The Economic Value of Sportfishing Trips to Oklahoma Lakes

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Recreation and Sportfishing at Oklahoma Lakes

As Oklahoma's agencies and policymakers try to balance competing water uses with prolonged drought conditions, it is increasingly important to learn about the value of water resources like lakes and rivers. For example, conflicts have arisen between Oklahoma City, the Choctaw and Chickasaw Nations and users of Lake Sardis, each of whom lay claim to the water in the lake (Layden, 2015). There is increasing municipal demand for the lake's water, but the community around Lake Sardis views the lake as a tourism draw, bringing in people for fishing, boating, hiking and wildlife viewing. Each year, millions of trips are taken to public waterbodies in Oklahoma for boating, swimming, fishing and other outdoor activities (U.S. Fish and Wildlife Service, 2014). One way to understand the value that Oklahomans place on preserving lakes and rivers is to measure and analyze visitation numbers.

Recently, thousands of trips have been affected by declining water quality conditions and water withdrawals at several Oklahoma lakes. Low lake conditions can result in lost access due to boat ramp closures, and algal blooms can warrant no-bodily-contact warnings. These changes can discourage potential visitors and impose economic costs on current water users by forcing them to travel to other lakes or not traveling at all. Additionally, fewer and/or shorter trips can mean fewer tourism dollars spent in the lake's vicinity, hurting the local economy.

One of the most popular forms of outdoor recreation in Oklahoma is sportfishing. According to a national report on outdoor recreation, Oklahomans spend more total days fishing than wildlife watching and hunting combined (U.S. Fish and Wildlife Service, 2014). Anglers spend more than $800 million annually on fishing-related purchases, generating $77 million in state and local tax revenue and supporting more than 11,000 jobs (American Sportfishing Association, 2012). Changing water conditions at Oklahoma lakes can therefore have an especially large effect on anglers and the economy.

The rest of this Fact Sheet summarizes a recent study on the value of sportfishing trips in Oklahoma and the impact of lake conditions on anglers. To evaluate the economic benefits of recreational fishing at Oklahoma lakes, an economic demand analysis of sportfishing trips taken by state residents was conducted. This analysis related angler's lake visitation patterns across the state to differences in lake conditions, including water quality. The study is part of an ongoing effort to advance our understanding of the recreational value of Oklahoma's lakes.

Summary of Key Results

- More than two-thirds of all sportfishing trips in Oklahoma are to public reservoirs, while another ten percent are to rivers.
- On average, an angler fishes 31 days during one year.
- The most popular lakes in Oklahoma for sportfishing are Eufaula, Texoma, Fort Gibson and Grand Lake.
- On average, an angler spends about $50 per fishing trip.
- The number and economic impact of sportfishing trips varies with the size and location of lakes. However, even a small lake may attract 10,000 visits per year and generate hundreds of thousands of dollars in spending by anglers.
- The average sportfishing trip has an economic value of about $67. This is the amount an angler is willing to pay to visit their preferred lake for a given trip. The specific value is higher for overnight trips and lower for day trips.
- Water quality impacts anglers. The number of sportfishing trips to lakes decrease as turbidity (a loss of clarity) and an increase in hypereutrophic conditions (an excess of nutrients such as phosphorus and nitrogen, associated with algal blooms and little available oxygen in the water).

Sportfishing Demand and Valuation Study

Objectives

Economists have developed several ways of analyzing the demand for recreational activities. One approach is to

use economic demand models to analyze the frequency of trips taken to different recreation sites across a region. This approach is convenient because it can be used to estimate the economic value of recreational trips with a valuation technique known as the travel cost method. Since there often is a small fee or even no fee to fish at lakes, this valuation method uses the cost of travel as a proxy for the price of visiting a site.

The main objective of the study was to analyze the demand for and estimate the value of fishing trips to individual lakes in Oklahoma. The study was able to identify the lake attributes that determine the angler's choice of Oklahoma fishing site. Unfortunately, fish catch rate information was not available in time for this study, but information was gathered about the water quality and shoreline setting of lakes.

Data

Data on fishing trips was provided by the Oklahoma Department of Wildlife Conservation (ODWC). In fall 2014, the ODWC conducted a survey of 3,000 randomly selected fishing license holders living in Oklahoma. The study did not examine non-resident anglers. About 780 surveys were returned, for a response rate of 26 percent. The survey asked about fishing participation in the past year, species preferences, gear preferences, opinions about ODWC regulations and information about the most recent fishing trip. Approximately 17 percent of respondents said they did not fish in the past year. Among those who did fish, most preferred to fish for catfish and black bass.

A list of 148 Oklahoma lakes based on the Oklahoma Water Resources Board (OWRB) lake index and the location information provided by anglers about their most recent fishing trip was determined. Table 1 provides some trip statistics from the ODWC data. Rivers and ponds were grouped into two generic fishing options and added to the list of lakes, making a total of 150 fishing alternatives used in the demand analysis.

Lake data came from a variety of sources. Water quality measures were obtained from the OWRB. Trophic State Index (TSI) and turbidity to measure water quality were used. Water with a TSI below 40 is considered oligotrophic, with low biomass and nutrient levels; oligotrophic lakes are associated with few game fish. Water with a TSI more than 60 is considered hypereutrophic, with excessive nutrient levels. Such lakes may contain more fish, but they have an increased risk of algal blooms and fish kills. Turbidity is a measure of suspended particulates in the water. High levels of turbidity reduce photosynthesis of submerged vegetation and fish biomass. Turbidity is perceptible to the eye and can be aesthetically unpleasant. The demand analysis used the TSI measure, plus an indicator for lakes classified as hypereutrophic to measure the relationship between lake nutrient levels and biological productivity and lake visitation. The analysis used the turbidity measure for the relationship between cloudy water conditions and visitation. The analysis also measured the impact of shoreline length, number of boat ramps and nearby forest size on visitation.

Methods

The demand analysis was conducted as a site choice model (Haab and McConnell, 2003). For Oklahoma fishing trips, this model assessed the importance of different lake features on visitation, including water quality, using data on 1) the 150 fishing alternatives, including all major lakes in the state, and 2) the locations anglers reported visiting most recently for the purpose of fishing.

The demand analysis was combined with the travel cost method to calculate the economic value of a fishing trip at individual lakes (Haab and McConnell, 2003). This per-trip value is measured as the difference between the maximum amount an angler is willing to pay to visit and fish at a site and the actual travel costs. In other words, this is the amount an angler is willing to pay to prevent their preferred site from being closed for one trip. An estimate of the damages from a site closure or a dead fishery can be estimated by multiplying this value by the total number of affected (or "lost") trips.

Results

The results of the demand analysis are summarized in Table 2. Sportfishing trips are significantly impacted by several lake characteristics:

1. Anglers are less likely to fish at lakes far from home.
2. Increases in TSI at a lake are associated with more trips.
3. Fewer trips are taken to lakes with high turbidity and classified as hypereutrophic.
4. Shoreline length, the amount of forest and the number of boat ramps all have a positive effect on visitation.
5. The impact of the Close-to-Home agreements between the ODWC and several municipalities to offer improved fishing opportunities at metro lakes. The analysis found

Table 1. Selected trip characteristics of Oklahoma resident anglers.

Trip characteristics	*All Trips*		*Single Day Trips*		*Overnight Trips*	
	Median	*Average*	*Median*	*Average*	*Median*	*Average*
Destination (in percentages)						
Lake/Reservoir	-	73	-	65	-	81
River	-	16	-	11	-	12
Pond	-	11	-	24	-	7
Spending (in dollars)						
Transportation	30	53	20	25	50	86
Lodging and food	10	62	0	14	50	113
Fishing costs (bait, boat, etc.)	10	34	8	20	20	49
Days	1	3	1	1	3	5

Table 2: Interpretation of the site choice model results.

Lake characteristic	*Impact on fishing trips**
Travel cost	–
Trophic state index	+
Hypereutrophic	–
Turbidity	–
Shoreline length	+
Surrounding forest	+
Number of boat ramps	+
Close to Home program	+

*A "–" and a "+" denote a reduction and increase in the number of sportfishing trips taken to a lake on average for all lakes.

lakes in the close-to-home program attract more trips than without the program.

Table 3 shows that a typical sportfishing trip at each lake has an economic value of about $60. This estimate can be used to calculate the economic damages when, for example, a lake's fishery is lost due to a fish kill, by multiplying the fishing trip value by the reduction in trips to the affected lake. For convenience, we have posted conservative estimates of the number of annual sportfishing trips taken to each lake. These figures are based on the demand analysis and USFWS's estimate of the annual statewide trips taken by Oklahoma resident anglers (US Fish and Wildlife Service, 2014). These visitation numbers do not include sportfishing trips taken by non-residents.

Conclusions

Sportfishing is an enduring pastime, but it also has important economic impacts on local economies. Maintaining a vibrant recreational fishery in Oklahoma and its associated economic benefits depends on protecting access to healthy lakes and rivers. This fact sheet summarized some of the work done on the economics of fishing in Oklahoma. Our analysis found that the value of a sportfishing trip to an individual lake is about $60. Furthermore, although fishing trips go to a wide variety of lakes in the state, the analysis found that angler visitation responds to differences in water quality. Lakes with high turbidity levels tend to receive fewer sportfishing trips. Lakes with low nutrient levels are also associated with fewer sportfishing trips, which suggest that anglers avoid lakes with less biomass (including fish biomass). On the other hand, lakes classified as hypereutrophic are associated with fewer sportfishing trips.

Managing Oklahoma's water resources requires information about the value of different uses, including household and municipal consumption, agriculture, water-based recreation and wildlife protection. This study has quantified the value Oklahomans have for one type of recreation, angling, and thus serves as a lower bound or conservative estimate of non-marketed uses. If we had a more comprehensive dataset of all uses and all users, we would likely find even higher values for specific lakes. Protecting lakes and rivers can be costly, but it can directly benefit users, including recreational anglers, and have direct and indirect benefits for local economies. With the information in this fact sheet, decision makers and the public may find it easier to gauge the economic benefits of protecting Oklahoma's lakes.

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Table 3. Estimated sportfishing trip value and total 2014 visitation to individual lakes.

Lake	*Annual trips*	*Value of a trip ($)*	*Lake*	*Annual trips*	*Value of a trip ($)*
Altus City	1,253	59.47	John Wells	2,018	59.48
American Horse	Closed in 2014		Kaw	90,838	59.85
Arbuckle	44,267	59.65	Kerr	156,250	60.11
Arcadia	69,218	59.75	Keystone	260,279	60.56
Ardmore City	3,616	59.48	Kitchen	14,469	59.53
Atoka	30,442	59.59	Konawa	19,047	59.55
Bell Cow	23,667	59.56	Langston	10,055	59.51
Birch	35,617	59.61	Lawtonka	24,692	59.57
Bixhoma	4,487	59.49	Liberty	10,622	59.51
Bluestem	10,621	59.51	Lloyd Church	2,382	59.48
Boomer	24,909	59.57	Lone Chimney	21,351	59.55
Broken Bow	64,530	59.75	Long Creek	380	59.47
Brushy Creek	2,085	59.48	Longmire	9,036	59.51
Burtschi	4,219	59.49	Lugert	No fishing in 2014	
Canton	23,150	59.56	Markham Ferry	141,433	60.05
Carl Albert	1,335	59.47	McAlester	7,823	59.50
Carl Blackwell	59,612	59.71	McGee Creek	38,469	59.62
Carl Etling	302	59.46	McMurtry	27,666	59.58
Carlton	648	59.47	Meeker	3,046	59.48
Carter	1,546	59.48	Mountain	1,916	59.48
Cedar	6,513	59.50	Murray	35,606	59.61
Chandler	7,230	59.50	Nanih Waiya	761	59.47
Chickasha	11,443	59.52	New Spiro	3,650	59.48
Claremore	19,681	59.55	Okemah	15,453	59.53
Clayton	1,051	59.47	Okmulgee	22,653	59.56
Clear Creek	11,180	59.51	Oologah	182,132	60.22
Cleveland	8,863	59.50	Overholser	16,748	59.54
Clinton	4,599	59.49	Ozzie Cobb	1,691	59.48
Coalgate	4,041	59.49	Pauls Valley	5,721	59.49
Comanche	3,835	59.48	Pawhuska	1,581	59.48
Copan	31,157	59.59	Pawnee	6,788	59.50
Crowder	8,413	59.50	Perry	8,090	59.50
Crystal	10,029	59.51	Pine Creek	47,285	59.66
Cumberland	7,725	59.50	Ponca	16,406	59.54
Cushing	8,607	59.50	Prague	7,327	59.50
Dave Boyer	796	59.47	Pretty Water	2,594	59.48
Dead Warrior	663	59.47	Purcell	6,052	59.49
Dolese	17,473	59.54	Quanah Parker	3,438	59.48
Dripping Springs	17,194	59.54	Raymond Gary	4,727	59.49
Duncan	5,681	59.49	Rocky	9,953	59.51
Durant	2,714	59.48	Sahoma	16,904	59.54
El Reno	8,545	59.50	Sardis	38,722	59.63
Elk City	4,497	59.49	Schooler	384	59.47
Ellsworth	57,187	59.70	Scott King	3,927	59.49
Elmer	1,291	59.47	Shawnee Twin	33,534	59.60
Elmer Thomas	5,559	59.49	Shell	25,436	59.57
Eucha	51,498	59.68	Skiatook	205,514	60.32
Eufaula	521,196	61.77	Sooner	34,541	59.61
Evan Chambers	786	59.47	Spavinaw	37,922	59.62

Table 3. Estimated sportfishing trip value and total 2014 visitation to individual lakes. (cont'd)

Lake	*Annual trips*	*Value of a trip ($)*	*Lake*	*Annual trips*	*Value of a trip ($)*
Fairfax City	3,633	59.48	Sportsman	13,483	59.52
Fort Cobb	37,970	59.62	Stanley Draper	48,475	59.66
Fort Gibson	414,706	61.28	Stroud	20,124	59.55
Fort Supply	6,431	59.50	Talawanda	5,022	59.49
Foss	28,495	59.59	Taylor	8,274	59.50
Frederick	5,492	59.49	Tecumseh	1,775	59.48
Fuqua	18,731	59.54	Tenkiller	106,657	59.90
Grand Lake	385,401	61.24	Texoma	478,036	62.36
Great Salt Plains	2,925	59.48	Thunderbird	148,152	60.10
Greenleaf	18,148	59.54	Tom Steed	27,485	59.58
Guthrie	8,562	59.50	Vanderwork	4,450	59.49
Hall	913	59.47	Veterans	2,268	59.48
Healdton	2,142	59.48	Vincent	1,258	59.47
Hefner	40,526	59.63	Watonga	3,506	59.48
Henryetta	3,620	59.48	Waurika	24,166	59.57
Heyburn	18,420	59.54	Waxhoma	4,546	59.49
Holdenville	11,596	59.52	Wayne Wallace	3,031	59.48
Holway	21,392	59.55	Webbers Falls	192,714	60.26
Hominy Municipal	9,227	59.51	Weleetka	2,212	59.48
Hudson	8,953	59.51	Wes Watkins	29,889	59.59
Hugo	31,809	59.60	Wetumka	5,096	59.49
Hulah	23,118	59.56	Wewoka	10,302	59.51
Humphreys	20,165	59.55	Wiley Post	7,860	59.50
Jap Beaver	1,008	59.47	Wister	64,894	59.75
Jean Neustadt	6,449	59.50	Yahola	6,722	59.50
All ponds	1,342,105	–	All rivers	923,384	–

Note: The sum of trips across all lakes, rivers and ponds equals total statewide annual trips (7,499,000), as estimated from a 2011 survey (US Fish and Wildlife Service, 2014).

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