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ECONOMIC IMPACTS OF GUIDED WHITEWATER RAFTING: A STUDY OF FIVE RIVERS[1]

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ABSTRACT: This paper presents estimates of the statewide economic impacts of guided whitewater rafting on five rivers in six states: the Nantahala (North Carolina), Gauley (West Virginia), Kennebec (Maine), Middle Fork of the Salmon (Idaho), and Chattooga (Georgia-South Carolina). Except for the Chattooga and Middle Fork, rafting is dependent on upstream dam releases. Guide fees range from about $15 per trip on the Nantahala to over $1,000 on the Middle Fork. Economic impacts per nonresident 1000 visitors increase along with length of the rafting trip and remoteness of the river. Total industrial output per 1000 nonresident visitors ranged from $95,000 on the Nantahala to over $2.5 million on the Middle Fork. However, because of differences in annual visitation levels, total impacts were greatest at the Nantahala, at over $14 million in 1993. Multipliers for all economic measures were relatively consistent over the rivers. Employment multipliers (Type III) ranged from 1.67 to 1.90, income multipliers from 2.0 to 2.4, and industrial output multipliers from 2.1 to 2.5.
(KEY TERMS: economic impacts; whitewater rafting; visitor expenditures; river recreation.)

INTRODUCTION

Whitewater rafting is among the eight fastest growing outdoor recreation activities tracked by the Forest Service's RPA Assessment process (English *et al.*, 1993). Activity levels are expected to at least double in the next 40 years. Hence, the consequences of increased whitewater recreation will be important for policy makers and planners. This will be especially true if managers must also contend with limiting recreational use of rivers and their corridors to protect both the resource and the quality of the recreation experience. For both managers and policy makers, information that assists decision making is critical.

One important criterion for choosing among policy or management alternatives regarding resources such as rivers is the change in net economic welfare. Such welfare changes are measured by changes in consumer surplus, or the value consumers place on the use of a resource, over and above what they actually pay to use it. For this measure, changes in the amount or location of market economic activity associated with the alternatives are largely irrelevant.

However, many public agencies also have goals of rural development, economic stability, or economic diversity. As a result, they may be highly concerned with the effects on jobs, income, and economic market activity in a local or regional area of a policy change or management action (Johnson and Moore, 1993; USDA Forest Service, 1995). Such regional economic impacts measure changes in the market value of industrial output (goods and services) produced in the region, as well as the effects on the region's level of employment (number of jobs) and earned income (wages and proprietor income) (Stoll *et al.*, 1987). Much of the impetus for performing impact analyses often comes from political interest or local groups. Because the focus is on where and how much market activity occurs, alternatives that shift jobs or production from one region to another may be considered highly successful regardless of any associated welfare changes as judged by economic efficiency criteria.

Spending by visitors is the primary engine for affecting an economy through recreation. For a recreation resource, the economic impacts measure the change in the level of market activity in the local economy if visitation to the resource were to change. With such information, policy makers could examine the loss to the economy of limiting recreational use of a crowded river or, conversely, examine how much an economy would grow if recreational use were expanded.

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In this paper we examine state level regional economic impacts of guided whitewater rafting at five rivers: the Chattooga (bordering Georgia and South Carolina), Gauley (West Virginia), Kennebec (Maine), Middle Fork of the Salmon (Idaho), and Nantahala (North Carolina). We combine detailed expenditure surveys, an input-output model, and visitation estimates to calculate average and aggregate measures of the economic impacts to state economies of guided commercial rafting. In addition, we offer profiles for each river and its users, and we review previous work in the area.

An important aspect of the study is that the rivers vary by region and by level of difficulty, cost, crowding, remoteness, and level of protection and management. Thus, we offer a range of results. Such a spectrum has potential value to policy makers and regional planners as a starting point for the creation of an impacts transfer framework analogous to the concept of benefits transfer currently being used with net economic surplus in demand studies (Walsh *et al.*, 1992).

RIVER CHARACTERISTICS

The rivers cover a wide range of trip length, difficulty, and market area (Table 1). The Nantahala River offers a short trip suitable for novices and families. At the other extreme, the Gauley requires substantial previous rafting experience, and the Middle Fork significant time and money requirements (Armstead 1989). The Chattooga and the Middle Fork are part of the designated National Wild and Scenic River System, and have limits on annual commercial use and staggered start times for rafting groups. Rafting on the other three rivers depends on dam releases. On the Nantahala, moderate commercial use limits are in place during mid-week days to provide rafters the opportunity for a higher quality and less crowded experience (M. Wilkins, December 17, 1995, Personal Communication with District Ranger, Wayah Ranger District, National Forests in North Carolina). A special draw for rafting the Middle Fork is that it entails rafting though the heart of the 2.5 million-acre Frank Church River of No Return Wilderness. One factor in the Gauley's popularity is its limited use season, often spanning less than two months.

The Gauley and Middle Fork are two of an elite class of whitewater rafting opportunities (Armstead, 1989). Extremely challenging rapids and very remote locations separate these two from the other three rivers. In contrast, the Nantahala is a low-end introduction to the sport, accessible to both adults and children. The Nantahala is near several metropolitan areas, and typical trips are short, inexpensive, and relatively tame. By far, the Nantahala is the most crowded of the rivers studied here. The Chattooga and the Kennebec fall in the middle, offering challenging trips to a regional audience.

ECONOMIC MEASURES OF REGIONAL IMPACTS

This paper examines four common dimensions of economic impacts. Total industrial output (TIO) measures the market value of goods and services

TABLE 1. Characteristics of the Five Study Rivers.

	Chattooga River	Gauley River	Kennebec River	Middle Fork River	Nantahala River
Trip Length					
Miles	8-20	14-28	28	100	8
Float time	1-2 days	1-2 days	1-2 days	5-6 days	3-4 hours
Dam Controlled	No	Yes	Yes	No	Yes
Wild and Scenic Designation	Yes	No	No	Yes	No
Commercial Use Limits	Annual	None	None	Annual	Midweek days
Difficulty of Rapid	II-V	III-V	III-V	III-V	II-III
Normal Use Season	April-Nov.	Sept.-Oct.	May-Sept.	May-Sept.	April-Nov.
Market	Region	Nation	Region	Nation	Local-Region
Annual Commercial Use (1000's)	39	45	36	4.5	213

produced. Total income (TI) is the sum of employees' wages and returns to business proprietors. Value added (Virginia) is the difference between the value of inputs purchased by businesses and the value of the goods or services sold. Employment measures the number of jobs (full- and part-time) in the economy.

For each of these, there are direct, indirect, and induced impacts. Direct impacts are the goods and services purchased by visitors. Indirect impacts represent the economic activity necessary to replace what visitors buy. Induced impacts are the result of workers and proprietors spending their additional income from direct and indirect impacts (e.g., guides spending their wages). Summing direct, indirect, and induced impacts yields total impacts.

For economic impact assessment, recreation is considered an export industry (English and Bergstrom, 1994). That is, growth from recreation comes only from outside money flowing into the economy. In general, only spending by nonresidents who come into the local area while on a recreation trip is included. Johnson and Moore (1993) note that if locals would go elsewhere for their recreation, thus taking their money to another region, then their spending should also be included in estimating economic impacts. However, if it can reasonably be expected that in the absence of the recreation resource under study, locals would still spend their money in the region, then local residents should not be included in impact analyses. We adopt the latter, perhaps more conservative, assumption for the small portion of locals in our study.

Not all expenditures made by nonlocals are necessarily relevant to economic impact analyses, particularly for multiple site trips (Chappelle, 1985; Johnson and Moore, 1993; English and Bergstrom, 1994). Expenditures that would have occurred without visiting the recreation site should be excluded. Here, if rafting was the trip's primary purpose, then relevant expenditures include all spending associated with rafting (outfitter fees, etc.) and a major portion of other trip spending (gas, lodging, and so forth). If rafting was not the primary purpose, then relevant expenditures include moneys spent for rafting, but at most a minor portion of other spending. A common practice is to prorate expenditures as a function of either time spent at other sites or the number of other sites visited (Cordell *et al.*, 1990, 1992; Bergstrom *et al.*, 1990a). For all but the Nantahala, most trips were primary purpose trips with at most one other site visited, so we prorate multiple destination trips according to number of sites visited.

PREVIOUS RESEARCH

Little published research exists on the regional economic impacts of river rafting. Only two studies have appeared in refereed journal literature related to the topic (Cordell *et al.*, 1990; Johnson and Moore, 1993). These studies are summarized in Table 2. Cordell *et al.* (1990) estimated economic impacts based on trip spending and an ad-hoc allocation of annual equipment purchases by nonresidents. Their sample included all river users, so expenditures were an average across a mix of rafters, swimmers, tubers, and others. Local economies were defined as five- to seven-county areas around the rivers.

Johnson and Moore (1993) provide estimates of whitewater recreation impacts on a two-county economy along the Klamath River in Oregon. Their sample included both guided and unguided rafters although they state that due to the degree of difficulty, 90 percent of the rafting is commercially guided. In determining impacts, they included all rafters who would have gone to some other region had the Klamath not been available. Thus, local residents who would have imported their recreation (gone elsewhere) were also included.

There is a substantial variation of both industrial output and jobs per 1000 visitors across the studies, ranging from $50,000 (New River) to over $200,000 (Klamath), and .91 jobs to 5.3 jobs, respectively. These per-visitor impacts can be combined with annual use estimates to derive aggregate annual regional economic impacts. Klamath rafting generates annual industrial output from $70 thousand to $1.6 million and 16 to 37 annual jobs depending on visitation estimates, leakage assumptions, and trip definition. Nonlocal use of the Upper Delaware generates over $17 million in industrial output and nearly 300 jobs.

In a state-level study, Gitelson and Graefe (1990) examined the contribution of rafting on the upper portion of the Youghigheny River in Maryland to a local and state economy. Their results indicated that each 1,000 rafters stimulated about $116,100 in total output from the one-county economy, and about $139,320 for the state of Maryland's economy.

The present study differs from previous works in a number of ways. First, we focus solely on the average and aggregate economic impacts of commercially guided rafting trips. Second, we evaluate these impacts over a range of rivers, from the Nantahala with short, inexpensive trips in a fairly developed setting to the Middle Fork of the Salmon with a week-long trip costing thousands of dollars through an expansive wilderness. As such, this study includes a set of rivers at which average expenditures per trip exceed any in previously published works. Finally, we

Table 2. Summary of Previous Research on Regional Economic Impacts of River Recreation.[1]

	Delaware Water Gap[2] River	Upper Delaware River	New River Gorge[2] River	Klamath[3] River
Sample (user types)	All Users	All Users	All Users	Rafters Only
Mean Expenditure Per Person Per Trip in Local Economy	$52.53	$24.95	$25.62	$157.00
Local Economy Size (number of counties)	5	6	7	2
Economic Impacts Per 1000 Visitors:				
Industrial output ($1000)	98.2	88.9	49.9	203.2
Jobs (number)	1.72	1.51	0.91	5.3
Nonresident Visitation (1000s of visitors)	90.7	193.1	66.0	3 to 5
Annual Economic Impacts:				
Industrial Output ($ million)	8.9	17.2	3.3	.07 to 1.6
Jobs	156	292	60	16 to 37

[1]Impacts for all studies are adjusted to 1992 dollars using the GDP deflator.
[2]Source: Cordell *et al.*, 1990.
[3]Source: Johnson and Moore, 1993.

use an expenditure sampling procedure that avoids the problem of endogenous stratification common to on-site sampling.

DATA

Data were collected in cooperation with America Outdoors (AO), a national organization of outfitters and guides. A random sample of names of individuals who had taken trips on any of the five rivers during the 1993 rafting season was selected to receive surveys in the mail. Name lists were provided by guides belonging to AO and who ran these rivers. The probability of an individual being selected for the sample was independent of the number of trips taken, so possible bias resulting from endogenous stratification was avoided (Shaw, 1988). Data were collected regarding the individual's most recent trip to the river. Although we begin with a sample of users rather than trips, we nonetheless get a reasonable proxy for a sample of trips since many of the individuals in our sample took only one trip per year to the river.

Surveys contained questions about trip length, number of other sites visited, group demographics, and expenditures. Individuals were asked to report the amount of money they spent in total and within the state of their rafting experience. Response rates for the surveys varied by river, ranging from about 45 percent for the Middle Fork to about 25 percent on the Nantahala. Although low, these response rates are typical of other mail surveys of recreation users (e.g., Bergstrom *et al.*, 1990a, 22 percent to 44.6 percent; Cordell *et al.*, 1990, 32 percent; Loomis and King, 1994, 35 percent; Stoll *et al.*, 1988, 30.1 percent; Gomez and Ozuna, 1993, 36.5 percent).

METHODS

In this study, impact areas were complete states. Thus, in-state residents were not included in the impact analyses. For the Chattooga River, separate analyses were developed for those who used outfitters based in Georgia and those who used outfitters based in South Carolina. On the survey form, respondents were asked in which state their trip was based. Only nonresidents of that state were used for each subgroup.

For single-site trips, all trip expenses were included in calculating expenditure means. For multiple-site visits, spending other than outfitter and equipment rental were prorated as a function of the number of other sites visited and whether rafting was the primary purpose for the recreation trip. The prorating percentage, PP, for spending was

$$PP = \frac{(1 + MAINREAS)}{(OTHSITEN + 2)} \quad (1)$$

where MAINREAS = 1 if rafting was the main reason for the trip and zero otherwise, and OTHSITEN is the number of other sites the individual visited on the trip. Thus, if OTHSITEN = 1, then PP = 1/3 for trips where rafting was not the primary purpose, and PP = 2/3 if rafting was the primary purpose. Expenses per person per trip were obtained by dividing relevant expenses by the number of people for whom expenses were paid. The result was an estimate of expenditures per person per trip by nonresidents.

Information on the total number of outfitted use at each river during the 1993 rafting season was supplied by America Outdoors. Sample percentages were used in determining the proportion of total use that were nonresidents of the impact states. The result was an estimate of the number of person trips taken by nonresidents to each river.

Impact analysis was performed using MicroIMPLAN, version 91-F, and 1992 base year data. Several previous studies, in addition to the two above, have used IMPLAN in conjunction with spending profiles obtained from visitors, to estimate regional economic impacts of recreation (Bergstrom *et al.*, 1990a, b; Cordell *et al.*, 1992; Dawson *et al.*, 1993). The advantages and disadvantages of using IMPLAN in this way have been discussed elsewhere (Alward and Lofting, 1985; Alward *et al.*, 1985; Hotvedt *et al.*, 1988; Stevens and Rose, 1985).

Reported spending per item was allocated to IMPLAN sectors following English *et al.* (1995). For IMPLAN analysis, per person per trip expenditures for each affected IMPLAN sector were treated as a final demand vector of commodity purchases. We used the default margins for trade and transportation margins, as well as regional purchase coefficients.

RESULTS

Visitor Characteristics

Demographic characteristics show that almost all rafters on the Gauley and the Middle Fork come from out of state (Table 3). About one-fourth of users on the other three rivers are in-state residents. These proportions indicate that these rivers are important means by which the states and local areas can capture revenues by exporting recreation experiences.

Except for the Middle Fork, age and income characteristics are similar across the rivers. High trip costs on the Middle Fork limits nearly half the clientele to households with income over $140,000 per year. Users of the Middle Fork are also generally older than users of the other rivers.

Middle Fork participants usually come from great distances, and most fly at least part of the way (Table 4). The Nantahala and Chattooga draw from a regional market, since half their users are within a three- or four-hour drive. For a fair number of users of these two Southern rivers, some activity or destination other than rafting was the primary purpose of the recreation trip.

Most users of the Gauley and Middle Fork take but one trip per year to these rivers. For the Gauley, the limited season is likely the most binding constraint, while cost and perhaps time are the most probable limitations for Middle Fork rafters. However, guided users of these two rivers are slightly more active in whitewater recreation generally than users of the other three rivers.

Table 3. Selected Demographic Characteristics of Whitewater Rafters on Five Rivers.

	Chattooga River	Gauley River	Kennebec River	Middle Fork River	Nantahala River
Percent from In-State	27.2	0.8	22.2	5.0	28.6
Household Income ($1000s)					
Mean	69.3	63.3	48.5	110.0	66.7
% ≤ 30	13.0	15.3	30.0	3.3	13.9
% 30 to 65	38.7	45.6	40.9	14.0	44.9
% 65 to 110	34.9	26.3	22.8	23.2	26.4
% 110 to 140	5.7	9.8	1.7	11.0	6.1
% over 140	7.7	3.1	4.6	48.5	8.7
Age					
Mean	39.7	35.5	31.5	47.4	41.4
Median	39.0	33.0	32.0	46.0	40.0
75th Percentile	45.0	41.0	41.0	54.0	47.0

Table 4. Selected Trip Characteristics of Whitewater Rafters on Five Rivers.

	Chattooga River	Gauley River	Kennebec River	Middle Fork River	Nantahala River
Miles traveled					
Mean	282.6	384.2	245.4	1516.1	219.4
Median	180.0	350.0	250.0	1500.0	120.0
75th Percentile	455.0	485.0	340.0	2000.0	300.0
Percent Using Air Travel	1.5	2.8	4.9	67.1	1.4
Percent Whose Main Trip Purpose Was Rafting	80.1	98.3	91.0	97.2	66.1
Mean Number of Annual Rafting Trips to This River	1.5	1.1	1.6	1.1	1.7
Mean Number of Annual Rafting Trips to Other Rivers	1.2 1.2	1.8 1.8	0.5 0.5	1.7 1.7	0.9 0.9

TABLE 5. Per Person Expenditures for Nonresident Rafters, Total, and in the State Visited.

	Chattooga River		Gauley River	Kennebec River	Middle Fork River	Nantahala River
	Georgia	South Carolina				
Total Spending By Item						
Lodging	37.12	38.24	38.24	46.61	98.97	36.05
Food	30.57	28.56	39.75	34.34	78.82	28.02
Transportation	25.15	19.31	33.30	22.34	265.60	20.88
Activities	237.80	128.24	343.74	150.07	2,338.89	96.07
Miscellaneous	24.33	16.83	25.05	22.15	113.03	16.19
TOTAL	**354.97**	**231.18**	**480.08**	**275.15**	**2,895.31**	**197.21**
In State Visited						
Lodging	26.67	15.90	24.76	39.35	77.74	13.16
Food	18.93	9.74	28.58	26.85	64.30	11.81
Transportation	7.20	4.09	8.31	13.34	106.66	4.25
Activities	37.16	56.76	73.40	107.90	982.67	24.80
Miscellaneous	8.03	8.76	13.69	17.45	52.26	6.93
TOTAL	**97.99**	**95.25**	**148.74**	**204.89**	**1,283.63**	**60.95**

Expenditure Patterns

Total per-person per-trip spending by nonresidents for rafting trips on the Eastern rivers ranged from about $200 for trips to the Nantahala to $480 for trips to the Gauley (Table 5). Because of the river's remoteness and much longer trip, costs for rafting the Middle Fork were much higher, averaging nearly $2,900 per person trip. Activity expenses, primarily outfitter and equipment rental fees, account for over 70 percent of total trip cost for visitors to the Gauley or Middle Fork Rivers. For the Nantahala, activity expenses make up less than half of the total trip cost.

The amount of money spent in the state visited while rafting varied from about $61 per person per trip for the Nantahala River to almost $1,300 for trips to the Middle Fork. Except for the Kennebec, between 25 and 40 percent of per-person per-trip expenditures were made in the state visited. The percentage of instate spending for the Kennebec was much higher, at nearly 75 percent.

Economic Impacts

As an intermediate step and to facilitate comparison with previous research, we calculated impacts from in-state spending per 1000 nonresident rafting trips (Table 6). On average, each 1000 trips by nonresidents on the Nantahala River generated about

TABLE 6. Statewide Impacts Per 1000 Nonresident Visits (in thousands of 1992 dollars).

	Chattooga River		Gauley River	Kennebec River	Middle Fork River	Nantahala River
	Georgia	South Carolina				
Direct*						
TIO ($1000)	71.9	69.6	86.4	153.0	986.9	39.6
INC ($1000)	44.3	39.4	48.6	88.0	512.7	23.7
VA ($1000)	48.9	44.5	55.2	94.8	577.6	26.0
EMP	2.01	2.04	2.71	5.33	29.16	1.27
Indirect						
TIO	17.8	15.6	15.0	33.8	246.8	9.1
INC	9.6	8.2	7.5	17.1	131.9	4.6
VA	10.3	8.9	8.2	19.5	143.3	5.0
EMP	0.25	0.26	0.26	0.60	5.09	0.13
Induced						
TIO	72.7	59.9	108.2	193.7	1,021.1	45.8
INC	40.2	32.4	59.6	108.3	555.9	25.0
VA	45.3	36.9	67.6	123.1	634.7	28.4
EMP	1.19	1.12	2.17	3.76	21.02	0.79
TOTAL						
TIO	162.5	145.2	209.5	380.5	2,254.7	94.5
INC	94.1	80.1	115.6	213.4	1,200.5	53.4
VA	104.5	90.3	131.0	237.4	1,355.6	59.4
EMP	3.45	3.41	5.14	9.69	55.28	2.20

*Direct impacts per 1000 visitors are less than direct expenditures per 1000 visitors due to immediate leakage out of the state for certain expenditures included in Table 5, primarily lodging at Federally-owned campgrounds.

$94,500 in TIO, $53,400 in income, and 2.2 jobs in North Carolina. In contrast, the same number of trips to the Middle Fork contributed over $2.2 million in TIO, $1.2 million in income, and over 55 jobs to Idaho's economy. These results are consistent with earlier studies insofar as the relationship between trip dimensions and average economic impacts are concerned. However, average impacts for the Middle Fork and the Kennebec Rivers exceed those for any previously reported river.

Induced impacts were generally greater than direct impacts. In all instances, indirect impacts were quite small. The reason for this is that most of rafters' expenditures are in service-related economic sectors, where the primary input to businesses is labor. This is particularly true in case of guided rafting, where guide fees are a significant part of the trip expenditures.

To derive total impacts of outfitted river use on state economies from the per-1000 visitor estimates in Table 6, one needs the number of nonresident outfitted river trips (Table 7). Use figures for these rivers were provided by America Outdoors. We applied the sample percentages of nonresident respondents, weighted by annual trips, of the impact states to estimate the number of annual nonresident outfitted rafting trips.

By multiplying impacts per 1000 nonresident users (Table 6) by the amount of nonresident use (Table 7), we arrived at total economic impacts for each river (Table 8). Due to the large number of nonresident rafters, aggregate impacts from outfitted recreation on the Nantahala are highest, at over $14 million in industrial output, $8 million in income, and over 330 jobs. This result is comparable to magnitudes found by Cordell *et al.* (1990). Statewide impacts from the Gauley, Kennebec, and Middle Fork are all about equal despite large differences in nonresident usage. Outfitted users of the Chattooga contribute about equally to the state economies of Georgia and South Carolina, totaling somewhat over $4 million in industrial output, almost $2.5 million in income, and just under 100 jobs between the two states.

Type III impact multipliers (Table 9) represent the ratio of total to direct impacts; they are the ratio of total effects (direct + indirect + induced) to direct effects. The amount and type of visitor spending as well as the structure of the state economy are important in determining multiplier values. For all economic measures, multipliers for South Carolina-based trips on the Chattooga were smallest. For all but employment, multipliers for the Kennebec were largest. For each of the four economic measures, the range of multipliers across the rivers was fairly small.

TABLE 7. Estimates of Annual Nonresidential Outfitter Use (in thousands of visitors).

River	Sample Total Commercial Use (1000s)*	X	Nonresident Proportion from Out-of-State	=	Commercial Use (1000s)
Chattooga**					
Georgia	19.5		.726		14.1
South Carolina	19.5		.730		14.2
Gauley	45.0		.800		40.5
Kennebec	36.0		.778		.28.0
Middle Fork	4.5		.949		4.3
Nantahala	213.0		.714		152.1

*Total use data provided by America Outdoors.
**About half of the sample indicated they spent most of their time during the trip in Georgia. Total commercial use of the Chattooga during 1993 was estimated at 39,000 people.

TABLE 8. Total Statewide Impacts of Outfitted River Use in Millions of 1992 Dollars, or Number of Jobs.

	Chattooga River		Gauley River	Kennebec River	Middle Fork River	Nantahala River
	Georgia	South Carolina				
Total Industrial Output	2.29	2.06	8.49	10.65	9.70	14.37
Total Income	1.33	1.14	4.68	5.98	5.16	8.12
Value Added	1.47	1.28	5.31	6.65	5.83	9.04
Employment	48.65	48.42	208.17	271.32	237.70	334.62

TABLE 9. Type III Multipliers (total impacts/direct impacts).

	Chattooga River		Gauley River	Kennebec River	Middle Fork River	Nantahala River
	Georgia	South Carolina				
Total Industrial Output	2.26	2.09	2.42	2.49	2.28	2.39
Total Income	2.12	2.03	2.38	2.43	2.34	2.25
Value Added	2.14	2.03	2.37	2.50	2.35	2.28
Employment	1.72	1.67	1.90	1.82	1.90	1.73

TIO multipliers ranged from about 2.1 on the Chattooga to about 2.5 for the Kennebec, while employment multipliers ranged from just under 1.7 to 1.90.

DISCUSSION

We have presented several measures of economic impacts of commercial rafting over a variety of whitewater rivers. Impacts per trip are important to identify resources where small changes in the number of trips can have large impacts to rural economies. Over the range of rivers examined here, there was a direct correlation between the length and difficulty of the rafting trip and the impacts per trip. However, because of water flow or annual use restrictions at these higher quality locations, total impacts can be greater for locations with lower trip quality but greater use levels.

As could be expected given the reported expenditure patterns, most of the impacts for outfitted whitewater rafting trips accrue to economic sectors that contain businesses such as recreation services (i.e.,

outfitters), lodging, restaurants, car rental, retail gasoline, and, especially for the Middle Fork, air travel. Because these are industries with high labor inputs, the induced effects were fairly high. Our estimated per-trip impacts and multipliers are somewhat higher than those reported in past studies. However, our impact regions are also larger, so we are likely to include a greater portion of all trip-related spending. In addition, state level economies generally have less leakage than local economies, which are smaller and less diverse, and this can also contribute to higher impact estimates.

Our sampling strategy allowed us to avoid any bias from the endogenous stratification inherent in many on-site recreation samples. However, we were unable to analyze or correct for any possible sample selection or nonresponse biases. Although nothing has been published to date to demonstrate the effects of sample selection on economic impact estimates, it seems prudent to assume that such biases may be important. Further research along these lines would seem warranted.

For most of the rivers examined here, the vast majority of rafting trips were solely for the purpose of rafting that river. However, for the Nantahala, rafting was not the trip's primary purpose for over one-third of our sample, and almost all respondents visited other recreation sites on the same trip. Like most previous studies, we used an ad hoc, although intuitively reasonable, method to allocate trip expenditures across multiple sites. More research is needed to evaluate the appropriateness of such methods and to examine the role of one site in determining total spending and trip demand patterns.

An important use of economic impact studies for agencies and land managers is to provide examples of results that can be applied to similar situations in other locations. Such "impacts transfers" from one resource to another are most appropriate if the type of resource, type of recreation use, and size of impact area are closely matched. Because we have measured impacts in a consistent manner over a range of river resources, we feel our results are a useful addition to the inventory of empirical results cataloguing the economic impacts of recreational uses of rivers. Clearly, however, more empirical results need to be reported in resource journals to further expand our knowledge.

Given the wide range of rivers in this study, the overall consistency of the multipliers is encouraging for extrapolating our results to other rivers using multiplier analysis. If estimates of total or per-person direct spending in a state on commercial rafting trips is known for some other river, then an estimate of statewide TIO impacts can be obtained via our multipliers. Applying the range of multiplier values found here (2.1 to 2.5) could provide lower and upper bounds for a rough estimate of impacts at the state level.

Although our economic impact areas were entire states, we could reasonably expect that a large portion of the direct and induced effects would occur close to where the outfitters' businesses and nearby lodging and restaurant establishments are located and along travel corridors to the rivers. The localized nature of the impacts has several consequences. Whitewater recreation can be a major force, good or bad, to rural communities near the river. River recreation can provide an environmentally friendly boost to an otherwise slow economic base, or be the centerpiece for the development of a more varied tourism-related sector. However, there are also down sides. In instances such as the Nantahala River where the river corridor is also the primary travel corridor, recreation use can lead to significant problems with traffic congestion, riverbank erosion, and crowding. In addition, automobile exhausts, runoff from roads and parking lots, and sewage treatment can have noticeable negative effects on the river ecosystem. These types of issues are particularly important for river managers who wish to use river resources for rural development but must balance use with river and ecosystem protection.

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LITERATURE CITED

Alward, G. S. and E. M. Lofting, 1985. Opportunities for Analyzing the Economic Impacts of Recreation and Tourism Expenditures Using IMPLAN. Contributed Paper, Annual Meeting of the Regional Science Association, Philadelphia, Pennsylvania.

Alward, G. S., H. G. Davis, K. A. Despotakis, and E. M. Lofting, 1985. Regional Non-Survey Input-Output Analysis with IMPLAN. Contributed Paper, Annual Meetings of the Southern Regional Science Association, Washington, D.C.

Armstead, L., 1989. Whitewater Rafting in Eastern North America (2nd Edition). Globe Pequot Press, Chester, Connecticut.

Bergstrom, J. C., H. K. Cordell, A. E. Watson, and G. A. Ashley, 1990a. Economic Impacts of State Parks on State Economies in the South. Southern Journal of Agricultural Economics 22:69-78.

Bergstrom, J. C., H. K. Cordell, G. A. Ashley, and A. E. Watson, 1990b. Economic Impacts of Recreational Spending on Rural Areas: A Case Study. Economic Development Quarterly. 4:29-39.

Chappelle, D. E., 1985. Strategies for Developing Multipliers Useful in Assessing Economic Impacts of Recreation and Tourism. *In:* Assessing the Economic Impacts of Recreation and Tourism, D. B. Propst (Editor). Southeastern Forest Experiment Station, Asheville, North Carolina, pp. 1-5.

Cordell, H. K., J. C. Bergstrom, G. A. Ashley, and J. Karish, 1990. Economic Effects of River Recreation on Local Economies. Water Resources Bulletin 26:53-60.

Cordell, H. K., J. C. Bergstrom, and A. E. Watson, 1992. Economic Growth and Interdependence Effects of State Parks Visitation in Local and State Economies. Journal of Leisure Research 24: 253-268.

Dawson, S. A., D. J. Blahna, and J. E. Keith, 1993. Expected and Actual Regional Economic Impacts of Great Basin National Park. Journal of Park and Recreation Administration 11:45-49.

English, D. B. K., C. J. Betz, J. M. Young, J. C. Bergstrom, and H. K. Cordell, 1993. Regional Demand and Supply Projections for Outdoor Recreation. Gen. Tech. Rep. RM-230, USDA-Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado.

English, D. B. K. and J. C. Bergstrom, 1994. The Conceptual Links Between Recreation Site Development and Regional Economic Impacts. Journal of Regional Science 34:599-611.

English, D. B. K., J. M. Bowker, J. C. Bergstrom, and H. K. Cordell, 1995. Estimating the Economic Impacts of Recreation Response to Resource Management Alternatives. Gen. Tech. Rep. SE-91, USDA Forest Service, Southern Research Station, Asheville, North Carolina.

Gitelson, R. J. and A. Graefe, 1990. Economic Impacts Associated with Whitewater Boating on the Upper Youghigheny. Gen. Tech Rep. NE-145, USDA-Forest Service, Northeastern Forest Experiment Station, Radnor, Pennsylvania, pp. 65-69.

Gomez, I. A. and T. Ozuna, 1993. Testing for Overdispersion in Truncated Count Data Recreation Demand Functions. Journal of Environmental Management 37:117-125.

Hotvedt, J. E., R. L. Busby, and R. E Jacob, 1988. Use of IMPLAN for Regional Input-Output Studies. Presented Paper, Annual Meetings of the Southern Forest Economic Association, Buena Vista, Florida.

Johnson, R. L. and E. Moore, 1993. Tourism Impact Estimation. Annals of Tourism Research 20:279-288.

Loomis, J. and M. King. 1994. Comparison of Mail and Telephone-Mail Contingent Valuation Surveys. Journal of Environmental Management 41:309-324.

Shaw, D. G., 1988. On-Site Samples' Regression: Problems of Non-Negative Integers, Truncation, and Endogenous Stratification. Journal of Econometrics 37:211-223.

Stevens, B. and A. Rose, 1985. Regional Input-Output Methods for Tourism Impact Analysis. *In:* Assessing the Economic Impacts of Recreation and Tourism, D. B. Propst (Editor). Southeastern Forest Experiment Station, Asheville, North Carolina, pp 16-22.

Stoll, J. R., J. C. Bergstrom, and L. L. Jones, 1988. Recreational Boating and Its Economic Impact in Texas. Leisure Sciences 10(1):51-67.

Stoll, J. R., J. Loomis, and J. Bergstrom, 1987. The Measurement of Economic Benefits and Beneficiaries of Outdoor Recreation. Policy Studies Review 7:443-452.

USDA Forest Service, 1995. Forest Service Program for Forest and Range Resources: Long Term Strategic Plan. Draft 1995 RPA Program, U.S. Department of Agriculture, Forest Service, Washington, D.C.

Walsh, R. G., D. M. Johnson, and J. R. McKean, 1992. Benefit Transfer of Outdoor Recreation Demand Studies, 1968-1988. Water Resources Research 28(3):707-713.