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Estimating the Economic Impacts of a Trophy Largemouth Bass Fishery: Issues and Applications

R. J. Chen*

Department of Consumer Services Management
University of Tennessee, Knoxville, Tennessee 37996, USA

K. M. Hunt

Department of Wildlife and Fisheries,
Mississippi State University, Mississippi State, Mississippi 39762, USA

R. B. Ditton

Department of Wildlife and Fisheries Sciences,
Texas A&M University, College Station, Texas 77843, USA

Abstract.—We sought to apply economic impact assessment methodology to better understand the local and state-level economic impacts associated with a trophy largemouth bass *Micropterus salmoides* fishery at Lake Fork, Texas. A sample of 848 anglers encountered during creel surveys were sent follow-up mail surveys and asked about their trip expenditures. Creel surveys indicated 74% of anglers were nonlocal state residents, 11% were residents of the three adjacent counties, 10% were from adjacent states, and 5% were other out-of-state anglers. An estimated 204,739 one-person, multiple-day fishing trips were made to Lake Fork between June 1, 1994, and May 31, 1995. We estimate that US$27,487,000 was spent on fishing trips during the study period: $15,783,000 in the local area, $10,637,000 elsewhere in Texas, and $1,067,000 out-of-state. Local residents spent the least per angler/trip ($44) and out-of-state anglers from nonbordering states spent the most per angler/trip ($474). Anglers residing outside of the local area (nonlocal residents and border state and other out-of-state residents) made about $14,540,000 (92%) of the total expenditures in the Lake Fork area. These direct expenditures for local goods and services generated an additional $4,019,871 in economic output, resulting in a total output of $18,559,871 and 367 full- and part-time jobs. The total value-added generated by this increased level of output was estimated at $9,355,999. The total output associated with the fishery at the state level was $9,585,057, and nonresident angler expenditures created 163 jobs in Texas. Besides showing the extent of positive economic impacts of nonlocal fishing activity, these results reveal the extent to which private sector stakeholders benefited from recreational fishing at Lake Fork.

Human dimensions researchers have stressed that anglers seek a diversity of fishing experiences (Driver and Cooksey 1977; Fedler and Ditton 1994). Typically, fishery managers have provided for this diversity through variations in the types of settings they manage (i.e., ponds, lakes, rivers, and streams) and by focusing on managerially relevant species that flourish in those settings. With the increases in fishing pressure that have accompanied human population growth over the past 30 years, however, anglers are demanding even more diversity in their fishing opportunities. No longer satisfied with just a change in fishing locale, anglers want greater variety in the size and number of fish from their desired species that they can catch (fishing quality). This is particularly the case with largemouth bass *Micropterus salmoides* fishing. Even though managers recognize this trend, implementing regimes that provide for this diversity is a difficult task because managing similar water bodies differently will ultimately result in directly or indirectly excluding some anglers at each location. However, this is what must be done if agencies are to enhance fishing quality and maintain high levels of satisfaction within the overall angler population. For many years, trout fisheries management has utilized various rules and regulations to reduce or manipulate angling mortality to provide anglers with the particular fishing quality they seek (see, for example, Deinstadt 1987; Hunt 1987).

From statewide angler surveys, fishery managers in Texas knew that some anglers wanted to catch ‘‘a lot of fish’’ on fishing trips, while others preferred to catch ‘‘a few large fish’’ (Ditton and Hunt 1996). At public hearings in the mid-1970s,

* Corresponding author: rchen@utk.edu

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anglers indicated they wanted some relief from the statewide minimum length limits (304 mm) for largemouth bass. This coincided with researchers' acceptance of the idea that bass populations could be manipulated with variations in length limits. Coupled with a boom in reservoir development, Texas Parks and Wildlife Department (TPWD) personnel began to experiment with extended minimum and slot-length limits at the new reservoirs in an effort to develop trophy largemouth bass fisheries for anglers interested in this particular fishing ''product'' (as they are referred to by Driver 1985).

Accordingly, a lake developed for water supply purposes in northeastern Texas was designed as a fishery for trophy largemouth bass from the outset. In 1978, before impoundment, the Florida subspecies of largemouth bass *Micropterus salmoides floridanus* was stocked in local farm ponds that eventually would be inundated. The reservoir opened in 1980 with a 355-mm minimum length limit and 5 fish/d daily bag limit—both the most stringent limits in Texas at the time. The minimum length regulation was changed in 1985 to a slot-length limit of 355–457 mm and changed again in 1988 to 355–533 mm; the daily bag limit was reduced to three fish in 1992 (only one of which could be longer than 533 mm). In 1998, the slot-length limit was changed again, to 406–609 mm, but the bag limit was extended to five fish (only one of which could be longer than 609 mm) (Hunt and Ditton 1996b). These strategies were designed to initially protect small fish from harvest, then to protect mid-sized fish so they could reach a trophy size, and finally to protect trophy-sized fish and prohibit stunting of the largemouth bass population by encouraging anglers to retain subslot-size fish (Kurzawski 2001). These regulations, along with the bass habitat created by limited tree clearing before impoundment, were intended to produce a quality trophy bass fishery. To date, the 11,211-hectare surface-area reservoir has yielded 35 of the 50 heaviest largemouth bass ever taken from Texas waters, including the current state record of 8.25 kg.

The development of this product-oriented fishery had more farreaching effects than producing large fish and satisfying anglers. Since the first state record fish was caught there in 1986, increases in the numbers of nonlocal and out-of-state anglers at the reservoir were evident from creel surveys and inspection of vehicle license plates at public and private boat ramps (P. Durocher, Texas Parks and Wildlife Department, personal communication). Recognizing that fishing trips made to the reservoir were probably generating extensive economic activity, we initiated this study to better understand the extent of the (largely unintended) economic consequences of developing this recreational fishery.

In particular, we wanted to estimate the extent of local and state-level economic impacts associated with the development of a fishery intended to meet the wants and needs of a particular angler segment: those interested in catching trophy-size largemouth bass. The role of economic impact assessments in reservoir and fisheries development is well established (Weithman 1986; Reichers and Fedler 1996). Total angler expenditures and economic impacts have been quantified at the national level (e.g., U.S. Fish and Wildlife Service and U.S. Bureau of the Census 1997) and at the state level (e.g., Volk and Montgomery 1973; Storey and Allen 1993; Maharaj and Carpenter 1998). Economic impacts of recreational fisheries have been quantified at the local level (e.g., Strang 1970; Martin 1987) and even at the local level for a single species (Brown 1976; Schorr et al. 1995; Bohnsack et al. 2002) but such studies are rare. Likewise, few published studies have used the IMPLAN (IMpact analysis for PLANning) model for assessing the economic impacts of a recreational fishery (e.g., Schorr et al. 1995; Rhodes and Iverson 1998; Steinback 1999; Bohnsack et al. 2002), and all but Schorr et al. (1995) have dealt with marine fisheries. No published results from economic impact studies of local largemouth bass fisheries or, for that matter, of trophy largemouth bass fisheries have appeared previously in the journal literature. Therefore, an assessment of the local and statewide economic impacts of a local fishery at Lake Fork should be useful to fishery managers for project planning and for evaluating the effects of existing reservoir projects in light of project goals.

Study objectives were fourfold: (1) to understand the differential effects of fishing-related expenditures by in-state and out-of-state anglers, (2) to estimate the extent of total economic impacts associated with the development of a new fishery where none existed previously, (3) to identify which business sectors benefit the most from local fishery development efforts, and (4) to better understand the methods, issues, and limitations of economic impact assessments.

Methods

Survey data collection.—We used follow-up mail surveys of anglers encountered through creel surveys to obtain additional information about anglers using a particular water body (Ditton and Hunt 2001). This approach provides an opportunity to explore angler and trip characteristics, as well as expenditures incurred on trips, after the trip has been completed and in greater detail than possible during the creel survey.

Initiating a follow-up mail survey of Lake Fork anglers required a sampling frame. This was accomplished by collecting mailing addresses from anglers who were intercepted on TPWD creel surveys of the reservoir, in addition to standard catch and harvest information. The creel survey was designed as an access-point intercept survey which intercepted anglers at one of four randomly selected public boat ramps for 36 d (9 per quarter) between June 1, 1994, and May 31, 1995 (Lyons and Poarch 1993). Creel results from the previous year suggested that additional sampling days were necessary to ensure a sufficient number of out-of-state anglers were represented. To increase sample size, a creel clerk was randomly assigned to one of the four public boat ramps on every weekend day when TPWD was not conducting a creel survey to solicit additional names and addresses from anglers. A total of 2,200 angler names and addresses were collected from regular TPWD creel sampling and these additional efforts.

Most (N = 1,652) anglers intercepted were nonlocal Texas residents who lived outside of the three counties bordering the reservoir. Because nonlocal Texans would be combined with nonresidents for economic analysis, this number was more than adequate to achieve the desired precision level, that is, a 5% margin of error. Thus, a random sample of 300 nonlocal Texas anglers was selected from this group, which was then combined with the full listing of local Texas anglers (N = 199) and out-of-state anglers (N = 349) for a final sample size of 848 anglers. Oversampling of names and addresses was necessary to obtain a sufficient number of out-of-state anglers for economic analysis. After accounting for survey nonresponse (estimated at 35%), this sample size was considered adequate to be representative of all Lake Fork anglers with a 5% margin of error (Krecjie and Morgan 1970; McNamara 1994).

A self-administered mail questionnaire was developed to collect information from anglers. First, anglers were asked several questions about the fishing trip when they were intercepted by TPWD creel clerks (the date they were intercepted was added to the questionnaire to facilitate respondent recall). Anglers were asked to indicate how many miles they traveled (one-way) to get to the reservoir, whether this was the first time they visited the reservoir, how many days they spent fishing on their trip, the size of their fishing party, and what species they targeted. Next, anglers were asked to indicate how much money they spent within 35 mi of the reservoir or the local area (Hopkins, Rains, and Woods counties) and elsewhere in Texas on their trip for several trip-related items, including automobile transportation, other transportation (e.g., airplane), boat rental, boat operation, boat launch fees, entrance and parking fees, lodging, restaurant meals, groceries, bait and tackle, fishing guide fees, fishing licenses, and other miscellaneous expenses in Texas. Last, out-of-state anglers were asked how much they spent overall outside of Texas on their trip.

Questionnaires were mailed between September 1994 and June 1995 to selected anglers. The mail survey was conducted in four waves immediately after each creel quarter to reduce potential recall bias associated with expenditure items (Hiett and Worrall 1977; Chase and Harada 1984). The subsample of 300 nonlocal anglers was evenly distributed among the four quarters: 75 were included in each wave. Survey procedures were based partly on Dillman (1978) and partly on previous experience with data collection in Texas (Hunt and Ditton 1996a). The survey was personalized to enhance response rate. Three mailings were sent to each angler (as necessary) with a reminder postcard sent 10 d after the first mailing.

Response rates did not differ significantly among the four survey waves (range 72–78%; χ^2 = 2.88, df = 3, P = 0.41), so the results for all four were combined for purposes of reporting results. A total of 619 anglers responded to the mail survey. After excluding nondeliverables from consideration, the effective overall response rate was 74.6%. Returned questionnaires were checked for completeness of response; 10 surveys were returned but were not usable because respondents reported they no longer fished (N = 2), refused to answer (N = 6), or were reported as deceased (N = 2). Another 14 anglers did not provide any economic expenditure data and were removed from the analysis. This left a total of 595 usable questionnaires.

A telephone survey of nonrespondents was used to test for nonresponse bias in the survey results (Bethlehem and Kersten 1985; Fisher 1996). Telephone calling resulted in 39 completed surveys from a sample of 45 nonrespondents (i.e., 20% of nonrespondents). We found no significant differences between respondents and nonrespondents on trip-related items pertinent to the economic analysis: distance traveled on the trip on which they were intercepted by TPWD ($t = 0.73$, df = 643, $P = 0.47$), days spent fishing on their trip ($t = 0.50$, df = 631, $P = 0.61$), and total expenditures on their trip ($t = 0.13$, df = 643, $P = 0.93$).

Economic impact analysis.—This study used an input−output (I−O) IMPLAN modeling system to estimate the economic impacts of a trophy fishery on the Lake Fork region and the state of Texas. The analytical framework for IMPLAN is the I−O economic modeling approach as described by Leontief (1986). The traditional purpose of an I−O model is to provide the quantified interdependent relationships among industries in a regional economy (at local or state levels or both). Miller and Blair (1985) provide a detailed discussion of the advantages and disadvantages of the I−O modeling technique. In addition, for more information about the calculation and limitations of the I−O IMPLAN, readers are referred to the IMPLAN Professional User's Guide (1999).

To ascertain the economic impacts of various management alternatives in contiguous areas, IMPLAN was developed in 1976 by the U.S. Forest Service Land Management Planning Division and Rocky Mountain Forest and Range Experiment Station. The initial application of IMPLAN was designed to calculate the economic impacts of land planning and timber-related management (Chen et al. 2001). In 1997, IMPLAN was modified by the Minnesota IMPLAN Group for estimating economic impacts resulting from various events.

In IMPLAN, yearly data sets are assembled from various secondary sources and industries are categorized into 528 economic sectors based on Standard Industrial Classification codes. IMPLAN allows users to estimate regional economic impacts at the national, statewide, and county level (Chen et al. 2001). Two separate I−O models were used for this study to determine the economic impacts associated with anglers' expenditures. One model focused on the economic impacts of angler expenditures on the three-county local study area; the other estimated the impacts of expenditures on the Texas economy. Within each model, only expenditures by nonresident anglers were counted (those not residing in one of the three local counties for the Lake Fork model and out-of-state residents for the Texas model).

In this study, survey data were used under the IMPLAN models to calculate the economic impacts of a recreational fishery. Residence location was determined from TPWD creel surveys. Using total days of fishing effort estimates from TPWD creel surveys (one-person) and the percentages of anglers by residence location, the total number of days fishing (one-person) was calculated for each residence group. Using average trip lengths for local, nonlocal, border state, and nonborder state anglers as reported in the mail survey, and the total numbers of days fishing per residence group, we calculated the total number of one-person, multiple-day fishing trips for each residence group.

Initial direct expenditures of anglers in the Lake Fork area by nonresident anglers constitute the direct economic effects of the Lake Fork fishery on the local economy. However, direct effects are only one component of the full economic impact of the Lake Fork fishery. Other factors include indirect and induced effects. Indirect effects include economic activity generated among the businesses supplying goods and services to the firms that directly sold their products to visiting angling parties (e.g., additional food supplied to area restaurants for anglers' consumption). Induced effects include economic activity generated by increased local incomes as a result of anglers' expenditures. The sum of direct, indirect, and induced effects constitutes total economic impact. Type I, Type II, and Type III are three types of multipliers available with IMPLAN. Selection among these multiplier types has an important effect on the size of the impacts that are estimated. The Type I multipliers capture the interindustry effects and exclude the induced effects. The Type II multipliers give the direct, indirect, and induced effects in cases where the induced effect works by incorporating labor income and the household consumption into the multiplier. The Type III multipliers measure the direct and indirect and induced effects in cases where the induced effect is based on population. A fundamental problem with the Type III multipliers is that a change in the economy may have reflected a change in productivity or unemployment and does not always result in an increase in population (Minnesota IMPLAN Group 1999). Indeed, for service-intensive exports such as recreation, Type II multipliers are preferred over Type III. Thus, this study used Type II multipliers.

An I−O model can describe the economic importance of a fishery in terms of changes in total industry output, value added, labor income (broken down by employee compensation and proprietor income), and employment (i.e., how much additional employment can be supported by that

TABLE 1.—Number of fishing trips, average trip length, and days of participation at Lake Fork, Texas, from June 1, 1994, to May 31, 1995, by angular residence.

Angler type	Number of boat trips	Average trip length (d [SD])	Number of days fishing
Residents of the Lake Fork area	27,953	1.32 (0.12)	36,898
Texas anglers who live outside the Lake Fork area	161,948	1.59 (0.12)	257,457
Out-of-state anglers from bordering states	11,714	2.98 (0.09)	34,908
Out-of-state anglers from nonbordering states	3,124	6.04 (1.07)	18,838
All anglers	204,739		348,181

spending). Total industry output is the dollar value of all goods and services produced to satisfy final demand for goods and services and the interindustry transactions needed to produce them. Output can also be thought of as a value of sales plus or minus inventory (Minnesota IMPLAN Group 1999). Final demand is the dollar value of purchases from producing industries for final consumption. Value added is the difference between purchased inputs and the value of goods and services produced; it includes salary and wages, state and local tax revenue, nonwage employee compensation, federal tax revenues, profits, and net interest.

The aggregate total effects of changes are calculated by matrix inversion, which estimates economic multipliers that reflect direct, indirect, and induced impacts. An assessment of the total economic impacts of angler economic activities must consider the sum of direct, indirect, and induced activities. At each round of spending, some dollars leak from the local economy. Leakages in an I−O model are typically defined as import purchases, taxes, or savings—all of which remove dollars from the initial spending stream as it passes from sector to sector. Calibration of leakages is critical because it affects the size of the multipliers. Because the Lake Fork fishery could require additional expenditures by local county governments for public services such as law enforcement, water supply, and waste treatment, tax income generated locally by anglers must be considered. Indirect business taxes (consisting primarily of excise and sales taxes paid by individuals to business) generated by angler expenditures will probably contribute to local counties through various business sectors.

Results

Overall, 74% of anglers fishing Lake Fork were nonlocal Texans, 10.6% of anglers were local residents from the three adjacent counties, 10% were from adjacent border states (Arkansas, Louisiana, and Oklahoma), and 5.4% were other out-of-state anglers. We estimated 204,739 one-person, multiple-day fishing trips were made to the reservoir between June 1, 1994, and May 31, 1995. Accordingly, nonlocal Texas anglers accounted for most of the fishing trips (79.1%), and out-of-state anglers accounted for 7.2% of the trips at Lake Fork (Table 1). Local residents spent the least per angler per trip (US$44) in the Lake Fork area, whereas out-of-state anglers from nonbordering states spent the most there per angler per trip ($474), nearly two-thirds more than out-of-state anglers from bordering states (Table 2).

Nonresidents of the Lake Fork area accounted for 89.4% of all anglers. Nonlocal Texans made up 82.7% of nonresidents, and border state and non-border-state anglers made up 11.2% and 6.1%, respectively. Using weighted proportions, nearly 23% of the direct expenditures made in the Lake Fork area were for ''lodging'' and 19% were for ''recreation, fishing, and boating fees.'' Other substantial categories of expenditures were for ''eating and drinking'' and ''transportation,'' which

TABLE 2.—Average trip-related expenditures (U.S. dollars) per angler per trip for a Lake Fork fishing trip from June 1, 1994, to May 31, 1995.

Angler type	Average expenditures in Lake Fork Area (SE)	Average expenditures elsewhere in Texas (SE)	Average expenditures out-of-state (SE)
Residents of the Lake Fork area	44.46 (4.62)	7.22 (3.76)	
Texas anglers who live outside the Lake Fork area	59.51 (5.02)	58.29 (15.13)	
Out-of-state anglers from bordering states	292.19 (14.93)	39.79 (5.78)	52.24 (4.91)
Out-of-state anglers from nonbordering states	473.74 (42.26)	169.27 (71.68)	145.75 (91.79)

TABLE 3.—Expenditures (U.S. dollars) by anglers for Lake Fork fishing trips from June 1, 1994, to May 31, 1995.

Angler type	Expenditures in Lake Fork area	Expenditures elsewhere in Texas	Expenditures out-of-state	Total expenditures
Residents of the Lake Fork area	1,243,000	202,000		1,445,000
Texas anglers who live outside the Lake Fork area	9,638,000	9,440,000		19,078,000
Out-of-state anglers from bordering states	3,422,000	466,000	612,000	4,500,000
Out-of-state anglers from nonbordering states	1,480,000	529,000	455,000	2,464,000
All anglers	15,783,000	10,637,000	1,067,000	27,487,000

made up nearly 18% and 17% of total expenditures, respectively. Of the total angler expenditures ($15,783,000) made in the Lake Fork area, $14,540,000 (92%) was spent by anglers residing outside of the local area and was included in the local three-county I−O model (Table 3).

Most of the economic effects were generated in the tourism sectors of hotels and lodging, eating and drinking, and recreation services (e.g., boat rentals, boat operation, boat launch fees, fishing guide fees, and fishing licenses). In turn, these expenditures generated additional expenditures by local service providers, such as restaurant and hotel employees, from tips and direct payments for services, which provided additional economic stimulant. The $14,540,000 in direct expenditures made by nonresident anglers (nonlocal, border state, and other non-Texas residents) for local goods and services generated an additional $4,019,871 in economic output, resulting in a total output of $18,559,871 and 367 full- and part-time jobs associated with or generated by this fishery (Table 4). The average output multiplier was 1.28; that is, every dollar spent in the economy generated $1.28 totally. The total value-added generated by this increased level of output was estimated to be $9,355,999. This is smaller than the total output figure because it represents only the amount of income and taxes retained in the three counties surrounding the reservoir. Many of the interindustry inputs such as labor, capital, and wholesale supplies had to be purchased from outside the region. Each of those outside purchases represents ''leakage'' from the local economy. The more leakage in an economy, the smaller the economic multiplier and the overall economic impacts from changes in final demand. A component of the total value-added impact generated estimated the impact on labor income at $5,912,242 (Table 4).

The fishery had a smaller economic impact at the state level, because only 15.4% of the anglers were not Texas residents (Table 3). Nearly 34% of the direct expenditures made in Texas by nonresident anglers were for lodging, 17% for recreation, fishing, and boating fees (Table 5). Other substantial categories of expenditures were for eating and drinking and transportation, which made up nearly 17% and 16% of total expenditures, respectively. The total output associated with the fishery at the state level was $9,585,057. Finally, $3,361,551 in labor incomes and 163 jobs were contributed to the state of Texas by Texas nonresident anglers

TABLE 4.—Impacts of angler expenditures on the local economy (Hopkins, Rains, and Woods counties, Texas) from June 1, 1994, to May 31, 1995. Industry output, value added, and labor income are in U.S. dollars; employment is number of jobs.

Sector	Industry output	Value added	Labor income	Employment
Agriculture	946,578	327,639	252,704	22.4
Mining	171,469	88,368	13,129	0.2
Construction	205,202	107,037	99,893	3.5
Manufacturing	1,292,717	405,742	254,654	6.3
Transportation, communication, and utilities	842,049	512,191	224,494	4.6
Trade	2,316,072	1,802,360	1,119,381	59.1
Eating and drinking	2,723,401	1,313,367	925,425	84.2
Finance, insurance, and real estate	1,545,051	1,205,033	627,523	33.9
Hotels and lodging	3,023,700	1,677,525	1,094,055	76.6
Services	2,715,675	1,168,779	823,664	38.8
Boating and recreation	1,116,139	677,629	412,837	34.7
Government	117,616	61,193	55,348	1.3
Other	9,136	9,136	9,136	1.4
Institutions	2,075,069			
Total	18,559,871	9,355,999	5,912,242	367.1

TABLE 5.—Impacts of nonresident angler expenditures on the economy of Texas from June 1, 1994, to May 31, 1995. See the caption to Table 4 for additional details.

Sector	Industry output	Value added	Labor income	Employment
Agriculture	88,250	35,419	23,924	2.0
Mining	92,697	56,292	16,283	0.2
Construction	118,719	65,016	60,047	1.7
Manufacturing	819,733	260,539	152,725	3.7
Transportation, communication, and utilities	474,249	293,700	139,976	2.5
Trade	997,562	765,652	471,696	20.1
Eating and drinking	1,032,472	526,421	370,933	29.4
Finance, insurance, and real estate	944,515	713,027	294,109	10.0
Hotels and lodging	2,010,972	1,212,284	790,760	37.4
Services	1,526,521	902,984	698,965	25.2
Boating and recreation	813,666	482,284	293,850	29.1
Government	112,611	59,467	43,403	1.0
Other	4,881	4,881	4,881	0.6
Institutions	548,209			
Total	9,585,057	5,377,967	3,361,551	163.0

(Table 5). Because expenditures by Texas residents were excluded from the Texas model, fewer total expenditures ($5,897,000) were included. The average output multiplier (1.62) was greater than the local multiplier because the statewide model captures more interindustry activity (i.e., the amount of economic leakage is smaller because the region of concern is larger).

Total direct and induced industry outputs in the taxable sectors (indirect expenditures are interindustry transfers and are not taxable in Texas) resulted in total tax revenue of $2,689,025 to the three local counties. Thirty-five percent of indirect business tax impacts were generated by trade and retail goods, 17% by hotels and lodging places, and 17% by eating and drinking categories.

Discussion

Trip expenditures by local and nonlocal anglers were comparable to those from other freshwater fisheries (Anderson et al. 1986; Schorr et al. 1995). The distribution of local (11%), nonlocal state resident (74%), and out-of-state (15%) anglers at Lake Fork was not comparable to those of other previously studied freshwater fisheries. Nearly twice as many (an estimated 40%) Lake Texoma anglers, for example, were from the local ''impact region,'' and the rest were nonlocals or from out-of-state (Schorr et al. 1995). At Devil's Lake in North Dakota, local anglers, nonlocal anglers, and out-of-state anglers were responsible for 20, 66, and 14% of total fishing trip-related expenditures, respectively. Had Lake Fork been managed under the generic statewide largemouth bass regulations instead of trophy bass limits, it would probably not have ''competed'' as well against other largemouth bass fishing destinations in the region, it probably would have attracted mainly local anglers, and this study probably would not have been done. Other destinations would have been closer to home than Lake Fork for many and hence cost less for anglers residing in Texas as well as those from out of state. Given no differences in the quality of fishing experience afforded, we would expect these lower trip-cost alternatives would have been used more frequently than the higher-cost Lake Fork experience (Loomis and Walsh 1997). But Lake Fork was designed to yield a unique type of fishing experience and because of this, anglers are apparently willing to incur additional travel costs and bypass other largemouth bass fishing destinations closer to home to be able fish at a location that suits their particular needs.

This paper provides a more conservative and detailed understanding of the economic impacts of a recreational fishery than available in many of the previously conducted studies of freshwater fisheries. Some have used I−O models such as IMPLAN and RIMS (Anderson et al. 1986; Schorr et al. 1995; Steinback 1999; Bohnsack et al. 2002); others have been ''quick and dirty'' analyses based on state-level impact multipliers derived from the 1996 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (U.S. Fish and Wildlife Service and U.S. Bureau of the Census 1997) or approximate multipliers from other sources. The practice of using a single multiplier wrongly assumes that all economic sectors have similar multiplier effects. An initial analysis of economic impacts at Lake Fork, for example, used single local (2.2) and state-level (3.0) multipliers to estimate indirect and induced impacts, respectively

(Hunt and Ditton 1996b). The resulting estimates of local and state-level total industry output impacts were 72% and 85% higher, respectively, than reported here using IMPLAN and their respective data files for county-level and state-level economies. Furthermore, Hunt and Ditton (1996b) were unable to determine which business sectors of the economy were impacted and to what extent by the indirect and induced impacts of angler expenditures.

Whereas we excluded all local and Texas residents when we completed our assessment of economic impacts, this has not always been the case with other economic impact assessments of recreational fisheries. In calculating the regional economic impact of the Devil's Lake fishery in North Dakota, for example, Anderson et al. (1986) used three residency-based scenarios, ranging from the conservative (the economic impacts of nonresidents only) to the optimistic (the economic impacts of locals, nonlocals, and nonresidents) to produce three different estimates of economic impact. Our approach closely approximated the assumptions of the middle scenario used by Anderson et al. (1986), which focused on the economic impacts of nonlocal and nonresident anglers. In contrast, when Schorr et al. (1995) calculated the effects of angler expenditures on the Lake Texoma regional economy, data for regional residents (locals) were included in the final overall estimate of total economic output ($57.4 million).

This analysis also revealed the extent to which respective private sector stakeholders benefit from fisheries. In this case, for example, the largest beneficiaries of the economic impact in terms of the number of part- or full-time jobs at Lake Fork were the hotels and lodging and the eating and drinking sectors. These results are fairly typical for other outdoor recreation activities as well (English and Bowker 1996; Loomis and Walsh 1997). Because these sectors have the most to lose, we would expect their representatives to want to be heard on any proposed changes in fishery rules and regulations that might impact the extent and distribution of current angler clientele. Further, this perspective is in keeping with a social definition of a ''fishery'' that includes not only fish but also anglers and all other businesses and related infrastructure involved in the provision of recreational fishing opportunities (Ditton 1996).

The total value-added component of economic output (Tables 4 and 5) and its labor component (salaries and wages) are probably more meaningful measures of the economic impact of angler expenditures at a reservoir, for example, than are overall output figures (Crompton and McKay 1994). Accordingly, with regard to related public sector developments, managers can expect the public to be more concerned with how much more income they will earn from nonlocal expenditures than with the extent of expenditures or total economic output.

Consistent with previous economic impact studies of recreational fisheries (Anderson et al. 1986; Schorr et al. 1995; Steinback 1999; Bohnsack et al. 2002), we did not investigate any of the negative effects that may have accompanied this fishery, although we should have done so to provide a more balanced perspective. In addition to estimates of local expenditures and their total economic impact, some consideration needs to be given to the costs of this facility and related activity to local governments and residents (Stokowski 1996). Negative impacts can be physical and environmental, economic, and social in nature (Pizam 1978). Negative physical and environmental impacts can include increased traffic densities and reduced accessibility. Negative economic impacts can include escalation in land prices, employment fluctuation, and dependency on a single industry. Negative social impacts can include crowding and congestion caused by increased fishing activity, introduction of undesirable activities, excessive concern for material gain, and loss of cultural identity. Accordingly, we would expect stakeholders to take these negative aspects into account in assessing the impacts of fishery developments and discount expected positive benefits accordingly.

Several final cautions are necessary. First, the reader is encouraged not to generalize study results to other bodies of water inhabited by largemouth bass or even to those with regulations in place that seek to promote a trophy largemouth bass fishery. Every water body is unique in terms of its resource capability, proximity to angler populations, extent of current use, and competition from other fishing destinations. Whether it will attract nonlocal in-state and out-of-state anglers to the same extent should be a planning objective, with exact outcomes remaining to be seen from a study similar to this one. Second, our analysis focused solely on the economic impact of nondurable goods and services; it did not include expenditures associated with the purchase of boats, motors, trailers, and overall fishing equipment, for example, because these expenditures cannot be attributed solely to a particular fishery, nor could we pro-rate the annual depreciation of the items. Hence, our results were conservative in that they included only direct expenditures for fishing at Lake Fork and their impacts. Third, as has been the case in all previous economic impact analyses of recreational fisheries, we failed to consider changes in the value of land surrounding the reservoir. Future studies of the economic impact of recreational fisheries should include a thorough examination of the changes in public and private assets including land (Stoevener et al. 1974). Finally, for clarification purposes, economic impact assessments are useful for estimating the economic effects of injecting new money into an area. They do not measure an angler's willingness to pay (i.e., net economic benefits) and hence they are not suitable for benefit–cost analyses (Propst and Gavrilis 1987; Edwards 1991).

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