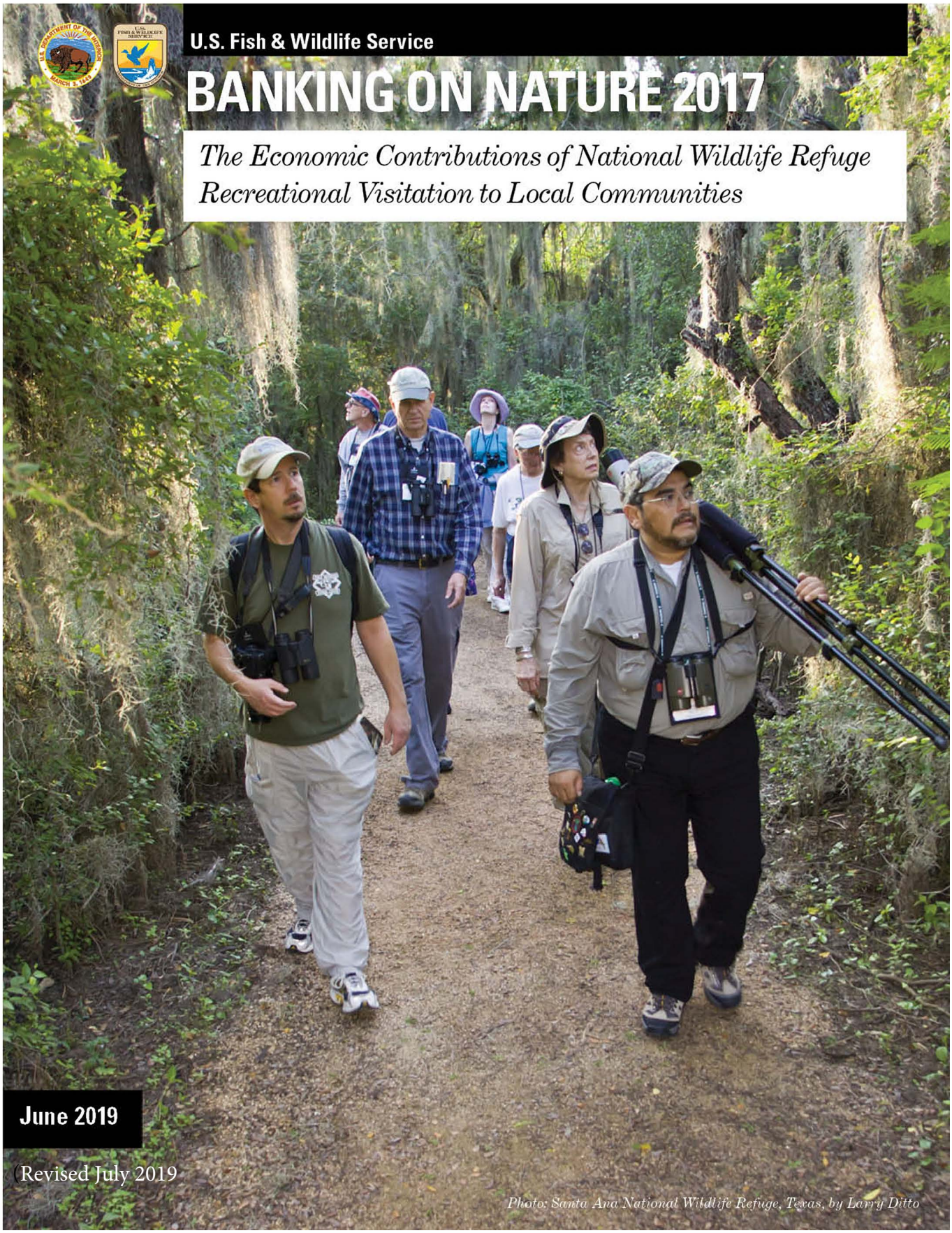
U.S. Fish & Wildlife Service

BANKING ON NATURE 2017

The Economic Contributions of National Wildlife Refuge Recreational Visitation to Local Communities



June 2019

Revised July 2019

Photo: Santa Ana National Wildlife Refuge, Texas, by Larry Ditto

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June 2019
Revised for language clarity July 2019

Please cite this publication as: Caudill, James and Erin Carver. 2019. Banking on Nature 2017: The Economic Contributions of National Wildlife Refuge Recreational Visitation to Local Communities. U.S. Fish and Wildlife Service, Falls Church, Virginia.

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Executive Summary

Banking on Nature 2017: The Economic Contributions of National Wildlife Refuge Recreational Visitation to Local Communities

With the 605 units of the National Wildlife Refuge System (NWRS), the U.S. Fish and Wildlife Service (USFWS) manages public lands in all 50 states and 5 U.S. territories and within an hour's drive of 100 major cities. This varied and abundant network of public lands and waters generates many individual and societal benefits. These include, but are not limited to, fish and wildlife conservation, open space, science and education, water quality improvement and flood resilience. The thriving fish and wildlife populations of the Refuge System also attract millions of recreational users. Some visitors take part in activities such as hunting and fishing (consumptive). Others enjoy hiking, paddling, wildlife viewing or nature photography (non-consumptive). This report focuses on economic contributions associated with recreational visitation. As a result, these are conservative estimates and do not represent the refuge's total social and environmental contributions.

This report examines the local economic contributions of recreational visits to 162 national wildlife refuges and wetland management districts in 47 states and 1 territory for the fiscal year (FY) 2017 (October 1, 2016 - September 30, 2017). Furthermore, this report utilizes the individual refuge results to estimate the local economic contributions of the entire Refuge System. Findings of this study include:

- For FY 2017, the National Wildlife Refuge System estimated 53.6 million visitors to national wildlife refuges.
- Trip-related spending by recreational visits generated $3.2 billion of economic output in local economies.
- As this spending flowed through the economy, it supported over 41,000 jobs and generated about $1.1 billion in employment income.
- About 86 percent of total recreation-related expenditures are generated by non-consumptive activities on refuges. Fishing accounted for 10 percent and hunting 4 percent of expenditures.
- On average, local visitors accounted for 17 percent of expenditures while visitors traveling more than 50 miles accounted for 83 percent of expenditures.
- Refuge recreational spending generated about $229 million in tax revenue at the local, county, and state.

Data sources used to compile this report include: the U.S. Fish and Wildlife Service's National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (NSFHWR) (2012), and the National Wildlife Refuge System's Annual Performance Plan or RAPP (2017). Along with detailed information on recreational activities from refuge staff, spending profiles were estimated for each of the sampled national wildlife refuges.

This report focuses on the economic contributions of recreational visitation. Spending and employment by the refuges themselves, payments in lieu of taxes and commercial activities on refuges are not estimated in this report.

Introduction

The U.S. Fish and Wildlife Service manages an unparalleled network of public lands and waters called the National Wildlife Refuge System. With 567 wildlife refuges and 38 wetland management districts in all 50 states and 5 U.S. territories, the national wildlife refuges neighbor communities of all sizes and are conservation and economic engines for both rural and urban areas. Because this system protects iconic species like eagles, manatees, bears, bison, and entire populations of migratory birds and river systems, it offers the public world-renowned wildlife-related recreation opportunities including wildlife viewing and photography, fishing and hunting, and other activities like boating and biking.

The National Wildlife Refuge System generates many individual and societal benefits including, but not limited to, fish and wildlife conservation, open spaces, science and educational services, improvements in water quality, and flood resilience. The *2017 Banking on Nature: The Economic Contribution of National Wildlife Refuge Recreational Visitation to Local Communities* report is the sixth in a series of studies commencing in 1997 and demonstrates that the National Wildlife Refuge System (NWRS) is an economic engine adding over 41,000 jobs to local communities.

This report analyzes the recreational visitation to 162 national wildlife refuges around the country to estimate the economic role that national wildlife refuge visitors play in local economies. Furthermore, this report utilizes the individual refuge results to estimate the local economic contributions of the entire Refuge System. This edition of Banking on Nature is the most comprehensive to date, representing an increase in sampled refuges of over 70 percent compared to past editions. Furthermore, it is the first time for 61 of the refuges to be analyzed, representing an increase in both the number and type of refuges studied. Data sources used to compile this report include: the U.S. Fish and Wildlife Service's National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (NSFHWR) (2012), and the National Wildlife Refuge System's Annual Performance Plan or RAPP (2017). Along with detailed information on recreational activities from refuge staff, these data collectively create a profile of refuge visitors' spending in local communities.

This report begins by presenting an overview of how national wildlife refuge recreational visitation supports economic contributions to local economies, followed by a description of the data and methods used for this analysis. The next section offers insights regarding sampled national wildlife refuge results. The National View estimates regional and nationwide contributions from refuge recreational visitation based on eight geographic regions. The appendices provide background detail on the economic models, the comparison to the National Park Service, and an alphabetical list of sampled refuges with economic and visitation results.

Economic contribution reports for sampled national wildlife refuges are available for a more in-depth examination of the individual results. Additionally, an interactive tool providing a snapshot of individual refuge results is available for users to explore recreational visitor spending, jobs, employment income, and local economic output. The individual refuge reports and interactive tool are available at https://www.fws.gov/economics/divisionpublications/bankingonnatureimpacts.asp.

Economic Contribution of Refuge Recreational Visitation

The National Wildlife Refuge counts over 53 million annual visits ranging from once-in-a-life-time hunting and fishing trips to the wilds of Alaska that support the livelihoods of local outfitters, to thousands of weekend warriors flocking to multi-day birding festivals supporting rural communities situated along migratory routes, and to international visitors viewing iconic species like manatees, bison, and gray wolves on wildlife refuges contribute to the economies of many well-known tourist destinations.

Visitors may pay for recreation in multiple ways: through entrance fees, lodging near the refuge, and purchases from local businesses for items to pursue their recreational experience. This spending supports economic activity throughout the local economy. This is only a small part of the benefits communities receive from recreational visitors traveling to a given area.

Expenditures and Local Communities

Recreational spending, whether it is gas to drive somewhere, feathers with which to tie flies, shotgun ammunition, or guide fees, goes hand in hand with the recreational experience. In our criteria in defining the "local economy," where the spending comes from matters. If the expenditure is generated by a person who resides 50 or more miles outside of the Refuge, then that person is considered a non-resident visitor and their expenditure is accounted for in determining economic contribution. If expenditures are made by a resident, we assume the expenditure would have occurred in the area anyway, and is calculated differently than non-resident expenditures. Regardless of expenditures by non-residents or residents, their activities are important for local businesses. For the analysis for this report, the local economy is defined as those counties adjacent to or within the refuge which have a large proportion of refuge recreation expenditures. Local economies were determined in consultation with refuge staff.

It is important to separate spending by people from outside the refuge's local economic area from spending by those who live locally. Local visitors (resident visitors traveling less than 50 miles) would probably have spent their recreation money in the local economy with or without the refuge. If they could not go birding, they might go bowling. In contrast, non-residents (visitors traveling more than 50 miles) may have been attracted to the refuge, either as a planned destination or a spontaneous side trip, *and* their spending is a stimulus to the economy, because it introduces outside money to the local area. Non-resident spending generates new income and new jobs because it is outside money coming into the local community. 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 *contribution* of the refuge to the local economy.

Methodology

This report analyzes the visitation records of 162 national wildlife refuges in 47 states and 1 territory, which is a representative cross-section of the National Wildlife Refuge System. The scale of the analysis captures the economic role that national wildlife refuge visitors play at a county level (local), regionally, and nationwide. Those interested in a particular refuge not sampled should be able to find a comparable case study based on similar selection factors. The economic effects were generated from the IMPLAN software and data System (IMPLAN Group LLC), a widely used input-output modeling system.

Data Sources

Data for this study are compiled from the 2011 FWS National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (NSFHWR) and the FWS Refuge Annual Performance Plan FY 2017 (RAPP). By combining information from these two sources, a profile of refuge visitors' spending in local communities was developed. The data are further enhanced with detailed information on recreational activities obtained from refuge staff. Refuge staff 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.

Daily visitor expenditures for both residents and non-residents were developed in four categories (food, lodging, transportation, and other expenses) for five activities (fishing, migratory bird hunting, small game hunting, big game hunting, and non-consumptive activities). Recreational 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 a regional input-output model calculated the final effects of these expenditures on the local economies.

Visitation Data

The Refuge Annual Performance Plan (RAPP) documents the annual accomplishments of individual refuges and wetland districts. Every year, managers for each unit of the Refuge System enter performance data for the current fiscal year and estimate performance level for the upcoming year. After all the station-level data are aggregated, annual achievements are summarized in RAPP and reflect how the Refuge System is performing. Nearly all the visitation data used in this study are derived from RAPP. The methods used to collect RAPP data vary with each refuge's unique situation, location, and types of activities offered. For example, many refuges have tightly controlled hunts. At Las Vegas NWR (NM), 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 (VA, MD), for example, so virtually everyone who enters can be counted and included in the RAPP 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.

Because RAPP visitor counts are based on several different counting methods, one visitor may be counted several times. If the visitor drives an auto tour route, they may be counted by a car counter. If the visitor stops to walk a trail, a trail counter may count again. If the visitor goes into the visitor center, a third counter may count 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 contribution to the local economy. Thus, visits are converted to recreational visitor days (RVDs).

People pursue many different activities while traveling. Their visits 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 (CA), and refuges along major tourist routes, such as the Kilauea Point NWR (HI), are 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[1]. Thus, a visitor who spends 4 hours at a refuge has spent half of an RVD, and half of their expenditures for the 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 staff estimate the average lengths of stay for each activity available on the refuge and the typical behavior pattern of visitors.

Expenditure Data

Every 5 years the Fish and Wildlife Service conducts the NSFHWR, which gathers nationwide information about recreationists, their activities, and their expenses. Daily expenditure information for the Banking on Nature report was extracted from the 2011 NSFHWR trip expenditure database (U.S. Department of the Interior et al. 2011). The 2016 NSFHWR expenditure data was not used because sample sizes by activity level and resident/non-resident were too small for reliable data at this level of detail. Fortunately, there is a fairly consistent relationship of spending across activities and time. By adjusting 2011 expenditure data to 2018 dollars, the expenditures utilized for this report adequately represent recreational visitors' expenditures. Each respondent who participated in an activity was asked about the trips they had taken to pursue the activity in the reporting period. A migratory bird hunter, for example, would be asked in what states she had hunted. For each state, a series of questions would reveal how many days the visitor hunted primarily for migratory birds and how much time the visitor spent 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 had pursued that activity.

[1]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.

Four Categories of Expenditures:

Food:

- Food, drink, and refreshments

Lodging:

- hotels, motels, cabins, lodges, or campgrounds

Transportation:

- Transportation, including airplanes, buses, and car rentals
- 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

For the NSFHWR, respondents were classified as non-residents if their state of residence differed from the state where the activity occurred. Using that definition, average daily expenditures were calculated for each Fish and Wildlife Service region. The Service uses these daily expenditure figures for the Banking on Nature report. We applied those expenditure figures to a more local definition of residents (within 50 miles) and non-residents (traveled more than 50 miles).

Selection of Sampled National Wildlife Refuges

This study examines 162 refuges, in which some refuges are in urban areas surrounded by large metropolitan areas, while others are located in remote areas. This edition of Banking on Nature is the most comprehensive to date, representing an increase in sampled refuges of over 70 percent compared to past editions. Furthermore, it is the first time for 61 of the refuges to be analyzed, representing an increase in both the number and type of refuges studied.

Economic Modeling

Input-Output Model

This study uses the IMPLAN model to generate the local economic effects from visitors' spending (see glossary). This model uses regional information to adjust for a standard input-output framework of the U.S., developed by the Department of Commerce, Bureau of Economic Analysis, to describe local conditions.

Based on the NSFHWR and categories described above, daily expenditures were developed for waterfowl, upland game, and deer hunting; freshwater and saltwater fishing; and wildlife watching. A budget was generated for residents and non-residents. Total expenditure was calculated by multiplying each budget by the number of recreational visitor days for that activity then, totaled expenditures were

allocated to appropriate industries Such as food, transportation, lodging, retail and many others. Food is allocated 35 percent to restaurants and 65 percent to grocery stores for residents, while 65 percent to restaurants and 35 percent to groceries for non-residents. Transportation is cataloged by gas and oil, car repairs, and airline tickets. Total expenditure for each industry is the input to the IMPLAN model. The model output estimates earnings, employment, economic output and local, state and federal tax revenue. Economic output is the total spending by the final consumers of all goods. Economic output is the amount of money which stays in the area after all exports are accounted for. Therefore, the economic output is contribution from both resident and non-residents based on refuge visitation.

IMPLAN calculates full-time, part-time, temporary, and seasonal jobs equally. Therefore, income is a better indicator of the employment effects of new spending than the jobs figure generated by IMPLAN. For each industry, some proportion of output goes to employee earnings (i.e., employment 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 employment income, and one job.

Generating National Estimates

This report analyzes the national contribution of refuges to their local economies — the aggregation of local impacts for the 162 sampled refuges and more than 300 other refuges that provide public recreation. Sampling all refuges with recreation visits would be prohibitively expensive. As an alternative, the results from 162 case studies can be treated as data points.

National estimates were derived by using the average ratio from the sampled refuges. Ratios were derived for (1) economic output per $1 expenditures, (2) jobs per $1 million in economic output; (3) economic output per visitor; and (4) the change in visitation in 2017 as compared to 2011. These ratios were averaged for the sampled refuges (adjusted for inflation). Averaging the sampled refuges provides more observations (data points) to improve the accuracy of national estimates. These ratios were then applied to recreation visitation on the un-sampled refuges to estimate the economic contribution of national wildlife refuges nationwide.

This technique produces approximate estimates of economic output, employment income and jobs created by all recreational visitor spending at each refuge. Only regional and national aggregates are reported.

Because natural sites are drawing increasingly more visitors, there has been a growing interest in quantifying their contribution. Such information can help refuges in planning and decision-making, and facilitate the interaction between refuges, local communities, and State tourism.

The national estimates and refuge case studies provide a rough scale of the economic contribution of refuge recreation in local communities.

An Overview of Sampled National Wildlife Refuges

The 162 refuges included in the report represent a reasonable cross-section of the National Wildlife Refuge System. Information regarding how individual refuge results were estimated, detailed discussions of recreation visits, and a description of the economic study area are provided in the individual refuge reports. These individual reports are available at the following link: https://www.fws.gov/economics/divisionpublications/bon2017refuges.asp

Characteristics of Sampled Refuges

The following graphs show various characteristics of sampled and non-sampled refuges.

Figure 1 shows while nearly half of refuges have fewer than 10,000 visits, this study sampled stations with more visitation.

Figure 1. Percent of National Wildlife Refuges by Recreational Visitor Days

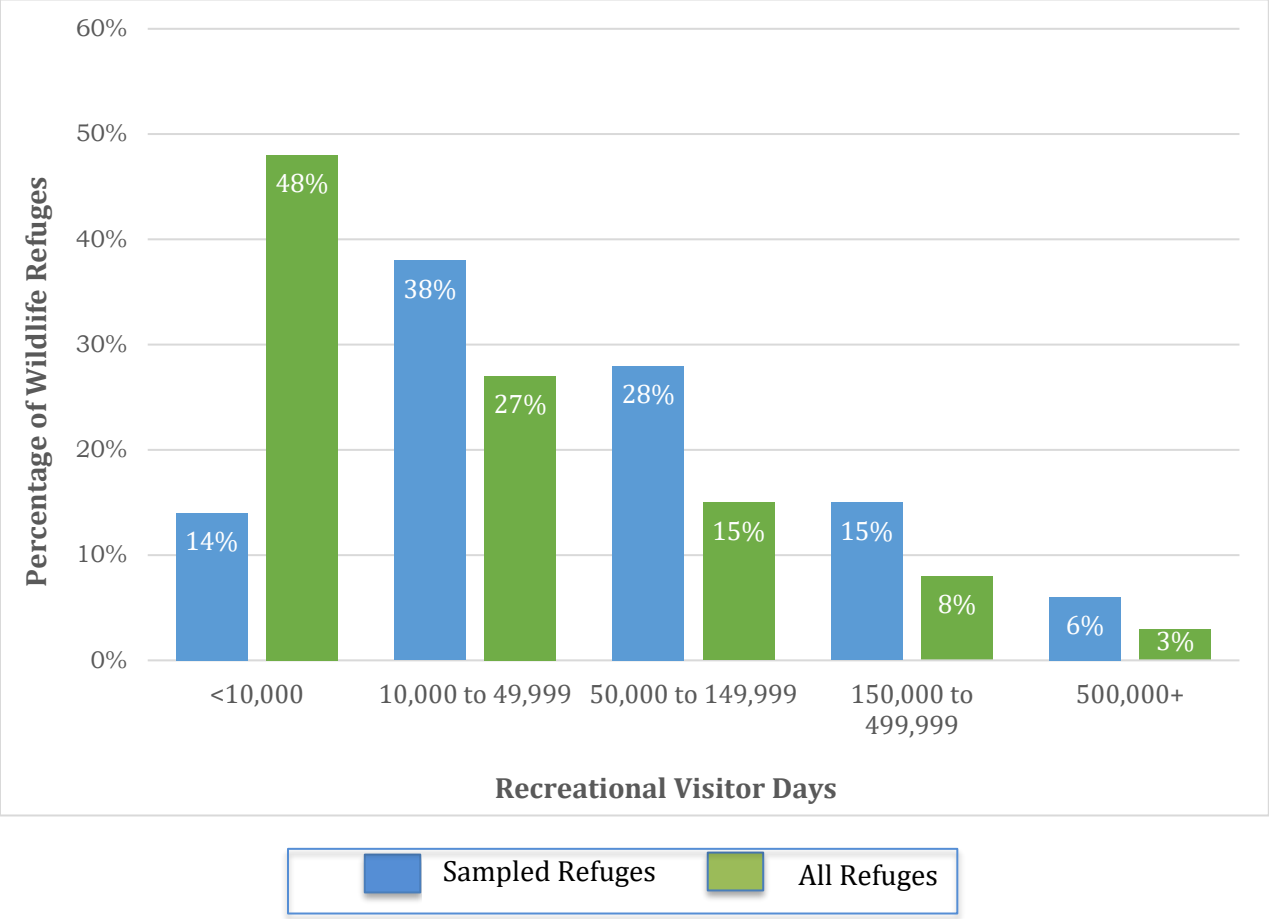


Figure 2 illustrates the percentage of RVDs across activities. Again, the sample represents the refuge population well when comparing averages. Non-consumptive activities are by far the most popular activities at national wildlife refuges. Activities such as wildlife observation (pedestrian, boating, auto tour, and bicycling) and photography are especially popular and comprise 74 percent of non-consumptive RVDs.

Figure 2. Percent of Recreational Visitor Days by Activity

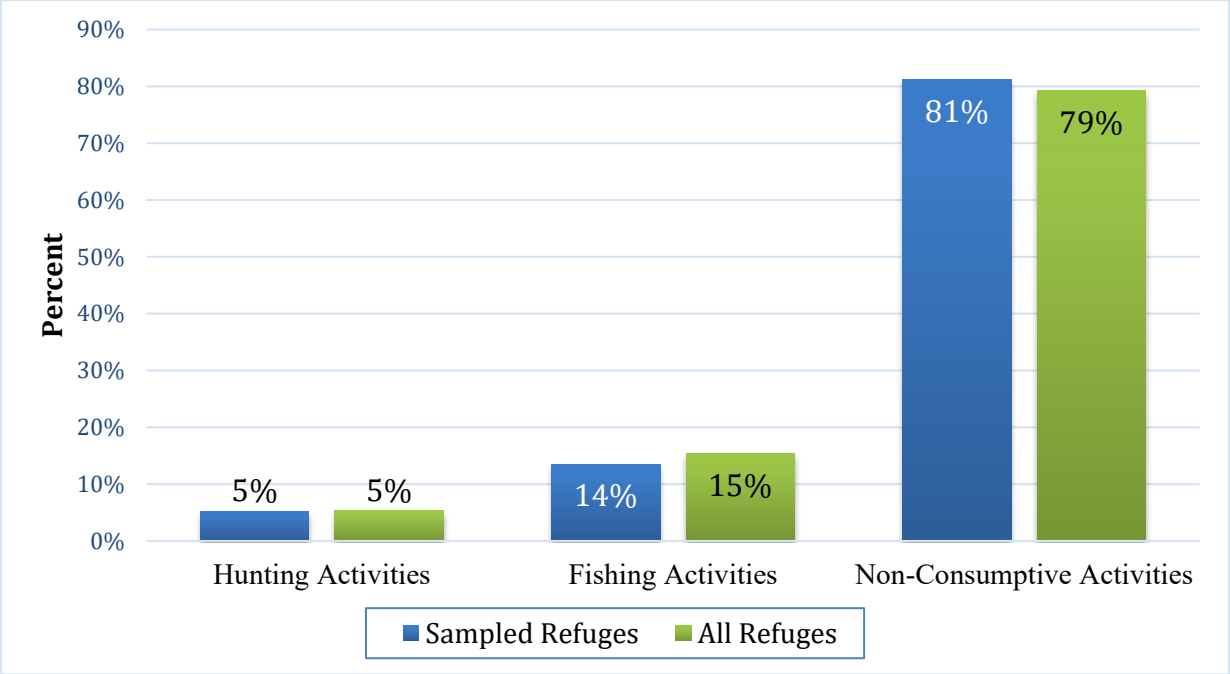
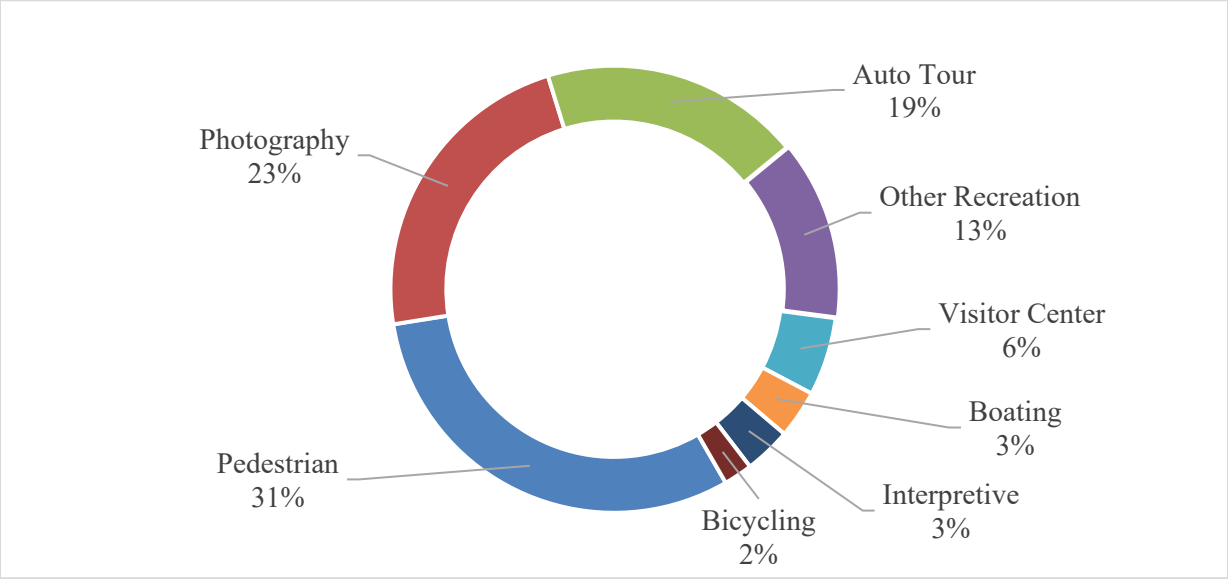


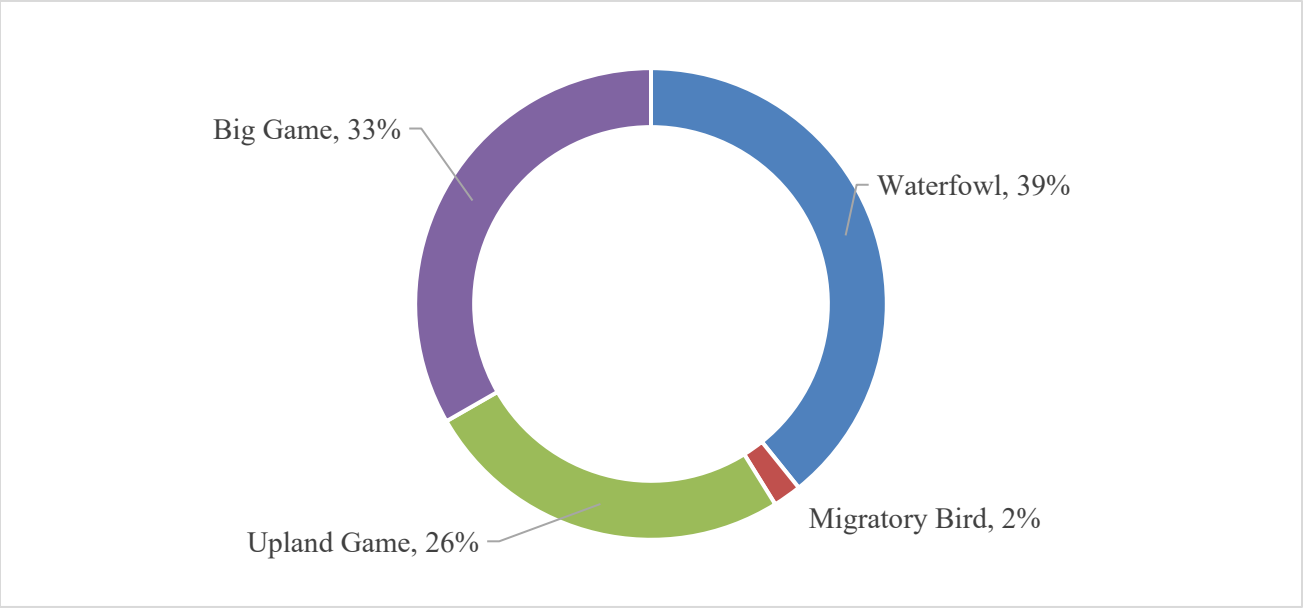
Figure 3 shows the distribution of non-consumptive activities for the sampled refuges. As noted earlier, non-consumptive activities represented 81 percent of all recreation visits at sampled refuges. Most non-consumptive visits are focused on pedestrian activities, photography, and auto tours. The "other recreation" category varies for each refuge and includes activities such as berry picking, picnicking, and others.

Figure 3. Distribution of Non-Consumptive Activities for Sampled Refuges



The distribution of hunting activities for sampled refuges is depicted in Figure 4. Hunting represents only 5 percent of recreational visitor days for the Refuge System. Within the hunting category, waterfowl was the most popular activity (39 percent), followed by big game (33 percent), upland game (26 percent), and migratory birds (2 percent). Within the sampled refuges, hunting activities are popular at Iowa WMD (IA) (96 percent of RVDs) and Cache River NWR (AR) (46 percent of RVDs).

Figure 4. Distribution of Hunting Activities for Sampled Refuges



<u>Economic Contributions of Sampled Refuges</u>

Many variables affect a refuge's economic contribution on its local economy. Some relate to the refuge and its management goals and public use programming; others relate to the economy of the region, such as the amount of goods and services imported into the local economy. This section recapitulates the results from the detailed case studies to highlight the differences among the sampled refuges. Every refuge was established for a specific purpose or set of purposes. All refuges provide important conservation value and a refuge with no public use still has value. For example, a particular refuge could be vital to the survival of an endangered species.

This figure illustrates the impact of resident and non-resident visitors on total expenditures. Non-resident visitors contribute 83 percent of the total expenditures. Non-residents have a higher daily expenditures compared to local visitors. The majority of expenditures (87 percent) are associated with non-consumptive activities, which is consistent with the majority of visitors partaking in non-consumptive activities.

Figure 5. Distribution of Expenditures (Millions) by Resident and Non-Resident Visitors at Sampled Refuges

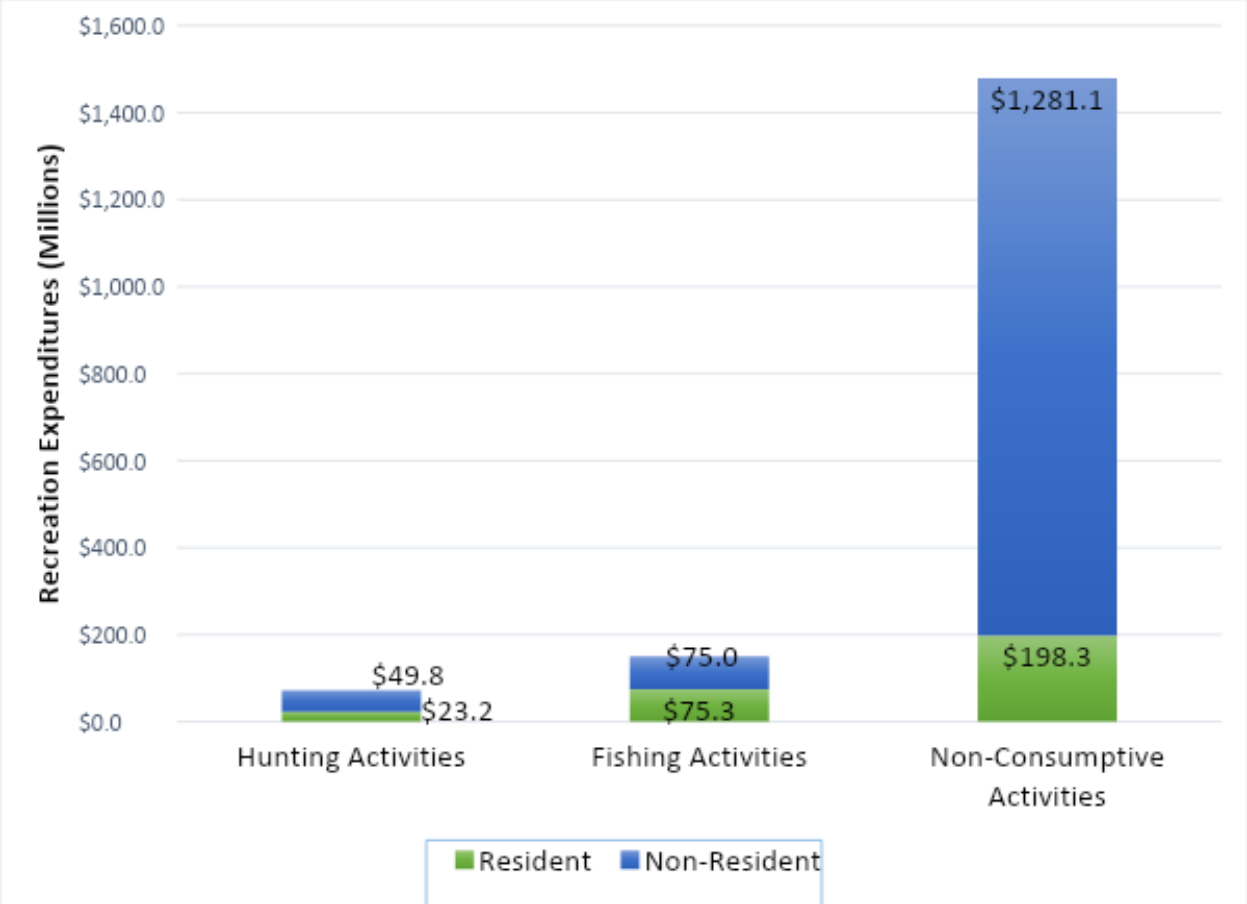


Table 1 shows the sampled refuges with the highest economic output generated by recreational visitation. Compared to all the sampled refuges, Oregon Islands NWR (OR) had the highest recreational visitation (10.1 million visits) and the highest economic output ($665.0 million). A close look at Table 1 shows how differences in refuge use result in different economic results. Time spent, activities enjoyed, and residence of visitors determine refuge recreation economics. Charles M. Russell NWR (MT) receives

about 439,000 recreation visits annually compared with Kilauea Point NWR (HI) receiving about 1.1 million recreation visits. Although Charles M. Russell NWR receives 40 percent less recreation visits, the economic output for both refuges is about the same. This difference is because visitors to Charles M. Russell NWR are spending more time on average than visitors to Kilauea Point NWR.

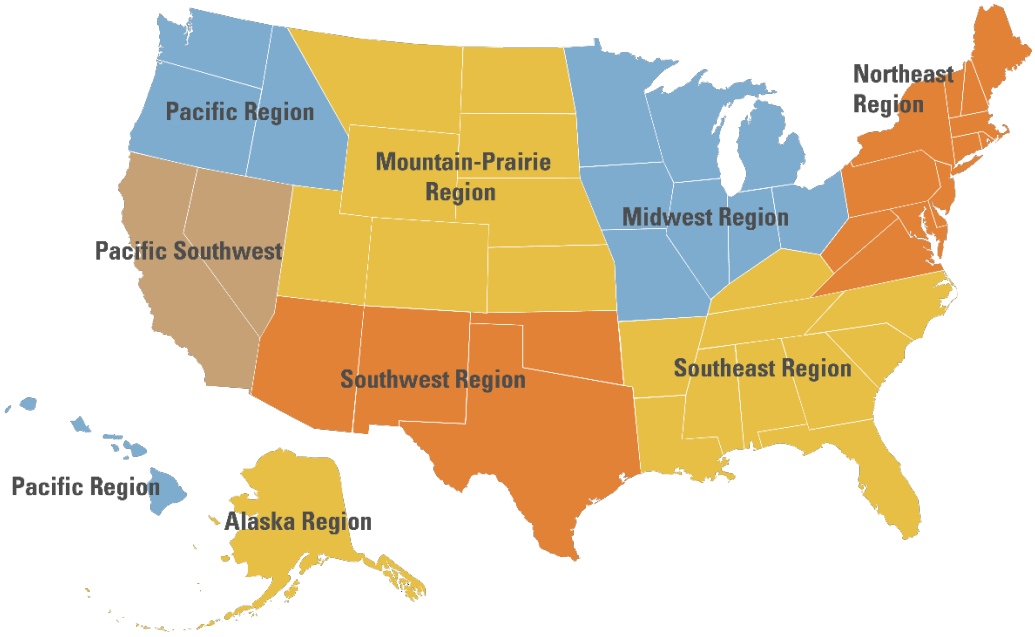
Appendix 2 summarizes the economic contributions of all the sampled refuges.

Table 1. Top 10 National Wildlife Refuges Ranked by Economic Output

Refuge	Recreational Visits	Economic Output $(,000)	Employment Income $(,000)	Jobs
Oregon Islands NWR (OR)	10,171,278	$665,081.5	$206,194.5	5,906
Chincoteague NWR (VA, MD)	6,976,117	$390,817.9	$119,366.9	3,647
Wichita Mountains NWR (OK)	4,142,068	$98,198.7	$26,589.4	923
Okefenokee NWR (GA, FL)	723,508	$64,703.2	$17,160.9	753
Wheeler NWR (AL)	1,389,418	$43,887.2	$13,223.1	405
Upper Mississippi River NWFR-La Crosse District (MN, WI)	834,143	$43,447.5	$13,186.4	485
Laguna Atascosa NWR (TX)	485,051	$43,317.0	$12,107.6	412
Upper Mississippi River NWFR-Winona District (MN, WI)	1,050,700	$40,711.0	$10,940.0	520
Kilauea Point NWR (HI)	1,147,503	$34,250.4	$10,196.0	293
Charles M. Russell NWR (MT)	438,500	$33,245.2	$9,105.8	320

A National View

One hundred sixty-two refuges (including wetland management districts) were studied in detail for this report. Sampled refuges were used to estimate the local economic contributions of refuge recreational visitation nationwide[2].



As shown in Table 2, economic contribution associated with recreation visits totaled approximately $3.2 billion. This economic output generated about $1.1 billion in employment income and about 41,000 jobs.

The Southeast Region had the most visitors and highest economic output in FY 2017. The region contains several very popular refuges such as Pea Island NWR (NC), Ding Darling NWR (FL), Merritt Island NWR (FL), and Okefenokee NWR (GA).

[2] Refer to the Introduction and Appendix 1 for further information.

Table 2. 2017 Contributions of Refuge Recreational Visitation by Region

Fish and Wildlife Service Region	Visitors FY 2017	Economic Output ($,000)	Employment Income ($,000)	Jobs
Pacific	10,762,972	$506.5	$168.6	6,484
Southwest	7,199,802	$305.4	$101.6	3,909
Midwest	7,568,320	$456.9	$152.1	5,849
Southeast	15,247,169	$938.7	$312.4	12,016
Northeast	6,321,326	$365.8	$121.7	4,683
Mountain-Prairie	3,323,033	$347.8	$115.7	4,452
Alaska	1,520,420	$198.3	$66.0	2,539
Pacific Southwest	1,667,815	$98.5	$32.8	1,260
Total	**53,610,857**	**$3,218.0**	**$1,071.0**	**41,191**
Change from 2011	15%	20%	22%	18%

Note: The 2011 dollar figures are adjusted to 2018 dollar figures for comparison.

Glossary

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

Consumptive Use: Activities that enjoy wildlife by consuming it, such as hunting and fishing.

Economic Contribution: The economic activity generated in a region by resident and non-resident recreation spending, which includes retail expenditures, economic output, jobs, job income, and tax revenue.

Economic Output: 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. Economic output includes spending by people who earn income from refuge visitors' activities as well as spending by refuge visitors themselves.

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

Expenditures: The spending by recreational visitors when visiting refuges. Expenditure categories include food, lodging, transportation, and other. Expenditure information is based on the 2011 National Survey of Fishing, Hunting and Wildlife Associated Recreation (NSFHWR).

Final Consumers: The last point in a distribution channel. Contrast final consumers with intermediate consumers who buy goods in order to sell them again.

FWS: U.S. Fish and Wildlife Service

FY: Fiscal Year. The fiscal year is from October 1 to September 30.

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

Jobs: Full and part-time jobs

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

MBR: Migratory Bird Refuge

Multiplier: Shows the regional economic effects resulting from changes in economic output for a commodity or group of commodities.

Non-Consumptive Use: Activities that do not consume wildlife, such as birding, photography, picnicking, etc.

Non-Resident Visitors: Visitors traveling more than 50 miles from the refuge

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

NWR: National Wildlife Refuge

NWFR: National Wildlife and Fish Refuge

RAPP: Refuge Annual Performance Plan

Recreational Visitor Day (RVD): A unit of measure of 1 person spending 1 full day (in this study, 8 hours) recreating at a particular refuge. RVDs indicate the length of stay for visitors.

Resident Visitors: Visitors traveling less than 50 miles from the refuge are considered local resident visitors.

Tax Revenue: Local, county and state taxes: sales tax, property tax, and income tax. Note: Some taxes may not be applicable in any given region or area.

Visitors: A visitor is someone who comes to the refuge and participates in one or more of the activities available at the refuge.

Visits (visitation): A visit is not the same as a visitor. One visitor could be responsible for several visits on a refuge. For example, if a family of four fished in the morning and hiked a short nature trail in the afternoon, they would have contributed 8 activity visits to the refuge; yet, they are only four visitors.

WMD: Wetland Management District

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Appendix 1: Estimating Economic Contributions

General Methodology and Assumptions

1. Model.

Economic contributions for the 162 sampled 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. Prior to 2013, the Minnesota IMPLAN Group, Inc. owned and distributed the software and databases. Since 2013, the company name has changed to IMPLAN and is located in North Carolina (www.implan.com). The software used in this report is the 2013 version.

2. Data Set.

The 2015 IMPLAN data set was used for the analysis. All monetary impacts were adjusted to 2018 dollars.

3. Expenditure Data

Per-person per-day expenditure information is based on the 2011 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. The 2016 Survey expenditure data was not used because sample sizes by activity level and resident/non-resident were too small for reliable data at this level of detail. Fortunately, there is a fairly consistent relationship of spending across activities and time. By adjusting 2011 expenditure data to 2018 dollars, the expenditures utilized for this report adequately represent the recreational visitors' expenditures. Expenditure categories include: (1) **food,** including food, drink, and refreshments; (2) **lodging**, which includes accommodations at motels, cabins, lodges, or campgrounds; (3) **transportation**, which includes both public transportation and transportation by private vehicle; and (4) **other trip-related**, 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.

Table A1.1. Allocation of Expenditures to IMPLAN Categories

Fish/ Hunt Survey Category	IMPLAN Activity/Sector	Percentage allocated to IMPLAN sector[3]
Lodging	hotels	100%
Food/drink	food for off-site consumption	Residents: 35% Non-residents 65%
..	purchased meals	Residents: 65% Non-residents: 35%
Air Transportation	airline	100%
Other Transportation	gas/oil	90%
..	car repairs	10%
Other	nondurable sport supplies	100%

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 Annual Performance Plan (RAPP). Fiscal year 2017 visitation data are used in this report.

(c) For the economic contribution analysis using IMPLAN, residents are defined as living within a 50-mile radius of the refuge; non-residents live outside of this area.

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

(d) Non-consumptive use is calculated by summing visitor use for nature trails, beach and water uses, wildlife observation, birding, observation towers/platforms/photo blinds, and other non-consumptive recreation specific to each refuge. Visitor use data for the 162 sampled 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 trip destinations or the primary purpose of the trip is not currently available, To account for this, we are using time spent on the refuge to adjust daily total expenditures to reflect what portion of those expenditures can be properly attributed to a refuge visit. , The following assumptions were used to determine how much of total per-person per-day trip expenditures can be attributed to refuge visitation:

(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 each activity (hunting, fishing, non-consumptive recreation) visits are converted to recreation visitor days based upon the average number of hours that visitors engaged in that activity at the sampled refuges.

5. Economic Study Area for the 162 Sampled Refuges

In lieu of specific regional and local trade-flow information, IMPLAN economic study areas are defined as those counties adjacent to or within the refuge which had a significant proportion of total refuge recreation expenditures. This 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. . It was decided that, given the lack of site-specific information on spending and trade flows, it would be better to underestimate economic contributions by keeping the study area small than to overestimate contributions by including counties marginally affected by refuge spending.

6. National Aggregation

One goal of this research is to generate estimates of the national contribution of refuges on their local economies. Ideally, an IMPLAN model and the necessary recreational 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 162 case studies can be treated as data points. National estimates were derived using the average ratios of the economic contributions from the sampled refuges plus visitation data from each region. Ratios were derived for (1) economic output per $1 expenditures, (2) jobs per $1 million in economic output; (3) economic output per visitor; and (4) the

change in visitation from 2011 to 2017 for each region. These ratios were averaged over the 162 sampled refuges respectively (adjusting for inflation). These ratios were used in conjunction with changes in regional visitation to develop regional estimates that were consistent with the national estimates of economic contributions.

It should be noted that the national contribution estimated in this report is an estimate of the ***total local*** economic contribution of refuge visitation, including both sampled refuges and refuges not in the 162 sampled refuges. Using information from the sampled refuges, we attempt to estimate the local contributions for the remaining non-sampled refuges. The sum total of the estimated local economic contributions from sampled and non-sampled refuges are what we call national contributions.

The national estimates and refuge case studies provide a rough, ballpark estimate of the economic contribution 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 – recreational visitation.

Appendix 2: Comparison of Economic Contribution Indices in U.S. Fish and Wildlife Service and National Park Service Visitation Reports

Economic Contributions to Local Communities

This appendix compares a number of selected indices (ratios) from a visitation report by the National Park Service (NPS) to the FWS Banking on Nature 2017 report.

The report used for comparison is the **2017 National Park Visitor Spending Effects: Economic Contributions to Local Communities, States and the Nation** (U.S. National Park Service 2018). Table 3 in the Appendix (pp. 18 – 30) shows total visits, total visitor spending, jobs, labor income, value added, and economic output for ***local economies*** (gateway regions) for 382 National Parks.

Table A2.1 compares the two reports for five indices: 1) ratio of economic output to expenditures; 2) jobs per $1 million in expenditures; 3) jobs per $1 million in economic output; 4) jobs per 1 million RVDs/Visits; and 5) expenditures per RVD/Visit. For each index, the mean, median and 95 % confidence level is shown. Mean is the average, median is the number in the middle of an array of numbers and the 95 % confidence interval means there is a 95 % probability that the specified interval contains the population mean. RVDs are used in the FWS report representing one person recreating on a refuge for one day. The NPS report uses visits which generally represent one person visiting a National Park for one day (Cullinane Thomas et al. p.7 footnote 4).

All the indices are quite similar, as would be expected for two reports that estimate the economic contributions of recreational visitor spending on local communities. Different sources for expenditure information were used for the two reports, but they are still reasonably similar to one another.

Economic Contributions to National Economy

A comparison of the NPS estimates of the contribution of park visitation to the national economy (Table 2 p. 13, U.S. National Park Service 2018) and the estimates of national significance of refuge visitation is problematic since they are addressing two different types of economic contributions. The NPS report estimates national economic contributions while the refuge report estimates an aggregate or summation of local economic contributions. Consequently, a direct comparison of the national economic contributions of the two reports is not possible.

Table A2.1. Comparison of Selected Economic Contribution Indices for Local Communities Estimated in Fish and Wildlife Service and National Park Service Visitation Reports.		
	U.S. Fish & Wildlife Service	**National Park Service**
Agency (Observations)	FWS (N = 162)	NPS (N = 382)
Ratio of Output to Expenditures:		
Mean	1.31	1.29
Median	1.32	1.31
95 % Confidence Interval	1.28 – 1.34	1.28 – 1.30
Jobs per $1 million Expenditures:		
Mean	12.8	14.1
Median	12.4	14.2
95 % Confidence Interval	12.5 - 13.2	13.9 – 14.2
Jobs per $1 million Output:		
Mean	9.8	10.6
Median	9.6	11.2
95 % Confidence Interval	9.5 – 10.2	10.3 – 10.9
Jobs per 1 million RVD's/visits		
Mean	658 (RVD)	738 (Visits)
Median	580	793
95 % Confidence Interval	613 - 703	711 - 766
Expenditures per Visit		
Mean	$47.86 (RVD)	$57.50 (Visits)
Median	$42.60	$57.17
95 % Confidence Interval	$45.37 - $50.36	$54.96 - $60.03

Appendix 3: Alphabetical List of Sampled Refuges' Economic Contributions to Local Economies

The following table provides a snapshot of the economic contributions for individual refuges. Insight regarding how the individual refuge results were estimated and detailed discussion of recreation visits and the economic study area are provided in the individual refuge reports. These individual reports are available at the following link:
https://www.fws.gov/economics/divisionpublications/bankingonnatureimpacts.asp

Table A3.1. Sampled Refuge's Economic Contributions to Local Economies

Refuge Name	State	Total Recreation Visits	Total Economic Output ($,000)	Total Employment Income ($,000)	Total Jobs
Agassiz NWR	MN	9,710	$167.1	$44.7	2
Amagansett NWR	NY	25,835	$368.6	$137.0	3
Ankeny NWR	OR	83,550	$2,310.3	$764.1	21
Aransas NWR	TX	84,428	$2,994.4	$782.7	25
Archie Carr NWR	FL	292,500	$14,688.1	$4,371.6	131
Arctic NWR	AK	59,265	$29,823.90	$8,923.70	218
Arthur R. Marshall Loxahatchee NWR	FL	369,396	$24,595.5	$8,594.4	202
Assabet River NWR	MA	177,862	$2,779.3	$1,236.2	20
Back Bay NWR	VA	186,608	$3,749.9	$1,135.6	35
Balcones Canyonlands NWR	TX	79,692	$2,347.1	$785.6	17
Bald Knob NWR	AR	19,344	$776.8	$246.6	9
Bandon Marsh NWR	OR	21,269	$450.1	$145.6	4
Baskett Slough NWR	OR	130,280	$1,880.0	$485.4	18
Bear Lake NWR	ID	10,661	$415.0	$232.6	8
Bear River Migratory Bird Refuge	UT	157,790	$4,102.6	$1,472.6	46

Refuge Name	State	Total Recreation Visits	Total Economic Output ($,000)	Total Employment Income ($,000)	Total Jobs
Big Lake NWR	AR	85,200	$1,942.1	$652.1	23
Big Muddy National Fish and Wildlife Refuge	MO	12,425	$444.2	$169.5	4
Big Stone NWR	MN	20,730	$175.2	$41.4	2
Bill Williams River NWR	AZ	326,344	$11,345.3	$2,944.2	113
Billy Frank Jr. Nisqually NWR	WA	289,450	$15,143.6	$4,056.2	111
Black Bayou Lake NWR	LA	48,178	$1,238.2	$363.4	11
Blackwater NWR	MD	222,792	$7,790.8	$2,314.6	63
Bombay Hook NWR	DE	166,442	$5,307.0	$1,577.5	48
Bon Secour NWR	AL	132,037	$8,110.2	$2,323.7	71
Bosque del Apache NWR	NM	306,330	$17,390.1	$3,962.7	181
Buenos Aires NWR	AZ	55,320	$1,843.4	$523.3	15
Cache River NWR	AR	474,136	$18,114.9	$5,299.8	228
Canaan Valley NWR	WV	73,501	$2,657.3	$704.5	33
Charles M. Russell NWR	MT	438,500	$33,245.2	$9,105.8	320
Cherry Valley NWR	PA	14,150	$611.0	$202.3	6
Chickasaw NWR	TN	80,170	$1,982.2	$711.7	22
Chincoteague NWR	VA and MD	6,976,117	$390,817.9	$119,366.9	3,647
Clarence Cannon NWR	MO	47,605	$457.0	$139.5	5
Clarks River NWR	KY	54,126	$2,163.6	$691.1	24
Crab Orchard NWR	IL	888,741	$29,168.4	$8,370.2	315

Refuge Name	State	Total Recreation Visits	Total Economic Output ($,000)	Total Employment Income ($,000)	Total Jobs
Cross Creeks NWR	TN	68,950	$2,708.2	$696.7	29
Cypress Creek NWR	IL	17,946	$558.1	$141.8	7
Dale Bumpers White River NWR	AR	410,435	$15,076.6	$4,796.2	153
D'Arbonne NWR	LA	35,068	$1,724.7	$508.5	15
Deer Flat NWR	ID and OR	173,060	$6,983.0	$2,343.1	61
Des Lacs NWR	ND	6,069	$252.3	$78.5	2
Don Edwards San Francisco Bay NWR	CA	973,405	$27,091.3	$9,563.5	181
Eastern Neck NWR	MD	82,095	$822.6	$250.3	9
Eastern Shore of Virginia NWR	VA	98,698	$5,152.7	$1,493.6	58
Edwin B. Forsythe NWR	NJ	306,870	$6,008.0	$2,353.1	50
Elizabeth A. Morton NWR	NY	126,254	$1,830.1	$680.2	15
Elizabeth Hartwell Mason Neck NWR	VA	150,322	$2,609.4	$948.7	20
Erie NWR	PA	30,467	$722.3	$226.9	8
Felsenthal NWR	AR	263,342	$13,558.9	$3,939.4	133
Fort Niobrara NWR	NE	98,610	$3,131.1	$747.8	32
Great Bay NWR	NH	22,495	$325.9	$114.4	3
Great Dismal Swamp NWR	VA and NC	72,941	$3,913.9	$1,141.8	38
Great Meadows NWR	MA	656,472	$12,184.5	$5,392.8	90
Great Plains Nature Center	KS	363,343	$5,011.1	$1,590.8	40
Great River NWR	IL and MO	11,870	$259.2	$90.1	2
Great Swamp NWR	NJ	208,795	$4,324.5	$1,681.8	26

Refuge Name	State	Total Recreation Visits	Total Economic Output ($,000)	Total Employment Income ($,000)	Total Jobs
Guam NWR	Guam	38,390	$2,541.8	$743.8	17
Hagerman NWR	TX	256,122	$4,876.0	$1,433.9	46
Hanalei NWR	HI	407,440	$12,454.9	$3,707.3	107
Hart Mountain National Antelope Refuge	OR	14,550	$897.4	$236.5	11
Hatchie NWR	TN	58,960	$1,171.0	$325.8	15
Holla Bend NWR	AR	47,490	$1,271.2	$346.0	14
Horicon NWR	WI	434,038	$8,577.7	$2,325.2	104
Imperial NWR	AZ and CA	274,159	$11,069.8	$3,228.6	100
Iowa WMD	IA	145,174	$4,292.5	$1,653.0	35
Iroquois NWR	NY	25,379	$632.0	$182.8	6
John Heinz NWR at Tinicum	PA	358,106	$4,623.7	$1,657.0	35
Julia Butler Hansen Refuge for Columbian White-tailed Deer	OR and WA	45,026	$1,345.8	$395.9	13
Kealia Pond NWR	HI	53,100	$2,167.1	$620.4	18
Kilauea Point NWR	HI	1,147,503	$34,250.4	$10,196.0	293
Kirwin NWR	KS	134,390	$7,300.7	$1,929.1	82
Kofa NWR	AZ	95,404	$1,692.1	$501.7	17
Kootenai NWR	ID	78,767	$1,926.5	$550.6	26
Laguna Atascosa NWR	TX	485,051	$43,317.0	$12,107.6	412
Lake Isom NWR	TN	16,005	$611.0	$229.1	6
Las Vegas NWR	NM	11,676	$174.2	$39.4	2

Refuge Name	State	Total Recreation Visits	Total Economic Output ($,000)	Total Employment Income ($,000)	Total Jobs
Lee Metcalf NWR	MT	177,769	$4,477.6	$1,181.3	45
Litchfield WMD	MN	131,050	$3,533.3	$1,394.6	30
Little Pend Oreille NWR	WA	54,266	$3,466.6	$844.8	28
Little River NWR	OK	14,220	$560.6	$206.4	6
Loess Bluffs NWR	MO	137,326	$1,998.2	$482.6	23
Lower Hatchie NWR	TN	70,445	$1,719.1	$483.6	22
Lower Rio Grande Valley NWR	TX	69,858	$1,988.8	$596.4	18
Madison WMD	SD	131,262	$7,023.0	$2,205.2	57
Malheur NWR	OR	210,340	$30,679.3	$8,261.8	387
Mattamuskeet NWR	NC	37,018	$1,810.6	$554.1	23
McFaddin NWR	TX	163,376	$4,748.0	$1,387.1	40
Merced NWR	CA	41,845	$1,645.3	$471.7	13
Mingo NWR	MO	129,279	$1,272.6	$388.3	15
Minnesota Valley NWR	MN	274,644	$4,206.4	$1,382.9	31
Missisquoi NWR	VT	129,690	$2,043.1	$725.8	20
Monomoy NWR	MA	71,360	$1,253.1	$443.1	12
Montezuma NWR	NY	231,180	$7,338.9	$8,007.8	90
Moosehorn NWR	ME	37,265	$1,673.3	$413.6	18
Morris WMD	MN	73,098	$4,629.7	$1,109.8	53
National Bison Range	MT	278,295	$24,751.2	$6,836.3	223

Refuge Name	State	Total Recreation Visits	Total Economic Output ($,000)	Total Employment Income ($,000)	Total Jobs
Neal Smith NWR	IA	285,437	$4,158.2	$1,363.2	34
Necedah NWR	WI	178,175	$5,704.0	$1,765.1	64
Nestucca Bay NWR	OR	49,588	$790.7	$239.8	9
Occoquan Bay NWR	VA	37,655	$839.9	$242.5	8
Ohio River Islands NWR	KY, PA, and WV	66,882	$1,496.6	$476.2	17
Okefenokee NWR	GA and FL	723,508	$64,703.2	$17,160.9	753
Oregon Islands NWR	OR	10,171,278	$665,081.5	$206,194.5	5,906
Oxbow NWR	MA	79,646	$1,348.7	$606.4	11
Oyster Bay NWR	NY	122,400	$4,099.5	$2,118.3	32
Parker River NWR	MA	686,774	$17,236.2	$5,901.9	166
Patoka River NWR	IN	35,894	$638.3	$243.0	8
Pelican Island NWR	FL	155,500	$5,156.9	$1,655.7	49
Pinckney Island NWR	SC	358,790	$8,575.1	$2,576.4	72
Pond Creek NWR	AR	36,190	$1,172.8	$329.5	14
Port Louisa NWR	IA	31,000	$658.9	$158.7	9
Prime Hook NWR	DE	153,823	$3,383.1	$957.9	29
Rainwater Basin WMD	NE	53,650	$2,245.5	$864.6	19
Red River NWR	LA	88,759	$1,778.0	$513.2	14
Reelfoot NWR	KY and TN	277,847	$9,092.8	$2,878.0	96
Rice Lake NWR	MN	26,140	$283.3	$83.2	3

Refuge Name	State	Total Recreation Visits	Total Economic Output ($,000)	Total Employment Income ($,000)	Total Jobs
Rocky Mountain Arsenal NWR	CO	868,900	$24,247.4	$6,681.0	201
Ruby Lake NWR	NV	38,527	$2,530.7	$990.9	30
Salt Plains NWR	OK	83,530	$2,123.7	$564.4	21
Sam D. Hamilton Noxubee NWR	MS	293,411	$11,027.9	$2,921.1	117
San Bernard NWR	TX	103,294	$1,578.3	$444.3	13
San Joaquin River NWR	CA	15,730	$908.5	$261.5	8
San Luis NWR	CA	104,720	$5,947.9	$1,708.4	46
Santa Ana NWR	TX	195,500	$3,414.7	$1,043.9	30
Savannah NWR	GA and SC	391,439	$8,849.0	$2,673.5	79
Seney NWR	MI	155,532	$2,933.5	$752.4	29
Shawangunk Grasslands NWR	NY	19,930	$372.2	$106.9	3
Sheldon NWR	NV and OR	36,993	$4,244.7	$1,322.2	32
Sherburne NWR	MN	78,398	$1,618.7	$396.3	19
Shiawassee NWR	MI	88,270	$984.5	$271.7	10
St. Croix WMD	WI	16,479	$416.9	$117.3	5
Steigerwald Lake NWR	WA	144,485	$3,455.6	$983.6	28
Stewart B. McKinney NWR	CT	13,520	$448.7	$169.2	3
Stone Lakes NWR	CA	45,960	$1,289.8	$407.0	10
Sullys Hill National Game Preserve	ND	68,589	$1,077.5	$277.7	9
Tallahatchie NWR	MS	4,160	$127.5	$45.5	1
Target Rock NWR	NY	42,709	$816.1	$304.3	7

Refuge Name	State	Total Recreation Visits	Total Economic Output ($,000)	Total Employment Income ($,000)	Total Jobs
Ten Thousand Islands NWR	FL	256,200	$11,775.3	$3,842.6	104
Tennessee NWR	TN	366,725	$18,064.4	$5,672.1	216
Tishomingo NWR	OK	60,970	$1,230.2	$383.7	14
Trempealeau NWR	WI	79,148	$1,629.3	$443.3	22
Trinity River NWR	TX	23,597	$470.8	$144.3	5
Tualatin River NWR	OR	157,370	$5,758.6	$2,048.5	62
Turnbull NWR	WA	82,141	$2,139.8	$597.3	16
Two Ponds NWR	CO	21,760	$478.9	$161.5	4
Two Rivers NWR	IL	21,420	$333.4	$82.9	4
Umbagog NWR	NH and ME	81,020	$4,574.7	$1,340.1	49
Upper Mississippi River NWFR-La Crosse District	MN and WI	834,143	$43,447.5	$13,186.4	485
Upper Mississippi River NWFR-McGregor District	IA, MN, and WI	411,800	$15,882.2	$4,342.4	181
Upper Mississippi River NWFR-Savanna District	IL and IA	665,992	$24,873.1	$7,360.1	243
Upper Mississippi River NWFR-Winona District	MN and WI	1,050,700	$40,711.0	$10,940.0	520
Upper Ouachita NWR	LA	18,652	$647.4	$183.8	6
Upper Souris NWR	ND	115,560	$4,284.4	$1,370.3	35
Waccamaw NWR	SC	509,300	$14,431.6	$3,985.8	148
Wallkill River NWR	NJ and NY	52,960	$1,847.5	$661.1	15
Wapack NWR	NH	21,050	$700.7	$248.5	6
Wertheim NWR	NY	109,656	$1,840.1	$684.9	15

Refuge Name	State	Total Recreation Visits	Total Economic Output ($,000)	Total Employment Income ($,000)	Total Jobs
Wheeler NWR	AL	1,389,418	$43,887.2	$13,223.1	405
Whittlesey Creek NWR	WI	105,341	$1,174.0	$330.6	14
Wichita Mountains Wildlife Refuge	OK	4,142,068	$98,198.7	$26,589.4	923
William L. Finley NWR	OR	231,288	$4,899.5	$1,613.4	52
Windom WMD	MN	35,705	$1,158.9	$298.9	13