested coulees, river bottoms, badlands, and the 250,000-acre Ft. Peck Reservoir. Refuge wildlife include mule and white-tailed deer, elk, bighorn sheep, antelope, coyote, bobcat, beaver, sharp-tailed grouse, and numerous other species.

The refuge is spread across 6 counties: Fergus, Phillips, Petroleum, Garfield, Valley, and McCone. Paved highway access to the refuge is available on the western portion only where State Highway 191 crosses the Missouri River, and in the eastern portion in certain areas around Ft. Peck Reservoir. Gravel and dirt roads provide access to most of the recreation facilities within the refuge. Eight of those facilities are administered by the Army Corps of Engineers, two by the state of Montana, one by the U.S. Bureau of Land Management, and two by the U.S. Fish and Wildlife Service. Nine of these facilities provide boat-launching ramps.

Area Economy

The economic base area for the refuge is defined as the 6-county area identified above. It is assumed that most of the visitor expenditures take place within this area. Table 33 shows a summary for the area economy for 2001. The area's population decreased by 8.6 percent from 1995 to 2001. Total employment was 17,000 in 2001, an increase of 0.9 percent from 1995. Per-capita personal income increased by 18.4 percent from 1995 to 2001, adjusting for inflation. Valley County had the area's highest per-capita income at $25,518; Petroleum County had the lowest at $17,385. The state of Montana had an average per- capita income of $24,424. The U.S. national average in 2001 was $30,894.

Table 33. Charles M. Russell NWR: Summary of Area Economy, 2001.
(Population and Employment in '000's; Per Capita Income in 2002 dollars)

	Population		Employment		Per Capita Income	
County	2001	Percent change 1995-2001	2001	Percent change 1995-2001	2001	Percent change 1995-2001
Fergus	11.8	-6.4%	7.5	7.9%	$23,179	16.7%
Phillips	4.4	-13.5%	2.8	-5.1%	$19,748	13.9%
Petroleum	0.5	-4.5%	0.3	6.3%	$17,385	17.9%
Garfield	1.3	-7.5%	0.8	4.6%	$22,898	40.3%
Valley	7.5	-8.3%	4.4	-7.2%	$25,518	10.7%
McCone	1.9	-12.9%	1.2	2.5%	$19,089	14.9%
Total	27.3	-8.6%	17.0	0.9%	$21,303	18.4%
MT	905.4	3.3%	566.9	11.5%	$24,424	11.3%
U.S.	28,531.6	7.2%	167,535.6	12.2%	$30,894	12.5%

Source: U.S. Department of Commerce 2003.

Activity Levels

The Charles M. Russell NWR recorded 247,000 visitors during FY 2002. About 49,000 visits were primarily for non-consumptive recreation. Hunting accounted for 78,555 visits, fishing for 47,950 visits. The refuge has a national reputation for elk and mule deer.

The refuge staff estimates that about 30 percent of big game hunters, 40 percent of small game hunters and 80 percent of waterfowl hunters are local area residents. Residents account for about 55 percent of all anglers. For non-consumptive use, about 60 percent of visitors are non-resident.

Regional Economic Analysis

Table 34 shows visitor recreation expenditures for the Charles M. Russell NWR for FY 2002. Total expenditures were $11.5 million with non-resident expenditures accounting for about 87 percent of the total. Total hunting expenditures were $8.1 million and total fishing expenditures $2.1 million.

Table 34. Charles M. Russell NWR: Visitor Recreation-related Expenditures (2002 $,000)

Activity	Resident	Non-Resident	Total
Non-consumptive	$313.7	$1,062.0	$1,375.7
Hunting			
big game	$592.5	$7,059.8	$7,652.3
small game	$59.8	$334.2	$394.0
migratory bird	$19.9	$18.6	$38.5
total hunting	$672.2	$7,412.6	$8,084.8
Fishing	$540.6	$1,525.9	$2,066.5
Total	**$1,526.5**	**$10,000.5**	**$11,527.0**

Table 35 summarizes the total economic impacts associated with refuge visitor spending. Total final demand associated with visitor spending was $8.3 million. This is the total monetary value of economic activity generated in the 6-county area by refuge visitor spending. In turn, this final demand generated 206 jobs (both full-time and part-time) with total employment income of $2.8 million.

Table 35. Charles M. Russell NWR: Economic Effects Associated with Refuge Visitation (2002 $,000)

	Non-Residents	Total
Final Demand	$7,288.3	$8,287.0
Jobs	180	206
Job Income	$2,494.4	$2,824.9

Table 36 shows total economic effects (total final demand plus net economic value) compared with the refuge budget for FY 2002. (Budget data are from the RMIS database and include 1260 staff funding, 1260 nonstaff funding, and other staff funding.) For an individual, net economic value is that person's total willingness to pay for a particular recreation activity minus his or her actual expenditures for that activity. The figure for net economic value is derived by multiplying net economic values for hunting, fishing, and non-consumptive recreation use (on a per-day basis) by estimated refuge visitor days for that activity. This is combined with the estimate of total final demand and divided by the refuge budget for FY 2002. The $7.30 means that for every $1 of budget expenditures, $7.30 of total economic effects are generated. This ratio is provided only for the purpose of broadly comparing the magnitude of the economic effects resulting from refuge visitation to total budget expenditures and should not be interpreted as a benefit-cost ratio.

Table 36. Charles M. Russell NWR:
Summary of Economic Effects of Refuge Visitation (2002 $,000)

	FY 2002 Budget	Final Demand	Net Economic value	Economic effects per $1 budget expenditure
Charles M. Russell NWR	$2,195.9	$8,287.0	$7,732.8	$7.30

Laguna Atascosa National Wildlife Refuge

Description

Laguna Atascosa is considered a "hotspot" by several birding guidebooks. Its location near the southern tip of Texas is the northern extreme of the range of many southern species and the southern extreme of many northern species--resulting in unusual levels of biodiversity. The 45,187-acre coastal plain refuge is essentially flat landscape interspersed with lakes, shallow wetlands, slow creeks, and low ridges. These features create several diverse habitats. The refuge is home to 5 endangered and 2 threatened species. It is managed to preserve 2 endangered cat species, the ocelot and the jaguarundi, and to provide habitat for migratory waterfowl and other species. Most of the nation's red-headed duck population winters on the refuge.

The refuge offers a 15-mile auto tour route, visitor center, and several trails. Most visitors come in the winter, when the weather is pleasant and northern birds are wintering in the area. Many visitors are "winter Texans" who move into the area's campgrounds and trailer parks to avoid the cold weather farther north. Summer temperatures often reach 100°F with high humidity.

A strip of refuge land along the Arroyo Colorado waterway has been intensively developed as a county park. The park is operated by the Cameron County Park System and offers boat ramps, fishing piers, and camping facilities. These activities are not related to the refuge mission and so are not counted in the economic analysis.

Area Economy

The population of Cameron County, where most of the refuge lies, has grown rapidly in the last 20 years. The city of Harlingen and its suburbs have over a quarter-million people. Willacy County and the part of Cameron County near the refuge are active cotton-growing areas. The refuge is a short drive from Brownsville, where many of the local users reside. Although Harlingen is removed from the *maquilladora* development at the Mexican border, much of its economy is driven by industrial development in Brownsville and McAllen. The regional chamber of commerce actively promotes the area to "winter Texans" and birders. An annual birding festival featuring the two national wildlife refuges in the area draws about 1,500 people each year.

Table 37 shows a summary for the area economy for 2001. Area population increased by 12.4 percent from 1995 to 2001. State population increased by 12.7 percent and the U.S. population increased by 7.2 percent during the same period. Area employment increased by 20.5 percent, compared with a 17.8 percent increase for the state and a 12.2 percent increase for the U.S. Area per capita income increased by 10.9 percent compared with increases of 15.5 and 12.5 percent for Texas and the U.S., respectively.

Table 37. Laguna Atascosa NWR: Summary of Area Economy, 2001.
(Population and Employment in '000's; Per Capita Income in 2002 dollars)

	Population		Employment		Per Capita Income	
County	2001	Percent change 1995-2001	2001	Percent change 1995-2001	2001	Percent change 1995-2001
Willacy	19.9	2.5%	5.4	8.3%	$12,962	15.4%
Cameron	344.6	13.0%	144.1	21.0%	$15,576	7.5%
Total	364.4	12.4%	149.6	20.5%	$14,269	10.9%
TX	21,371.0	12.7%	12,411.6	17.8%	$28,922	15.5%
U.S.	28,531.6	7.2%	167,535.6	12.2%	$30,894	12.5%

Source: U.S. Department of Commerce 2003.

Activities

Laguna Atascosa is almost exclusively a non-consumptive-use refuge. A limited deer and feral hog hunt is allowed each year, with about 100 participants spending 390 visitor days on the refuge. In contrast, over 146,000 visitor days were recorded by people watching wildlife and using the trails.

Regional Economic Analysis

Table 38 shows visitor recreation expenditures for the refuge during FY 2002.

Table 38. Laguna Atascosa NWR: Visitor Recreation-related Expenditures (2002 $,000)

Activity	Resident	Non-Resident	Total
Non-consumptive	$138.2	$911.8	$1,050.0
Hunting			
big game	$19.3	$28.8	$48.1
small game	$0.0	$0.0	$0.0
migratory bird	$0.0	$0.0	$0.0
total hunting	$19.3	$28.8	$48.1
Fishing	$1,354.1	$1,458.3	$2,812.4
Total	**$1,511.6**	**$2,398.9**	**$3,910.5**

Non-residents spend almost $2.4 million related to their visits to Laguna Atascosa. Through the multiplier effect, $2.2 million in new economic activity is thus created, generating 46 new jobs and $873,400 in payroll.

Table 39. Laguna Atascosa: Economic Effects Associated with Refuge Visitation (2002 $,000)

	Non-Residents	Total
Final Demand	$2,166.3	$3,530.1
Jobs	46	75
Job Income	$873.4	$1,422.9

Most visitors are not residents of the area so total spending is similar to non-resident spending--$3.9 million. After the multiplier effect, this spending is responsible for $1.4 million in employee compensation and 75 jobs.

Table 40 shows total economic effects (total final demand plus net economic value) compared with the refuge budget for FY 2002. Government spending for Laguna Atascosa NWR in FY 2002 was $844,500. (Refuge budget data are from the RMIS database.) The net economic value visitors derived from their use of the refuge was $2.7 million. Almost $6.3 million in benefits was derived from maintaining public use of this refuge.

Table 40. Laguna Atascosa NWR: Summary of Economic Effects of Refuge Visitation (2002 $,000)

	FY 2002 Budget	Final Demand	Net Economic value	Economic effects per $1 budget expenditure
Laguna Atascosa NWR	$844.5	$3,530.1	$2,745.3	$7.43

Las Vegas National Wildlife Refuge

Description

Las Vegas NWR encompasses 8,672 acres at the western edge of the Great Plains near the base of the Sangre de Cristo Mountains in New Mexico. At 6,500 feet, the high plains grassland is cut by steep, timbered canyons leading down to the Gallinas River and Vegosa Creek, which border the refuge. More than 40 lakes and ponds on the refuge provide habitat for wintering and migrating waterfowl. Irrigated farming provides cover and food for wildlife. The refuge is a popular place to view pronghorn antelope, diverse waterfowl, marsh and shorebirds, and many species of songbirds. Wintering bald eagles and other raptors may also be seen.

Lake McAllister, near the center of the refuge, is a state wildlife area owned and managed by the New Mexico Department of Game and Fish. It is a popular rainbow trout fishery open for sport fishing from March through October. Duck hunting is permitted on McAllister from October through January. All refuge lakes are closed to fishing.

There is a tightly controlled goose hunt each year. Hunters must participate in a drawing for permits. Hunting is allowed from established pit blinds only. As many as 18 hunters may be accommodated at one time. About 15 hunters take advantage of lands opened for dove hunting each year. The refuge has a 7-mile auto tour route, which also provides access to and from the McAllister Lake fishing area. Refuge staff distinguish anglers from non-consumptive wildlife users via sample counts and the refuge visitor log. A nature trail skirts a small canyon in the southwest corner of the refuge.

Area Economy

Las Vegas, New Mexico, is a small city 60 miles east of Santa Fe. The area is thinly populated. Ranching and government services are the major industries. The city provides ample shopping, medical, and other personal services. Table 41 shows a summary of the county economy for 2001. The county population increased by 1.9 percent from 1995. Employment increased by 26.4 percent and per capita income increased by 11.9 percent. Per-capita income is $17,329, about 56 percent of the national average.

Table 41. Las Vegas NWR: Summary of Area Economy, 2001.
(Population and Employment in '000's; Per Capita Income in 2002 dollars)

	Population		Employment		Per Capita Income	
County	2001	Percent change 1995-2001	2001	Percent change 1995-2001	2001	Percent change 1995-2001
San Miguel	29.8	1.9%	12.7	26.4%	$17,329	11.9%
NM	1,830.9	6.4%	990.0	25.3%	$23,446	7.7%
U.S.	285,317.6	7.2%	167,535.6	12.2%	$30,894	12.5%

Source: U.S. Department of Commerce 2003.

Activity Levels

The RMIS data indicates 43,602 visitors to Las Vegas NWR during FY 2002. A total of 135 waterfowl hunting days were counted at the refuge in FY 2002.

Regional Economic Analysis

San Miguel County is fairly remote but self contained, so it is assumed to represent the refuge's local area. Table 42 shows visitor recreation expenditures for the refuge during FY 2002. Non-resident visitors to the area spent $662,4000 in the local economy in FY 2002. San Miguel County produces only a small array of products, so many goods are imported to the region. As a result, leakage of expenditures from the regional economy is unusually large. The total effect of non-resident spending is $376,400 in final demand, nine new jobs, and $140,600 in new employee compensation.

Table 42. Las Vegas NWR: Visitor Recreation-related Expenditures (2002 $,000)

Activity	Resident	Non-Resident	Total
Non-consumptive	$63.3	$649.9	$713.2
Hunting			
big game	$0.0	$0.0	$0.0
small game	$0.0	$0.0	$0.0
migratory bird	$0.3	$12.5	$12.8
total hunting	$0.3	$12.5	$12.8
Fishing	$0.0	$0.0	$0.0
Total	**$63.6**	**$662.4**	**$726.0**

Because most visitors are non-resident and residents spend less, the significance is only $28,000 more than the impact from the refuge. The total effect of this in the local economy is $418,000 in total demand, 11 jobs, and $156,000 employee compensation.

Table 43. Las Vegas: Economic Effects Associated with Refuge Visitation (2002 $,000)

	Non-Residents	Total
Final Demand	$376.4	$418.5
Jobs	9	11
Job Income	$140.6	$156.0

Table 44 shows total economic effects (total final demand plus net economic value) compared with the refuge budget for FY 2002. Staff and nonstaff funding at Las Vegas NWR accumulated to $536,300 in FY 2002 (U.S. Department of Interior, Refuge Management Information System 2002). In addition to spending money in the area, visitors to the refuge derived pleasure from their stay. For Las Vegas visitors this net economic value is estimated to be $2.1 million.

Table 44. Las Vegas NWR: Summary of Economic Effects of Refuge Visitation (2002 $,000)

	FY 2002 Budget	Final Demand	Net Economic value	Economic effects per $1 budget expenditure
Las Vegas NWR	$536.3	$418.5	$2,046.6	$4.60

Umatilla National Wildlife Refuge

Description

The Umatilla National Wildlife Refuge consists of approximately 23,000 acres of upland, marsh, and open water along the Columbia River between Irrigon, Oregon, and Crow Butte State Park, Washington. The refuge was officially established on July 3, 1969, to mitigate the loss of flooding of wildlife habitat caused by the construction of the John Day Lock and Dam by the U.S. Army Corps of Engineers. Dam construction raised the level of the river 25 feet, creating Lake Umatilla between the John Day and McNary dams.

The refuge is divided into 6 units, 2 in Oregon, 3 in Washington, and 1 in mid-river. Portions of the McCormack and Whitcomb Island units are cooperatively farmed; the other units are managed as wildlands.

Umatilla NWR is intensively managed to meet its wildlife objectives: producing Great Basin Canada geese during spring and fall migrations, and providing habitat for other migratory birds. Waterfowl populations peak in mid to late November, when 200,000 mallards and 33,000 Canada geese visit the refuge.

Area Economy

The Umatilla NWR is located in Morrow County in northeastern Oregon and in Benton County in southeastern Washington. Franklin County, Washington, is also included in the refuge's economic area since a significant number of refuge anglers live there. The area had a population of 207,900 in 2001, an increase of 9.7 percent from 1995. Total employment increased by 8.8 percent from 1995 to 2001.

Per-capita personal income increased in Benton County by 5.7 percent from 1995 to 2001, adjusted for inflation. Per-capita income decreased by 2.0 percent in Franklin County and decreased by 2.4 percent in Morrow County. In 2001, per-capita income was $27,888 for Benton County, $19,256 for Franklin County, and $18,432 for Morrow County. This compares with $32,481 for the state of Washington, $28,518 for the state of Oregon, and a national average of $30,894.

Table 45. Umatilla NWR: Summary of Area Economy, 2001.
(Population and Employment in '000's; Per Capita Income in 2002 dollars)

	Population		Employment		Per Capita Income	
County	2001	Percent change 1995-2001	2001	Percent change 1995-2001	2001	Percent change 1995-2001
Morrow OR	11.3	24.1%	5.4	13.8%	$18,432	-2.4%
Benton WA	145.9	8.3%	81.1	8.0%	$27,888	5.7%
Franklin WA	50.8	11.0%	26.6	10.2%	$19,256	-2.0%
Total	207.9	9.7%	113.1	8.8%	$21,858	1.0%
OR	3,473.4	9.1%	2,108.3	13.3%	$28,518	8.0%
WA	5,993.4	9.3%	3,552.7	13.6%	$32,481	16.3%
U.S.	285,317.6	7.2%	167,535.6	12.2%	$30,894	12.5%

Source: U.S. Department of Commerce 2003.

Activity Levels

The refuge recorded 68,450 visits during FY 2002. Non-consumptive uses, including boating, wildlife photography and observation, hiking, and picnicking, totaled 50,500. Fishing accounted for 25,000 visits, waterfowl hunting for 13,500 visits, and upland and big-game hunting for 2,500 visits.

The refuge staff estimates that about 85 to 90 percent of non-consumptive users and 70 percent of anglers are residents of the area (defined as living within a 30-mile radius of the refuge). Migratory waterfowl hunters are comprised of 50 percent non-residents, big-game hunters are 75 percent non-residents, and small-game hunters are 25 percent non-residents.

The refuge staff also estimated the number of hours visitors spend on the refuge for different activities. Anglers typically spend about 4 hours per day per visit; non-consumptive users range from one hour to 7 hours per day, depending on the activity; waterfowl hunters spend about 6 hours, and upland and big-game hunters about 4 and 8 hours, respectively.

A number of small towns are close by the refuge, including Paterson and Plymouth on the Washington side and Boardman, Irrigon, and Umatilla on the Oregon side. These towns benefit from recreation expenditures on food, gas, lodging, sporting goods, and other items.

For the purposes of this analysis, non-consumptive visits are converted to refuge visitor days, defined as 8 hours of non-consumptive recreation activity per day. Non-consumptive use visitor days totaled 27,689.

Regional Economic Analysis

The economic area for the refuge is defined as Morrow County in Oregon and Benton and Franklin counties in Washington. It is assumed that refuge visitor expenditures occur primarily within this 3-county area.

Table 46 shows visitor recreation expenditures for the refuge for FY 2002. Total expenditures were $3.2 million with non-residents accounting for $2.2 million, 71 percent of the total. Expenditures on fishing accounted for 23 percent of the total, hunting 46 percent, and non-consumptive use 37 percent.

Table 46. Umatilla NWR: Visitor Recreation-related Expenditures (2002 $,000)

Activity	Resident	Non-Resident	Total
Non-consumptive	$430.1	$746.9	$1,177.0
Hunting			
big game	$0.0	$0.6	$0.6
small game	$28.9	$57.9	$86.8
migratory bird	$85.8	$1,089.5	$1,175.3
total hunting	$114.7	$1,148.0	$1,262.7
Fishing	$384.1	$351.3	$735.4
Total	**$928.9**	**$2,246.2**	**$3,175.1**

Table 47 summarizes the total economic impacts associated with refuge visitor spending. Total final demand was $853,700. This is the total monetary value of economic activity generated in the 3-county area by refuge visitor spending. In turn, this final demand generated 48 jobs (both full-time and part-time) with total employment income of $838,400.

Table 47. Umatilla NWR: Economic Effects Associated with Refuge Visitation (2002 $,000)

	Non-Residents	Total
Final Demand	$1,433.9	$2,116.9
Jobs	31	48
Job Income	$570.3	$838.4

Table 48 shows total economic effects (total final demand plus net economic value) compared with the refuge budget for FY 2002. For an individual, net economic value is that person's total willingness to pay for a particular recreation activity minus his or her actual expenditures for that activity. The figure for net economic value is derived by multiplying net economic values for hunting, fishing, and non-consumptive recreation use (on a per-day basis) by estimated refuge visitor days for that activity. This figure is combined with the estimate of total final demand and divided by the refuge budget for FY

2002. (Budget data are from the RMIS database and include 1260 staff funding, 1260 nonstaff funding, and other staff funding.) The $8.81 means that for every $1 of budget expenditures, $8.81 of total economic effects are generated. This ratio is provided only for the purpose of broadly comparing the magnitude of the economic effects resulting from refuge visitation to total budget expenditures and should not be interpreted as a benefit-cost ratio.

Table 48. Umatilla NWR: Summary of Economic Effects of Refuge Visitation (2002 $,000)

	FY 2002 Budget	Final Demand	Net Economic Value	Economic effects per $1 budget expenditure
Umatilla NWR	$506.8	$2,116.9	$2,348.1	$8.81

Upper Souris National Wildlife Refuge

Description

The Upper Souris National Wildlife Refuge is situated in the drift prairie region of north- central North Dakota, on the western arm of the Souris River Loop. Entering the U.S. from Canada 28 river miles north of the refuge, the Souris River flows through the refuge for 69 miles before heading for Minot and the J. Clark Salyer NWR.

Upper Souris NWR covers 32,092 acres of the Souris River valley in Ward and Renville counties. Wildlife habitat on the refuge includes 17,504 acres of native grasslands, 40 acres of introduced grasses, 733 acres of dense nesting cover, 812 acres of woodlands, 12,643 wetland acres (river, lake, and shallow marshes), and 360 acres of administrative area. The landscape includes a narrow band of river-bottom woodlands, fertile floodplains, rolling hills, and steep brush-covered coulees.

The refuge receives considerable public use due to its nearness to the city of Minot and the Minot Air Force Base. An auto tour route, hiking trails, canoe routes, observation points, and grouse observation blinds provide many opportunities for the visitor to view wildlife.

Area Economy

The economic center of the area is the city of Minot (population 36,567). Ward County is economically diverse, serving as the finance, banking, retail, and health-care center for the surrounding areas. Both Minot State University and Minot Air Force Base are located in the county. Renville County is predominantly agricultural.

The 2-county area had a population of 60,300 in 2001, a 2.8 percent drop from 1995. The population of Renville County decreased by 3.6 percent from 1995 to 2001.

Per-capita personal income increased by 15.2 percent in Ward County and 10.3 percent in Renville County from 1995 to 2001, adjusting for inflation. Ward County had a per-capita income of $27,373 in 2001; Renville County's was $23,969. This compares with the North Dakota state average of $26,206 and the national average of $30,894.

Table 49. Upper Souris NWR: Summary of Area Economy, 2001.
(Population and Employment in '000's; Per Capita Income in 2002 dollars)

	Population		Employment		Per Capita Income	
County	2001	Percent change 1995-2001	2001	Percent change 1995-2001	2001	Percent change 1995-2001
Ward	57.8	-2.6%	40.3	3.6%	$27,373	15.2%
Renville	2.5	-8.6%	1.6	2.8%	$23,969	10.3%
Total	60.3	-2.8%	41.8	3.6%	$25,671	12.8%
ND	636.6	-1.7%	452.1	7.3%	$26,206	17.5%
U.S.	28,531.6	7.2%	167,535.6	12.2%	$30,894	12.5%

Source: U.S. Department of Commerce 2003.

Activity Levels

The refuge recorded 64,093 visitors during FY 2002. Of this number, 54,740 visits were for the primary purpose of fishing, 5765 were for non-consumptive recreation such as birding, photography, wildlife observation, auto-tours, canoe tours, hiking, and picnicking; and 540 were for hunting upland and big game.

The staff estimated that about 75 percent of anglers and 85 percent of hunters are residents (people who live within 30 miles of the refuge). About 75 percent of non-consumptive users are residents. Anglers and hunters typically spend 4 or more hours per day per visit on the refuge; non-consumptive users typically spend between one and two hours per day per visit.

For the purposes of this analysis, non-consumptive visits are converted to refuge visitor days, defined as 8 hours of non-consumptive recreation activity per day. Non-consumptive refuge visitor days totaled 1,518 for residents and 80 for non-residents.

Regional Economic Analysis

The economic base area for the refuge is defined as Ward and Renville counties. It is assumed that refuge visitor expenditures occur primarily within this area.

Table 50 shows visitor recreation expenditures for the refuge for FY 2002. Total expenditures were $1.8 million, with residents accounting for slightly over 50 percent. Fishing-related expenditures accounted for over 97 percent of the total.

Table 50. Upper Souris NWR: Visitor Recreation-related Expenditures (2002 $,000)			
Activity	**Resident**	**Non-Resident**	**Total**
Non-consumptive	$8.1	$10.3	$18.4
Hunting			
big game	$10.7	$9.6	$20.3
small game	$0.6	$2.4	$3.0
migratory bird	$0.0	$0.0	$0.0
total hunting	$11.3	$12.0	$23.3
Fishing	$841.6	$967.8	$1,809.4
Total	**$861.0**	**$990.1**	**$1,851.1**

Table 51 summarizes the total economic impacts associated with refuge visitor spending. Total final demand associated with visitor spending was $2.1 million. This is the total monetary value of economic activity generated in the 2-county area by refuge visitor spending. In turn, this final demand generated 55 jobs (both full-time and part-time) with total employment income of $854,800.

Table 51. Economic Effects Associated with Refuge Visitation (2002 $,000)		
	Non-Residents	**Total**
Final Demand	$1,105.9	$2,094.2
Jobs	30	55
Job Income	$461.2	$854.8

Table 52 shows total economic effects (total final demand plus net economic value) compared with the refuge budget for FY 2002. (Refuge budget data are from the RMIS database.) For an individual, net economic value is that person's total willingness to pay for a particular recreation activity minus his or her actual expenditures for that activity. The figure for net economic value is derived by multiplying net economic values for hunting, fishing, and non-consumptive recreation use (on a per-day basis) by estimated refuge visitor days for that activity. This is combined with the estimate of total final demand and divided by the refuge budget for FY 2002. The $5.16 means that for every $1 of budget expenditures, $5.16 of total economic effects are generated. This ratio is provided only for the purpose of broadly comparing the magnitude of the economic effects resulting from refuge visitation to total budget expenditures and should not be interpreted as a benefit-cost ratio.

Table 52. Upper Souris NWR: Summary of Economic Effects of Refuge Visitation (2002 $,000)

	FY 2002 Budget	Final Demand	Net Economic Value	Economic effects per $1 budget expenditure
Upper Souris NWR	$878.5	$2,094.2	$2,443.1	$5.16

Quivira National Wildlife Refuge

Description

Quivira NWR is located in Stafford, Rice, and Reno counties in south-central Kansas. Its establishment was approved by the Migratory Bird Conservation Commission on May 3, 1955, and acquisition of the 21,820 acres was completed in 1969. The natural and developed marshes on the refuge provide resting and feeding areas for spring and fall migrating waterfowl and wintering habitat for mallards and Canada geese. In addition, thousands of shorebirds and sandhill cranes use the refuge during migration in the spring and fall. Whooping cranes, bald eagles, and interior least terns use the refuge as well. Summer residents include white pelicans, gulls, various hawks, avocets, egrets, and many others. Ring-necked pheasants, bobwhite quail, wild turkey, white-tailed deer, prairie dogs, and coyotes are commonly seen.

The refuge has 21 miles of canals through which water is diverted to over 30 wetlands ranging in size from 10 to 1,500 acres and totaling over 5,000 acres. Hunting and fishing are permitted on 8,000 acres of the refuge in accordance with state seasons. The refuge is an excellent birding area.

Area Economy

The refuge's economic base is defined as the counties of Stafford, Reno, and Rice in south-central Kansas, plus Barton County to the northwest of the refuge. Hutchinson (population 40,787) in Reno County, about 20 miles from the refuge, is the largest town in the area. Over 500,000 people live within a 1½-hour drive of the refuge. This larger area includes the cities of Wichita (344,284 population), Salina (45,679), Great Bend (15,345), McPherson (13,770), Newton (17,190), and Pratt (6,570).

Total employment in the 4-county area was 65,300 in 2001, a decrease of 0.8 percent from 1995. Per-capita personal income increased by 8.8 percent in the 4-county area from 1995 to 2001, adjusting for inflation. Stafford County had the area's largest per-capita income at $23,718 (a 7.5 percent increase from 1995), followed by Reno at $24,974 (6.9 percent), Barton at $25,683 (14.4 percent), and Rice at $20,107 (6.1 percent). Average 2001 per-capita income for Kansas was $28,881, and the national average was $30,894.

Table 53. Quivira NWR: Summary of Area Economy, 2001.
(Population and Employment in '000's; Per Capita Income in 2002 dollars)

	Population		Employment		Per Capita Income	
County	2001	Percent change 1995-2001	2001	Percent change 1995-2001	2001	Percent change 1995-2001
Stafford	4.7	-7.2%	3.1	0.1%	$23,718	7.5%
Reno	64.3	1.4%	37.4	-2.0%	$24,974	6.9%
Rice	10.6	-1.3%	5.1	-3.3%	$20,107	6.1%
Barton	27.8	-4.4%	19.7	2.6%	$25,683	14.4%
Total	107.6	-0.8%	65.3	-0.6%	$23,621	8.8%
KS	2,702.1	3.9%	1,784.3	10.6%	$28,881	12.4%
U.S.	28,531.6	7.2%	167,535.6	12.2%	$30,894	12.5%

Source: U.S. Department of Commerce 2003.

Activity Levels

The Quivira NWR recorded 223,269 visits during FY 2002. Non-consumptive recreation, such as birding, auto-touring, wildlife photography, and observation, totaled 118,379 visits. Hunting of migratory birds accounted for 10,825 visits, upland game hunting for 875 visits. Angling accounted for 2,755 visits.

The refuge staff estimated that about 80 percent of all hunters were non-residents (defined as living more than 30 miles from the refuge). About 95 percent of non-consumptive visits are by non-residents. Non-consumptive use visitors typically spend one to two hours per visit, hunters about 4 hours.

For the purposes of this analysis, non-consumptive use visits are converted to refuge visitor days, defined as 8 hours of non-consumptive recreation activity per day. Non-consumptive refuge visitor days totaled 25,595 in FY 2002.

Regional Economic Analysis

Table 54 shows recreation-related expenditures by refuge visitors for FY 2002. It is assumed that most of the expenditures for refuge visits occurs within the 4-county area. Total expenditures were $2.7 million, with non-residents totaling $2.6 million. Non-consumptive recreation expenditures were $2.0 million. Hunting expenditures totaled $540,000.

Table 54. Quivira NWR: Visitor Recreation-related Expenditures (2002 $,000)			
Activity	**Resident**	**Non-Resident**	**Total**
Non-consumptive	$20.7	$1,999.7	$2,020.4
Hunting			
big game	$0.0	$0.0	$0.0
small game	$3.2	$47.0	$50.2
migratory bird	$30.7	$459.1	$489.8
total hunting	$33.9	$506.1	$540.0
Fishing	$33.9	$77.9	$111.8
Total	**$88.5**	**$2,583.7**	**$2,672.2**

Table 55 summarizes the total economic impacts associated with refuge visitor spending. Total final demand associated with visitor spending was $2.9 million. This is the total monetary value of economic activity generated in the 4-county area by refuge visitor spending. In turn, this final demand generated 56 jobs (both full-time and part-time) with total employment income of $991,500.

Table 55. Quivira NWR: Economic Effects Associated with Refuge Visitation (2002 $,000)		
	Non-Residents	**Total**
Final Demand	$2,726.1	$2,868.2
Jobs	54	56
Job Income	$947.9	$991.5

Table 56 shows total economic effects (total final demand plus net economic value) compared with the refuge budget for FY 2002. For an individual, net economic value is that person's total willingness to pay for a particular recreation activity minus his or her actual expenditures for that activity. The figure for net economic value is derived by multiplying net economic values for hunting, fishing, and non-consumptive recreation use (on a per-day basis) by estimated refuge visitor days for that activity. This is combined with the estimate of total final demand and divided by the refuge budget for FY 2002. (Budget data include 1260 staff funding, 1260 nonstaff funding, and other staff funding.) The $3.56 means that for every $1 of budget expenditures, $3.56 of total economic effects are generated. This ratio is provided only for the purpose of broadly comparing the magnitude of the economic effects resulting from refuge visitation to total budget expenditures and should not be interpreted as a benefit-cost ratio.

Table 56. Quivira NWR: Summary of Economic Effects of Refuge Visitation (2002 $,000)

	FY 2002 Budget	Final Demand	Net Economic value	Economic effects per $1 budget expenditure
Quivira NWR	$1,247.2	$2,868.2	$1,570.3	$3.56

Tensas River National Wildlife Refuge

Description

Tensas River NWR is a 63,925-acre island of forest in a sea of agricultural land. It was established in 1980 to preserve the largest privately owned tract of bottomland hardwood habitat remaining in the Mississippi delta. The refuge is home to the threatened Louisiana black bear and American alligator. Human activities affect this environment tremendously. The Tensas River is polluted by agricultural runoff of pesticides and fertilizers. Oil and gas production activities penetrate the refuge.

Hunting and fishing are the largest public-use programs on the refuge. Deer, squirrel, raccoon, turkey, and waterfowl are hunted with bow and arrow, muzzleloaders, and other weapons. Special permits and training are required to hunt on the refuge. Bass and crappie are popular quarries for anglers. Several lakes are open for fishing year-round.

Much of the refuge is difficult to access on foot, limiting non-consumptive use. A hiking trail loop around Rainey Lake and a boardwalk to an observation platform receive most of the land-based attention. A primitive canoe-launch site provides water access to the river. All-terrain vehicles (ATVs) are permitted on designated trails. The refuge has a strong environmental education program. Teacher-training workshops and environmental summer camps are hosted annually.

Area Economy

Tensas River NWR is about 25 miles west of Vicksburg, Mississippi, in the Madison, Tensas, and Franklin parishes of Louisiana. Table 57 shows a summary of the area economy for 2001. Area population decreased by 0.9 percent from 1995 to 2001. During the same period, the population in Louisiana increased by 2.1 percent and the Mississippi population increased by 5.0 percent. Area employment increased by 1.9 percent from 1995 to 2001; employment in Louisiana increased by 9.4 percent and by 7.2 percent in Mississippi. Area per capita income increased by 1.5 percent from 1995 to 2001, compared with a 9.0 percent increase in Louisiana and a 9.7 percent increase in Mississippi.

Table 57. Tensas River NWR: Summary of Area Economy, 2001.
(Population and Employment in '000's; Per Capita Income in 2002 dollars)

	Population		Employment		Per Capita Income	
County	2001	Percent change 1995-2001	2001	Percent change 1995-2001	2001	Percent change 1995-2001
West Carroll LA	12.1	0.1%	4.5	13.1%	$17,100	7.7%
East Carroll LA	9.2	-5.9%	3.3	-2.6%	$14,793	-3.0%
Richland LA	20.9	0.7%	8.2	-3.3%	$18,103	-1.9%
Madison LA	13.5	0.3%	5.3	11.1%	$16,181	2.4%
Franklin LA	21.0	-3.4%	9.4	6.6%	$17,386	0.1%
Tensas LA	6.5	-6.3%	2.6	-2.1%	$16,397	-4.0%
Warren MS	49.5	0.6%	31.1	0.0%	$26,917	6.9%
Total	132.7	-0.9%	64.5	1.9%	$18,125	1.5%
LA	4,470.4	2.1%	2,426.2	9.4%	$24,840	9.0%
MS	2,859.7	5.0%	1,478.5	7.2%	$21,995	9.7%
U.S.	28,531.6	7.2%	167,535.6	12.2%	$30,894	12.5%

Source: U.S. Department of Commerce 2003.

Activity Levels

RMIS data shows 95,325 visitors to Tensas River NWR in FY 2002. More than half of them hunted or fished. Tensas River was included in this study to represent refuges in the South that have relatively low visitation and a high proportion of hunting recreation. Some 21,250 visitor days were attributed to big-game hunting. Only 20 percent of big-game hunters were from the adjacent parishes. Small-game hunters spent 7,340 visitor days pursuing squirrels and raccoons. Thirty percent of small game hunters lived in the area. Migratory bird hunters and anglers spent 1,225 and 930 days, respectively, at the refuge. About half of each group was believed to reside in the area.

Most non-consumptive wildlife users were from outside the local area. They took part in several different activities on the refuge, so each visitor was counted several times. Most users of the boardwalk trail, for example, pause at the observation platform at the end and so are counted twice. More than 35,367 activity visits were recorded.

Regional Economic Analysis

The refuge touches 3 Louisiana parishes -- Tensas, Madison, and Franklin. Richland and East and West Carroll parishes are within a few miles, so they are also included in the local region. Vicksburg, Mississippi, is the business center for the area, so it too is included.

Table 58 shows visitor recreation expenditures for the refuge during FY 2002. Non-resident visitors spent $1.7 million in the region. The largest contributors were non-resident non-consumptive users. As it flowed through the regional economy, this spending increased final demand by $1.5 million, added $433,500 to employee compensation and resulted in 26 new jobs. When resident spending is included, job income totals $477,600.

Table 58. Tensas River NWR: Visitor Recreation-related Expenditures (2002 $,000)

Activity	Resident	Non-Resident	Total
Non-consumptive	$53.5	$704.2	$757.7
Hunting			
big game	$70.2	$690.1	$760.3
small game	$23.5	$205.9	$229.4
migratory bird	$10.3	$49.7	$60.0
total hunting	$104.0	$945.7	$1,049.7
Fishing	$7.9	$21.5	$29.4
Total	**$165.4**	**$1,671.4**	**$1,836.8**

Table 59 summarizes the total economic impacts associated with refuge visitor spending. Total final demand associated with visitor spending was $1.6 million. This is the total monetary value of economic activity generated in the 7-county area by refuge visitor spending. In turn, this final demand generated 29 jobs (both full-time and part-time) with total employment income of $447,600.

Table 59. Tensas River NWR: Economic Effects Associated with Refuge Visitation (2002 $,000)

	Non-Residents	Total
Final Demand	$1,460.9	$1,611.6
Jobs	26	29
Job Income	$433.5	$477.6

Table 60 shows total economic effects (total final demand plus net economic value) compared with the refuge budget for FY 2002. As explained earlier, people derive benefits over and above what they pay for recreation. This consumer surplus is estimated to be $2.0 million for Tensas River. The refuge spent over $1 million for personnel, maintenance, and operations during FY 2002 (Department of

Interior, Refuge Mangement Information System 2002). This money also contributes to the regional economy as both payrolls and other expenses are income to local people and businesses. For every $1 spent for the refuge, $3.59 in recreational benefits accrue. All the other benefits of the refuge (habitat preservation, flood control, etc.) are in addition to this amount.

Table 60. Tensas River NWR: Summary of Economic Effects of Refuge Visitation (2002 $,000)

	FY 2002 Budget	Final Demand	Net Economic value	Economic effects per $1 budget expenditure
Tensas River NWR	$1,018.0	$1,611.6	$2,046.6	$3.59

An Overview of Sample Refuges

Many variables affect a refuge's economic impact on its region. Some relate to the refuge and its public use program; others relate to the economy of the region. This section recapitulates the results from the detailed case studies to highlight the differences among the sampled refuges. This information is not intended to rate refuges. Refuges serve many different purposes -- a refuge with no public use, for example, could be vital to the survival of an endangered species. Each refuge must be viewed in light of its individual goals and how it achieves them.

A close look at Table 61 shows how differences in refuge use result in different economic results. Time spent, activities enjoyed, and residence of visitors determine refuge recreation economics. The National Elk Refuge, for example, is on a heavily traveled tourist route between Jackson Hole and Yellowstone National Park in Wyoming. Many visitors stop for a short break from the drive, so non-consumptive user visitation is very high but time spent on the refuge is relatively short. The number of recreational visitor days is lower than on other refuges with similar visitation and so the economic results are smaller.

Charles M. Russell NWR highlights the importance of visitors' activities. Although it receives less than one-third the number of visitors of the National Elk Refuge, more than twice the economic activity is produced (see Figure 4).

Table 61. Sample Refuges' Visitation and Economic Significance

Refuge	FY 2002 Visits	Recreational Visitor Days	Total Expenditures (mm$2002)	Non-Resident Expenditures (mm$2002)	Final Demand (mm$2002)	Jobs	Employee Income (mm$2002)
Chincoteague	1,553,959	926,596	$40.3	$39.1	$28.2	617	$12.5
Crab Orchard	995,052	591,388	$11.7	$6.7	$12.0	245	$4.2
National Elk Refuge	854,535	81,929	$4.5	$4.1	$2.9	64	$1.2
Eufaula	371,251	174,479	$7.1	$6.2	$5.6	125	$2.4
Don Edwards San Francisco Bay	498,200	98,025	$3.4	$1.6	$3.8	65	$1.8
Tule Lake	175,720	23,903	$2.1	$1.9	$2.0	47	$0.80
Mattamuskeet	66,500	19,733	$0.69	$0.49	$0.45	11	$0.18
Horicon	572,547	192,253	$7.3	$6.9	$5.9	144	$2.4
Charles M. Russell	247,000	169,050	$11.5	$10.0	$8.3	206	$2.8
Laguna Atascosa	182,685	67,383	$3.9	$2.4	$3.5	75	$1.4
Las Vegas	43,602	11,329	$0.73	$0.66	$0.42	11	$0.16
Umatilla	68,450	58,324	$3.2	$2.2	$2.1	48	$0.84
Upper Souris	64,093	56,004	$1.9	$1.0	$2.1	55	$0.85
Quivira	223,269	40,050	$2.7	$2.6	$2.9	56	$1.0
Tensas River	95,325	44,008	$1.8	$1.7	$1.6	29	$0.48

Figure 4. Expenditures by Visitor Activity on the Refuges

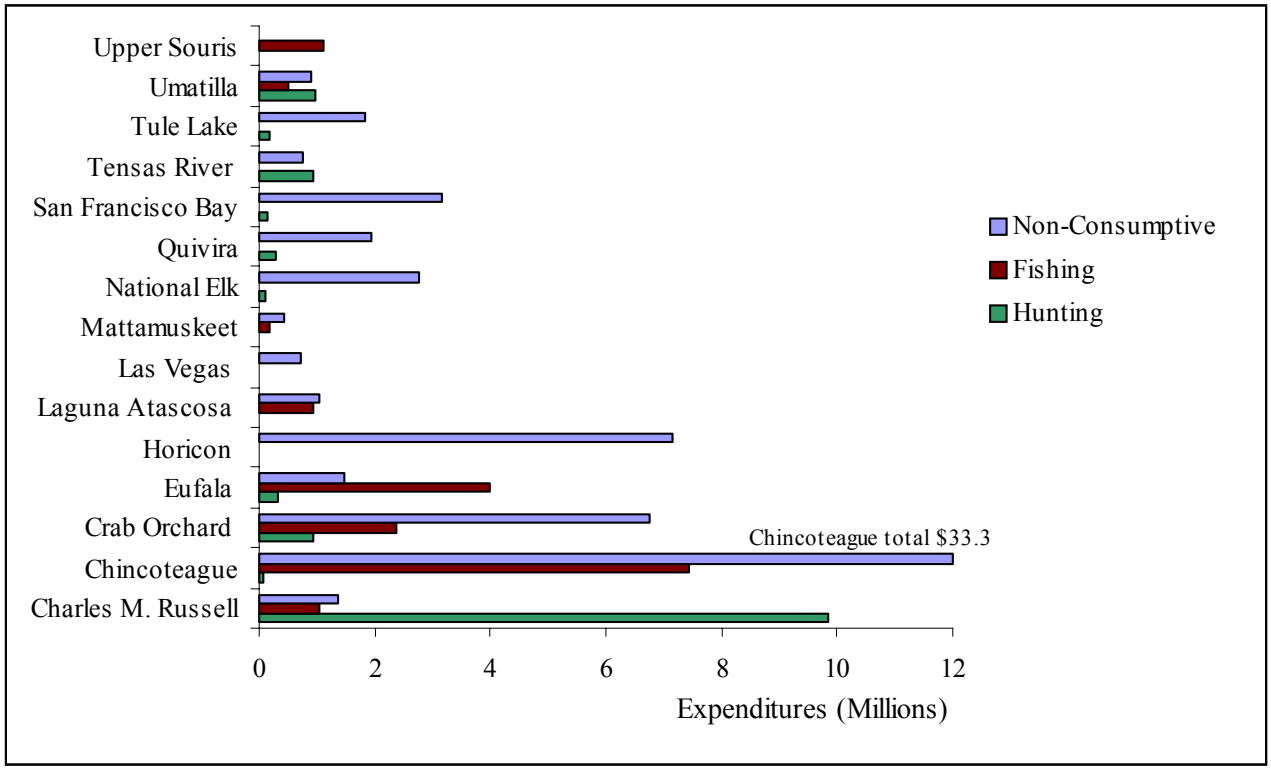
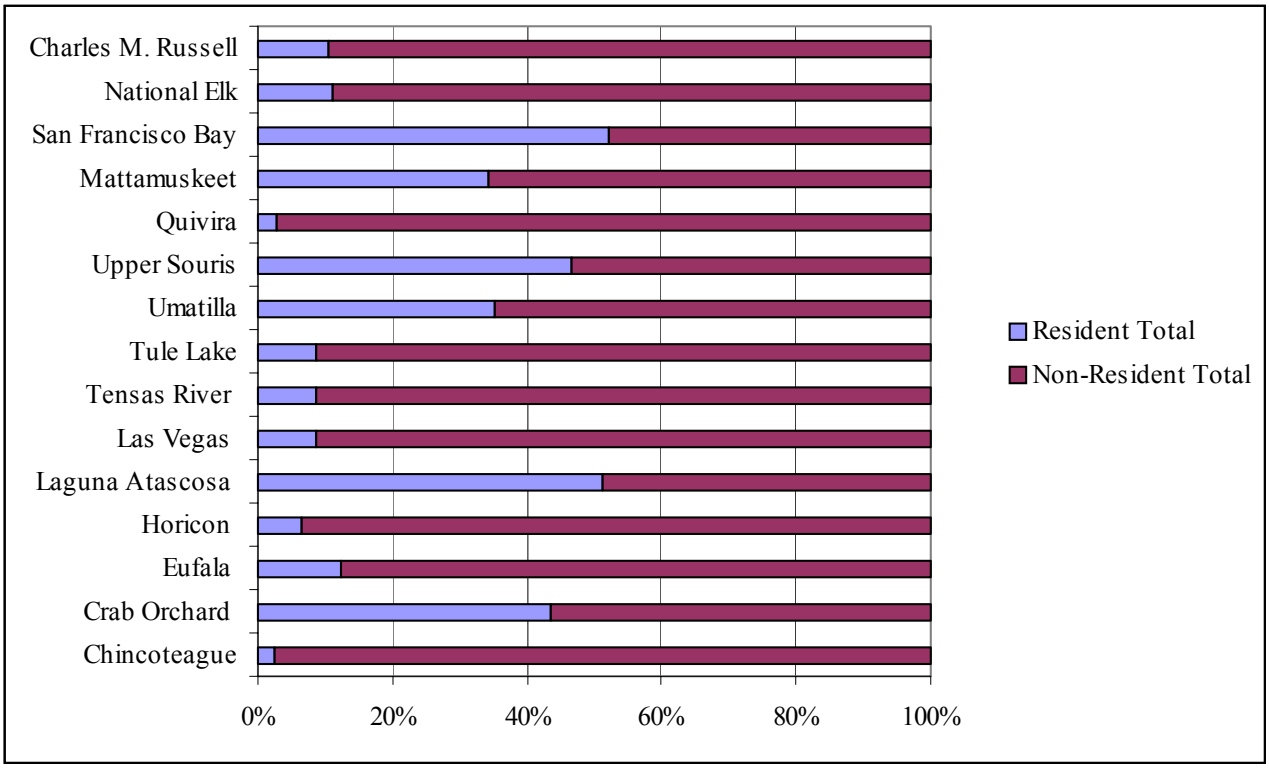


Figure 5. Expenditures by Visitor's State of Residence



Charles M. Russell visitors are primarily hunters and anglers who stay in the area for long periods of time. The refuge is also very large, so it may take several hours to move from one area to another. A visit is often an all-day activity.

Crab Orchard NWR illustrates the importance of residence. Although it receives about 64 percent of Chincoteague's number of recreational visitor days, Crab Orchard generates less than 45 percent of Chincoteague's economic activity (final demand). Many of Crab Orchard's visitors are local anglers who do not spend as much as non-resident visitors (see Figure 5).

Certain ratios may shed more light on the differences among the sample refuges and their local economies. The differences in visitors' length of stay are shown by the Recreation Visitor Days per Visit ratio in Table 62 and Figure 6. The Umatilla NWR and Upper Souris NWR have ratios near 0.9 while the National Elk Refuge's ratio is 0.1.

Final demand, jobs generated, and employment income are broad measures of the economic significance of a refuge's visitation to its neighborhood. These measures show the variation in the ultimate impact of the refuge when all of the factors are included. The broad range of change in final demand per 1,000 visits from $3,335 for National Elk Refuge to $33,551 for Charles M. Russell Refuge highlights how any blanket assumptions about the value of refuge visitation may be inaccurate. Taking any kind of average rate for impacts will clearly be inaccurate for any single refuge.

Table 62. Sample Refuges' Economic Ratios

	Final Demand per 1,000 visits	Jobs per 1,000 visits	Employee Income per 1,000 visits	Recreation Visitor Days per Visit
Chincoteague	$18,165	0.397	$8,035	0.596
Crab Orchard	$12,039	0.247	$4,260	0.594
National Elk Refuge	$3,335	0.074	$1,418	0.096
Eufaula	$15,162	0.336	$6,358	0.47
San Francisco Bay	$7,684	0.131	$3,557	0.197
Tule Lake	$11,328	0.267	$4,539	0.136
Mattamuskeet	$6,748	0.162	$2,662	0.297
Horicon	$10,336	0.252	$4,166	0.336
Charles M. Russell	$33,551	0.833	$11,437	0.684
Laguna Atascosa	$19,323	0.409	$7,789	0.369
Las Vegas	$9,599	0.246	$3,578	0.26
Umatilla	$30,927	0.706	$12,248	0.852
Upper Souris	$32,674	0.861	$13,337	0.874
Quivira	$12,846	0.249	$4,441	0.197
Tensas River	$16,906	0.305	$5,010	0.462

Net economic values reflect the value people place on their use of a refuge. The figures shown in Table 63 are not derived from market transactions but from asking people what they would be willing to pay for the refuge experience. For each refuge, the number of RVDs spent in each activity is multiplied by the average amount people in the refuge's state said they would be willing to pay to

continue to participate in that activity. That figure represents both the amount of benefit people in the state derive from the activity and the amount of the activity occurring at the refuge.

Table 63. Sample Refuges' Net Economic Values (2002 $,000)

Refuge	Non-Consumptive Use	Hunting	Freshwater Fishing	Saltwater Fishing	Total
Chincoteague	$24,980.5	$52.5	$0.0	$6,862.2	$31,895.2
Crab Orchard	$12,369.9	$2,187.4	$7,400.6	$0.0	$21,957.9
National Elk Refuge	$2,478.1	$115.8	$152.9	$0.0	$2,746.8
Eufaula	$779.5	$465.5	$6,188.8	$0.0	$7,433.7
San Francisco Bay	$3,043.3	$206.0	$0.0	$21.8	$3,271.2
Tule Lake	$664.9	$182.1	$0.0	$0.0	$847.0
Mattamuskeet	$272.0	$11.4	$487.0	$0.0	$770.4
Horicon	$5,984.2	$161.4	$222.8	$0.0	$6,368.4
Charles M. Russell	$1,213.3	$4,425.0	$2,094.4	$0.0	$7,732.8
Laguna Atascosa	$595.9	$39.6	$0.0	$2,109.7	$2,745.3
Las Vegas	$364.1	$6.8	$0.0	$0.0	$370.9
Umatilla	$898.7	$632.5	$816.8	$0.0	$2,348.1
Upper Souris	$23.5	$28.5	$2,391.0	$0.0	$2,443.1
Quivira	$832.0	$618.0	$120.3	$0.0	$1,570.3
Tensas River	$431.1	$1,574.9	$40.6	$0.0	$2,046.6
Total	$54,931.0	$10,707.4	$19,915.2	$8,993.7	$94,547.7

A National View

Aggregate National Economic Effects

Fifteen refuges were studied in detail for this report. From the information developed for those 15 refuges, an effort was made to estimate the local economic effects of refuge visitation nationwide. The methodology for this aggregation, described in the Introduction, provides only a rough approximation at the refuge level. In the regional totals shown here, some of the errors for individual refuges will cancel out as they are added up, thus making the regional totals somewhat more reliable.

As shown in Table 64, Region 4 had the most visits in FY 2002 and was responsible for the highest number of jobs. The region contains several very popular refuges such as Pea Island, Ding Darling, Merritt Island, and Okefenokee. High non-consumptive and hunting use imply high final demand per visitor and thus large numbers of jobs and high job income.

National wildlife refuges received more visitors in 2002 than Grand Canyon, Yosemite, Yellowstone, Acadia, Grand Teton, and Statue of Liberty national parks combined (35.5 million vs. 18.9 million; National Park Service, 2003). The National Park system as a whole received 277 million visitors for about 104 million visitor days. In 2002, the Bureau of Land Management lands received about 53 million visitors for nearly 68 million visitor days, and the National Forests hosted 214 million visitors (U.S. Department of Agriculture 2002, and U.S. Department of the Interior 2002). Although national wildlife refuges are used less intensively than the other federal lands, they are a major contributor to the mix of outdoor recreational opportunities in the United States.

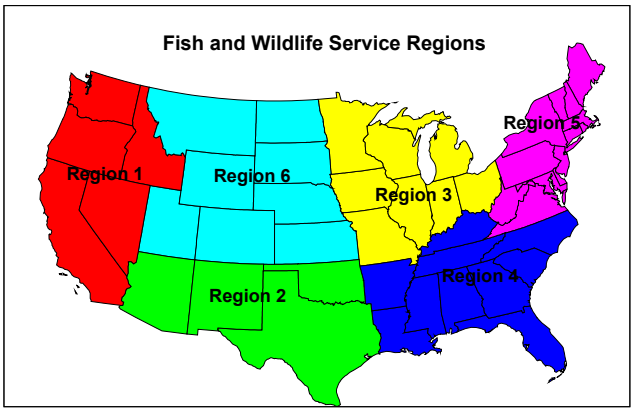


Table 64. National Significance of Refuge Visitation by FWS Region

Fish and Wildlife Service Region	Visits FY 2002	Final Demand ($2002 ,000)	Job Income ($2002 ,000)	Jobs
1	4,177,600	113,458	42,857	2,630
2	4,702,485	97,182	38,389	2,298
3	7,242,888	111,783	44,128	2,484
4	10,563,134	283,535	111,489	6,605
5	6,235,100	125,968	50,135	2,788
6	2,567,015	77,250	28,160	1,923

Total	**35,488,222**	**809,177**	**315,158**	**18,728**

Net Economic Value

As explained in the Introduction, refuge visitors derive more benefits from their recreation than they pay for it. Surveys can measure the additional benefit by asking how much the costs of recreating would need to rise before the visitor would decide not to participate in the activity. These amounts have been estimated for the nation[3]. Multiplying the national value by the number of recreational visitor days spent pursuing that activity on a refuge yields an estimate for the net economic value (or consumer surplus) of the activity. These values are summed by Fish and Wildlife Service region in Table 65.

About one-fourth of the consumer surplus in Regions 2 and 3, the Southwest and the Midwest, is derived from fishing. Consumer surplus from consumptive recreation (hunting and fishing) exceeds non-consumptive consumer surplus only in region 4 (the South), where several refuges' activities are dominated by fishing. While hunting consumer surplus has the greatest value per trip ($52.82), hunting consumer surplus comprises only 9 percent of the consumer surplus values from national refuge visitation. Regional variation is caused by differing levels of activity.

Table 65. Net Economic Values from National Refuge Visitation by FWS Region

Fish and Wildlife Service Region	Visits FY 2002	Non-Consumptive (2002 $,000)	Hunting (2002 $,000)	Fishing (2002 $,000)	Total (2002 $,000)
1	4,177,600	66,444	8,059	9,554	84,056
2	4,702,485	70,233	4,663	27,258	102,154
3	7,242,888	63,134	17,848	37,545	124,527
4	10,563,134	141,910	27,417	116,837	286,164
5	6,235,100	123,494	2,988	24,776	151,258
6	2,567,015	25,963	8,960	8,977	43,901
Total	**35,488,222**	**497,178**	**69,936**	**224,947**	**792,061**

[3]Due to data limitations, regional consumer surplus values were unavailable. Therefore, national estimates were substituted.

References

Aiken, Richard and Genevieve Pullis LaRouche. *Net Economic Values for Wildlife-Related Recreation in 2001*. (Report 2001-3). Addendum to the 2001 National Survey of Fishing, Hunting, and Wildlife Associated Recreation.) U. S. Department of the Interior, Fish and Wildlife Service. Washington, D.C. September 2003.

Heinrich, James W. And Scott R. Gaven. "The Economic Impact of Canada Geese at the Horicon Marsh, Wisconsin." *Wildlife Society Bulletin*, 20:364-371. 1972.

Kerlinger, Paul. *The Economic Impact of Birding on the Chincoteague National Wildlife Refuge Area, Virginia, 1993-1994* (unpublished survey report.) 1994.

Kerlinger, Paul. *The Economic Impact of Birding on the Laguna Atascosa National Wildlife Refuge Area, Texas, 1993-1994* (unpublished survey report.) 1994.

Kerlinger, Paul. *The Economic Impact of Birding on the Quivira National Wildlife Refuge Area, Kansas, 1993-1994* (unpublished survey report.) 1994.

Minnesota IMPLAN Group, Inc. *IMPLAN System (1998 data and software). 1940 South Greeley Street, Suite 101, Stillwater MN 55082. 1998.*

Olson, Doug and Scott Lindall**.** *IMPLAN Professional Software, Analysis and Data Guide*. 1940 South Greeley Street, Suite 101, Stillwater, MN 55082. 1996.

Taylor, Carol, Susan Winter, Greg Alward and Eric Siverts. *Micro IMPLAN User's Guide*. Fort Collins CO: U.S. Department of Agriculture - Forest Service, Land Management Planning Systems Group, 1993.

U.S. Department of Agriculture. Forest Service. *National Forest Visitor Use Monitoring National and Regional Project Results*. September 2002. http://www.fs.fed.us/recreation/programs/nvum/reports/year2/2002_national_report_final.htm Accessed 10 September 2003.

U. S. Department of Commerce. Bureau of the Census. *Statistical Abstract of the United States: 1995.* Washington, D.C. 1995.

U. S. Department of Commerce. Bureau of Economic Analysis. *Regional Economic Accounts.* www.bea.doc.gov/bea/regional/data.htm. Washington, D.C. July 2003.

U. S. Department of the Interior. *Fiscal Year 2001 U. S. Department of the Interior Annual Financial Report*. Washington, D.C. 2001.

U.S. Department of the Interior, Bureau of Land Management. *Estimated Recreational Use of Public Lands Administered by the BLM, Fiscal Year 2002*. http://www.blm.gov/natacq/pls02/pls4-1.pdf Accessed 10 September 2003.

U.S. Department of the Interior, National Park Service. *National Park Service Statistical Abstract 2002*. http://www2.nature.nps.gov/stats Accessed 10 September 2003.

U. S. Department of the Interior, U.S. Fish and Wildlife Service, Division of Federal Aid. *2001 National Survey of Fishing, Hunting, and Wildlife Associated Recreation* (CD-ROM.) Washington, D.C. May 2002.

U.S. Department of the Interior, U.S. Fish and Wildlife Service, National Wildlife Refuge System. *Refuge Management Information System 2002*. Washington, D.C. Unpublished.

Note on the Appendices

The following appendices are intended to provide technical background information on the data, methods, and assumptions used to produce "Banking on Nature: The Economic Benefits to Local Communities of National Wildlife Refuge Recreation." The appendices should be read in conjunction with the report, especially the Introduction. There is very little expository material in the appendices.

Appendix 1 - Sample Refuges Data and Assumptions

This appendix summarizes the economic base area, activity hours, residence, and public use data used to estimate the impact of each sample refuge.

Appendix 2 - Estimating Economic Impacts: General Methodology and Assumptions

This appendix explains the methodology and assumptions used to generate estimates of the sample refuges' impacts and the national aggregation of local impacts. It is intended for economists and others knowledgeable in impact analysis.

Appendix 3 - Regional Recreation Expenditures

This appendix shows the expenditure function by Fish and Wildlife Service region, activity, and residence for four categories of expenditures (food, lodging, transportation, and other).

Appendix 4 - Comparison of 1995 and 2002 Visitation and Economic Impacts

This appendix compares 1995 and 2002 visitation data and selected economic impacts for each of the sample refuges and for the nation as a whole.

Appendix 1.
Sample Refuges Data and Assumptions

Chincoteague National Wildlife Refuge

1. **Economic Base Area.**

a. Accomack County, Virginia
b. Worcester County, Maryland

2. **Recreation Information[4]: activity hours and residents/non-residents**.

Activity	Hours per person per visit	Resident as percentage of total visitors	Non-resident as percentage of total visitors
Non-Consumptive:			
Nature Trails	3	10	90
Observation Platforms	1	10	90
Other Wildlife Observation	4	10	90
Beach/Water Use	6	10	90
Other Recreation	1	10	90
Hunting:			
Upland Game	na	na	na
Big Game	10	30	70
Migratory Birds	5	30	70
Fishing:			
Freshwater	na	na	na
Saltwater	5	10	90

[4]Information obtained from refuge personnel.

3. **Chincoteague NWR Public Use Data for FY 2002[5].**

I.	Total Number of Visitors	1,553,959
II.	Interpretation & Nature Observation (on site)	1,579,275
	A. Staff/Volunteer Conducted Activities	20,158
	1. Talks	20,501
	2. Tours	5,090
	3. Demonstrations	2,653
	B. Visitor Centers	197,077
	C. Administrative Office	321
	D. Kiosks	1,553,959
	E. Nature Trails	1,457,561
	1. Foot	1,457,561
	2. Boat	0
	3. Auto	1,457,561
	F. Observation Towers / Platforms / Photo Blinds	155,397
	G. Other Wildlife Observation	1,015,215
III.	Environmental Education	10,827
	A. Staff/Volunteer Conducted	4,146
	1. Teachers participating in workshops	14
	2. Students taught on-site	2,361
	3. Students taught off-site	2,169
	B. Non-Staff Conducted	10,351
IV.	Recreation	1,191,922
	A. Hunting	824
	1. Migratory Birds	234
	a. Waterfowl	242
	b. Other Migratory Birds	0
	2. Upland Game	0
	3. Big Game	759
	B. Fishing	157,104
	1. Freshwater	0
	2. Saltwater	157,104
	C. Trapping	0
	D. Beach & Water Uses	1,191,922
	E. Other Recreation	1,800
V.	Education Outreach (off-site)	5,480
	A. Group Presentations	0
	B. Exhibits	5,330
	C. Other Education Outreach	150
VI.	Special Events	
	A. Number of News Releases	26
	B. Number of Radio/TV Spots	0
	C. Number of Other Special Events	13

[5]Data are from the RMIS Public Education & Recreation Database.

Crab Orchard National Wildlife Refuge

1. **Economic Base Area.**

a. Williamson, Union, Jackson, Johnson, and Franklin counties, Illinois

2. **Recreation Information[6]: activity hours and residents/non-residents**.

Activity	Hours per person per visit	Resident as percentage of total visitors	Non-resident as percentage of total visitors
Non-Consumptive			
Nature Trails	1	80	20
Observation Platforms	1	70	30
Other Wildlife Observation	2	70	30
Beach/Water Use	3	90	10
Other Recreation	12	75	25
Hunting			
Upland Game	3	90	10
Big Game	10	30	70
Migratory Birds	7	60	40
Fishing			
Freshwater	5	80	20
Saltwater	na	na	na

[6]Information obtained from Refuge personnel.

3. **Crab Orchard NWR Public Use Data for FY 2002[7].**

I.	Total Number of Visitors	995,052
II.	Interpretation & Nature Observation (on site)	446,595
	A. Staff/Volunteer Conducted Activities	15,283
	1. Talks	3,428
	2. Tours	1,225
	3. Demonstrations	10,630
	B. Visitor Centers	41,379
	C. Administrative Office	1,219
	D. Kiosks	127,500
	E. Nature Trails	86,970
	1. Foot	54,793
	2. Boat	0
	3. Auto	32,177
	F. Observation Towers / Platforms / Photo Blinds	77,000
	G. Other Wildlife Observation	97,244
III.	Environmental Education	35,384
	A. Staff/Volunteer Conducted	5,821
	1. Teachers participating in workshops	23
	2. Students taught on-site	4,327
	3. Students taught off-site	1,471
	B. Non-Staff Conducted	29,563
IV.	Recreation	514,544
	A. Hunting	41,411
	1. Migratory Birds	28,753
	a. Waterfowl	26,973
	b. Other Migratory Birds	1,780
	2. Upland Game	2,935
	3. Big Game	9,723
	B. Fishing	169,430
	1. Freshwater	169,430
	2. Saltwater	0
	C. Trapping	97
	D. Beach & Water Uses	106,436
	E. Other Recreation	197,170
V.	Education Outreach (off-site)	33,347
	A. Group Presentations	1,347
	B. Exhibits	28,000
	C. Other Education Outreach	4,000
VI.	Special Events	
	A. Number of News Releases	27
	B. Number of Radio/TV Spots	8
	C. Number of Other Special Events	6

[7]Data are from the RMIS Public Education & Recreation Database

National Elk Refuge

1. **Economic Base Area.**

   a. Teton County, Wyoming

2. **Recreation Information[8]: activity hours and residents/non-residents**.

Activity	Hours per person per visit	Resident as percentage of total visitors	Non-resident as percentage of total visitors
Non-consumptive			
Nature Trails	na	na	na
Observation Platforms	0.75	25	75
Other Wildlife Observation	0.75	25	75
Beach/Water Use	na	na	na
Other Recreation	0.75	25	75
Hunting			
Upland Game	na	na	na
Big Game	8	85	15
Migratory Birds	na	na	na
Fishing			
Freshwater	4	90	10
Saltwater	na	na	na

[8]Information obtained from Refuge personnel.

3. **National Elk NWR Public Use Data for FY 2002[9].**

I.	Total Number of Visitors	854,535
II.	Interpretation & Nature Observation (on site)	755,616
	A. Staff/Volunteer Conducted Activities	30,355
	1. Talks	7,600
	2. Tours	22,755
	3. Demonstrations	0
	B. Visitor Centers	294,687
	C. Administrative Office	3,600
	D. Kiosks	0
	E. Nature Trails	0
	1. Foot	0
	2. Boat	0
	3. Auto	0
	F. Observation Towers / Platforms / Photo Blinds	1,000
	G. Other Wildlife Observation	425,974
III.	Environmental Education	1,200
	A. Staff/Volunteer Conducted	850
	1. Teachers participating in workshops	0
	2. Students taught on-site	500
	3. Students taught off-site	350
	B. Non-Staff Conducted	1,200
IV.	Recreation	97,219
	A. Hunting	2,193
	1. Migratory Birds	0
	a. Waterfowl	0
	b. Other Migratory Birds	0
	2. Upland Game	0
	3. Big Game	2,193
	B. Fishing	3,500
	1. Freshwater	3,500
	2. Saltwater	0
	C. Trapping	0
	D. Beach & Water Uses	0
	E. Other Recreation	91,526
V.	Education Outreach (off-site)	40,200
	A. Group Presentations	1,800
	B. Exhibits	38,000
	C. Other Education Outreach	400
VI.	Special Events	
	A. Number of News Releases	30
	B. Number of Radio/TV Spots	30
	C. Number of Other Special Events	10

[9]Data are from the RMIS Public Education & Recreation Database.

Eufaula National Wildlife Refuge

1. **Economic Base Area.**

a. Barbour and Russell counties, Alabama
b. Quitman, Stewart, Chattahoochee, and Muscogee counties, Georgia

2. **Recreation Information[10]: activity hours and residents/non-residents**.

Activity	Hours per person per visit	Resident as percentage of total visitors	Non-resident as percentage of total visitors
Non-Consumptive			
Nature Trails	2	30	70
Observation Platforms	1	20	80
Other Wildlife Observation	1	20	80
Beach/Water Use	na	na	na
Other Recreation	2	20	80
Hunting			
Upland Game	4	20	80
Big Game	8	30	70
Migratory Birds	6	10	90
Fishing	8	30	70
Freshwater	6	30	70
Saltwater	na	na	na

[10]Information obtained from Refuge personnel.

3. **Eufaula NWR Public Use Data for FY 2002[11].**

I.	Total Number of Visitors	371,251
II.	Interpretation & Nature Observation (on site)	101,190
	A. Staff/Volunteer Conducted Activities	427
	1. Talks	0
	2. Tours	427
	3. Demonstrations	0
	B. Visitor Centers	0
	C. Administrative Office	9,763
	D. Kiosks	6,719
	E. Nature Trails	29,875
	1. Foot	2,564
	2. Boat	0
	3. Auto	35,974
	F. Observation Towers / Platforms / Photo Blinds	2,505
	G. Other Wildlife Observation	75,212
III.	Environmental Education	0
	A. Staff/Volunteer Conducted	0
	1. Teachers participating in workshops	0
	2. Students taught on-site	0
	3. Students taught off-site	0
	B. Non-Staff Conducted	0
IV.	Recreation	246,132
	A. Hunting	6,823
	1. Migratory Birds	700
	a. Waterfowl	857
	b. Other Migratory Birds	0
	2. Upland Game	25
	3. Big Game	8,087
	B. Fishing	129,959
	1. Freshwater	141,686
	2. Saltwater	0
	C. Trapping	0
	D. Beach & Water Uses	0
	E. Other Recreation	27,515
V.	Education Outreach (off-site)	6,079
	A. Group Presentations	2,548
	B. Exhibits	3,531
	C. Other Education Outreach	0
VI.	Special Events	
	A. Number of News Releases	2
	B. Number of Radio/TV Spots	0
	C. Number of Other Special Events	0

[11]Data are from the RMIS Public Education & Recreation Database.

Don Edwards San Francisco Bay National Wildlife Refuge

1. **Economic Base Area.**

   a. Santa Clara, San Mateo, and Alameda Counties.

2. **Recreation Information[12]: activity hours and residents/non-residents**.

Activity	Hours per person per visit	Resident as percentage of total visitors	Non-resident as percentage of total visitors
Non-consumptive			
Nature Trails	2	85	15
Observation Platforms	2	85	15
Other Wildlife Observation	na	na	na
Beach/Water Use	2	85	15
Other Recreation	na	na	na
Hunting			
Upland Game	na	na	na
Big Game	na	na	na
Migratory Birds	6	85	15
Fishing			
Freshwater	na	na	na
Saltwater	6	85	15

[12]Information obtained from Refuge personnel.

3. **Don Edwards San Francisco Bay NWR Public Use Data for FY 2002[13].**

I.	Total Number of Visitors	498,200
II.	Interpretation & Nature Observation (on site)	498,200
	A. Staff/Volunteer Conducted Activities	2,194
	1. Talks	2,151
	2. Tours	24
	3. Demonstrations	19
	B. Visitor Centers	27,600
	C. Administrative Office	0
	D. Kiosks	169,000
	E. Nature Trails	332,900
	1. Foot	332,700
	2. Boat	200
	3. Auto	0
	F. Observation Towers / Platforms / Photo Blinds	41,400
	G. Other Wildlife Observation	0
III.	Environmental Education	9,661
	A. Staff/Volunteer Conducted	8,934
	1. Teachers participating in workshops	1,834
	2. Students taught on-site	5,456
	3. Students taught off-site	1,644
	B. Non-Staff Conducted	727
IV.	Recreation	4,600
	A. Hunting	3,900
	1. Migratory Birds	3,900
	a. Waterfowl	3,900
	b. Other Migratory Birds	0
	2. Upland Game	0
	3. Big Game	0
	B. Fishing	500
	1. Freshwater	0
	2. Saltwater	500
	C. Trapping	0
	D. Beach & Water Uses	200
	E. Other Recreation	0
V.	Education Outreach (off-site)	635
	A. Group Presentations	435
	B. Exhibits	200
	C. Other Education Outreach	0
VI.	Special Events	
	A. Number of News Releases	9
	B. Number of Radio/TV Spots	4
	C. Number of Other Special Events	15

[13]Data are from the RMIS Public Education & Recreation Database.

Tule Lake National Wildlife Refuge

1. **Economic Base Area.**

a. Klamath County, Oregon; Modoc and Siskiyou counties, California. .

2. **Recreation Information[14]: activity hours and residents/non-residents**.

Activity	Hours per person per visit	Residents as percentage of total visitors	Non-residents as percentage of total visitors
Non-consumptive			
Nature Trails	2	50	50
Observation Platforms	1	30	70
Other Wildlife Observation	1	30	70
Beach/Water Use	na	na	na
Other Recreation	1	30	70
Hunting			
Upland Game	4	30	70
Big Game	na	na	na
Migratory Birds	4	30	70
Fishing			
Freshwater	na	na	na
Saltwater	na	na	na

[14]Information obtained from Refuge personnel.

3. **Tule Lake NWR Public Use Data for FY 2002[15].**

I.	Total Number of Visitors	175,720
II.	Interpretation & Nature Observation (on site)	166,105
	A. Staff/Volunteer Conducted Activities	499
	1. Talks	99
	2. Tours	222
	3. Demonstrations	178
	B. Visitor Centers	11,423
	C. Administrative Office	0
	D. Kiosks	4,597
	E. Nature Trails	17,206
	1. Foot	1,450
	2. Boat	106
	3. Auto	15,650
	F. Observation Towers / Platforms / Photo Blinds	941
	G. Other Wildlife Observation	148,772
III.	Environmental Education	1,999
	A. Staff/Volunteer Conducted	1,999
	1. Teachers participating in workshops	212
	2. Students taught on-site	737
	3. Students taught off-site	1,057
	B. Non-Staff Conducted	0
IV.	Recreation	4,837
	A. Hunting	3,447
	1. Migratory Birds	3,222
	a. Waterfowl	3,222
	b. Other Migratory Birds	0
	2. Upland Game	225
	3. Big Game	0
	B. Fishing	0
	1. Freshwater	0
	2. Saltwater	0
	C. Trapping	0
	D. Beach & Water Uses	0
	E. Other Recreation	1,390
V.	Education Outreach (off-site)	5,536
	A. Group Presentations	476
	B. Exhibits	5,060
	C. Other Education Outreach	0
VI.	Special Events	
	A. Number of News Releases	28
	B. Number of Radio/TV Spots	16
	C. Number of Other Special Events	0

[15]Data are from the RMIS Public Education & Recreation Database.

Mattamuskeet National Wildlife Refuge

1. **Economic Base Area.**

   a. Hyde, Beaufort, and Tyrell counties, North Carolina

2. **Recreation Information[16]: activity hours and residents/non-residents**.

Activity	Hours per person per visit	Resident as percentage of total visitors	Non-resident as percentage of total visitors
Non-Consumptive:			
Nature Trails	1	30	70
Observation Platforms	1	30	70
Other Wildlife Observation	2	50	50
Beach/Water Use	na	na	na
Other Recreation	1	50	50
Hunting			
Upland Game	na	na	na
Big Game	8	50	50
Migratory Birds	7	90	10
Fishing			
Freshwater	4	80	20
Saltwater	4	85	15

[16]Information obtained from Refuge personnel.

3. **Mattamuskeet NWR Public Use Data for FY 2002[17].**

I.	Total Number of Visitors	66,500
II.	Interpretation & Nature Observation (on site)	46,060
	A. Staff/Volunteer Conducted Activities	1.623
	1. Talks	609
	2. Tours	514
	3. Demonstrations	1,000
	B. Visitor Centers	0
	C. Administrative Office	10,150
	D. Kiosks	3,900
	E. Nature Trails	27,248
	1. Foot	4,600
	2. Boat	400
	3. Auto	24,500
	F. Observation Towers / Platforms / Photo Blinds	4,250
	G. Other Wildlife Observation	17,700
III.	Environmental Education	0
	A. Staff/Volunteer Conducted	0
	1. Teachers participating in workshops	0
	2. Students taught on-site	0
	3. Students taught off-site	0
	B. Non-Staff Conducted	0
IV.	Recreation	16,357
	A. Hunting	215
	1. Migratory Birds	50
	a. Waterfowl	50
	b. Other Migratory Birds	0
	2. Upland Game	0
	3. Big Game	165
	B. Fishing	13,500
	1. Freshwater	11,150
	2. Saltwater	2,350
	C. Trapping	0
	D. Beach & Water Uses	0
	E. Other Recreation	3,100
V.	Education Outreach (off-site)	10,005
	A. Group Presentations	10
	B. Exhibits	10,000
	C. Other Education Outreach	0
VI.	Special Events	
	A. Number of News Releases	5
	B. Number of Radio/TV Spots	0
	C. Number of Other Special Events	1

[17]Data are from the RMIS Public Education & Recreation Database.

Horicon National Wildlife Refuge

1. **Economic Base Area.**

   a. Dodge and Fond du Lac counties, Wisconsin

2. **Recreation Information[18]: activity hours and residents/non-residents**.

Activity	Hours per person per visit	Resident as percentage of total visitors	Non-resident as percentage of total visitors
Non-Consumptive			
Nature Trails	3	25	75
Observation Platforms	na	na	na
Other Wildlife Observation	3	25	75
Beach/Water Use	na	na	na
Other Recreation	3	25	75
Hunting			
Upland Game	6	80	20
Big Game	6	80	20
Migratory Birds	6	80	20
Fishing			
Freshwater	3	80	20
Saltwater	na	na	na

[18]Information obtained from Refuge personnel.

3. **Horicon NWR Public Use Data for FY 2002[19].**

I.	Total Number of Visitors	572,547
II.	Interpretation & Nature Observation (on site)	396,459
	A. Staff/Volunteer Conducted Activities	6,807
	1. Talks	2,987
	2. Tours	354
	3. Demonstrations	3,466
	B. Visitor Centers	20,492
	C. Administrative Office	40,984
	D. Kiosks	176,210
	E. Nature Trails	232,607
	1. Foot	115,643
	2. Boat	0
	3. Auto	176,210
	F. Observation Towers / Platforms / Photo Blinds	0
	G. Other Wildlife Observation	248,872
III.	Environmental Education	4,241
	A. Staff/Volunteer Conducted	992
	1. Teachers participating in workshops	26
	2. Students taught on-site	966
	3. Students taught off-site	0
	B. Non-Staff Conducted	3,740
IV.	Recreation	17,928
	A. Hunting	3,055
	1. Migratory Birds	10
	a. Waterfowl	10
	b. Other Migratory Birds	0
	2. Upland Game	1,135
	3. Big Game	1,910
	B. Fishing	5,180
	1. Freshwater	5,180
	2. Saltwater	0
	C. Trapping	243
	D. Beach & Water Uses	0
	E. Other Recreation	9,450
V.	Education Outreach (off-site)	81,254
	A. Group Presentations	7,108
	B. Exhibits	74,146
	C. Other Education Outreach	0
VI.	Special Events	
	A. Number of News Releases	19
	B. Number of Radio/TV Spots	16
	C. Number of Other Special Events	63

[19]Data are from the RMIS Public Education & Recreation Database.

Charles M. Russell National Wildlife Refuge

1. **Economic Base Area.**

   a. Fergus, Philips, Petroleum, Garfield, Valley, and McCone counties, Montana

2. **Recreation Information[20]: activity hours and residents/non-residents**.

Activity	Hours per person per visit	Resident as percentage of total visitors	Non-resident as percentage of total visitors
Non-consumptive			
Nature Trails	2	60	40
Observation Platforms	na	na	na
Other Wildlife Observation	2	30	70
Beach/Water Use	3	65	35
Other Recreation	2	70	30
Hunting			
Upland Game	5	40	60
Big Game	10	30	70
Migratory Bird	5	80	20
Fishing			
Freshwater	4	55	45
Saltwater	na	na	na

[20]Information obtained from refuge personnel.

3. **Charles M. Russell NWR Public Use Data for FY 2002[21].**

I.	Total Number of Visitors	247,000
II.	Interpretation & Nature Observation (on site)	106,648
	A. Staff/Volunteer Conducted Activities	79
	1. Talks	45
	2. Tours	45
	3. Demonstrations	23
	B. Visitor Centers	62,150
	C. Administrative Office	8,400
	D. Kiosks	32,560
	E. Nature Trails	31,177
	1. Foot	0
	2. Boat	1,554
	3. Auto	30,400
	F. Observation Towers / Platforms / Photo Blinds	0
	G. Other Wildlife Observation	16,725
III.	Environmental Education	910
	A. Staff/Volunteer Conducted	895
	1. Teachers participating in workshops	40
	2. Students taught on-site	600
	3. Students taught off-site	550
	B. Non-Staff Conducted	30
IV.	Recreation	138,545
	A. Hunting	78,558
	1. Migratory Birds	1,785
	a. Waterfowl	815
	b. Other Migratory Birds	970
	2. Upland Game	8,290
	3. Big Game	73,725
	B. Fishing	47,950
	1. Freshwater	47,950
	2. Saltwater	0
	C. Trapping	0
	D. Beach & Water Uses	59,200
	E. Other Recreation	12,825
V.	Education Outreach (off-site)	18,800
	A. Group Presentations	600
	B. Exhibits	18,500
	C. Other Education Outreach	0
VI.	Special Events	
	A. Number of News Releases	40
	B. Number of Radio/TV Spots	8
	C. Number of Other Special Events	3

[21]Data are from the RMIS Public Education & Recreation Database.

Laguna Atascosa National Wildlife Refuge

1. **Economic Base Area.**

   a. Willacy and Cameron counties, Texas

2. **Recreation Information[22]: activity hours and residents/non-residents**.

Activity	Hours per person per visit	Resident as percentage of total visitors	Non-resident as percentage of total visitors
Non-Consumptive			
Nature Trails	1	40	60
Observation Platforms	1	50	50
Other Wildlife Observation	na	na	na
Beach/Water Use	na	na	na
Other Recreation	1	20	80
Hunting			
Upland Game	na	na	na
Big Game	6	75	25
Migratory Bird	na	na	na
Fishing			
Freshwater	na	na	na
Saltwater	4	65	35

[22]Information obtained from Refuge personnel.

3. **Laguna Atascosa NWR Public Use Data for FY 2002[23].**

I.	Total Number of Visitors	182,685
II.	Interpretation & Nature Observation (on site)	180,214
	A. Staff/Volunteer Conducted Activities	2,089
	1. Talks	905
	2. Tours	1,600
	3. Demonstrations	0
	B. Visitor Centers	31,025
	C. Administrative Office	2,400
	D. Kiosks	43,710
	E. Nature Trails	136,415
	1. Foot	32,820
	2. Boat	0
	3. Auto	117,600
	F. Observation Towers / Platforms / Photo Blinds	5,500
	G. Other Wildlife Observation	0
III.	Environmental Education	3,142
	A. Staff/Volunteer Conducted	405
	1. Teachers participating in workshops	0
	2. Students taught on-site	300
	3. Students taught off-site	180
	B. Non-Staff Conducted	2,940
IV.	Recreation	51,050
	A. Hunting	750
	1. Migratory Birds	0
	a. Waterfowl	0
	b. Other Migratory Birds	0
	2. Upland Game	0
	3. Big Game	750
	B. Fishing	48,300
	1. Freshwater	0
	2. Saltwater	48,300
	C. Trapping	0
	D. Beach & Water Uses	0
	E. Other Recreation	4,750
V.	Education Outreach (off-site)	0
	A. Group Presentations	0
	B. Exhibits	0
	C. Other Education Outreach	0
VI.	Special Events	
	A. Number of News Releases	2
	B. Number of Radio/TV Spots	10
	C. Number of Other Special Events	1

[23]Data are from the RMIS Public Education & Recreation Database.

Las Vegas National Wildlife Refuge

1. **Economic Base Area.**

   a. San Miguel County, New Mexico

2. **Recreation Information[24]: activity hours and residents/non-residents**.

Activity	Hours per person per visit	Resident as percentage of total visitors	Non-resident as percentage of total visitors
Non-Consumptive			
Nature Trails	2	30	70
Observation Platforms	1	30	70
Other Wildlife Observation	na	na	na
Beach/Water Use	na	na	na
Other Recreation	na	na	na
Hunting			
Upland Game	na	na	na
Big Game	na	na	na
Migratory Birds	6	10	90
Fishing			
Freshwater	na	na	na
Saltwater	na	na	na

[24]Information obtained from Refuge personnel.

3. **Las Vegas NWR Public Use Data for FY 2002[25].**

I.	Total Number of Visitors	43,602
II.	Interpretation & Nature Observation (on site)	43,602
	A. Staff/Volunteer Conducted Activities	4
	1. Talks	4
	2. Tours	0
	3. Demonstrations	0
	B. Visitor Centers	0
	C. Administrative Office	1,084
	D. Kiosks	0
	E. Nature Trails	43,602
	1. Foot	98
	2. Boat	0
	3. Auto	43,602
	F. Observation Towers / Platforms / Photo Blinds	2,350
	G. Other Wildlife Observation	0
III.	Environmental Education	50
	A. Staff/Volunteer Conducted	70
	1. Teachers participating in workshops	0
	2. Students taught on-site	70
	3. Students taught off-site	0
	B. Non-Staff Conducted	0
IV.	Recreation	135
	A. Hunting	135
	1. Migratory Birds	135
	a. Waterfowl	94
	b. Other Migratory Birds	41
	2. Upland Game	0
	3. Big Game	0
	B. Fishing	0
	1. Freshwater	0
	2. Saltwater	0
	C. Trapping	0
	D. Beach & Water Uses	0
	E. Other Recreation	0
V.	Education Outreach (off-site)	280
	A. Group Presentations	0
	B. Exhibits	280
	C. Other Education Outreach	0
VI.	Special Events	
	A. Number of News Releases	12
	B. Number of Radio/TV Spots	2
	C. Number of Other Special Events	6

[25]Data are from the RMIS Public Education & Recreation Database.

Umatilla National Wildlife Refuge

1. **Economic Base Area.**

   a. Morrow County, Oregon; Benton and Franklin counties, Washington.

2. **Recreation Information[26]: activity hours and residents/non-residents**.

Activity	Hours per person per visit	Resident as percentage of total visitors	Non-resident as percentage of total visitors
Non-consumptive			
Nature Trails	3	90	10
Observation Platforms	1	65	35
Other Wildlife Observation	na	na	na
Beach/Water Use	7	85	15
Other Recreation	na	na	na
Hunting			
Upland Game	4	75	25
Big Game	8	25	75
Migratory Birds	6	50	50
Fishing			
Freshwater	4	70	30
Saltwater	na	na	na

[26]Information obtained from Refuge personnel.

3. **Umatilla NWR Public Use Data for FY 2002[27].**

I.	Total Number of Visitors	68,450
II.	Interpretation & Nature Observation (on site)	30,725
	A. Staff/Volunteer Conducted Activities	300
	1. Talks	100
	2. Tours	100
	3. Demonstrations	100
	B. Visitor Centers	0
	C. Administrative Office	150
	D. Kiosks	5,000
	E. Nature Trails	25,500
	1. Foot	15,000
	2. Boat	0
	3. Auto	20,000
	F. Observation Towers / Platforms / Photo Blinds	5,000
	G. Other Wildlife Observation	0
III.	Environmental Education	0
	A. Staff/Volunteer Conducted	0
	1. Teachers participating in workshops	0
	2. Students taught on-site	0
	3. Students taught off-site	0
	B. Non-Staff Conducted	0
IV.	Recreation	61,009
	A. Hunting	16,009
	1. Migratory Birds	13,500
	a. Waterfowl	13,500
	b. Other Migratory Birds	0
	2. Upland Game	2,500
	3. Big Game	9
	B. Fishing	25,000
	1. Freshwater	25,000
	2. Saltwater	0
	C. Trapping	0
	D. Beach & Water Uses	20,000
	E. Other Recreation	0
V.	Education Outreach (off-site)	500
	A. Group Presentations	500
	B. Exhibits	0
	C. Other Education Outreach	0
VI.	Special Events	
	A. Number of News Releases	5
	B. Number of Radio/TV Spots	2
	C. Number of Other Special Events	2

[27]Data are from the RMIS Public Education & Recreation Database.

Upper Souris National Wildlife Refuge

1. **Economic Base Area.**

   a. Ward and Renville counties, North Dakota.

2. **Recreation Information[28]: activity hours and residents/non-residents**.

Activity	Hours per person per visit	Resident as percentage of total visitors	Non-resident as percentage of total visitors
Non-consumptive			
Nature Trails	1	75	25
Observation Platforms	2	90	10
Other Wildlife Observation	1	75	25
Beach/Water Use	na	na	na
Other Recreation	1	90	10
Hunting			
Upland Game	4	50	50
Big Game	6	85	15
Migratory Birds	na	na	na
Fishing			
Freshwater	5	75	25
Saltwater	na	na	na

[28]Information obtained from Refuge personnel.

3. **Upper Souris NWR Public Use Data for FY 2002[29].**

I.	Total Number of Visitors	64,093
II.	Interpretation & Nature Observation (on site)	7,580
	A. Staff/Volunteer Conducted Activities	110
	1. Talks	0
	2. Tours	110
	3. Demonstrations	0
	B. Visitor Centers	0
	C. Administrative Office	1,175
	D. Kiosks	1,200
	E. Nature Trails	2,575
	1. Foot	600
	2. Boat	75
	3. Auto	1,900
	F. Observation Towers / Platforms / Photo Blinds	120
	G. Other Wildlife Observation	2,400
III.	Environmental Education	313
	A. Staff/Volunteer Conducted	313
	1. Teachers participating in workshops	3
	2. Students taught on-site	310
	3. Students taught off-site	0
	B. Non-Staff Conducted	0
IV.	Recreation	55,980
	A. Hunting	540
	1. Migratory Birds	0
	a. Waterfowl	0
	b. Other Migratory Birds	0
	2. Upland Game	70
	3. Big Game	470
	B. Fishing	54,740
	1. Freshwater	54,740
	2. Saltwater	0
	C. Trapping	0
	D. Beach & Water Uses	0
	E. Other Recreation	700
V.	Education Outreach (off-site)	5,620
	A. Group Presentations	320
	B. Exhibits	5,300
	C. Other Education Outreach	0
VI.	Special Events	
	A. Number of News Releases	110
	B. Number of Radio/TV Spots	19
	C. Number of Other Special Events	5

[29]Data are from the RMIS Public Education & Recreation Database.

Quivira National Wildlife Refuge

1. **Economic Base Area.**

   a. Stafford, Reno, Rice, and Barton counties, Kansas.

2. **Recreation Information[30]: activity hours and residents/non-residents**.

Activity	Hours per person per visit	Resident as percentage of total visitors	Non-resident as percentage of total visitors
Non-consumptive			
Nature Trails	2	5	95
Observation Platforms	1	5	95
Other Wildlife Observation	2	5	95
Beach/Water Use	na	na	na
Other Recreation	na	na	na
Hunting			
Upland Game	4	20	80
Big Game	na	na	na
Migratory Birds	4	20	80
Fishing			
Freshwater	2	60	40
Saltwater	na	na	na

[30]Information obtained from Refuge personnel.

3. **Quivira NWR Public Use Data for FY 2002[31].**

I.	Total Number of Visitors	223,269
II.	Interpretation & Nature Observation (on site)	164,419
	A. Staff/Volunteer Conducted Activities	35,994
	1. Talks	26,865
	2. Tours	15,547
	3. Demonstrations	2,462
	B. Visitor Centers	108,695
	C. Administrative Office	11,298
	D. Kiosks	29,850
	E. Nature Trails	108,079
	1. Foot	74,424
	2. Boat	0
	3. Auto	42,500
	F. Observation Towers / Platforms / Photo Blinds	7,450
	G. Other Wildlife Observation	2,850
III.	Environmental Education	38,744
	A. Staff/Volunteer Conducted	36,478
	1. Teachers participating in workshops	109
	2. Students taught on-site	27,008
	3. Students taught off-site	18,162
	B. Non-Staff Conducted	3,630
IV.	Recreation	14,255
	A. Hunting	11,500
	1. Migratory Birds	10,625
	a. Waterfowl	10,250
	b. Other Migratory Birds	375
	2. Upland Game	875
	3. Big Game	0
	B. Fishing	2,755
	1. Freshwater	2,755
	2. Saltwater	0
	C. Trapping	0
	D. Beach & Water Uses	0
	E. Other Recreation	0
V.	Education Outreach (off-site)	425,807
	A. Group Presentations	33,175
	B. Exhibits	372,987
	C. Other Education Outreach	23,175
VI.	Special Events	
	A. Number of News Releases	77
	B. Number of Radio/TV Spots	45
	C. Number of Other Special Events	21

[31]Data are from the RMIS Public Education & Recreation Database.

Tensas River National Wildlife Refuge

1. **Economic Base Area.**

   a. West Carroll, East Carroll, Richland, Madison, Franklin, and Tensas parishes, Louisiana
   b. Warren County, Mississippi

2. **Recreation Information[32]: activity hours and residents/non-residents**.

Activity	Hours per person per visit	Resident as percentage of total visitors	Non-resident as percentage of total visitors
Non-Consumptive:			
Nature Trails	3	20	80
Observation Platforms	2	30	70
Other Wildlife Observation	3	30	70
Beach/Water Use	na	na	na
Other Recreation	3	70	30
Hunting			
Upland Game	5	30	70
Big Game	8	20	80
Migratory Birds	5	50	50
Fishing			
Freshwater	3	50	50
Saltwater	na	na	na

[32]Information obtained from Refuge personnel.

3. **Tensas River NWR Public Use Data for FY 2002[33].**

I.	Total Number of Visitors	95,325
II.	Interpretation & Nature Observation (on site)	79,639
	A. Staff/Volunteer Conducted Activities	81
	1. Talks	45
	2. Tours	34
	3. Demonstrations	14
	B. Visitor Centers	36,156
	C. Administrative Office	28,460
	D. Kiosks	23,390
	E. Nature Trails	22,017
	1. Foot	22,000
	2. Boat	35
	3. Auto	0
	F. Observation Towers / Platforms / Photo Blinds	8,000
	G. Other Wildlife Observation	5,000
III.	Environmental Education	6,090
	A. Staff/Volunteer Conducted	5,840
	1. Teachers participating in workshops	80
	2. Students taught on-site	3,000
	3. Students taught off-site	4,300
	B. Non-Staff Conducted	500
IV.	Recreation	31,095
	A. Hunting	29,815
	1. Migratory Birds	1,225
	a. Waterfowl	1,225
	b. Other Migratory Birds	0
	2. Upland Game	7,340
	3. Big Game	21,250
	B. Fishing	930
	1. Freshwater	930
	2. Saltwater	0
	C. Trapping	0
	D. Beach & Water Uses	0
	E. Other Recreation	350
V.	Education Outreach (off-site)	7,000
	A. Group Presentations	2,000
	B. Exhibits	5,000
	C. Other Education Outreach	0
VI.	Special Events	
	A. Number of News Releases	20
	B. Number of Radio/TV Spots	4
	C. Number of Other Special Events	3

[33]Data are from the RMIS Public Education & Recreation Database.

Appendix 2.
Estimating Economic Impacts: General Methodology and Assumptions

1. Model.

Economic impacts for the 15 sample refuges were estimated using IMPLAN, a regional input-output modeling system. For more information on IMPLAN and regional input-output economic analysis, see Taylor et. al. **Micro IMPLAN User's Guide**. U.S. Department of Agriculture - Forest Service. Fort Collins, CO, May 1993, and Olson and Lindall, **IMPLAN Professional Software, Analysis and Data Guide**., Stillwater, MN, 1996

2. Data Set.

The 1998 IMPLAN data set was used for the analysis. All monetary impacts were adjusted to 2002 dollars.

3. Expenditure Data

Per-person per-day expenditure information is based on the 2001 National Survey of Fishing, Hunting and Wildlife Associated Recreation (NSFHWR). This survey is conducted every 5 years by the U.S. Fish and Wildlife Service. Expenditure categories include: (1) **food,** including food, drink, and refreshments; (2) **lodging**, which includes lodging at motels, cabins, lodges, or campgrounds; (3) **transportation**, which includes both public transportation and the round-trip cost of transportation by private vehicle; and (4) **other**, which encompasses guide fees, pack trip or package fees, public land use or access fees, private land use or access fees (not including leases), equipment rental, and miscellaneous retail expenditures.

NSFHWR respondents were classified as non-residents if their state of residence differed from the state where the activity took place. Mean expenditures were calculated for each Fish and Wildlife Service region. Smaller geographic breakdowns left too few respondents in some categories for reliable averages.

Appendix 3 shows the per-day per-person expenditures for U.S. Fish and Wildlife Regions 1 through 6.

These expenditures were allocated to IMPLAN sectors and activities as follows (Table 2a):

Table 2a. Allocation of Expenditures to IMPLAN Categories			
Fish/ Hunt Survey Category	**IMPLAN Sector/ Activity Number**	**IMPLAN Activity/Sector**	**Percentage allocated to IMPLAN sector[34]**
Lodging	463	hotels	100%
Food/drink	1111	food for off-site consumption	Residents: 35% Non-residents 65%
..	1120	purchased meals	Residents: 65% Non-residents: 35%
Transportation	8140	gas/oil	Residents: 90% Non-residents: 85%
..	8130	car repairs	10%
..	8330	airline	Residents: 0% Non-residents: 5%
Other	421	sporting goods	40%
..	1500	tobacco	1%
..	1112	alcohol	1%
..	2100	shoes	8%
..	2311	clothing: women	8%
..	2321	clothing: men	8%
..	2800	personal/misc.	8%
..	3100	toilet articles	8%
..	5900	telephone	6%
..	5917	postage	6%
..	991h	film development	6%

[34]Percentage of spending in NSFHWR category allocated to specified IMPLAN activity or sector.

4. Recreation Visits and Expenditures

(a) Visits to the refuge are assumed to be for the primary purpose of engaging in wildlife-dependent recreation activities.

(b) Visitor use data is based on information obtained from the U.S. Fish and Wildlife Service Division of Refuges' Refuge Management Information System (RMIS). Fiscal year 2002 data are used in this report.

(c) For the economic impact IMPLAN analysis, residents are defined as living within a 30-mile radius of the refuge; non-residents live outside of this area.

(d) Non-consumptive use is calculated by summing visitor use for nature trails, beach and water uses, wildlife observation, observation towers/platforms/photo blinds, and other non-consumptive recreation specific to each refuge. Visitor use data for the 15 sample refuges were further refined by discussions with refuge personnel to minimize the possibility of double-counting visitors who engage in more than one activity during a given visit.

(e) It is assumed that all expenditures related to refuge visits occur primarily in the economic base area defined for the refuge.

(f) Information on refuge visitors concerning trip destinations or the primary purpose of the trip is not currently available. To address the question of how much of total per-person per-day trip expenditures can be attributed to refuge visitation, the following assumptions were used for this study:

(i) On average, the more hours people spend on the refuge per trip, the higher the proportion of total daily trip expenditures are attributed to the refuge visit.

(ii) For hunting and fishing, it is assumed that refuge-related expenditures are the full amount of the NSFHWR per-person per-day trip expenditures for the specified activity in the given USFWS region. This assumption is appropriate since most hunting and fishing activities on refuges typically last 6 or more hours, making the refuge the probable primary destination for the day.

(iii) For non-consumptive activities, visits are converted to recreation visitor days based upon the average number of hours that visitors engaged in non-consumptive activities at the sample refuges. Thus, each refuge visitor day is then assumed to result in just less than half of the NSFHWR per-person per-day trip expenditures for non-consumptive recreation.

5. Economic Study Area for the 15 Sample Refuges

In lieu of specific regional and local trade-flow information, IMPLAN economic study areas are defined as those counties adjacent or within the refuge which had a significant proportion of total refuge recreation expenditures. Significance was determined in consultation with refuge personnel and is based on estimates of where refuge visitors spent money and the location of major travel corridors. Generally, a conservative approach was taken in identifying counties to be included in the study area. Only spatial expenditure patterns and major travel corridors were used as criteria for determining counties to be included in the study area for each refuge. Backward linkages were not explicitly considered. It was decided that, given the lack of site-specific information on spending and trade flows, it would be better to underestimate economic impacts by keeping the study area small than to overestimate impacts by including counties marginally affected by refuge spending.

6. National Aggregation

(a) Economic Significance - One goal of this research is to generate estimates of the national impact of refuges on their regional economies. Ideally, an IMPLAN model and the necessary visitation information would be developed for each refuge and the results summed for a national estimate. Such a process would be prohibitively expensive. As an alternative, the results from the 15 case studies can be treated as data points. Regression analysis determines the impacts of refuge characteristics to explain the differences in final demand, employment income, and jobs generated by visits to each refuge. Economic results for refuges not studied can be estimated from the regression coefficients developed from the regression analysis of the 15 sample refuges. The totals of these refuge estimates are national estimates for final demand, employment income, and jobs generated by refuge visitation. The process is explained in more detail below.

Basic visitation information about the refuges is available from the Refuge Management Information System database (RMIS). The Fish and Wildlife Service has also collected information about the counties where refuges are located from the Bureau of Census data and other sources. Various combinations of these variables were tested to see how well they predicted three dependent variables from the economic significance analysis:

1. Final Demand per thousand visitors
2. Ratio of Employment Income to Final Demand per thousand visitors
3. Ratio of Employment Income to Jobs

With predictions of these variables and visitation for each of the unstudied refuges, final demand, employment income, and jobs could be estimated. After testing several combinations of the available variables to predict these dependent variables, the equations in Table 2b were selected. These equations are virtually the same as those in the 1997 report. Each dependent variable is assumed to be a linear combination of the independent variables. Table 2b shows the coefficients.

Table 2b. Prediction Equations
(Unless otherwise noted, data is for FY2002.)

Variable	Final Demand per 1,000 visitors	Employment Income/ Final Demand per 1,000 visitors	Employment Income/ Jobs
Intercept	1,117.688***	245.605**	5993.71
Natural Log of Visits		11.411	926.478**
Non-Consumptive Visits	0.012***		
Hunting Visits	0.055***		
Fishing Visits	0.034***		
Area of County in Sq. Mi.	0.246		
Share Big Game Hunting of all visits		-255.020**	
Share Fishing of all visits		79.691	
County Population, 1990		1.757 E-5*	0.002***
Distance of nearest city > 50,000 population			-5.835
R^2	0.987	0.686	0.814
Adjusted R^2	0.982	0.56	0.764

***Significant at the 1 percent confidence level.
**Significant at the 5 percent confidence level.
*Significant at the 10 percent confidence level.

Several adjustments were made to the data to ensure consistency. The sample refuges' visitation ranged from 44 thousand to 1.5 million. Applying the equations derived from this sample to refuges with very low visitation yielded very high estimates of final demand per thousand visits. To avoid adding these into the national results, all refuges with fewer than 1,500 visits were deleted from the calculations. This eliminated about 97 refuges but relatively few visits. Refuges in Alaska, Hawaii, and the U.S. Territories were also deleted from the calculations. These areas were considered to have very different local economies which this model did not capture well. The distance to the nearest city over 50,000 was over 1,000 miles for some Pacific Island refuges, for example. The model applied the average length of stay for the sample refuges to all refuges, and this was felt to be problematic only for the Upper Mississippi Refuge which records extremely high visitation much of which is only loosely attributable to the refuge. To adjust for this the final demand for Upper Mississippi was reduced to one eighth of the calculated value. Even so, it showed the highest final demand ahead of Pea Island and Chincoteague.

This technique produces estimates of final demand, employment income and jobs created by all visitor spending at each refuge. From comparison of these predictions with the case study results, it was clear that the estimates could be wide of the mark. However, the predicted values were both too high and too low so it appeared that the deviations would balance each other when applied to

aggregates of refuges. For this reason, the results for refuges outside of the study sample are not reported. Only regional and national aggregates are reported.

For the most part, the coefficients are logical. For example, the variable that denotes the distance to a city with greater than 50,000 people is negative for the employment income/jobs generated equation. This implies that smaller towns in rural areas have a lower cost of living. However, the coefficient for the big game hunting as a share of total visits variable was unexpected. A negative coefficient suggests that as the number of big game hunters increases in proportion to total visits, then employment income divided by final demand will decrease.

(b) Consumer Surplus - Consumer surplus was estimated for the sample refuges by multiplying recreational visitor days by the national consumer surplus value. Essentially the same process was followed for the refuges outside of the sample. Outside of the sample, detailed information was not available on the amount of time spent in each activity on the refuge. This was not a problem for hunting and fishing as it had been assumed that these were full day activities for the most part. Non-consumptive use was adjusted to recreational visitor days using the average length of time such visitors stayed at the sample refuges.

The national estimates and refuge case studies provide a rough scale of the economic significance of refuge recreation in local communities. These results are broadly descriptive. They are not intended to provide policy direction or performance measures. Refuge management balances multiple goals. This report highlights only one component.

Appendix 3.
Regional Recreation Expenditures

Table 3a. Region 1 Recreation Expenditures: Per Person Per Day, by Recreation Activity (2002 $).

	Non-consumptive		Big Game Hunting		Small Game Hunting		Migratory waterfowl Hunting		Freshwater Fishing		Saltwater Fishing	
Sector	**Resident**	**Non-resident**	**Resident**	**Non-resident**	**Resident**	**Non-resident**	**Resident**	**Non-resident**	**Resident**	**Non-resident**	**Resident**	**Non-resident**
Lodging	$5.17	$35.10	$1.78	$3.05	$3.52	$6.85	$0.45	$9.80	$3.47	$8.21	$2.44	$19.41
Food/drink	$7.45	$27.25	$16.00	$18.99	$9.19	$18.99	$7.80	$38.56	$8.68	$17.51	$12.75	$22.45
Transportation	$6.59	$41.91	$14.14	$37.36	$10.25	$46.44	$6.74	$91.71	$8.11	$29.50	$7.31	$20.53
Other	$1.52	$3.81	$4.23	$29.04	$2.84	$5.17	$13.35	$14.06	$9.09	$7.39	$25.78	$16.58
Totals	$20.74	$108.07	$36.15	$88.44	$25.80	$77.45	$28.34	$154.13	$29.35	$62.61	$48.28	$78.97

For the purpose of this analysis, Region 1 includes California, Idaho, Nevada, Oregon, and Washington.

Table 3b. Region 2 Recreation Expenditures: Per Person Per Day, by Recreation Activity (2002 $).

	Non-consumptive		Big Game Hunting		Small Game Hunting		Migratory waterfowl Hunting		Freshwater Fishing		Saltwater Fishing	
Sector	**Resident**	**Non-resident**	**Resident**	**Non-resident**	**Resident**	**Non-resident**	**Resident**	**Non-resident**	**Resident**	**Non-resident**	**Resident**	**Non-resident**
Lodging	$4.40	$21.12	$3.60	$11.88	$1.03	$20.64	$2.28	$28.26	$1.46	$12.67	$7.11	$4.97
Food/drink	$7.17	$29.28	$14.36	$31.31	$5.89	$15.37	$8.50	$20.69	$6.55	$19.42	$11.07	$5.25
Transportation	$5.85	$28.65	$11.22	$27.15	$4.32	$5.04	$8.58	$33.85	$6.24	$19.86	$7.33	$7.22
Other	$1.41	$3.84	$5.07	$83.19	$1.10	$6.55	$2.94	$25.30	$6.50	$14.96	$17.62	$11.34
Totals	$18.84	$82.88	$34.26	$153.53	$12.33	$47.59	$22.30	$108.10	$20.74	$66.91	$43.13	$28.77

Region 2 includes Arizona, New Mexico, Oklahoma and Texas.

Table 3c. Region 3 Recreation Expenditures: Per Person Per Day, by Recreation Activity (2002 $).												
	Non-consumptive		Big Game Hunting		Small Game Hunting		Migratory waterfowl Hunting		Freshwater Fishing		Saltwater Fishing	
Sector	Resident	Non-resident	Resident	Non-resident	Resident	Non-resident	Resident	Non-resident	Resident	Non-resident	Resident	Non-resident
Lodging	$1.51	$9.78	$1.26	$3.93	$0.32	$9.61	$0.82	$2.56	$2.00	$11.20	--	--
Food/drink	$3.21	$22.41	$7.21	$19.91	$4.27	$16.04	$7.11	$7.53	$5.63	$13.05	--	--
Transportation	$2.31	$15.69	$5.35	$12.95	$4.25	$14.33	$6.08	$5.48	$4.96	$11.66	--	--
Other	$0.93	$1.22	$1.11	$11.42	$0.74	$23.06	$1.15	$5.24	$4.74	$7.50	--	--
Totals	$7.96	$49.10	$14.93	$48.22	$9.58	$63.04	$15.16	$20.81	$17.33	$43.42	--	--

Region 3 includes Iowa, Illinois, Indiana, Minnesota, Missouri, Michigan, Ohio and Wisconsin.

Table 3d. Region 4 Recreation Expenditures: Per Person Per Day, by Recreation Activity (2002 $).												
	Non-consumptive		Big Game Hunting		Small Game Hunting		Migratory waterfowl Hunting		Freshwater Fishing		Saltwater Fishing	
Sector	Resident	Non-resident	Resident	Non-resident	Resident	Non-resident	Resident	Non-resident	Resident	Non-resident	Resident	Non-resident
Lodging	$2.07	$23.12	$1.44	$4.73	$1.16	$6.18	$1.15	$5.83	$1.14	$9.21	$4.47	$29.85
Food/drink	$5.05	$27.55	$6.43	$18.39	$4.39	$7.99	$6.52	$13.85	$5.43	$12.79	$10.22	$21.16
Transportation	$3.82	$21.69	$5.14	$12.76	$3.79	$17.44	$5.39	$41.00	$3.83	$14.18	$5.57	$28.22
Other	$2.50	$3.50	$3.50	$4.70	$1.33	$8.47	$3.69	$20.48	$6.56	$9.95	$20.83	$47.56
Total	$13.45	$75.85	$16.52	$40.58	$10.67	$40.08	$16.75	$81.16	$16.97	$46.13	$41.10	$126.79

Region 4 includes Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Puerto Rico, South Carolina, and Tennessee.

Table 3e. Region 5 Recreation Expenditures: Per Person Per Day, by Recreation Activity (2002 $).												
	Non-consumptive		Big Game Hunting		Small Game Hunting		Migratory waterfowl Hunting		Freshwater Fishing		Saltwater Fishing	
Sector	Resident	Non-resident	Resident	Non-resident	Resident	Non-resident	Resident	Non-resident	Resident	Non-resident	Resident	Non-resident
Lodging	$1.04	$13.62	$0.59	$6.07	$0.52	$4.51	$0.76	$7.70	$0.87	$8.81	$0.79	$7.33
Food/drink	$3.18	$15.61	$5.37	$17.00	$3.66	$12.84	$3.59	$23.91	$4.13	$9.43	$7.80	$12.01
Transportation	$2.66	$11.21	$3.84	$13.09	$3.12	$12.52	$2.86	$16.86	$3.18	$10.81	$3.98	$9.75
Other	$1.43	$5.32	$2.24	$10.03	$2.14	$7.59	$1.38	$19.49	$4.67	$6.63	$25.80	$23.13
Total	$8.31	$45.77	$12.04	$46.19	$9.44	$37.46	$8.60	$67.96	$12.85	$35.67	$38.36	$52.22

Region 5 includes Connecticut, District of Columbia, Delaware, Massachusetts, Maryland, Maine, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Virginia, Vermont, and West Virginia.

Table 3f. Region 6 Recreation Expenditures: Per Person Per Day, by Recreation Activity (2002 $).												
	Non-consumptive		Big Game Hunting		Small Game Hunting		Migratory Waterfowl Hunting		Freshwater Fishing		Saltwater Fishing	
Sector	Resident	Non-resident	Resident	Non-resident	Resident	Non-resident	Resident	Non-resident	Resident	Non-resident	Resident	Non-resident
Lodging	$1.94	$22.79	$1.51	$16.63	$0.83	$13.91	$0.28	$9.69	$1.19	$17.78	--	--
Food/drink	$5.39	$23.41	$11.92	$27.17	$7.16	$19.29	$5.34	$25.06	$7.43	$22.56	--	--
Transportation	$5.38	$22.13	$11.02	$32.34	$8.83	$25.54	$7.02	$15.26	$6.80	$22.91	--	--
Other	$1.30	$2.80	$2.34	$60.65	$1.20	$9.48	$1.54	$3.00	$5.08	$7.46	--	--
Total	$14.01	$71.13	$26.80	$136.80	$18.02	$68.21	$14.18	$53.01	$20.51	$70.72	--	--

Region 6 includes Colorado, Kansas, Montana, North Dakota, Nebraska, South Dakota, Utah, and Wyoming.

Appendix 4
Comparison of 1995 and 2002 Visitation and Economic Impacts

Table 4a shows a comparison of visitation and associated RVD's in 1995 and 2002 for the sample refuges. Since visitation at the Chincoteague NWR comprises such a large portion of the total visitation for the 15 sample refuges as a whole (in 2002, 25 percent of total visitation and 36 percent of RVDs), total visitation and RVDs for the sample refuges is shown both with and without Chincoteague NWR.

Table 4a. Refuge Visitation and Associated Recreational Visitor Days (RVDs): 1995 - 2002

	Visitation (thousands)			RVDs		
Refuge	1995	2002	percent change	1995	2002	percent change
Chincoteague	1,384.0	1,554.0	12.3%	1,053,424	926,596	-12.0%
Crab Orchard	839.0	995.1	18.6%	325,668	591,388	81.6%
National Elk Refuge	661.0	854.5	29.3%	65,438	81,929	25.2%
Eufaula	245.0	371.3	51.4%	206,717	174,479	-15.6%
Don Edwards San Francisco Bay	281.0	498.2	77.2%	77,713	98,025	26.1%
Tule Lake	197.0	175.7	-10.7%	16,952	23,903	41.0%
Mattamuskeet	137.0	66.5	-51.1%	23,210	19,733	-15.0%
Horicon	134.0	572.5	327.6%	67,960	192,253	182.9%
Charles M. Russell	111.0	247.0	122.5%	107,366	169,050	57.5%
Laguna Atascosa	107.0	182.7	71.0%	53,738	67,383	25.4%
Las Vegas	70.0	43.6	-37.1%	12,702	11,329	-10.8%
Umatilla	56.0	68.5	23.2%	41,155	58,324	41.7%
Upper Souris	47.0	64.1	36.2%	42,033	56,004	33.2%
Quivira	38.0	223.3	486.8%	23,720	40,050	68.8%
Tensas River	18.0	95.3	427.8%	16,763	44,008	162.5%
Sample Refuges	4,325.0	6,012.3	39.0%	2,134,559	2,554,454	19.7%
Sample Refuges w/o Chincoteague	2,941.0	4,458.3	51.6%	1,081,135	1,627,858	50.1%
National	24,887,074	35,488,222	42.6%	na	na	na

Nationwide, refuge visitation increased by 42 percent from 1995 to 2002. For the sample refuges as a whole, visitation increased by 39 percent including Chincoteague and by over 50 percent with the exclusion of Chincoteague. Likewise, RVDs increased by 19.7 percent with Chincoteague included and by 50 percent with Chincoteague excluded.

Table 4b compares refuge expenditures and average expenditure per RVD for 1995 and 2002 (dollar figures are adjusted for inflation to 2002 dollars). Recreation-related expenditures increased by 33 percent from 1995 to 2002 for the sample refuges with Chincoteague included and by 62 percent with Chincoteague excluded. The average percent increase per sample refuge (Chincoteague included) was 77 percent. Average expenditures per RVD increased by 11.4 percent for the sample refuges with Chincoteague included and by 7.6 percent without Chincoteague. The average expenditure per RVD per refuge increased by 22.6 percent (Chincoteague included).

Table 4b. Refuge Expenditures and Average Expenditures per RVD: 1995 - 2002

	Expenditures (2002 dollars; thousands)			Average Expenditure per RVD (2002 dollars)		
Refuge	1995	2002	percent change	1995	2002	percent change
Chincoteague	$38,561.3	$40,362.6	4.6%	$36.61	$43.56	19.0%
Crab Orchard	$6,999.5	$11,679.8	66.9%	$21.49	$19.75	-8.1%
National Elk Refuge	$2,914.9	$4,518.1	55.0%	$44.55	$55.15	23.8%
Eufaula	$7,925.3	$7,063.8	-10.9%	$38.34	$40.49	5.6%
Don Edwards San Francisco Bay	$1,862.8	$3,378.9	81.4%	$23.97	$34.47	43.8%
Tule Lake	$826.8	$2,039.5	146.7%	$48.77	$85.32	75.0%
Mattamuskeet	$825.8	$685.9	-16.9%	$35.58	$34.76	-2.3%
Horicon	$2,236.2	$7,327.5	227.7%	$32.90	$38.11	15.8%
Charles M. Russell	$5,715.5	$11,527.0	101.7%	$53.23	$68.19	28.1%
Laguna Atascosa	$4,241.2	$3,910.5	-7.8%	$78.92	$58.03	-26.5%
Las Vegas	$542.2	$726.0	33.9%	$42.68	$64.08	50.1%
Umatilla	$1,511.5	$3,175.1	110.1%	$36.73	$54.44	48.2%
Upper Souris	$1,073.3	$1,851.1	72.5%	$25.54	$33.05	29.4%
Quivira	$1,151.4	$2,672.2	132.1%	$48.54	$66.72	37.5%
Tensas River	$695.5	$1,836.8	164.1%	$41.49	$41.74	-0.6%
Sample Refuges	$77,083.2	$102,754.8	33.3%	$36.11	$40.22	11.4%
Sample Refuges w/o Chincoteague	$38,521.9	$62,392.2	62.0%	$35.63	$38.33	7.6%
Average Percent Increase per Refuge	na	na	77.4%	na	na	22.6%

Table 4c compares national refuge visitation and economic impacts between 1995 and 2002. Note that refuge visitation is for the lower-48 states only and does not include refuges with less than1,500 annual visits.

Table 4c. National Visitation and Economic Impacts: 1995 - 2002
(Dollar figures in 2002 dollars; '000's)

	1995	2002	percent change
Visits	24,887,074	35,488,222	42.6%
Final Demand	$473,490	$809,177	70.1%
Job Income	$192,295	$315,158	63.4%
Jobs	10,169	18,728	84.2%