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Economic Contribution of State Parks to the North Dakota Economy

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PREFACE

North Dakota's state parks are an important part of tourism which is an important component of the infrastructure supporting the state's economy. The purpose of this study was to estimate the contribution of state parks to the North Dakota economy in the form of increased levels of business activity, employment, personal income, and tax collections.

The authors wish to express their appreciation to several individuals who made significant contributions to the successful completion of this study. Ms. Karen Assel, Project Coordinator in the North Dakota Parks and Recreation Department, was an unfailing source of information and inspiration throughout the course of this study. The authors also express their appreciation to state park personnel for dissemination and collection of the survey instrument and to the hundreds of park visitors who took time to complete the questionnaire.

For their reviews of this manuscript, we wish to thank Tim Mueller, Randal Coon, Brenda Ekstrom, and F. Larry Leistritz.

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A self-administered questionnaire returned by 1,302 state park visitors in North Dakota between July 1983 and June 1984 provided the data to estimate the contribution of state parks to the state's economy. The economic impacts of operation-and-maintenance expenditures for state parks also were estimated.

Expenditures by state parks and state park visitors were estimated at nearly $35 million in fiscal 1984. These expenditures resulted in estimated employment for over 1,800 North Dakota residents and personal income of nearly $18 million. State park and state park visitors' expenditure patterns resulted in business activity estimated at over $78 million. Tax revenues accruing to the state as a result of these expenditures were estimated at over $1.6 million for fiscal 1984.

ECONOMIC CONTRIBUTION OF STATE PARKS TO THE NORTH DAKOTA ECONOMY

John F. Mittleider and Jay A. Leitch*

Tourism has grown to the third largest industry in North Dakota, generating $229 million in new wealth in 1983.[1] North Dakota tourism is expected to continue a growth trend, creating employment and income opportunities for residents and tax receipts for the state.

An important component of North Dakota's tourism industry is state parks, which were visited by 1,029,070 persons in 1983 compared with 394,000 visitors in 1971--an average annual increase of 13 percent (Table 1).

TABLE 1. ESTIMATED ANNUAL NORTH DAKOTA STATE PARK VISITORS, 1971-1983

Year	Number of Visitors
1971	394,309
1972	347,855
1973	[a]
1974	773,749
1975	808,144
1976	937,953
1977	950,317
1978	1,094,960
1979	884,131
1980	919,176
1981	948,210
1982	975,416
1983	1,029,070

[a]Not available.

SOURCE: North Dakota Parks and Recreation Department, Bismarck, North Dakota.

North Dakota began establishing state parks in 1921 under the administrative jurisdiction of the State Historical Society.[2] In 1965 the

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[1]Greater North Dakota Association, Preliminary Estimate, North Dakota Chamber of Commerce, Fargo, North Dakota, September 1984.

[2]Wirth Associates and Mountain West Associates, Technical Report North Dakota State Parks System Plan, Billings, Montana, 1980.

legislature created the North Dakota Park Service (renamed in 1977 to North Dakota Parks and Recreation Department) which became responsible for their operations. Fifteen state parks are now in operation in North Dakota (Figure 1). Doyle Memorial and Streeter Memorial State Parks are under the auspices of Beaver Lake State Park, while Butte View and Sully Creek are under Fort Lincoln State Park supervision. Little Missouri Bay is under the auspices of Lake Sakakawea State Park, and the Devils Lake access area is supervised by Turtle River State Park.

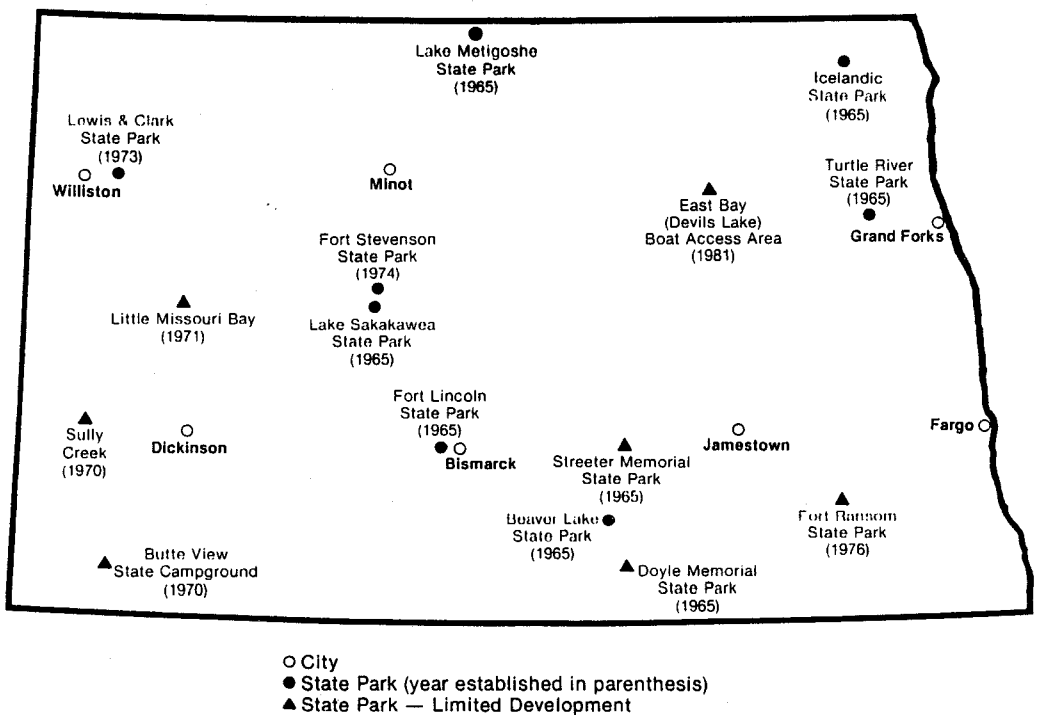

Figure 1. North Dakota State Parks, 1983

Purpose of Study

The purpose of this study was to estimate the impact state parks have on North Dakota's economy. Economic activities attributable to the existence of the park system include employment, personal income, business volume, and several sources of tax revenues such as sales and use, personal income, and corporate income taxes. Data and information for the study were supplied by the North Dakota Parks and Recreation Department and state park visitors. Collection of data was initiated in July 1983 and completed in July 1984.

Direct economic impacts of the state park system include employment and income for state residents. Economic impacts also result from the park system's purchase of goods and services from other segments of North Dakota's economy.

Additionally, secondary (indirect and induced) economic impacts result when the park system's expenditures are recirculated within the local economy in the form of wages and salaries and purchases of goods and services. Secondary impacts as a result of expenditures by the park system and by the parks' visitors also include increased employment and income for North Dakotans. In addition, the state receives tax revenue through the indirect and induced rounds of respending. Thus, the total contribution of North Dakota's state parks to the state's economy is the combination of both direct and secondary (indirect and induced) expenditures by the park system and parks' visitors.[3]

Analytical Procedures

Economic impacts of North Dakota's state parks were analyzed on a statewide basis for fiscal year 1984 (July 1, 1983 to June 30, 1984). Impacts were divided into two categories: the direct and secondary impacts of park operation-and-maintenance expenditure patterns and the direct and secondary impacts of park visitors' expenditures.

Expenditures, total business activity, personal income, taxes, and employment were calculated to estimate the total economic contribution of the state park system to North Dakota's economy. A combination of primary and secondary data was utilized to address the various objectives.

First, fiscal 1984 employment, payroll, and expenditure data by park were obtained from the North Dakota Parks and Recreation Department. Expenditure data by specific economic sector were collected to allow detailed estimation of economic impacts.

Second, state park expenditure data were applied to the North Dakota Input-Output Model (Appendix B) to estimate direct and secondary economic impacts in North Dakota. These impacts include increased levels of employment, personal income, and business activity.

Third, tax revenue collections were estimated from the results of applying expenditures to the North Dakota Input-Output Model. Sales and use, personal income, and corporate income tax collections as a secondary result of park expenditures were estimated using tax revenue estimating equations (Appendix B).

Fourth, state park visitors were surveyed on selected days throughout the fiscal year to obtain their expenditure patterns for the trip while at the

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[3]Actual impacts vary depending upon assumptions regarding with and without activity and expenditures, sources of operation expenditures, and perspective of the policymaker. A regional perspective is assumed throughout this study. That is, all visitor expenditures are assumed to be import substitutions or regional exports. Additionally, operation-and-maintenance expenditures are assumed to be new money to the regions. Appendix A presents a model to illustrate these assumptions.

state park and for the entire trip in North Dakota (Appendix C).[4] Detailed expenditure patterns for each visiting party were requested so that expenditures could be categorized into sectors corresponding with the North Dakota Input-Output Model delineations.

State park visitors were surveyed on 22 randomly selected days throughout fiscal 1984 (Table 2). A survey instrument was given to each vehicle operator entering the park on the survey day. Park visitors were asked to complete the questionnaire at their leisure and return it when exiting the park. Park name and date included on each survey instrument allowed for statistical analysis by park and/or date.

TABLE 2. NORTH DAKOTA STATE PARK SURVEY DATES,[a] BY SEASON, FISCAL 1984

Summer	Winter
May 17	October 26
May 25	October 31
May 29	November 3
June 11	November 14
June 29	November 24
July 19	December 4
July 23	December 10
August 8	January 10
August 9	March 4
August 15	April 24
August 31	
September 22	

[a]Dates were selected using a random number generator linked to a Julian calendar.

Fifth, fiscal 1984 visitation estimates were obtained from the North Dakota Parks and Recreation Department (Table 3). Only a small proportion of park visitors were surveyed each month (Table 4). Statistically insufficient observations precluded using statistical methods for obtaining disaggregated estimates.

Expenditure patterns of the survey's respondents were divided by the total number of visitors in the party to estimate expenditure patterns per individual. Individual expenditure patterns were then multiplied by the total number of park visitors to obtain total visitors' expenditure patterns.

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[4]Additional participatory characteristics of park visitors were collected and are shown in Appendix D.

TABLE 3. NORTH DAKOTA STATE PARK VISITATION ESTIMATES, BY PARK AND MONTH, FISCAL 1984

State Park	Month						
	July	August	September	October through April[a]	May	June	Total
	number						
Beaver Lake, Doyle, & Streeter	9,111	5,112	862	2,640	6,245	7,270	31,240
Fort Lincoln, Butte View, & Sully Creek	33,432	30,001	15,251	21,805	34,184	25,488	160,161
Fort Stevenson	48,635	25,644	10,127	22,064	4,828	17,530	128,828
Fort Ransom	3,412	2,780	3,019	1,764	1,898	2,439	15,312
Icelandic	35,126	20,132	6,244	17,056	8,840	13,308	100,706
Lake Metigoshe	35,320	22,752	9,927	21,616	4,686	15,742	110,043
Lake Sakakawea & Little Missouri Bay	56,033	39,212	18,637	31,810	10,642	30,216	186,550
Lewis & Clark	37,089	19,089	7,366	9,735	2,221	15,414	90,914
Turtle River & Devils Lake	31,413	23,750	14,190	18,161	15,814	27,446	130,774
Total	289,571	188,472	85,623	146,651	89,358	154,853	954,528

[a]Actual visitation figures were not available for this time period. Therefore, North Dakota State Parks and Recreation Department estimates were used.

SOURCE: North Dakota Parks and Recreation Department, Bismarck, North Dakota.

Sixth, total state park visitors' expenditure patterns by park were applied to the North Dakota Input-Output Model to estimate direct and secondary impacts on levels of employment, personal income, and business activity.

Seventh, tax revenues accruing to the state as a result of direct and secondary impacts of park visitors were estimated.

Finally, the total contribution of North Dakota's state parks to the state's economy was estimated. The contribution includes increased levels of

TABLE 4. NORTH DAKOTA STATE PARK SURVEY RESPONDENTS, BY PARK AND MONTH, FISCAL 1984

State Park	Month						
	July	August	September	October through April	May	June	Total
	number of surveys collected						
Beaver Lake, Doyle, & Streeter	17	17	0	0	3	5	42
Fort Lincoln, Butte View, & Sully Creek	49	30	0	8	3	33	123
Fort Stevenson	53	74	0	2	12	7	148
Fort Ransom	4	1	0	15	8	18	46
Icelandic	106	36	0	20	9	20	191
Lake Metigoshe	17	36	2	10	5	14	84
Lake Sakakawea & Little Missouri Bay	61	80	5	6	22	11	185
Lewis & Clark	35	49	2	5	16	35	142
Turtle River & Devils Lake	144	95	11	33	18	40	341
Total	486	418	20	99	96	183	1,302

employment, personal income, business activity, and tax revenue as a result of direct and secondary expenditures.

Economic Impact

A two-part economic impact analysis of North Dakota's state parks was performed to determine the economic contributions to the state; expenditures for state park operation and maintenance and by state park visitors were analyzed.

State Park Operation-and-Maintenance Expenditure Analysis

State park operation-and-maintenance expenditures occurred in several sectors of the economy (Table 5). Households (wages and salaries), construction, and retail trade were the sectors with the largest state park expenditures, accounting for over 90 percent of the total. State park operation-and-maintenance expenditures totalled $2,753,448 in fiscal 1984, compared to the previous five-year average of $2,102,529. Headquarter operations accounted for over 38 percent of total park expenditures.

Applying state park operation-and-maintenance expenditures to the interdependence coefficients (multipliers) yielded total business activity for all sectors. Personal income, retail sales, business activity for all business sectors, and total business activity were estimated for each state park for fiscal 1984 (Table 6). These values include both the first-round effect (Table 5) and the secondary impact. Operation-and-maintenance expenditures by the state park system resulted in personal income of over $2.6 million and retail sales over $2 million. Over $7 million in total business activity occurred as a result of the original $2,753,448 in state park operation-and-maintenance expenditures. The multiplier effect for these expenditures was 2.65, meaning that each dollar spent for state park operation and maintenance generated $2.65--the original dollar plus $1.65 in additional business activity.

Personal income, retail sales, and business activity of all business sectors were used to estimate income tax collections resulting from state park operation-and-maintenance expenditures (Table 7). Personal income tax estimates included both direct and secondary effects; that is, income taxes attributable to wages and salaries for state park employees plus income taxes resulting from the multiplier effect. Total tax collections accruing to the state were $86,978 as a result of state park operation-and-maintenance expenditures. Sales and use tax collections of over $50,000 (58 percent of the total) were the largest tax collection category, followed by personal income taxes of $23,700 (27 percent) and corporate income taxes of $13,000 (15 percent).

In addition to tax revenues, operation-and-maintenance expenditures create direct and secondary employment opportunities. Direct employment figures were obtained from the North Dakota Parks and Recreation Department, and secondary employment was estimated by using productivity ratios, the number of dollars of business activity needed to support one worker for each respective sector (see Appendix B for a detailed explanation). Direct employment in state parks, in full-time equivalents, was 68.5 for fiscal 1984 (Table 8). Secondary employment, resulting from additional rounds of spending, was estimated to be 106 people for the same period.

State Park Visitors' Expenditure Analysis

Economic impacts resulting from expenditures by North Dakota state park visitors were estimated in a manner similar to park expenditures. Ten cost categories (i.e., food, lodging, etc.) were identified by survey respondents (Table 9). Although park visitors are charged a fee when entering state parks, entrance fees were not included in the economic impact study because of assumptions underlying the input-output model. Payments to governmental

TABLE 5. ESTIMATED NORTH DAKOTA STATE PARK OPERATION-AND-MAINTENANCE EXPENDITURES, BY ECONOMIC SECTOR AND PARK, FISCAL YEAR 1984

State Park	Expenditures by Sector							
	Construction	Transportation	Communication & Public Utilities	Retail Trade	Finance, Insurance, Real Estate	Business & Personal Service	Household	Total
	dollars							
Beaver Lake, Doyle, & Streeter	---	540	2,926	11,394	1,260	664	36,368	53,152
Fort Lincoln, Butte View, & Sully Creek	147,000	945	14,715	28,120	2,498	1,745	102,983	298,006
Fort Stevenson	215,000	900	9,237	19,405	1,620	1,166	83,101	330,429
Fort Ransom	---	540	3,263	10,891	1,215	754	28,246	44,909
Icelandic	35,000	990	8,798	19,283	2,295	1,166	83,968	151,500
Lake Metigoshe	30,000	990	13,388	27,647	1,845	1,919	101,460	177,249
Lake Sakakawea & Little Missouri Bay	45,000	990	12,634	26,832	3,060	1,745	103,533	193,794
Lewis & Clark	152,417	990	7,729	17,283	1,575	1,166	77,221	258,381
Turtle River & Devils Lake	36,200	1,035	11,475	27,317	3,060	1,919	113,070	194,076
Headquarters	116,500	20,460	18,926	447,337	1,755	101,718	345,256	1,051,952
Total	777,117	28,380	103,041	635,509	20,183	113,962	1,075,206	2,753,448

SOURCE: North Dakota Parks and Recreation Department, Bismarck, North Dakota.

TABLE 6. ESTIMATED PERSONAL INCOME, RETAIL SALES, BUSINESS ACTIVITY OF ALL BUSINESS (NONAGRICULTURAL) SECTORS, AND TOTAL BUSINESS ACTIVITY, RESULTING FROM STATE PARK SYSTEM OPERATION-AND-MAINTENANCE EXPENDITURES, BY PARK, FISCAL YEAR 1984

State Park	Personal Income	Retail Sales	Business Activity of All Business Sectors[a]	Total Business Activity
	----------	----------	dollars ----------	----------
Beaver Lake, Doyle, & Streeter	65,794	44,303	76,052	151,981
Fort Lincoln, Butte View, & Sully Creek	277,418	182,118	472,027	792,684
Fort Stevenson	278,583	180,850	537,121	859,196
Fort Ransom	53,261	37,772	65,219	126,949
Icelandic	170,811	107,856	226,771	423,403
Lake Metigoshe	201,942	131,501	262,841	495,686
Lake Sakakawea & Little Missouri Bay	214,702	138,575	291,403	538,903
Lewis & Clark	229,310	147,477	414,847	679,679
Turtle River & Devils Lake	223,583	142,289	287,781	545,149
Headquarters	893,469	941,102	1,609,220	2,678,768
Total	2,608,873	2,053,843	4,243,282	7,292,398

[a]Includes all sectors except agriculture (crops and livestock), households, and government.

agencies are considered a transfer payment and, therefore, do not result in a multiplier effect. Total annual, daily, camping, and honor vehicle entrance fees numbered 4,357; 69,005; 34,321; and 7,011, respectively, for fiscal 1984.

Average personal expenditures per trip by state park visitors ranged from a high of $50.83 at Lake Sakakawea and Little Missouri Bay State Parks to a low of $16.12 at Fort Ransom State Park (Table 9). The average per trip expenditure by each person was $29.62 for all parks.

TABLE 7. ESTIMATED TAX REVENUES RESULTING FROM NORTH DAKOTA STATE PARK OPERATION-AND-MAINTENANCE EXPENDITURES, FISCAL YEAR 1984

State Park	Sales and Use Tax[a]	Personal Income Tax	Corporate Income Tax	Total
	dollars			
Beaver Lake, Doyle, & Streeter	1,165	599	233	1,997
Fort Lincoln, Butte View, & Sully Creek	5,452	2,525	1,449	9,426
Fort Stevenson	5,715	2,535	1,649	9,899
Fort Ransom	952	485	200	1,637
Icelandic	3,135	1,554	696	5,385
Lake Metigoshe	3,676	1,838	807	6,321
Lake Sakakawea & Little Missouri Bay	3,956	1,954	895	6,805
Lewis & Clark	4,609	2,087	1,274	7,970
Turtle River & Devils Lake	4,070	2,035	883	6,988
Headquarters	17,479	8,131	4,940	30,550
Total	50,209	23,743	13,026	86,978

[a]Includes only tax assessments on nonpark expenditures to the retail trade sector as parks do not pay sales and use tax. Taxable retail sales are total retail sales (Table 6) less park operation and maintenance expenditures to the retail trade sector (Table 5).

Itemized cost categories were aggregated into appropriate sector delineations corresponding to those in the North Dakota Input-Output Model (Table 10), allowing for estimation of the indirect and induced effects of state park visitors' expenditures. Thus, state park visitors' expenditures were aggregated into two sectors--retail trade and business and personal services (Table 11). Nearly 80 percent ($23.39) of the total per person per trip expenditures by state park visitors was to the retail trade sector with the remaining ($6.23) to the business and personal services sector.

TABLE 8. ESTIMATED DIRECT AND SECONDARY EMPLOYMENT ATTRIBUTABLE TO NORTH DAKOTA STATE PARK OPERATION-AND-MAINTENANCE EXPENDITURES, FISCAL YEAR 1984

State Park	Direct Employment[a]	Secondary Employment
Beaver Lake, Doyle, & Streeter	3.75	--
Fort Lincoln, Butte View, & Sully Creek	7.00	12
Fort Stevenson	6.25	14
Fort Ransom	2.75	--
Icelandic	6.25	4
Lake Metigoshe	6.50	4
Lake Sakakawea & Little Missouri Bay	6.50	6
Lewis & Clark	4.50	11
Turtle River & Devils Lake	7.50	5
Headquarters	17.50	50
Total	68.50	106

[a]Includes part-time employees. Part-time personnel are reported in full-time equivalents. Obtained from the North Dakota Parks and Recreation Department.

Visitor expenditures per person (Table 11) were multiplied by the number of park visitors per year (Table 3) to obtain total expenditures for each park by economic sector. State park visitors spent an estimated total of nearly $32 million in North Dakota for fiscal 1984 (Table 12). Over $25 million was spent in the retail trade sector by state park visitors. Over $9 million was spent by individuals visiting Lake Sakakawea and Little Missouri Bay State Parks, followed by over $5 million for those visiting Lake Metigoshe State Park.

Applying interdependence coefficients to expenditures (Appendix Table B2) yielded total business activity for all sectors of the economy. (Business activity of the household and retail trade sectors are personal income and

TABLE 9. AVERAGE NORTH DAKOTA STATE PARK VISITORS' EXPENDITURES, PER PERSON PER TRIP, BY PARK, FISCAL 1984

Expenditure Item	State Park									
	Beaver Lake, Doyle, & Streeter	Fort Lincoln, Butte View, & Sully Creek	Fort Stevenson	Fort Ransom	Icelandic	Lake Metigoshe	Lake Sakakawea & Little Missouri Bay	Lewis & Clark	Turtle River & Devils Lake	Average
	dollars									
Food and Beverages	10.62	12.74	9.98	7.99	11.45	20.21	18.08	9.44	5.85	11.20
Lodging	--	1.46	.37	--	.50	3.87	1.26	.71	.80	.99
Transportation	7.63	10.53	9.64	6.64	10.13	14.47	19.44	9.17	6.25	10.48
Camera, Film, & Developing	.39	.77	1.02	1.18	.99	1.71	1.41	.79	.48	.92
Boat Launching Fees	--	--	.29	--	.09	.23	.14	.16	--	.10
Bait	.46	.41	.73	--	.18	.10	1.10	.59	.01	.39
Campsite Fees	3.73	6.16	2.90	.30	5.71	7.08	8.78	3.60	2.81	4.76
Equipment Rental	--	.12	1.72	--	.05	.37	.52	.30	.12	.37
Guiding Fees	--	.01	--	.01	--	--	.04	--	--	.01
Other	.06	.76	.14	--	.70	.22	.06	.22	.63	.40
Total	22.89	32.96	26.79	16.12	29.80	48.26	50.83	24.98	16.95	29.62

TABLE 10. STATE PARK VISITORS' COST CATEGORIES AND CORRESPONDING SECTOR DELINEATION

Cost Category	Sector Delineation
Food and Beverages	Retail Trade
Lodging	Business & Personal Services
Transportation	Retail Trade
Camera, Film, and Developing	Retail Trade
Boat Launching Fees	Business & Personal Services
Bait	Retail Trade
Campsite Fees	Business & Personal Services
Equipment Rental	Business & Personal Services
Guiding Fees	Business & Personal Services
Other	Retail Trade

TABLE 11. ESTIMATED EXPENDITURES BY NORTH DAKOTA STATE PARK VISITORS, PER PERSON PER TRIP, BY ECONOMIC SECTOR AND PARK, FISCAL 1984

State Park	Sector		
	Retail Trade	Business & Personal Services	Total
	dollars		
Beaver Lake, Doyle, & Streeter	19.16	3.73	22.89
Fort Lincoln, Butte View, & Sully Creek	25.21	7.75	32.96
Fort Stevenson	21.51	5.28	26.79
Fort Ransom	15.81	.31	16.12
Icelandic	23.45	6.35	29.80
Lake Metigoshe	36.71	11.55	48.26
Lake Sakakawea & Little Missouri Bay	40.09	10.74	50.83
Lewis & Clark	20.21	4.77	24.98
Turtle River & Devils Lake	13.22	3.73	16.95
Average	23.39	6.23	29.62

TABLE 12. ESTIMATED TOTAL EXPENDITURES BY NORTH DAKOTA STATE PARK VISITORS, BY ECONOMIC SECTOR AND PARK, FISCAL 1984

State Park	Sector		Total
	Retail Trade	Business & Personal Services	
	dollars		
Beaver Lake, Doyle, & Streeter	598,558	116,525	715,083
Fort Lincoln, Butte View, & Sully Creek	4,037,659	1,241,248	5,278,907
Fort Stevenson	2,771,090	680,212	3,451,302
Fort Ransom	242,083	4,747	246,830
Icelandic	2,361,556	639,483	3,001,039
Lake Metigoshe	4,039,679	1,270,997	5,310,676
Lake Sakakawea & Little Missouri Bay	7,478,790	2,003,547	9,482,337
Lewis & Clark	1,837,372	433,660	2,271,032
Turtle River & Devils Lake	1,728,832	487,787	2,216,619
Total	25,095,619	6,878,206	31,973,825

retail sales, respectively.) Total business activity generated by park visitors was estimated at over $71 million in fiscal 1984 (Table 13) as a result of the original $32 million in visitors' expenditures. The multiplier effect of park visitors' expenditures was 2.22. In other words, every dollar spent by park visitors generated $2.22--the original dollar plus $1.22 in additional business activity. Total personal income and retail sales created as a result of park visitors' expenditures were $15 million and $35 million, respectively.

Income tax collections resulting from state park visitors' expenditures were based on personal income, retail sales, and business activity of all business sectors (Table 14). Total tax collections as a result of park visitor expenditures were $1,535,360. Over $1.2 million (81 percent) in sales and use taxes were collected, $157,000 (10 percent) in corporate income taxes, and $137,000 (9 percent) in personal income taxes.

TABLE 13. ESTIMATED PERSONAL INCOME, RETAIL SALES, BUSINESS ACTIVITY OF ALL BUSINESS (NONAGRICULTURAL) SECTORS, AND TOTAL BUSINESS ACTIVITY, RESULTING FROM STATE PARK VISITORS' EXPENDITURES, BY PARK, NORTH DAKOTA, FISCAL 1984

State Park	Personal Income	Retail Sales	Business Activity of All Business Sectors[a]	Total Business Activity
	---dollars---			
Beaver Lake, Doyle, & Streeter	326,000	816,000	1,130,000	1,567,000
Fort Lincoln, Butte View, & Sully Creek	2,518,000	5,704,000	8,468,000	11,795,000
Fort Stevenson	1,605,000	3,837,000	5,491,000	7,628,000
Fort Ransom	102,000	310,000	377,000	519,000
Icelandic	1,411,000	3,297,000	4,791,000	6,664,000
Lake Metigoshe	2,540,000	5,720,000	8,529,000	11,881,000
Lake Sakakawea & Little Missouri Bay	4,452,000	10,431,000	15,135,000	21,046,000
Lewis & Clark	1,052,000	2,535,000	3,609,000	5,012,000
Turtle River & Devils Lake	1,046,000	2,423,000	3,546,000	4,933,000
Total	15,052,000	35,073,000	51,076,000	71,045,000

[a]Includes all sectors except agriculture (crops and livestock), households, and government. This column is used only to estimate state corporate income tax collections.

State park visitor expenditures also create secondary employment opportunities. Secondary employment was determined by using productivity ratios, and result from the total dollars of business activity generated by successive rounds of respending of the original state park visitors' expenditures. Secondary employment was estimated at 1,647 persons for fiscal 1984 (Table 15). These secondary jobs occurred across many sectors of the North Dakota economy with retail trade, business and personal service, and government sectors realizing employment of 510, 668, and 175, respectively, as a result.

TABLE 14. ESTIMATED TAX REVENUES RESULTING FROM NORTH DAKOTA STATE PARK VISITORS' EXPENDITURES, BY PARK, FISCAL 1984

State Park	Sales & Use Tax	Personal Income Tax	Corporate Income Tax	Total
	----------dollars----------			
Beaver Lake, Doyle, & Streeter	28,886	2,967	3,469	35,322
Fort Lincoln, Butte View, & Sully Creek	201,922	22,914	25,997	250,833
Fort Stevenson	135,830	14,606	16,857	167,293
Fort Ransom	10,974	928	1,157	13,059
Icelandic	116,714	12,840	14,708	144,262
Lake Metigoshe	202,488	23,114	26,184	251,786
Lake Sakakawea & Little Missouri Bay	369,257	40,513	46,464	456,234
Lewis & Clark	89,739	9,573	11,080	110,392
Turtle River & Devils Lake	85,774	9,519	10,886	106,179
Total	1,241,584	136,974	156,802	1,535,360

Summary and Conclusions

Economic impacts resulting from North Dakota's state parks were analyzed separately for two categories: state park operation-and-maintenance expenditures and state park visitors' expenditures. State park expenditure impacts are those which occur as a result of operation-and-maintenance expenditures by the North Dakota Parks and Recreation Department, while state park visitors' expenditure impacts are the result of expenditures by state park visitors in transit and while staying at the park. Although impacts from these two categories were analyzed separately, the impacts are additive from a regional perspective. Economic contributions accruing to North Dakota were in the form of increased levels of business activity, personal income, tax collections, and employment.

Total expenditures by state parks and state park visitors were $35 million in fiscal 1984 (Table 16). Over $78 million in total business activity was generated in North Dakota as a result of the state parks in

TABLE 15. ESTIMATED SECONDARY EMPLOYMENT FOR SELECTED ECONOMIC SECTORS, RESULTING FROM STATE PARK VISITORS' EXPENDITURES, BY PARK, NORTH DAKOTA, FISCAL 1984

State Park	Sector: Retail Trade	Bus & Pers Services	Professional & Social Services	Government	Other[a]	Total
Beaver Lake, Doyle, & Streeter	11	11	2	3	0	27
Fort Lincoln, Butte View, & Sully Creek	83	120	17	29	35	284
Fort Stevenson	56	67	11	19	20	173
Fort Ransom	4	0	0	1	0	5
Icelandic	48	62	9	16	20	155
Lake Metigoshe	83	123	17	30	35	288
Lake Sakakawea & Little Missouri Bay	153	196	30	52	62	493
Lewis & Clark	37	42	7	12	11	109
Turtle River & Devils Lake	35	47	7	12	12	113
Total	510	668	100	175	195	1,647

[a]Includes agriculture (livestock and crops), nonmetallic mining, construction, transportation, communication and public utilities, wholesale trade, finance-insurance-real estate, and the four energy sectors.

fiscal 1984. State parks were responsible for personal incomes of nearly $18 million and retail sales of over $37 million. The state government realized tax revenue collections in excess of $1.6 million. Total employment (direct and secondary) attributable to the state parks was 1,821.5 persons in fiscal 1984.

North Dakota state parks are an important segment of the state's economy. The state parks not only play an important role in the creation of employment, income, and tax collections but also make diverse economic contributions that affect numerous sectors of North Dakota's economy. However, some park visitor activity may merely replace other activity within

TABLE 16. TOTAL ECONOMIC IMPACTS ACCRUING TO THE STATE OF NORTH DAKOTA AS A RESULT OF STATE PARK OPERATION-AND-MAINTENANCE, AND STATE PARK VISITORS' EXPENDITURES, BY PARK, NORTH DAKOTA, FISCAL 1984

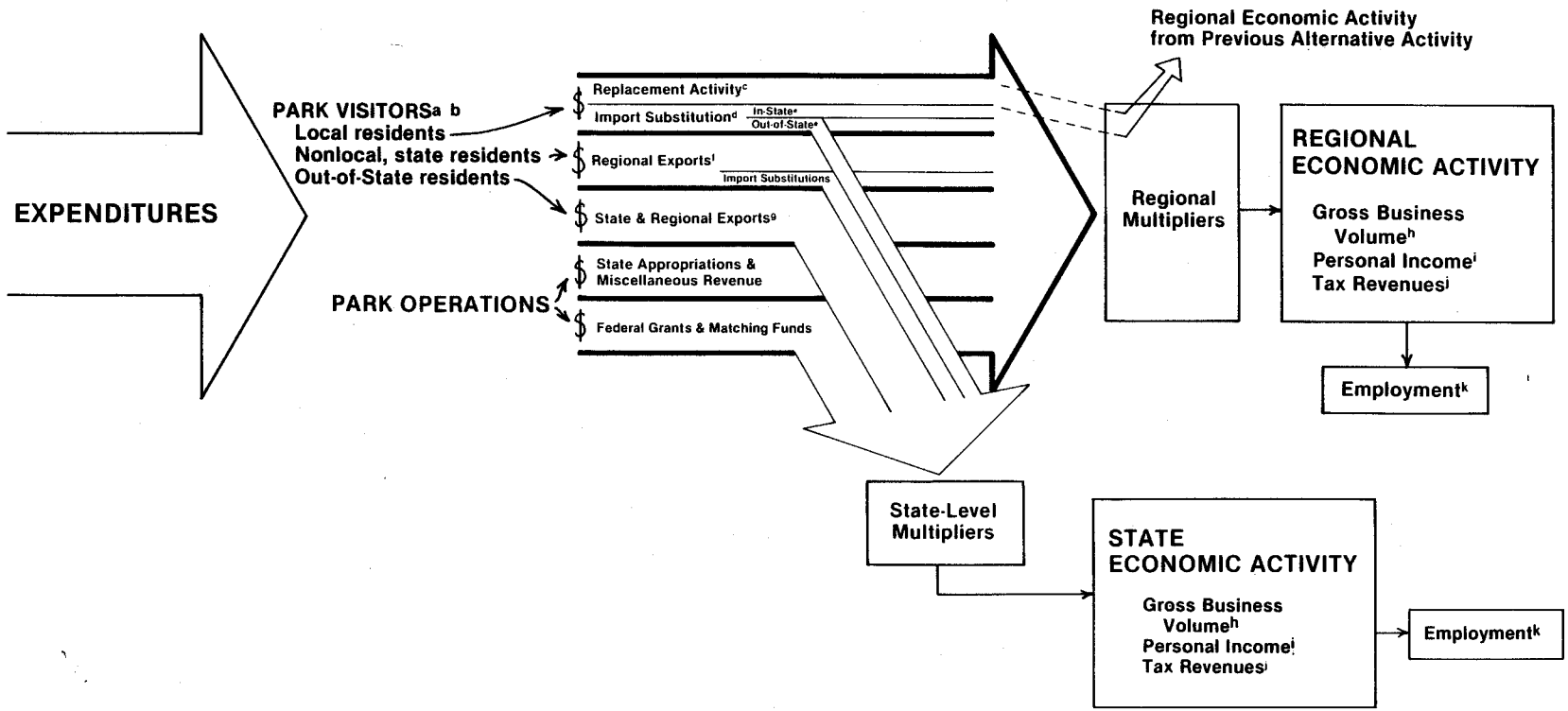
Item	State Park										
	Beaver Lake, Doyle, & Streeter	Fort Lincoln, Butte View, & Sully Creek	Fort Stevenson	Fort Ransom	Icelandic	Lake Metigoshe	Lake Sakakawea & Little Missouri Bay	Lewis & Clark	Turtle River & Devils Lake	Headquarters	Total
Expenditures (000 dollars)	768	5,577	3,782	292	3,153	5,488	9,676	2,529	2,411	1,052	34,728
Personal Income (000 dollars)	392	2,795	1,884	155	1,582	2,742	4,667	1,281	1,270	893	17,661
Retail Sales (000 dollars)	860	5,886	4,018	348	3,405	5,852	10,570	2,682	2,565	941	37,127
Business Activity (000 dollars)											
Business Sectors	1,206	8,940	6,028	442	5,018	8,792	15,426	4,024	3,834	1,609	55,319
All Sectors	1,719	12,588	8,487	646	7,087	12,377	21,585	5,692	5,478	2,679	78,338
Tax Collections (000 dollars)											
Sales and Use	30	207	142	12	120	206	373	94	90	17	1,291
Personal Income	4	25	17	1	16	25	42	12	12	8	162
Corporate Income	4	27	19	1	15	27	47	12	12	5	169
Total	38	259	178	14	151	258	462	118	114	30	1,622
Employment											
Direct	3.75	7	6.25	2.75	6.25	6.5	6.5	4.5	7.5	17.5	62.5
Secondary	27	296	187	5	159	292	499	120	118	50	1,753
Total	30.75	303	193.25	7.75	165.25	298.5	505.5	124.5	125.5	67.5	1,821.5

the region or state. In this instance, the economic activity is not new to the state but is an indicator of the impact of the state park system. Additionally, state appropriations, while new to a region, are not new income to the state and thus do not represent additional economic activity at the state level.

Appendix A

IMPACT AND FLOWS OF STATE PARK VISITORS' EXPENDITURE PATTERNS

REGIONAL ECONOMIC ACTIVITY MODEL (REAM) State Parks



[a]USER VALUES are a separate issue. They represent the value of the recreational experience to the user, are measurable, but do not necessarily contribute to economic activity. They contribute to user satisfaction and well-being, and are thus important to society and can be used as a measure of project benefits if alternative uses of project resources also include similar estimates of consumers' surplus.

[b]See the accompanying figure for examples of the three visitor types.

[c]REPLACEMENT ACTIVITY — Park users merely shift expenditures from an alternative activity (e.g. bowling) to this park.

[d]IMPORT SUBSTITUTION — The park is a substitute for importing alternative activity from outside the region or from outside the state.

[e]IN-STATE IMPORT SUBSTITUTIONS — substituting a park activity within the region for one outside the region merely shifts activity into the region, it does not change state level activity. Whereas, substituting a park activity within the region for one out-of-state shifts activity into both the state and region.

[f]REGIONAL EXPORTS — All park activity within a region by nonlocal visitors represents an export of the region. But, only the part that is an import substitute for out-of-state activity is additional activity to the state.

[g]All activity by out-of-state residents is added activity to both the region and state. Without the park opportunity, nonresidents would have sbustituted an out-of-state activity.

[h]GROSS BUSINESS VOLUME — A measure of total business volume, tracing a purchase/sale through the regional economy.

[i]PERSONAL INCOME — The component of gross business volume that goes to households.

[j]TAX REVENUES — The component of gross business volume that goes to government jurisdictions.

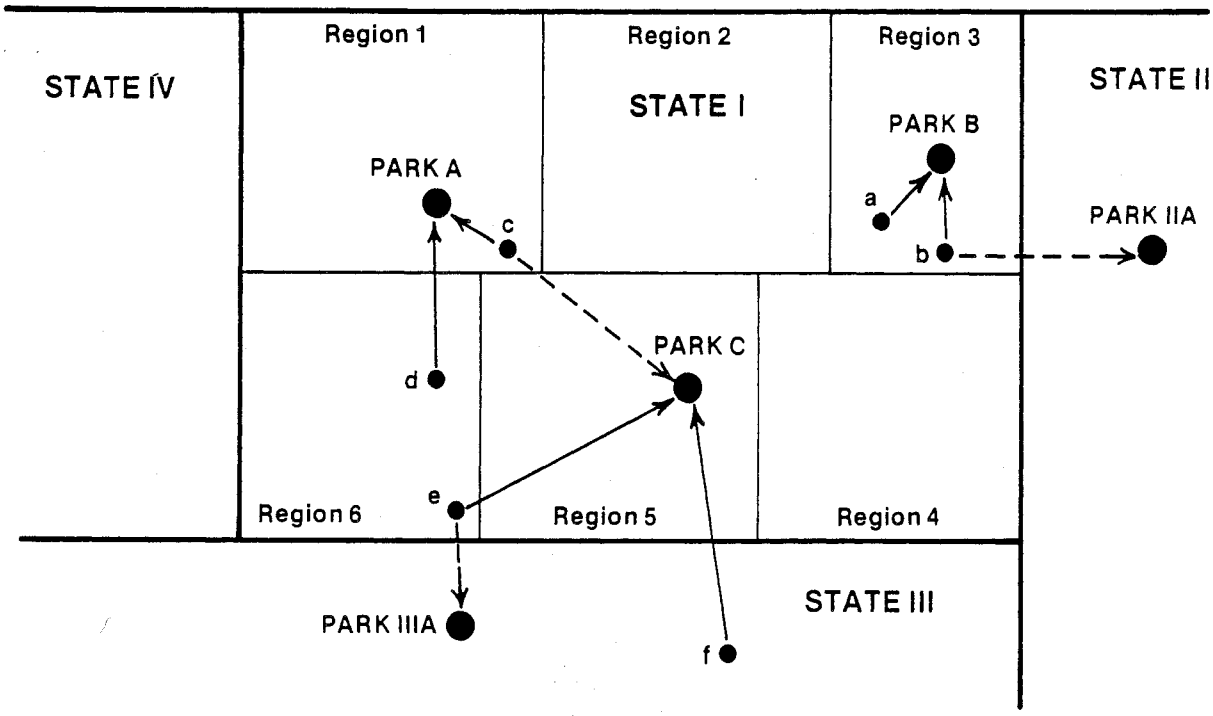
[k]EMPLOYMENT — The number of jobs supported as a result of the econmic activity.

Park Visitation Scenarios for REAM

Individual a goes to a park B within region 3 instead of another activity in region 3 — a replacement activity which only adds to regional economic activity by the net increase over the former activity. No significant change in state-level REA.

Individual c visits park A within region 1 instead of park C in neighboring region 5. This represents regional import substitution. The activity is additional to region 1 but no gain to state, and a loss to region 5.

Individual b visits park B within region 3 instead of park IIA in neighboring state. This reprsents regional and state import substitution. The activity is new to both region 3 and the state.



Individual d visits park A in neighboring region 1. This is additional activity to Region 1, no activity change to the state, and a loss to Region 6.

Individual e visits park C in neighboring region is an import substitute for visiting park IIIA in neighboring state. This represents regional and state imports substitution. The activity is new to both Region 5 and the state.

Individual f from outside the state visits park C in Region 5. This represents regional and state exports from his home state, imports to state I, and additional activity to both region 5 and the state.

Appendix B

NORTH DAKOTA INPUT-OUTPUT MODEL AND TAX REVENUE ESTIMATING EQUATIONS

The Input-Output Model

Economic impact analysis requires choosing a technique for estimating the indirect and induced effects of an industry or a new project on economic activity, employment, and income. The alternatives considered included the economic base approach, econometric estimation based on time-series or cross-sectional data, and input-output analysis. Input-output (I-O) analysis was selected as the economic impact assessment framework for the North Dakota Parks and Recreation Department study. The primary reasons for this were that, compared to the economic base approach, I-O provides considerably more detailed impact estimates (i.e., business volume and employment by sector) and that I-O allows the analyst to take explicit account of differences in wage rates and local input purchasing patterns in evaluating the impacts of various development proposals.[1] Econometric techniques were thought to be inappropriate for this application because data were of insufficient detail for such analyses.[2]

Input-output analysis is a technique for tabulating and describing the linkages or interdependencies between various industrial groups within an economy. The economy considered may be the national economy or an economy as small as that of a multicounty area served by one of the state's major retail trade centers. The North Dakota economy is divided into 17 industrial groups referred to as sectors of the economy. The sector delineation and corresponding SIC codes are presented in Appendix Table B1.

The input-output analysis used in this model assumes that economic activity in a region is dependent upon the basic industries that exist in an area, referred to as its economic base. The economic base is largely a region's export base, i.e., those industries (or "basic" sectors) that earn income from outside the area. These activities in North Dakota consist of livestock and crop production, manufacturing, mining, tourism in the area, and federal government outlays in the area. The remaining economic activities are the trade and service sectors, which exist to provide the inputs required by other sectors in the area.

The North Dakota input-output model has three features which merit special comment. First, the model is closed with respect to households. In other words, households are included in the model as a producing and a consuming sector. Second, the total gross business volume of trade sectors was used (both for expenditures and receipts in the transactions table) rather than value added by those sectors. This procedure results in larger activity

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[1]For additional discussion of the comparative capabilities of the input-output and economic base approaches, see Lewis, W. C., "Export Base Theory and Multiplier Estimation: A Critique," The Annals of Regional Science, Vol. 10, No. 2, 1976, pp. 68-70. Richardson, H. W., Input-Output and Regional Economics, Halstead Press, New York, 1972.

[2]For a detailed discussion of the application of econometric techniques to regional analysis, see Glickman, N. J., Econometric Analysis of Regional Systems: Exploration of Model-Building and Policy Analysis, Academic Press, New York, 1977.

APPENDIX TABLE B1. ECONOMIC SECTORS OF THE NORTH DAKOTA INPUT-OUTPUT MODEL AND STANDARD INDUSTRIAL CLASSIFICATION CODE OF EACH

	Economic Sector	SIC Code[a]
1.	Ag., Livestock	Group 013 - Livestock
2.	Ag., Crops	All of major group 01 - agricultural production, except group 013 - livestock
3.	Sand & Gravel Mining	Major group 14 - mining and quarrying of nonmetallic minerals, except fuels
4.	Construction	Division C - contract construction (major groups 15, 16, and 17)
5.	Transportation	All division E - transportation, communications, electric, gas, and sanitary services, except major groups 48 and 49
6.	Communications & Public Utilities	Major group 48 - communications and major group 49 - electric, gas, and sanitary services, except industry no. 4911
7.	Ag. Processing & Miscellaneous Manufacturing	Major group 50 - wholesale trade, and major group 20 - food and kindred products manufacturing
8.	Retail Trade	All of division F - wholesale and retail trade, except major group 50 - wholesale trade
9.	Finance, Insurance, and Real Estate	Division G - finance, insurance, and real estate
10.	Business and Personal Service	All of division H - services, except major groups 80, 81, 82, 86, and 89
11.	Professional and Social Services	Major group 80 - medical and other health services, major group 8, legal services, major group 82 - educational services, major group 86 - nonprofit membership organizations, and major group 89 - miscellaneous services
12.	Households	Not applicable
13.	Government	Division I - government
14.	Coal Mining	Major group 12 - bituminous coal and lignite mining
15.	Electric Generating	Industry number 4911 - electric companies and systems
16.	Petroleum and Natural Gas Exploration and Extraction	Major group 13 - crude petroleum and natural gas
17.	Petroleum Refining	Major group 29 - petroleum refining and related industries

[a]Executive Office of the President/Bureau of the Budget, Standard Industrial Classification Manual, 1967, U.S. Government Printing Office, Washington, D.C., 1967.

levels for those sectors than would be obtained by conventional techniques, but this is offset by correspondingly larger levels of expenditures outside the region by those sectors for goods purchased for resale. The advantage of this procedure is that the results of the analysis are expressed in terms of gross business volumes of the respective sectors, which is usually more meaningful to most users. The third feature is all elements in the column of interdependence coefficients for the local government sector were assigned values of zero, except for a one (1.00) in the main diagonal. This was intended to reflect the fact that expenditures of local units of government are determined by the budgeting process of those units, rather than endogenously within the economic system.

Production by any sector requires the use of production inputs, such as materials, equipment, fuel, services, labor, etc., by that sector. These inputs are referred to as the direct requirements of that sector. Some of these inputs will be obtained from outside the region (imported), but many will be produced by and purchased from other sectors in the area economy. If so, these other sectors will require their own inputs from still other sectors, which in turn will require inputs from yet other sectors, and so on. These additional rounds of input requirements that are generated by production of the direct input requirements (of the initial sector) are known as the indirect requirements.

The total of the direct and indirect input requirements of each sector in an economy is measured by a set of coefficients that is known as the input-output interdependence coefficients. Each coefficient indicates the total (direct and indirect) input requirement that must be produced by the row sector per dollar of output for final demand by the column sector. Final demand is defined as output by a basic sector that is sold outside the region. Final demand consists of receipts from sales of livestock (Sector 1), crops (Sector 2), federal government outlays for construction, processed agricultural products and other manufacturing (Sector 7), tourist expenditures (Sectors 8 & 10), exported mine products (Sector 14), electricity exported (Sector 15), exports of crude oil (Sector 16), and exported refined petroleum products (Sector 17). For any of these basic sectors which produce for final demand, the sum of the values for that column indicates the multiplier effect in the region's economy resulting from a dollar's worth of sales outside the region by that sector. For example, if the column total of interdependence coefficients for the livestock producing sector is 4.49, $4.49 worth of output is required by all sectors in the economy in order that $1.00 worth of livestock be produced for final demand. Thus, it can be said that the output multiplier for the livestock producing sector is 4.49 or that the original dollar "turns over" about 4.5 times in the region.

If the level of output of any of the basic sectors were to increase, the level of output of other sectors also would be expected to increase. The amount of the increase in other sectors would be equal to the dollar amount of the increase in the basic sector's output times the respective interdependence coefficients in the column for the basic sector. For example, the effect of a $1 million increase in federal government outlays for construction in the region could be estimated from Column 4, Appendix Table B2. Livestock production in the region could be expected to increase by $30,000 (0.03 times $1 million); crop production by $10,000 (0.01 times $1 million); retail trade volume by $410,000 (0.41 times $1 million); personal income (the income of

APPENDIX TABLE B2. INPUT-OUTPUT INTERDEPENDENCE COEFFICIENTS, BASED ON TECHNICAL COEFFICIENTS FOR 17-SECTOR MODEL FOR NORTH DAKOTA

Sector	(1) Ag, Lvstk	(2) Ag, Crops	(3) Nonmetallic Mining	(4) Const	(5) Trans	(6) Comm & Pub Util	(7) Ag Proc & Misc Mfg	(8) Retail Trade	(9) FIRE
(1) Ag, Livestock	1.2072	0.0774	0.0445	0.0343	0.0455	0.0379	0.1911	0.0889	0.0617
(2) Ag, Crops	0.3938	1.0921	0.0174	0.0134	0.0178	0.0151	0.6488	0.0317	0.0368
(3) Nonmetallic Mining	0.0083	0.0068	1.0395	0.0302	0.0092	0.0043	0.0063	0.0024	0.0049
(4) Construction	0.0722	0.0794	0.0521	1.0501	0.0496	0.0653	0.0618	0.0347	0.0740
(5) Transportation	0.0151	0.0113	0.0284	0.0105	1.0079	0.0135	0.0128	0.0104	0.0120
(6) Comm & Public Util	0.0921	0.0836	0.1556	0.0604	0.0839	1.1006	0.0766	0.0529	0.1321
(7) Ag Proc & Misc Mfg	0.5730	0.1612	0.0272	0.0207	0.0277	0.0239	1.7401	0.0452	0.0704
(8) Retail Trade	0.7071	0.8130	0.5232	0.4100	0.5475	0.4317	0.6113	1.2734	0.6764
(9) Fin, Ins, Real Estate	0.1526	0.1677	0.1139	0.0837	0.1204	0.1128	0.1322	0.0577	1.1424
(10) Bus & Pers Services	0.0562	0.0684	0.0430	0.0287	0.0461	0.0374	0.0514	0.0194	0.0766
(11) Prof & Soc Services	0.0710	0.0643	0.0559	0.0402	0.0519	0.0526	0.0530	0.0276	0.0816
(12) Households	1.0458	0.9642	0.8424	0.6089	0.7876	0.7951	0.7859	0.4034	1.2018
(13) Government	0.0987	0.0957	0.0853	0.0519	0.2583	0.0999	0.0796	0.0394	0.1071
(14) Coal Mining	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(15) Thermal-Elec Generation	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(16) Pet Exp/Ext	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(17) Pet Refining	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Gross Receipts Multiplier	4.4931	3.6851	3.0284	2.4430	3.0534	2.7901	4.4509	2.0871	3.6778

- continued -

APPENDIX TABLE B2. INPUT-OUTPUT INTERDEPENDENCE COEFFICIENTS, BASED ON TECHNICAL COEFFICIENTS FOR 17-SECTOR MODEL FOR NORTH DAKOTA (CONTINUED)

Sector	(10) Bus & Pers Service	(11) Prof & Soc Service	(12) Households	(13) Govt	(14) Coal Mining	(15) Thermal-Elec Generation	(16) Pet Exp/Ext	(17) Pet Refining
(1) Ag, Livestock	0.0384	0.0571	0.0674	0.0000	0.0376	0.0251	0.0159	0.0145
(2) Ag, Crops	0.0152	0.0229	0.0266	0.0000	0.0285	0.0321	0.0062	0.0057
(3) Nonmetallic Mining	0.0043	0.0050	0.0057	0.0000	0.0032	0.0019	0.0045	0.0037
(4) Construction	0.0546	0.0787	0.0902	0.0000	0.0526	0.0328	0.1148	0.0929
(5) Transportation	0.0118	0.0100	0.0093	0.0000	0.0084	0.0048	0.0180	0.0172
(6) Comm & Public Util	0.1104	0.1192	0.1055	0.0000	0.0712	0.0378	0.0510	0.0444
(7) Ag Proc & Misc Mfg	0.0237	0.0362	0.0417	0.0000	0.0618	0.0782	0.0097	0.0089
(8) Retail Trade	0.4525	0.6668	0.7447	0.0000	0.3995	0.2266	0.1838	0.1675
(9) Fin, Ins, Real Estate	0.1084	0.1401	0.1681	0.0000	0.0771	0.0977	0.0388	0.0358
(10) Bus & Pers Services	1.0509	0.0455	0.0605	0.0000	0.0289	0.0201	0.0139	0.0127
(11) Prof & Soc Services	0.0497	1.1026	0.0982	0.0000	0.0493	0.0301	0.0210	0.0195
(12) Households	0.7160	1.0437	1.5524	0.0000	0.6666	0.3973	0.3205	0.2951
(13) Government	0.0774	0.0881	0.1080	1.0000	0.0511	0.0444	0.0280	0.0285
(14) Coal Mining	0.0000	0.0000	0.0000	0.0000	1.0000	0.1582	0.0003	0.0002
(15) Thermal-Elec Generation	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000
(16) Pet Exp/Ext	0.0000	0.0000	0.0000	0.0000	0.0138	0.0084	1.0981	0.8227
(17) Pet Refining	0.0000	0.0000	0.0000	0.0000	0.0168	0.0102	0.0000	1.0000
Gross Receipts Multiplier	2.7133	3.4159	3.0783	1.0000	2.5664	2.2057	1.9245	2.5693

households, Sector 12) by $610,000 (0.61 times $1 million); and the total for all sectors in the economy by $2,440,000 (2.44 times $1 million). These increases in the respective sectors represent both the direct and the indirect effects of expanded final demand that is injected into the region via the contract construction sector because of increased federal expenditures to it.

Given these basic procedures, the gross business volumes of each sector in the area economy can be estimated by multiplying the output of the "basic" sectors (payments received from outside the area) by the interdependence coefficients for those sectors.

The multiplier effect for a sector (which is measured by the sum of the sector's column of interdependence coefficients) results from the spending and respending, within the region's economy, of income that is received from sale of its exports. For example, the establishment of a new manufacturing plant in a region would result in expenditures by the plant for some locally supplied inputs, such as materials, labor, etc. These expenditures will generate additional rounds of spending in the region because the firms providing materials to the plant will now purchase some additional inputs in the region and employees of the plant will spend a part of their income in the region. These expenditures, in turn, will generate another round of spending and so on.

Multiplication of the interdependence coefficients by the sales of the basic sectors (income received from outside the region or sales for final demand) yields estimates of the gross business volumes of each of the sectors in the region. Sales of the basic sectors can be baseline or project and industry specific which are used in the case of impact analysis. The resulting product for the household sector (Sector 12) is personal income received from the respective business sectors in the form of wages and salaries, profits, rents, and interest income of individuals.

Interdependence Coefficients

The input-output technical and interdependence coefficients for the North Dakota economy were derived from actual expenditure data collected in 1965 for business firms, households, and units of government in southwestern North Dakota.[3] The North Dakota input-output interdependence coefficients were calculated originally for a 13-sector model.

The original coefficients were derived when energy production (coal, electricity, crude petroleum, and refined petroleum products) was not a very

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[3]Sand, L. D., "Analysis of Effects of Income Changes in Intersectoral and Intercommunity Economic Structure," unpublished M.S. Thesis, Department of Agricultural Economics, North Dakota State University, Fargo, 1968; Bartch, B. L., "Analysis of Intersectoral and Intercommunity Structure in Southwestern North Dakota," unpublished M.S. Thesis, Department of Agricultural Economics, North Dakota State University, Fargo, 1968; Senechal, D. M., "Analysis of Validity of North Dakota Input-Output Models," unpublished M.S. Thesis, Department of Agricultural Economics, North Dakota State University, Fargo, 1971.

large component of the North Dakota economic base. Increasing importance of North Dakota energy exports made expansion of the model necessary. Survey expenditure data of the energy-related industries were collected in 1975.[4] These expenditures data yielded technical coefficients (direct requirements) for four additional economic sectors. These coefficients were simply appended to the 13-sector direct requirements matrix to form an augmented 17-sector direct requirements matrix. The technical coefficients for the four energy sectors were included as columns 14-17. Rows 14 to 17 for columns 1-13 were assigned a value of zero. This was appropriate because the original 13 sectors have insignificant amounts of expenditures to the energy sectors, but the energy sectors had a considerable amount of expenditures to the original 13 sectors. Inverting the 17 by 17 technical coefficients matrix yielded the 17-sector interdependence coefficients. Interdependence coefficients for the 17-sector model are presented in Appendix Table B2.

Gross Business Volumes

Application of the input-output multipliers to the final demand vectors yields estimates of gross business volume of all sectors of the economy. Final demand vectors can be baseline or project (industry) specific and historic or projected. Multipliers applied to the historic final demand vectors yield estimates of historic gross business volumes. Gross business volume of the household sector (Sector 12) is personal income. Applying multipliers to the specific North Dakota parks and the resulting visitor expenditures for fiscal 1984 yielded estimates of the gross business volumes and personal incomes that are directly or indirectly attributable to North Dakota state parks for that time period.

The accuracy of the input-output model has been tested by comparing personal income from the model with personal income reported by the Bureau of Economic Analysis, U.S. Department of Commerce. For the time period 1958 to 1982, estimates of North Dakota personal income from the input-output model had an average deviation of 5.25 percent from Department of Commerce estimates (Appendix Table B3). The Theil's coefficient of .044 also indicates the model is quite accurate for predictive purposes.[5]

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[4]Hertsgaard, T. A., Randal C. Coon, F. Larry Leistritz, and Norman L. Dalsted, Developing Economic Impact Projection Models for the Fort Union Coal Region, EPA-908/4-77-009, Environmental Protection Agency, Denver, Colorado, June 1977.

[5]The Theil U_1 coefficient is a summary measure, bounded to the interval 0 and 1. A value of 0 for U_1 indicates perfect prediction, while a value of 1 corresponds to perfect inequality (i.e., between the actual and predicted values). For further discussion on the Theil coefficient, see Leuthold, Raymond M., "On the Use of Theil's Inequality Coefficients," American Journal of Agricultural Economics, Vol. 57, No. 2, 1975, pp. 344-346; Pindyck, Robert S. and Daniel L. Rubinfeld, Econometric Models and Economic Forecasts, Second Edition, McGraw-Hill, New York, 1981.

APPENDIX TABLE B3. ESTIMATES OF PERSONAL INCOME AND DIFFERENCES IN ESTIMATES, NORTH DAKOTA, 1958-1982 (THOUSAND DOLLARS)

Year	Department of Commerce Estimates	I-O Analysis Estimates	Percent Difference
1958	---	1,022,412	---
1959	1,008,057	978,420	- 2.94
1960	---	942,488	---
1961	---	1,011,462	---
1962	1,460,980	1,285,790	-11.99
1963	---	1,353,864	---
1964	---	1,521,191	---
1965	1,497,762	1,470,129	- 1.84
1966	1,555,539	1,662,394	6.87
1967	1,595,042	1,573,010	- 1.38
1968	1,643,964	1,684,451	2.46
1969	1,850,417	1,890,973	2.19
1970	1,913,283	2,117,319	10.66
1971	2,158,416	2,156,642	- 0.08
1972	2,676,385	2,601,416	- 2.80
1973	3,841,862	3,674,738	- 4.35
1974	3,739,859	4,104,667	9.75
1975	3,755,431	4,009,827	6.77
1976	3,828,880	3,860,970	.84
1977	3,982,404	3,829,503	- 3.84
1978	4,861,726	4,481,331	- 7.82
1979	5,265,772	4,872,108	- 7.47
1980	5,415,442	5,448,191	.60
1981	6,740,708	5,717,370	-15.18
1982	---	5,278,985	---
Average Error =			5.25

Mean = -1.029 (S.D. = 6.832)

Theil's Coefficient = .044

Productivity Ratios

The ratio of gross business volume to employment is called the productivity ratio. This ratio indicates the gross business volume required in each sector to generate one more worker in that sector. Employment data are available from information published annually by the North Dakota Employment Security Bureau, Bismarck, North Dakota. Labor force data were reorganized into classifications similar to the sectors of the input-output model. Productivity ratios for North Dakota were calculated for the 1958 to 1982 time period (Appendix Table B4). Productivity ratios are all in current year dollars because state park and visitor expenditures are current year dollar values. Gross business volumes resulting from park and visitors'

APPENDIX TABLE B4. GROSS BUSINESS VOLUME TO EMPLOYMENT (PRODUCTIVITY) RATIOS, BY ECONOMIC SECTOR, NORTH DAKOTA, 1958-1982 (CURRENT DOLLARS)

Year	(1)&(2) Agric	(3) Nonmetallic Mining	(4) Const	(5) Trans	(6) Comm & Pub Util	(7) Ag Proc & Misc Mfg	(8) Retail Trade	(9) FIRE	(10) Bus & Pers Service	(11) Prof & Soc Service	(12) House-holds	(13) Govt	(14) Coal Mining	(15) Thermal-Elec Generation	(16) Pet Exp/Ext	(17) Pet Refining
1958	9,444	53,846	6,485	1,768	10,644	19,169	19,939	29,783	5,122	4,798	--	3,030	2,894	--	8,828	39,104
1959	9,290	54,330	6,259	1,687	10,035	17,659	18,451	26,617	4,597	4,304	--	2,787	2,610	--	12,611	39,692
1960	8,887	55,284	7,409	1,624	9,760	17,353	17,593	24,713	4,275	4,045	--	2,660	2,610	--	19,568	39,682
1961	9,414	52,307	7,188	1,779	10,824	18,846	18,451	25,166	4,288	4,159	--	2,729	3,403	--	23,296	41,311
1962	11,016	69,565	6,986	2,168	13,605	18,827	23,753	30,488	5,179	5,102	--	3,260	3,937	--	27,786	42,229
1963	12,872	77,981	7,999	2,344	14,551	19,251	24,422	31,894	5,361	5,161	--	3,238	3,561	--	29,850	43,706
1964	12,649	82,300	8,972	2,503	16,086	18,583	25,087	33,178	5,523	5,566	--	3,286	4,297	--	30,516	46,014
1965	15,406	71,111	9,135	2,656	16,060	19,562	25,420	32,893	5,807	5,437	--	3,169	5,190	--	27,822	50,375
1966	17,930	77,037	11,896	2,933	17,673	21,005	28,358	36,465	6,543	6,012	--	3,414	5,649	23,404	30,742	53,807
1967	18,988	78,906	12,355	2,853	16,765	21,745	27,589	33,397	6,189	5,451	--	3,086	9,855	43,298	31,613	55,263
1968	19,376	84,800	14,093	3,046	17,968	21,858	29,140	35,118	6,561	5,654	--	3,071	13,056	63,730	37,650	58,203
1969	22,583	88,235	16,356	3,428	20,153	27,370	32,433	39,220	7,325	6,322	--	3,376	13,230	59,693	29,449	61,133
1970	27,374	129,545	26,968	4,002	24,828	28,071	36,472	46,044	8,012	6,987	--	4,036	16,167	57,740	45,862	71,296
1971	28,922	106,060	16,353	3,992	24,964	29,513	36,402	45,721	7,842	6,739	--	3,096	17,647	70,281	50,458	77,777
1972	38,088	134,108	17,549	4,932	30,102	32,432	42,244	54,486	8,816	17,804	--	4,923	17,914	79,553	55,781	85,500
1973	61,728	190,625	23,762	7,042	41,942	42,699	59,244	77,240	11,984	10,545	--	7,071	18,750	68,683	64,096	92,822
1974	66,322	200,000	25,637	7,763	45,645	44,746	63,783	81,936	12,619	11,207	--	7,736	23,876	71,794	99,225	113,930
1975	59,977	171,333	21,977	7,356	44,515	36,673	56,823	72,700	11,346	10,288	--	6,932	24,413	61,676	83,949	125,670
1976	52,517	151,923	16,800	7,019	41,584	43,572	50,590	64,487	10,626	9,483	--	6,424	42,996	109,039	81,215	137,128
1977	46,259	146,583	16,377	6,615	39,361	40,263	49,143	58,964	10,220	9,038	--	6,207	42,737	129,329	66,699	147,058
1978	59,804	170,303	17,481	7,264	42,991	42,946	57,438	66,303	11,471	9,996	--	7,057	43,665	180,165	48,564	154,348
1979	70,122	185,294	19,829	7,639	43,650	46,486	60,235	69,154	11,567	10,411	--	7,619	57,849	248,913	59,838	216,425
1980	74,255	205,142	26,655	8,504	46,863	54,674	66,253	73,138	12,125	11,291	--	8,414	69,484	311,139	83,432	315,566
1981	83,663	219,444	32,509	10,024	50,085	56,804	73,564	77,427	12,578	11,213	--	9,117	67,989	282,730	133,040	534,562
1982	82,666	198,369	27,533	9,441	47,617	52,129	68,118	72,292	11,466	9,896	--	8,503	64,883	319,526	145,906	552,061

expenditures divided by the corresponding productivity ratios yield indirect and induced employment. Expenditures by the state parks and visitors industry to sectors of the economy create indirect and induced, or secondary, employment necessary to support the industry.

Tax Revenue Estimation

Estimation of tax revenues resulting from the state parks operation and visitors' expenditures is also an important part of the impact analysis. Gross business volumes generated by the input-output model provide business activity upon which taxes can be calculated. Equations were developed that estimate tax revenues based on gross business volumes. The tax rates were determined by dividing the taxes collected[6] for sales and use, personal income, and corporate income tax by their gross business volumes that were estimated for the respective sectors in each year by use of the input-output model. An average tax rate, calculated for each tax based on the average of 1980, 1981, and 1982 tax rates, was used to estimate tax collections for fiscal 1984. Equations for revenues from other minor taxes were available but were not considered for the state parks impact analysis.[7]

State sales and use tax collections were estimated using the following equation:

> State sales and use tax collections = 3.54% X gross business volume of the retail trade sector.[8]

State personal income tax collections were determined using the following relationship:

> State personal income tax collections = 0.91% X personal income.[9]

The equation to estimate state corporate income tax collections is

> State corporate income tax collections = 0.307% X gross business volumes of all business sectors.[10]

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[6]Tax collections were provided by Mr. Bill Cudworth, State Tax Department, Bismarck, North Dakota, October 15, 1982.

[7]Tax revenue estimators were available for highway taxes; cigarette and tobacco taxes; liquor and beer taxes; and local ad valorem property taxes.

[8]Retail trade sector of the input-output model is Sector 8.

[9]Personal income from the input-output model is the gross business volume in the household sector (Sector 12).

[10]All business sectors consist of all nonfarm business sectors. This includes all sectors of the North Dakota input-output model except Sectors 1, 2, 12, and 13.

Appendix C

QUESTIONNAIRE

PARK VISITOR SURVEY

Park _____

Date _____

PARK VISITOR SURVEY

The Department of Agricultural Economics, North Dakota State University, in conjunction with the North Dakota Parks and Recreation Department requests about five minutes of your time to provide information about yourself, your party, and your visit. This questionnaire is being used at all North Dakota State Parks to determine what people are participating in during their visit and how much they spend on each visit. This information will be used to review park usage and determine future park needs. Your individual responses will remain strictly confidential. Only summarys from all respondents will be used. Park officials will return to pick up your completed questionnaire or you may drop it off at the Park exit when you leave. Thank you for your assistance and have a nice visit.

1. Where do you live? _____
   (Town) (County) (State/Country) (Zip)

2. Please indicate the one-way distance from your home to this park. ____ miles

3. Where did you stay last night?
   ____Home
   ____This park
   ____Other park
   ____ Other ND state park
   ____ Other _____

4. Where do you plan to stay tonight?
   ____Home
   ____This park
   ____Other park
   ____Other ND state park
   ____ Other _____

5. Did you purchase a season or day pass to this park? ____ season ____ day

6. How many people are in your party? ____Adults ____Children

7. Please indicate your age and sex. ____Age Sex: M F

8. What activities do you and your family participate in while at this park?
   ____Swim
   ____Bicycle
   ____Water-ski
   ____Picnic
   ____Sightsee
   ____Fish (Lake)
   ____Fish (Shore)
   ____Nature study
   ____Boat/Sail
   ____Hike
   ____Camp (Tent)
   ____Camp (RV,Modern)
   ____Camp (RV,Primative)
   ____Horseback riding
   ____Canoe
   ____Active recreation
   ____Downhill ski
   ____Cross country ski
   ____Snowmobile
   ____Snowshoeing
   ____Other _____
   _____

9. What was the average length of time (in days) of participation in each of the following activities while at this park?
   ____Swim
   ____Bicycle
   ____Water-ski
   ____Picnic
   ____Sightsee
   ____Fish (Lake)
   ____Fish (Shore)
   ____Nature study
   ____Boat/Sail
   ____Hike
   ____Camp (Tent)
   ____Camp (RV,Modern)
   ____Camp (RV,Primative)
   ____Horseback riding
   ____Canoe
   ____Active recreation
   ____Downhill ski
   ____Cross country ski
   ____Snowmobile
   ____Snowshoeing
   ____Other _____

10. How long do you plan to stay in this park on this trip? ____Days

11. How many times have you visited this park since July 1, 1983? ____ Days

12. How many more times do you plan to come to this park between now and June 30, 1984? ____ Days

13. Why did you come to this particular park?

____ Location
____ Driving through
____ Visit friends
____ Vacation
____ Other (please specify) _____

14. Do you feel there are sufficient highway signs to direct you to this park? ____Yes ____ No

Comments: _____
_____
_____

15. In terms of overall recreational value, rate this park from 1 (very poor) to 5 (very good) on the following:

	Very Poor	Poor	Fair	Good	Very Good
Activities	1	2	3	4	5
Facilities	1	2	3	4	5
Accessibility	1	2	3	4	5

Comments:_____
_____
_____

16. Please check in the spaces below which facilities or activities you would like to see added or expanded to help make the North Dakota park system more enjoyable, comfortable, and inviting to the public.

____Concession area
____Boat docks
____Fitness trail
____Playground
____Organized activities
____Play fields
____Additional camping areas
____Cabins
____Winter activities
____Equipment rental
____Meeting hall/kitchen
____Other_____

17. Please estimate as best as you can the money spent for this trip to the park. Please include estimated expenditures for your return trip home. If you are not a North Dakota resident, please indicate only those expenditures you made while in North Dakota. Include expenditures for your entire party.

Food and beverages	$_____
Lodging (hotels, motels)	$_____
Transportation expenses (gas, oil, repairs to vehicle during trip)	$_____
Camera film and developing	$_____
Boat launching fees	$_____
Bait	$_____
Campsite fees	$_____
Equipment rental (for example, boats and motors, canoes, camping equipment)	$_____
Guiding fees	$_____
Other (Please specify)	
_____	$_____
_____	$_____
_____	$_____

18. Have you filled out this questionnaire before? ____ yes ____ no

    If yes, how many times? _____

19. Did you have any unusually good or bad experiences on your visit to this park?

THANK YOU FOR YOUR COOPERATION

Appendix D

SEECTED CHARACTERISTICS OF STATE PARK VISITORS

APPENDIX TABLE D1. MEAN RESPONSES FROM NORTH DAKOTA STATE PARK VISITORS, SURVEY RESPONDENTS, FISCAL YEAR 1984 (TOTAL RESPONDENTS=1,302)

Variable	No. of Observations	Mean
One-Way Distance from Home	1,285	243 miles
Party Size	1,282	3.85 people
Adults per Party	1,279	2.56 people
Children per Party	1,151	1.45 people
Age of Respondent	1,236	38.93 years
Respondents Participating in Activity (1,302=100 percent)		
Swimming	661	
Bicycle	205	
Water-Ski	146	
Picnic	665	
Sightsee	655	
Lake Fish	222	
Shore Fish	232	
Nature Study	262	
Boat/Sail	150	
Hike	388	
Tent Camp	218	
Modern RV Camp	414	
Primative RV Camp	100	
Horseback Riding	33	
Canoe	42	
Active Recreation	133	
Downhill Ski	18	
Cross Country Ski	55	
Snowmobile	16	
Snowshoeing	5	
Other	66	
Average Number of Activities Participated in	1,119	8.67 activities
Average Length of Participation		
Swimming	518	2.91 days
Bicycle	152	3.09 days
Water-Ski	104	3.38 days
Picnic	443	2.65 days
Sightsee	400	2.00 days
Lake Fish	172	4.39 days
Shore Fish	171	3.02 days
Nature Study	177	1.99 days
Boat/Sail	101	4.86 days
Hike	250	1.99 days
Tent Camp	170	2.64 days
Modern RV Camp	333	3.27 days
Primative RV Camp	78	3.54 days
Horseback Riding	21	3.76 days
Canoe	31	3.74 days
Active Recreation	89	2.76 days
Downhill Ski	18	5.44 days
Cross Country Ski	52	3.52 days
Snowmobile	10	4.50 days
Snowshoeing	14	6.36 days
Other	42	4.17 days
Length of Stay at Park This Trip	1,203	1.69 days
Days Visited This Park Since July 1, 1983	1,129	2.95 days
Days Will Visit Park to June 30, 1984	835	3.32 days
Ranking of Park		
Activities	1,127	4.03
Facilities	1,200	4.22
Accessibility	1,190	4.37

APPENDIX TABLE D2. FREQUENCY DISTRIBUTIONS OF NORTH DAKOTA STATE PARK VISITORS, SURVEY RESPONDENTS, FISCAL YEAR 1984

Variable	No. of Observations	Frequency
		percent
Park	1,302	
Beaver Lake, Doyle, Streeter		3.23
Fort Lincoln, Butte View, Sully Creek		9.45
Fort Stevenson		11.37
Fort Ransom		3.53
Icelandic		14.67
Lake Metigoshe		6.45
Lake Sakakawea, Little Missouri Bay		14.21
Lewis & Clark		10.91
Turtle River, Devils Lake		26.19
Month Surveyed	1,302	
January		.85
February		0
March		1.46
April		.61
May		7.37
June		14.06
July		37.33
August		32.10
September		1.54
October		.85
November		1.00
December		2.84
Zip Code Classification Centers/ State/Country	1,302	
Bismarck		16.36
Devils Lake		4.30
Dickinson		.92
Fargo		4.30
Grand Forks		25.35
Jamestown		3.46
Minot		9.99
Williston		7.45
Montana		.85
South Dakota		.61
Minnesota		4.15
Other U.S. States		13.98
Manitoba		5.53
Ontario		.77
Saskatchewan		.85
Other Canada		.92
Other Countries		.23

- continued -

APPENDIX TABLE D2. FREQUENCY DISTRIBUTIONS OF NORTH DAKOTA STATE PARK VISITORS, SURVEY RESPONDENTS, FISCAL YEAR 1984 (CONTINUED)

Variable	No. of Observations	Frequency
		percent
One-Way Distance From Home	1,285	
0-50 miles		49.65
51-100 miles		21.87
101-200 miles		7.78
201-300 miles		3.27
301-400 miles		1.71
401-500 miles		2.18
501-1,000 miles		5.29
1,001+ miles		8.25
Resided Last Night	1,278	
Home		55.32
This Park		26.84
Other Park		5.56
Other ND State Park		1.49
Motel		5.01
Relatives		1.17
Campground		2.58
Friends		1.10
Other		.94
Reside Tonight	1,261	
Home		52.82
This Park		32.51
Other Park		4.60
Other ND State Park		1.43
Motel		4.44
Campground		1.27
Friends		.95
Other		1.98
Type of Pass	1,261	
Season		33.55
Day		63.68
Senior Citizen		2.78
Respondent's Sex	1,270	
Male		64.25
Female		35.75

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APPENDIX TABLE D2. FREQUENCY DISTRIBUTIONS OF NORTH DAKOTA STATE PARK VISITORS, SURVEY RESPONDENTS, FISCAL YEAR 1984 (CONTINUED)

Variable	No. of Observations	Frequency
		percent
Total Number of Activities Participated In	1,259	
1		21.76
2		15.01
3		15.89
4		14.22
5		11.76
6		9.21
7		4.53
8		3.97
9		1.67
10		.95
11		.40
12		.16
13		0
14		.08
15		.08
16		.16
17		.16
Reason for Choosing This Park	1,276	
Location		53.45
Driving Through		15.36
Visit Friends		8.23
Vacation		14.26
Good Boat Ramp		.78
Facilities		.94
Group Party		1.18
Fishing		.94
Good Beach		.86
Other		4.00
Sufficient Highway Signs	1,264	
Yes		83.54
No		16.46

- continued -

APPENDIX TABLE D2. FREQUENCY DISTRIBUTIONS OF NORTH DAKOTA STATE PARK VISITORS, SURVEY RESPONDENTS, FISCAL YEAR 1984 (CONTINUED)

Variable	No. of Observations	Frequency
		percent
Facilities (Activities Would Like Added/Expanded)		
Concession Area	388	
Boat Docks	156	
Fitness Trails	165	
Playground	194	
Organized Facilities	120	
Play Fields	94	
Additional Camping Areas	178	
Cabins	221	
Winter Activities	200	
Equipment Rental	274	
Meeting Hall/Kitchen	71	
Rest Rooms	29	
Expanded Swimming Facilities	26	
Store	16	
Water Facilities	10	
Cleaner Lake	102	
Other	32	
Completed Questionnaire Previously	1,299	
Yes		4.47
No		95.53
If Yes, Number of Times	1,247	
1		67.92
2		24.53
3		1.89
4		1.89
7		1.89
8		1.89
Unusually Good or Bad Experiences	171	
Pleasant Personnel		30.41
Too Many Insects		19.30
Best Park to Date		5.85
Other		44.44