USGS
science for a changing world

Regional Economic Effects of Current and Proposed Management Alternatives for Arrowwood National Wildlife Refuge

By Lynne Koontz and Heather Lambert

Open-File Report 2005-1415

U.S. Department of the Interior
U.S. Geological Survey

U.S. Department of the Interior
Gale A. Norton, Secretary

U.S. Geological Survey
P. Patrick Leahy, Acting Director

U.S. Geological Survey, Reston, Virginia 2005

For product and ordering information:
World Wide Web: http://www.usgs.gov/pubprod
Telephone: 1-888-ASK-USGS

For more information on the USGS—the Federal source for science about the Earth, its natural and living resources, natural hazards, and the environment:
World Wide Web: http://www.usgs.gov
Telephone: 1-888-ASK-USGS

Suggested citation:

Koontz, L., and Lambert, H., 2005. Regional economic effects of current and proposed management alternatives for Arrowood National Wildlife Refuge: U. S. Geological Survey, Biological Resources Discipline, Open-File Report 2005-1415, 19 p.

Contents

Tables

Regional Economic Effects of Current and Proposed Management Alternatives for Arrowwood National Wildlife Refuge

Lynne Koontz and Heather Lambert, U.S. Geological Survey

Introduction

The National Wildlife Refuge System Improvement Act of 1997 requires all units of the National Wildlife Refuge System to be managed under a Comprehensive Conservation Plan (CCP). The CCP must describe the desired future conditions of a Refuge and provide long range guidance and management direction to achieve Refuge purposes. Arrowwood National Wildlife Refuge (NWR), located along the James River in east central North Dakota, is in the process of developing a range of management goals, objectives, and strategies for the CCP. The CCP for Arrowwood NWR must contain an analysis of expected effects associated with current and proposed Refuge management strategies.

Special interest groups and local residents often criticize a change in Refuge management, especially if there is a perceived negative impact to the local economy. Having objective data on income and employment impacts may show that these economic fears are overstated. Quite often, residents do not realize the extent of economic benefits a Refuge provides to a local community, yet at the same time overestimate the impact of negative changes. Spending associated with Refuge recreational activities such as wildlife viewing and hunting can generate considerable tourism activity for the regional economy. Additionally, Refuge personnel typically spend considerable amounts of money purchasing supplies in the local lumber and hardware stores, repairing equipment and purchasing fuel at the local service stations, as well as reside and spend their salaries in the local community.

The purpose of this study was to provide the economic analysis needed for the Arrowwood NWR CCP by evaluating the regional economic impacts associated with the Arrowwood NWR Draft CCP management strategies. For Refuge CCP planning, an economic impact analysis describes how current (No Action Alternative) and proposed management activities (alternatives) affect the local economy. This type of analysis provides two critical pieces of information: 1) it illustrates a refuge's contribution to the local community; and 2) it can help in determining whether local economic effects are or are not a real concern in choosing among management alternatives. Refuge personnel provided the information needed to analyze the economic impacts of the three alternatives evaluated in the draft CCP.

This report first provides a description of the local community and economy near the Refuge. An analysis of current and proposed management strategies that could affect the local economy is then presented. The Refuge management activities of economic concern in this analysis are Refuge personnel staffing and Refuge spending within the local community, and spending in the local community by Refuge visitors.

Regional Economic Setting

Arrowwood NWR occupies 14 miles of the James River Valley in Foster and Stutsman Counties approximately 30 miles north of Jamestown, North Dakota. Jamestown (Stutsman County) and Carrington (Foster County) are the primary communities near the Refuge. According to Tour North Dakota (2004), one of the greatest assets of the area is the quality of life enjoyed by its residents.

Population, Employment, and Income

In 2000, the population of North Dakota was 642,200 with an average density of 9.3 persons/square mile (U.S. Census 2002). Stutsman County accounted for 3.4% of North Dakota's total population in the year 2000, with a population of 21,908 residents averaging 9.9 persons per square mile (U.S. Census 2002). Jamestown, the county seat, is located in the south end of Stutsman County with a population of 15,571 people. Located in the valley where the James and Pipestem Rivers meet, Jamestown offers a variety of recreational opportunities: from summer activities such as fishing, hunting, and golfing to winter activities such as ice fishing, snowmobiling, and cross-country skiing (Welcome to Jamestown, 2004).

Foster County located just north of Stutsman County, is one of the smallest of the state's 53 counties, 18 miles by 36 miles in dimension. Foster County accounted for less than one percent (0.5%) of North Dakota's total population in the year 2000, with a population of 3,759 residents averaging 5.9 persons per square mile (U.S. Census 2002). Carrington, the main town in Foster County, is commonly referred to as the 'Central City' for its location central to the four major North Dakota cities of Bismarck, Fargo, Minot and Grand Forks. With its outstanding leadership, community commitment, location and updated infrastructure, Carrington has been recognized as the most dynamic community in North Dakota with a population under 2500 (Carrington North Dakota, 2004).

While the state of North Dakota experienced a relatively low 0.5 % population increase from 1990 to 2000, Stutsman County's population increased by 3.0% while Foster County's population decreased 6.0% over the same time frame. Approximately 78% of Foster County and 81% of Stutsman County population 25 years and older have high school diplomas, while 20% were college graduates (US Census Bureau, 2002).

Based on population origin estimates from the 2000 Census, 1.2% of the state population consists of persons of Hispanic or Latino origin, 91.7% of white persons not of Hispanic/Latino origin, 5.0% of American Indian and Alaska Native Persons, 0.6% of Black or African American persons, and 0.6% of Asian persons. Population origin in Foster and Stutsman Counties were similar to the state population (US Census Bureau, 2002). The predominant immigrant cultures in the region include Scandinavian, German, Ukrainian and Icelandic (Tour North Dakota, 2004).

The majority of Stutsman and Foster counties are rural with agriculture as the main industry (U.S. Department of Commerce, 2002). Like most North Dakota communities, Jamestown and Carrington can trace their development to the arrival of the railroad (Tour North Dakota, 2004). Agriculture formed the basis for the region's early economy and still is an important component today. According to the U.S. Department of Commerce (2002), total farm self employment accounted for 8.3% of total employment in North Dakota (8.3% of Stutsman County and 13.8% in Foster County) in 2000. Besides agriculture, the other major local and state employers are service related businesses, government, and retail trade (Table 1).

Table 1. Industry breakdown of full time and part time employment for 2000.

Industry	Foster County (% of County total)	Stutsman County (% of County total)	State of North Dakota (% of State total)
Ag. Services, forestry, & fishing	(D)*	(D)	1.5
Mining	(D)	(D)	1.0
Construction	4.2	3.7	5.2
Manufacturing	(D)	9.6	5.9
Transport/utilities	5.1	5.9	5.3
Wholesale trade	5.1	3.9	5.1
Retail trade	14.7	17.8	16.5
Insurance/real estate	4.4	5.6	6.2
Services	24.2	29.1	28.0
Government	11.4	14.0	17.2

Source: U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economic Information System, 2002.
*(L) less than 10 jobs, but the estimates for this item are included in the totals.

Major employers in Jamestown include health providers, education, and aerospace products manufacturing (U.S. Census, 2002). Carrington's business community is diversified, including agriculture, manufacturing, financial, retail, and technology-based endeavors (Carrington North Dakota, 2004). Carrington serves as the center of an important corridor of agribusiness (Dietz, 2003). Carrington is home to state of-the-art Dakota Growers Pasta Company, which markets premium quality pasta worldwide (Carrington North Dakota, 2004).

Foster County per capita personal income was $25,138 in 2000, which very close to the state average of $25,109. Meanwhile, Stutsman County per capita personal income was $23,686, which was $1,423 lower than the state average (U.S. Dept. of Commerce, 2002). Total personal income was $94 million in Foster County and $517 million for Stutsman County in 2000 (U.S. Dept. of Commerce, 2002).

Economic Impacts of Current and Proposed Management Activities

For the purposes of an economic impact analysis, a region (and its economy) is typically defined as all counties within a 30-60 mile radius of the impact area. Only spending that takes place within this local area is included as stimulating the changes in economic activity. The size of the region influences both the amount of spending captured and the multiplier effects. Based on the relative self-containment in terms of retail trade, Stutsman and Foster Counties were assumed to comprise the economic region for this analysis.

Economic impacts are typically measured in terms of number of jobs lost or gained, and the associated result on income. Economic input-output models are commonly used to determine how economic sectors will and will not be affected by demographic, economic, and policy changes. The economic impacts of the management alternatives for Arrowwood NWR were estimated using IMPLAN, a regional input-output modeling system developed by the USDA Forest Service (Olson and Lindall, 1996). IMPLAN is a computerized database and modeling system that provides a

regional input-output analysis of economic activity in terms of 10 industrial groups involving as many as 528 sectors (Olson and Lindall, 1996). The year 2000 Stustman and Foster County IMPLAN data profiles were used in this study. IMPLAN estimates for employment include both full time and part time workers, which are measured in total jobs.
The IMPLAN model draws upon data collected by the Minnesota IMPLAN Group from multiple federal and state sources including the Bureau of Economic Analysis, Bureau of Labor Statistics, and the U.S. Census Bureau (Olson and Lindall, 1999).

Because of the way industries interact in an economy, a change in the activity of one industry affects activity levels in several other industries. For example, if more visitors come to an area, local businesses will purchase extra labor and supplies to meet the increase in demand for additional services. The income and employment resulting from visitor purchases from local businesses represent the ***direct*** effects of visitor spending within the economy. In order to increase supplies to local businesses, input suppliers must also increase their purchases of inputs from other industries. The income and employment resulting from these secondary purchases by input suppliers are the ***indirect*** effects of visitor spending within the county. The input supplier's new employees use their incomes to purchase goods and services. The resulting increased economic activity from new employee income is the ***induced*** effect of visitor spending. The indirect and induced effects are known as the secondary effects of visitor spending. Multipliers capture the size of the secondary effects, usually as a ratio of total effects to direct effects (Stynes 1998). The sums of the direct and secondary effects describe the total economic impact of visitor spending in the local economy.

Regional economic effects from the IMPLAN model are reported in the following categories:

- ***Employment*** represents the change in number of jobs generated in the region from a change in regional output. IMPLAN estimates for employment include both full time and part time workers, which are measured in total jobs.
- ***Personal income*** represents the change in employment income in the region that is generated from a change in regional output.

Refuge Staffing and Budgeting

Refuge employees reside and spend their salaries on daily living expenses in communities near the Refuge thereby generating impacts within the local economy. Household consumption expenditures consist of payments by individuals/households to industries for goods and services used for personal consumption. The IMPLAN modeling system contains household consumption spending profiles that account for average household spending patterns by income level. These profiles also capture average annual savings and allow for leakage of household spending to outside the region. Table 2 presents the current and proposed staffing needs for each management alternative. As shown in Table 2, current staffing (Alternative I) at the Refuge consists of ten permanent full time employees and one half time employee. The current staff accounted for an annual payroll (including salaries and benefits) of $706,000 in 2004. Additional annual funding needed for the proposed personnel/staffing is anticipated to cost $1,029,800 for Alternative II and $1,099,400 for Alternative III (Table 2).

Table 2. Current and Proposed Staff by Management Alternative

	Alternative I - Current Management	**Alternative II - Enhanced Refuge Management**	**Alternative III - Enhanced Refuge and Watershed Management**
Management Staff	Project Leader* Deputy. Proj. Leader* Refuge Oper. Spec.*	Project Leader* Deputy Proj. Leader* Refuge Oper. Spec. * Refuge Oper. Spec.	Project Leader* Deputy Proj. Leader* Refuge Oper. Spec. * Refuge Oper. Spec.
Biological Staff	Wildlife Biologist*	Wildlife Biologist* Biological Tech Biological Tech	Wildlife Biologist* Biological Tech F/W Biologist Biological Tech
Public Use Staff	Outdoor Rec. Planner (½ time, shared w/Long Lake)	Outdoor Rec. Planner Park Ranger	Outdoor Rec. Planner Park Ranger
Admin Staff	Admin. Officer* Clerk*	Admin. Officer* Clerk*	Admin. Officer* Clerk*
Maintenance Staff	Engineer. Equip. Op. Tractor Operator	Engineer. Equip. Op. Tractor Operator Maintenance Worker Maintenance Worker	Engineer. Equip. Op. Tractor Operator Maintenance Worker Maintenance Worker
Fire Staff	Fire Manage. Officer* Fire Tech*	Fire Manage. Officer* Fire Tech* Seasonal Range Tech	Fire Manage. Officer* Fire Tech* Seasonal Range Tech
Staff Salary & Benefits	$706,000	$1,029,800	$1,099,400

* Shared with other stations in Arrowwood Complex Management

Table 3 shows the economic impacts associated with current and proposed management with local staff salary. The current level (Alternative I) spending of salaries by Refuge personnel directly accounts for 5.7 jobs and $107,600 in personal income. The associated indirect and induced effects generate an additional 1.8 jobs and $37,400 in personal income throughout the local economy for a total economic impact of 7.5 jobs and $145,000 associated with the current level of spending of salaries by Refuge personnel (Table 3). Due to the increased staffing levels for Alternatives II and III (Table 2), the associated economic effects generate more jobs and income than Alternative I.

Table 3. Local economic impacts of salary spending by refuge personnel (2004$).

Stutsman and Foster Counties	Alternative I	Alternative II	Alternative III
Salary Spending Impacts			
Direct Effects			
Income ($/year)	$107,600	$156,900	$167,600
Jobs	5.7	8.4	8.9
Indirect and Induced Effects			
Income ($/year)	$37,400	$54,600	$58,300
Jobs	1.8	2.6	2.8
Total Effects			
Income ($/year)	$145,000	$211,500	$225,900
Jobs	7.5	11.0	11.7

In addition to providing salaries and benefits, the Refuge purchased goods and services (non salary expenditures) totaling $248,100 in 2004, approximately 60% of which was spent locally in Stutsman and Foster Counties. Base operational funding for FY 2004 totaled $1,079,900 with additional funds for annual maintenance, deferred maintenance, small equipment, and fire program, the total was $1,527,200. This current budget represents the minimum required to maintain existing programs but does not adequately support planned habitat management, biological monitoring, public use and education programs, and maintenance of all Refuge facilities and structures. Annual non salary expenditures are anticipated to cost $343,200 for Alternative II and $366,500 for Alternative III. For Alternatives II and III, it is assumed that approximately 60% of non salary expenditures will still be spent locally in Stutsman and Foster Counties. Table 4 summarizes the anticipated annual expenditures by management alternative.

Table 4. Refuge staffing and budgeting expenditures by management alternative (2004$).

	Annual Expenditures by Alternative		
	I	II	III
Salary	$706,000	$1,029,800	$1,099,400
Non salary	$248,100	$343,200	$366,500
Total	$954,100	$1,373,000	$1,465,900

Table 5 shows the economic impacts associated with current and proposed management non salary spending in Stutsman and Foster Counties. For each alternative, it is assumed that 60% of the non salary expenditures reported in Table 4 are spent locally in Stutsman and Foster Counties. The current level (Alternative I) of Refuge non salary expenditures directly accounts for 5.9 jobs and $70,500 in personal income. The associated indirect and induced effects generate an additional 1.6 jobs and $35,700 in personal income throughout the economy of Stutsman and Foster Counties for a total local economic impact of 7.5 jobs and $106,200 in personal income associated with the current level of Refuge non salary spending in the local economy. Due to the

increased non-salary spending levels for Alternatives II and III (Table 4), the associated economic effects generate more jobs and income than Alternative I.

Table 5. Local economic impacts of Refuge non salary expenditures (2004$).

Stutsman and Foster Counties	Alternative I	Alternative II	Alternative III
Non Salary Impacts *(60% of total non salary expenditures spent locally)*			
Direct Effects			
Income ($/year)	$70,500	$97,600	$104,200
Jobs	5.9	8.2	8.8
Indirect and Induced Effects			
Income ($/year)	$35,700	$49,400	$52,800
Jobs	1.6	2.2	2.3
Total Effects			
Income ($/year)	$106,200	$147,000	$157,000
Jobs	7.5	10.4	11.1

Table 6 presents the combined economic impacts associated with Refuge non salary purchases and spending of salaries by Refuge staff members within the community. Refuge management activities currently generate 15 jobs and $251,300 in personal income in the local economy. Alternatives II would generate an additional 6.4 jobs and $107,300 in personal income as compared to Alternative I. Alternative III would generate an additional 7.8 jobs and $131,700 more in personal income than Alternative I.

Table 6. Combined impacts from Refuge management activities (2004$).

Stutsman and Foster Counties	Alternative I	Alternative II	Alternative III
Total salary spending and budgeting impacts			
Direct Effects			
Income ($/year)	$178,100	$254,500	$271,800
Jobs	11.6	16.6	17.7
Indirect and Induced Effects			
Income ($/year)	$73,100	$104,000	$111,100
Jobs	3.4	4.8	5.1
Total Effects			
Income ($/year)	$251,200	$358,500	$382,900
Jobs	15.0	21.4	22.8

Recreation Activities

North Dakota is widely considered a top bird watching destination, with more National Wildlife Refuges than any other state (North Dakota Legendary 2002). Arrowwood NWR offers visitors a variety of recreation opportunities including an auto tour route, nature trails, wildlife observation and photography, upland and big game hunting, fishing, environmental education, and interpretation. A tourist usually buys a wide range of goods and services while visiting an area. Major visitor expenditure categories include lodging, food, and supplies.

To determine the local economic impacts of visitor spending, only spending by persons living outside the local area is included in the analysis. The rational for excluding local visitor spending is two fold. First, money flowing into Stutsman and Foster Counties from visitors living outside is considered new money injected into the local economy. Second, if residents of Stutsman and Foster Counties visit Arrowwood NWR more or less due to the management changes, they will correspondingly change their spending of money elsewhere in the local area, resulting in no net change to the economy of Stutsman and Foster Counties. These are standard assumptions made in most regional economic analyses at the local level.

Refuge visitors were divided by type of visitor activity and place of residence (local Stutsman and Foster County residents, non local North Dakota residents, and nonresidents). Arrowwood NWR annual visitation was estimated based on the 2003 Refuge annual visitation estimates. The Refuge bases visitation estimates on visitors entering the Visitor Center/Office and general observation. Estimates on the percentage of visitors by place of residence were provided by Refuge personnel. Table 7 summarizes estimated Refuge visitation by type of visitor activity and percentage of visitors by place of residence.

Table 7. Estimated annual refuge visitation by visitor activity and place of residence.

	Total # of Visitors	Percentage (%) of Local Stutsman and Foster County Visitors	Percentage (%) of Non Local North Dakota Visitors	Percentage (%) of Nonresident Visitors (live outside of North Dakota)
Total Estimated Visitors	5,157			
Non-Consumptive Users				
Nature Trails	3,087	70	15	15
Observation Platforms	75	70	15	15
Other Wildlife Observation (grouse blind & roadside)	125	75	13	12
Water Use	60	95	3	2
Other (wild food gathering, horseback riding, bicycling, etc)	275	98	1	1
Hunting				
Upland Game	200	90	5	5
Big Game	1,250	80	10	10
Fishing	85	90	5	5

The next step in estimating total visitor spending is the development of visitor spending profiles. Average daily travel related expenditure profiles for various recreation activities derived from the 1996 National Survey of Hunting, Fishing and Wildlife Related Recreation (U.S. Dept. of Interior 1996) by the U.S. Forest Service (Niccolucci and Winter 2002) were used in this analysis. For each type of visitor activity, the Survey reports trip related spending of state residents and non residents for several different recreational activities. State resident and nonresident spending profiles for non-consumptive wildlife recreation (observing, feeding, or photographing fish and wildlife) were used for non consumptive use visitors at Arrowwood NWR. State resident and nonresident spending profiles for big game hunting, upland game hunting, and fresh water fishing were used for Arrowwood NWR hunting and fishing related visitor activities. Because the non resident big game hunting spending profile was not available for North Dakota, the non resident big game hunting profile for the neighboring state of Minnesota was used instead. For each visitor activity, spending is reported in the categories of lodging, food & drink, transportation, and other expenses. Total spending per day for state residents and nonresidents by visitor activity is reported in Table 8.

Table 8. Time spent on the refuge and spending per day for each visitor activity.

	Average state resident spending per day	Average nonresident spending per day
Non Consumptive Users	$11	$149
Upland game hunting	$20	$129
Big game hunting	$23	$112
Fishing	$22	$63

Source: Niccolucci and Winter (2002).

Visitor spending is typically estimated on an average per day (eight hours) or average per trip basis. In order to properly account for the amount of spending associated with each type of refuge visitor, it is important to determine the average length of trip. Refuge personnel provided estimates for the number of hours spent at Arrowwood NWR for each visitor activity (shown in Table 9). Because the visitor spending profiles are for an 8 hour visitor day, the number of 8 hour state resident and nonresident visitor days for each visitor activity had to be calculated. The current number of visitor days per activity is shown in Table 9.

Table 9. Annual number of non local visitor days per activity for Alternative I.

	Number of non local North Dakota visitors	Number of nonresident visitors	Estimated time spent at Refuge	Number of non local North Dakota resident visitor days[1]	Number of nonresident visitor days[1]
Non-Consumptive					
Nature Trails	463	463	2 hours	116	116
Observation Platforms	11	11	1 hours	1	1
Other Wildlife Observation	16	15	1 hours	2	2
Water Use	2	1	2 hours	0	0
Other	3	3	3 hours	1	1
Hunting					
Upland Game	10	10	4 hours	5	5
Big Game	125	125	6 hours	94	94
Fishing	4	4	4 hours	2	2
Total				222	221

[1]One visitor day = 8 hours.

Table 10 shows the anticipated increase in visitation levels for Alternatives II and III. For Alternatives II and III, non consumptive use visitation is expected to increase substantially. The percentage of non local resident and non resident visitation is also anticipated to increase for Alternatives II and III (Table 10). The expected number of non local resident and nonresident visitor days per activity is shown in Table 11.

Table 10. Anticipated annual Refuge visitation for Alternatives II and III.

	Total # of Visitors	Percentage (%) of Local Stutsman and Foster County Visitors	Percentage (%) of Non Local North Dakota Visitors	Percentage (%) of Nonresident Visitors (live outside of North Dakota)
Total Estimated Visitors	17,690			
Non-Consumptive				
Nature Trails	9,500	60	20	20
Observation Platforms	6,000	60	20	20
Other Wildlife Observation	250	65	18	17
Water Use	75	75	13	12
Other	500	85	8	7
Hunting				
Upland Game	250	90	5	5
Big Game	1,300	80	10	10
Fishing	85	90	5	5

Table 11. Annual non local visitor days for Alternatives II and III.

	Number of non local North Dakota visitors	Number of nonresident visitors	Estimated time spent at Refuge	Number of non local North Dakota resident visitor days	Number of nonresident visitor days
Non-Consumptive					
Nature Trails	1,900	1,900	2	475	475
Observation Platforms	1,200	1,200	1	150	150
Other Wildlife Observation	45	43	1	6	5
Water Use	10	9	2	2	2
Other	40	35	3	15	13
Hunting					
Upland Game	13	13	4	6	6
Big Game	130	130	6	98	98
Fishing	4	4	4	2	2
Total				754	752

[1]One visitor day = 8 hours.

Total visitor spending is determined by multiplying the total spending per day (Table 8) by the number of non local and non resident visitor days for each visitor activity (Tables 10 and 12). Current Refuge visitors spend about $32,850 annually in the local economy (Stutsman and Foster

Counties). Table 12 shows the economic impacts associated with current visitation and anticipated changes in visitation by management alternative. The current level (Alternative I) of visitor spending directly generates over $6,400 in personal income and 0.4 of a job for local businesses accommodating visitors (hotels, restaurants, supply stores, and gas stations). The associated indirect and induced effects generate an additional 0.1 of a job and $3,600 in personal income throughout the local economy for a total local economic impact of one half of a job and $10,000 in personal income associated with the current level of Refuge visitation. For Alternatives II and III, the total local economic impact would be 2 jobs and $38,400 in personal income associated the expected increased level in Refuge visitation (Table 12).

Table 12. Economic impacts of Arrowwood NWR visitor spending by alternative (2004$).

Stutsman and Foster Counties	Alternative I	Alternatives II and III
Visitor spending impacts		
Direct effects		
Income ($/year)	$6,400	$24,500
Jobs	0.4	1.6
Indirect and induced effects		
Income ($/year)	$3,600	$13,900
Jobs	0.1	0.4
Total Effects		
Income ($/year)	$10,000	$38,400
Jobs	0.5	2.0

As shown in Table 12, the economic impacts associated with current Refuge visitation and anticipated changes in visitation for Alternatives II and III are limited in terms of contributing to the overall local income and employment. Any decrease in visitation associated with a change in Refuge management will not have a significant economic effect. An increase in the amount of time current visitors spend on the Refuge will increase the amount of daily spending that can be attributed to visiting the Refuge. An increase in both the length of stay on the Refuge (and in the local economy) and the number of non local residents and nonresidents visiting the Refuge could have a considerable impact on increasing the role Refuge visitors play in the local economy.

Economic Significance of Local Visitation

Local visitation accounts for over 75% of the total annual number of refuge visits at Arrowwood NWR. The recent FWS Banking on Nature report (Caudill and Henderson, 2005) estimated the *economic impact* and the *economic significance* associated with Arrowwood NWR. As previously discussed, an economic impact analysis only includes spending by persons living outside the local area because only money flowing into the local economic impact area from outside is considered having an economic impact on the region. An economic significance analysis evaluates the spending of local and non-local visitors to show how large a part of the local economy is connected to refuge activities. The economic significance analysis conducted by

Caudill and Henderson (2005) estimated that local visitors generated a total (including direct and secondary effects) of $14,000 in personal income and 1 job. While this can not be interpreted as income and jobs that would be lost if the refuge were not there since local residents would probably have spent their recreation money in the local economy with or without the refuge, it does show that there is a connection between the local economy and local visitation activities at Arrowwood NWR (Caudill and Henderson, 2005).

Summary and Conclusions

Table 13 summarizes the direct and total economic impacts for all Refuge management activities by management alternative. Under current Refuge management (Alternative I), economic activity directly related to all Refuge operations generates an estimated 12 jobs and $184,600 in personal income in Stutsman and Foster Counties. Including direct, indirect, and induced effects, all Refuge activities account for 15.5 jobs and $261,200 in personal income in Stutsman and Foster Counties. Current Refuge management activities account for less than 1% of total income and employment in Stutsman and Foster Counties. The associated economic effects of Alternatives II and III generate more jobs and income than Alternative I because of the increased levels Refuge staffing, non salary expenditures, and higher visitation levels.

Table 13. Summary of all refuge management activities by alternative (2004$).

Stutsman and Foster Counties	Alternative I	Alternative II	Alternative III
Total Refuge Staffing and Budgeting Impacts			
Direct Effects			
Income ($/year)	$178,100	$254,500	$271,800
Jobs	11.6	16.6	17.7
Total Effects			
Income ($/year)	$251,200	$358,500	$382,900
Jobs	15.0	21.4	22.8
Recreation Activities			
Direct Effects			
Income ($/year)	$6,400	$24,500	$24,500
Jobs	0.4	1.6	1.6
Total Effects			
Income ($/year)	$10,000	$38,400	$38,400
Jobs	0.5	2.0	2.0
Aggregate Impacts			
Direct Effects			
Income ($/year)	$184,500	$279,000	$296,300
Jobs	12.0	18.2	19.3
Total Effects			
Income ($/year)	$261,200	$396,900	$421,300
Jobs	15.5	23.4	24.8
% of Total Local Employment	*0.12%*	*0.18%*	*0.19%*

Table 14 summarizes the economic effects associated with management changes from Alternative I. Both proposed alternatives will increase employment and personal income in Stutsman and Foster Counties primarily because of proposed increases in staffing and non salary expenditures.

Table 14. Economic effects associated with changing from Alternative I (2004$).

Stutsman and Foster Counties	Alternative II	Alternative III
Total salary spending and budgeting impacts		
Direct effects		
Income ($/year)	+$76,400	+$93,700
Jobs	+5.0	+6.1
Total effects		
Income ($/year)	+$107,300	+$131,700
Jobs	+6.4	+7.8
Recreation activities		
Direct effects		
Income ($/year)	+$18,100	+$18,100
Jobs	+1.2	+1.2
Total effects		
Income ($/year)	+$28,400	+$28,400
Jobs	+1.5	+1.5
Aggregate impacts		
Direct Effects		
Income ($/year)	+$94,500	+$111,800
Jobs	+6.2	+7.3
Total effects		
Income ($/year)	+$135,700	+$160,100
Jobs	+7.9	+9.3

References Cited

Caudill J., and Henderson, E., 2005, Banking on Nature 2004: The Economic Benefits to Local Communities of National Wildlife Refuge Visitation: U.S. Department of the Interior, Fish and Wildlife Service, Division of Economics, Washington D.C.

Carrington, North Dakota, 2004, http://www.carringtonnd.com/website/outdoor.htm

Dietz, Laurie, 2003, Prairie Business. March 2003. http://www.prairiebizmag.com

Minnesota IMPLAN Group, Inc., 2002, Year 2000 IMPLAN Data Files. www.implan.com

Niccolucci, M., and Winter, S., 2002, Trip-related expenditures for hunting, fishing, and non-consumptive wildlife recreation activities: U.S. Forest Service, Fort Collins, Colorado.

North Dakota Legendary, 2002, Department of Commerce, Tourism Division. http://www.ndtourism.com/

Olson, D., and Lindall, S., 1996, IMPLAN Professional Software, Analysis, and Data Guide: Minnesota IMPLAN Group, Inc.

Stynes, D., 1998, Guidelines for measuring visitor spending: Department of Park Recreation and Tourism Resources, Michigan State University.
Tour North Dakota, 2004, http://www.tour-nd.com/communities/communities.html
U.S. Census Bureau, 2002, www.census.gov
U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economic Information System, 2002, www.bea.gov
U.S. Department of the Interior, 1996, National Survey of Fishing, Hunting and Wildlife-Associated Recreation, National Report: U.S. Department of the Interior, Fish and Wildlife Service. Washington, D.C.
Welcome to Jamestown, ND., 2004, http://www.jamestownnd.com/