Analysis of the 1985 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation

Trout Fishing in the U.S.; 1985

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TROUT FISHING IN THE U.S.; 1985

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Abstract

This paper presents estimates of the number of trout anglers and days of fishing for trout for the nation as a whole and for each of the 50 states. Sociodemographic characteristics of those who fish for trout bass are compared with the U.S. population. Trout anglers are also compared to freshwater anglers in general in order to determine if there are systematic differences between the two groups.

Introduction

This report summarizes and discusses the extent of trout fishing in the United States. Trout includes rainbow trout, brown trout, brook trout, lake trout, etc. This report covers anglers 16 years old or older who fished in rivers or streams, manmade ponds or reservoirs, or natural lakes or ponds. Trout fishing in the Great Lakes is not included in this report. These estimates are based upon results from the 1985 National Survey of Fishing, Hunting, and Wildlife Associated Recreation[1].

The next section consists of estimates of fishing for trout for the nation as a whole and for each of the 50 states. The third section consists of a discussion of the sociodemographic characteristics of those who fish for trout and comparisons with all freshwater anglers in order to determine if there are systematic differences between the two groups. This section will rely on both descriptive statistics and a probability of participation model. The final section provides a summary and closing comments.

Fishing for Trout

Trout was one of the most popularly sought after fish species in 1985. As Table 1 shows, over 11 million freshwater anglers 16 years old or older fished for trout in the U.S. This meant that about one out of every three freshwater anglers (29 percent) fished for trout. In comparison, over 16 million anglers fished for black bass (42 percent), about 14 million fished for catfish (36 percent), approximately 4 milion fished for walleye or sauger (11 percent) and 3.5 million fished for northern pike(9 percent). Of course, anglers can fish for more than one species so that summing the number of anglers who fished for the various species will result in a total that is greater than the number of freshwater anglers (38.4 million). Trout anglers spent more than 159 million days on the water pursuing that elusive trout, accounting for 20 percent of freshwater fishing days. As noted above, anglers can fish for more than one species and they can do this on a particular day, so that the number of freshwater fishing days (785.9 million) is less than the total from summing the days for each species.

Tables 2, 3, and 4 provide estimates of fishing for trout on a state by state basis. These estimates represent freshwater and trout fishing in-state by residents and nonresidents combined. The sample size for Hawaii was too small to permit estimates of trout fishing in Hawaii. In a number of other states the sample sizes were relatively small and the estimates should be used with caution[2]. The map which shows participation in

Table 1. Anglers and Days of Fishing for Trout and other Fish: 1985

(Anglers 16 years old or older. Numbers in thousands. Excludes Great Lakes Fishing)

Type of Fish Sought	Anglers		Days of Fishing	
	Number	Percent	Number	Percent
Total, all freshwater anglers	38,433	100	785,855	100
Black bass	16,241	42	342,587	44
Panfish	14,160	37	264,493	34
Catfish	14,023	36	284,516	36
Crappie	11,747	31	229,824	29
+ **Trout**	**11,317**	**29**	**159,255**	**20**
Walleye/sauger	4,122	11	79,461	10
Northern pike/pickerel	3,512	9	69,508	9
White bass	3,102	8	69,141	9
Striped bass	3,032	8	70,025	9
Salmon	1,170	3	15,562	2

1 Many of the estimates presented here can be found in the 1985 Survey's national and state reports (USDI 1988).

2 Estimates based on sample sizes of less than 10 observations were considered too unreliable to report and are indicated by . . . in the tables. Estimates based on relatively small sample sizes (between 10 and 25) are indicated by an * in the tables.

bass fishing by state includes only the contiguous 48 states and Alaska.

Table 2 shows that the percentage of freshwater anglers who fished for trout varied considerably across states. Participation rates ranged from a low of 2 percent in Indiana to 94 percent in Wyoming. In general, a higher percentage of freshwater anglers fished for trout in the western states, New England, and Pennsylvania. Conversely, states with a lower percentage of anglers fishing for trout were concentrated in the southern and north central states.

The map below reinforces this observation. Relatively lower participation rates (8 percent of freshwater anglers or less) occurred in the south, from Texas to Florida, and in the north central area, from Minnesota to Ohio, as shown by the right hatched area. States with an open white background had participation rates ranging from 14 to 47 percent, which bracketed the national rate of 29 percent. This can be considered an average or medium rate of participation in trout fishing. In the remaining states, 48 percent or more, or nearly half, of freshwater anglers fished for trout.

One interesting feature of the distribution of participation rates in trout fishing was the wide dispersion of state participation rates around the national rate. While the national participation rate was 29 percent, few states had a participation rate that was close to that rate. States either had rates that were significantly above this rate (e.g. 11 states had participation rates in excess of 65 percent) or significantly below this rate (e.g. 12 states had participation rates of 6 percent or less). This meant that there were some gaps in the distribution that could be

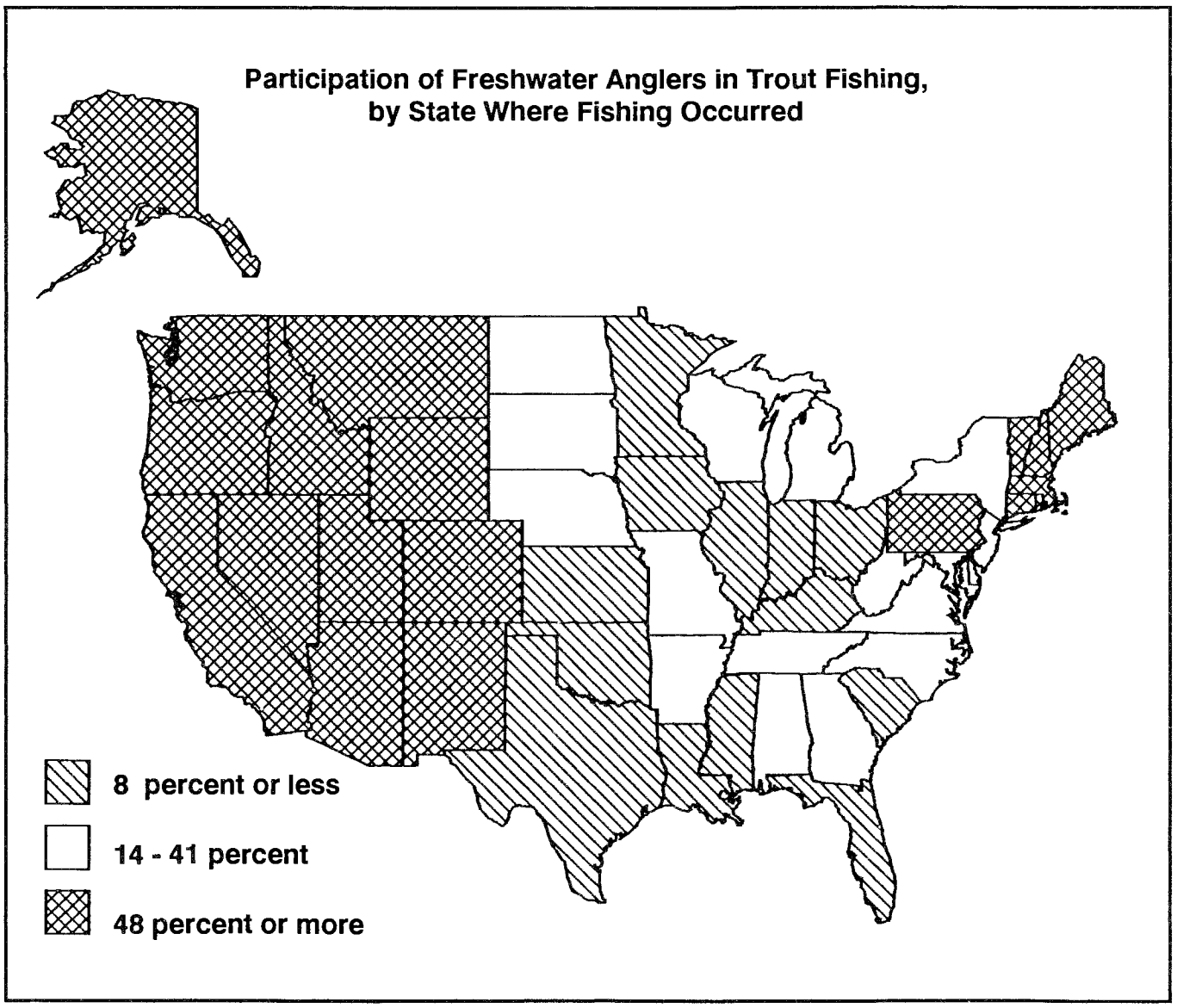

Table 2. Freshwater Anglers and Trout Anglers, by State Where Fishing Occurred

(Anglers 16 years old or older. Numbers in thousands. Excludes Great Lakes Fishing.)

State	Freshwater Anglers	Trout Anglers	
		Number	Percent
United States	38,433	11,317	29
Alabama	1,061	33*	3*
Alaska	223	113	51
Arizona	638	318	50
Arkansas	932	146	16
California	3,061	2,110	69
Colorado	1,174	1,011	86
Connecticut	360	209	58
Delaware	60	13*	22*
Florida	1,914	97	5
Georgia	1,355	211	16
Hawaii	11	...	...
Idaho	455	374	82
Illinois	1,423	51*	4*
Indiana	1,311	24*	2*
Iowa	771	44	6
Kansas	554	22*	4*
Kentucky	1,102	60	5
Louisiana	1,054	67*	6*
Maine	365	250	69
Maryland	382	105	27
Massachusetts	492	288	59
Michigan	1,697	262	15
Minnesota	1,777	115	6
Mississippi	926	32*	3*
Missouri	1,600	219	14
Montana	372	307	83
Nebraska	356	49	14
Nevada	237	173	73
New Hampshire	272	168	62
New Jersey	505	196	39
New Mexico	413	313	76
New York	1,148	475	41
North Carolina	1,273	236	19
North Dakota	202	29	14
Ohio	1,571	105	7
Oklahoma	1,086	29*	3*
Oregon	871	655	75
Pennsylvania	1,573	1,016	65
Rhode Island	96	46	48
South Carolina	740	58	8
South Dakota	230	79	34
Tennessee	1,144	180	16
Texas	2,479	119*	5*
Utah	433	357	83
Vermont	188	124	66
Virginia	903	196	22
Washington	928	737	79
West Virginia	463	185	40
Wisconsin	1,642	231	14
Wyoming	353	332	94

... Sample size too small to report data reliably.

* Estimate based on a small sample size.

Table 3. Days of Fishing in Freshwater and for Trout, by State Where Fishing Occurred

(Days of fishing by anglers 16 years old or older. Numbers in thousands. Excludes Great Lakes fishing.)

State	Days of Fishing in Freshwater	Days of Trout Fishing	
		Number	Percent
United States	785,855	159,255	20
Alabama	20,962	684*	3*
Alaska	2,648	1,499	57
Arizona	7,800	2,743	35
Arkansas	19,076	1,255	7
California	43,888	22,821	52
Colorado	15,452	12,225	79
Connecticut	7,045	4,471	63
Delaware	866	160*	19*
Florida	39,978	1,526	4
Georgia	28,454	2,761	10
Hawaii	53	...	...
Idaho	6,622	5,257	79
Illinois	27,489	464*	2*
Indiana	27,158	304*	1*
Iowa	14,500	473	3
Kansas	10,203	814*	8*
Kentucky	20,715	534	3
Louisiana	24,278	571*	2*
Maine	5,746	3,918	68
Maryland	3,895	975	25
Massachusetts	9,687	4,856	50
Michigan	30,387	2,239	7
Minnesota	27,850	856	3
Mississippi	15,407	309*	2*
Missouri	29,607	2,138	7
Montana	4,952	3,820	77
Nebraska	6,860	763	11
Nevada	3,224	1,245	39
New Hampshire	4,315	2,553	59
New Jersey	8,609	2,894	34
New Mexico	4,772	3,450	72
New York	18,011	5,555	31
North Carolina	21,857	2,223	10
North Dakota	2,894	273	9
Ohio	34,339	1,264	4
Oklahoma	21,937	406*	2*
Oregon	12,863	8,034	62
Pennsylvania	39,252	21,583	55
Rhode Island	1,777	744	41
South Carolina	14,770	737	5
South Dakota	2,891	691	24
Tennessee	22,698	2,604	11
Texas	40,462	1,985*	5*
Utah	5,263	4,276	83
Vermont	3,186	1,565	66
Virginia	15,984	1,894	12
Washington	15,348	10,057	66
West Virginia	8,674	2,818	32
Wisconsin	25,991	2,325	9
Wyoming	3,132	2,919	93

... Sample size too small to report data reliably.

* Estimate based on a small sample size.

Table 4. Average Days of Fishing in Freshwater and for Trout, by State

(Anglers 16 years old or older. Excludes Great Lakes fishing.)

State	Average Days of Freshwater Fishing	Average Days of Trout Fishing
United States	20	14
Alabama	20	21*
Alaska	12	13
Arizona	12	9
Arkansas	20	9
California	14	11
Colorado	13	12
Connecticut	20	21
Delaware	14	12*
Florida	21	16
Georgia	21	13
Hawaii	5	...
Idaho	15	14
Illinois	19	9*
Indiana	21	13*
Iowa	19	11
Kansas	18	37*
Kentucky	19	9
Louisiana	23	8*
Maine	16	16
Maryland	10	9
Massachusetts	20	17
Michigan	18	9
Minnesota	16	7
Mississippi	17	10*
Missouri	19	10
Montana	13	12
Nebraska	19	16
Nevada	14	7
New Hampshire	16	15
New Jersey	17	15
New Mexico	12	11
New York	16	12
North Carolina	17	9
North Dakota	14	9
Ohio	22	12
Oklahoma	20	14*
Oregon	15	12
Pennsylvania	25	21
Rhode Island	19	16
South Carolina	20	13
South Dakota	13	9
Tennessee	20	14
Texas	16	17*
Utah	12	12
Vermont	17	13
Virginia	18	10
Washington	17	14
West Virginia	19	15
Wisconsin	16	10
Wyoming	10	9

... Sample size too small to report data reliably.
* Estimate based on a small sample size.

exploited for grouping the states into the higher, medium, and lower participation rate groups that were depicted in the map. But these divisions were somewhat arbitrary. For example, should New York be considered a medium or higher participation rate state, with a participation rate of 41 percent? Similarly, should Wisconsin be considered a medium or a lower participation rate state, with a participation rate of 14 percent? In both cases, these rates are significantly different from the national rate of 29 percent.

Table 3 shows the relative shares of freshwater fishing days that were spent fishing for trout. To a certain extent days of trout fishing follow the pattern of trout anglers, i.e. where there were many trout anglers there were many trout fishing days. However, in most states the percentage of anglers who fished for trout was greater than the percentage of freshwater days spent fishing for trout. In many cases these differences were probably not statistically significant, due to the large standard errors caused by the relatively small sample sizes at the state level[3]. Another way to characterize this phenomenon is shown in Table 4, which provides estimates of average days of freshwater fishing and trout fishing. In most states the average days of fishing for trout is less than the average days of fishing in freshwater. Again, these differences may not be statistically significant.

Characteristics of Trout Anglers

There are a number ways to describe the population that goes fishing for trout. One approach would be to list the percentages of people who fished for trout (e.g. the percentage of women who fished for trout). This would measure the participation rate of the particular population group in trout fishing. Another approach would be to list the percentages of anglers who fished for trout (e.g. the percentage of female anglers who fished for trout). This conditional participation rate (conditional on the person being an angler) will be discussed below and in the context of a participation model. Finally the distribution of sociodemographic characteristics within the trout angler population could be used to describe these anglers. In the discussions below, comparisons of the distribution of characteristics of the U.S. population, freshwater anglers, and trout anglers will be highlighted.

Age

Fishing for trout appealed to anglers of all ages. At least 26 percent of the freshwater anglers in each age group fished for trout. Participation rates for freshwater anglers in trout fishing were higher for the middle age groupings (18-24 years old and 25-34 years).

Table 5. Age Distribution of the U.S. Population, Freshwater Anglers and Trout Anglers

(Numbers in thousands. Excludes Great Lakes fishing.)

					Trout Anglers		
	U.S. Population		Freshwater Anglers				Percent of Freshwater
Age Group	Number	Percent	Number	Percent	Number	Percent	Anglers
Total	181,095	100	38,433	100	11,317	100	29
16-17 years old	7,659	4	2,064	5	565	5	27
18-24 years old	25,509	14	5,948	15	1,867	16	31
25-34 years old	39,470	22	10,395	27	3,222	28	31
35-44 years old	33,787	19	8,424	22	2,576	23	31
45-54 years old	23,885	13	4,721	12	1,267	11	27
55-64 years old	22,754	13	3,829	10	980	9	26
65 years old or older	28,030	15	3,053	8	840	7	28

3 Unless otherwise noted, comparisons are based on tests of statistical significance at the 90% level of confidence.

Table 6. Sex Distribution of the U.S. Population, Freshwater Anglers, and Trout Anglers

(Numbers in thousands. Excludes Great Lakes fishing.)

Sex Group	U.S. Population		Freshwater Anglers		Trout Anglers		
	Number	Percent	Number	Percent	Number	Percent	Percent of Freshwater Anglers
Total	181,095	100	38,433	100	11,317	100	29
Male	85,781	47	26,106	68	8,305	73	32
Female	95,314	53	12,327	32	3,012	27	24

Lower rates were observed for anglers between the ages of 55 and 64 (26 percent).

Trout anglers tended to be younger than the U.S. population as a whole. About 73 percent of trout anglers were between the ages of 16 and 44, while only 59 percent of the U.S. population fell into this age group. Trout anglers were also slightly younger than freshwater anglers, with 70 percent of freshwater anglers between the ages of 16 and 44. For the older age groups the situation was reversed. In the U.S., 28 percent of the population was 55 years of age or older. For freshwater anglers, 18 percent were 55 or older and for trout anglers the percentage fell to 16 percent.

Sex

Trout fishing has a higher concentration of men than freshwater fishing in general. In the U.S. women are a majority of the population (53 percent). While the number of women participating in fishing has been increasing over time, they accounted for only 32 percent of freshwater anglers and 27 percent of trout anglers. Men accounted for 47 percent of the U.S. population, 68 percent of the freshwater fishing population, and 73 percent of the bass fishing population.

Almost one third (32 percent) of the men who fished in freshwater fished for trout. For women anglers, 24 percent fished for trout.

Education

About one out of every four Americans 16 years old or older (25 percent) had 11 or fewer years of education. Freshwater anglers had a slightly lower percentage (23 percent) in this educational attainment category. Trout anglers on the other hand had a substantially lower

Table 7. Education Distribution of the U.S. Population, Freshwater Anglers, and Trout Anglers

(Numbers in thousands. Excludes Great Lakes fishing.)

Education Group	U.S. Population		Freshwater Anglers		Trout Anglers		
	Number	Percent	Number	Percent	Number	Percent	Percent of Freshwater Anglers
Total	181,095	100	38,433	100	11,317	100	29
0-11 years	44,783	25	9,032	23	1,606	14	18
12 years	69,752	39	14,936	39	4,550	40	30
1-3 years college	34,272	19	7,730	20	2,582	23	33
4 or more years of college	32,289	18	6,735	18	2,573	23	38

percentage (14 percent) than either the U.S. population or freshwater anglers falling in this category. Trout fishing had a slightly higher percentage (40 percent) of its anglers with 12 years of school than was true for the U.S. population (39 percent). About 39 percent of freshwater anglers attained this level of education but this was not significantly different than the trout percentage. The percentages of those with some college education were significantly higher for trout anglers (46 percent) than for either the U.S. population (37 percent) or freshwater anglers in general (38 percent).

Participation rates for freshwater anglers in trout fishing varied considerably with education levels. Roughly one out of five freshwater anglers with less than 12 years of school (18 percent) fished for trout. In comparison, 38 percent of freshwater anglers with 4 years of college or more fished for trout. There appears to be a positive relationship between participation in trout fishing and educational attainment levels.

Annual Household Income

In 1985 the median household income for the U.S. was about $25,000. As shown in the table, 47 percent of the U.S. population 16 years or older lived in households with incomes under $25,000, 48 percent lived in households with incomes over $25,000, and 5 percent lived in households that did not report their income. For freshwater fishing, 43 percent of freshwater anglers lived in households with incomes under $25,000, and the percentage of trout anglers in this income group was even lower at 41 percent. Of course the opposite is true for the higher income groups. Anglers who lived in households with incomes above the median ($25,000) accounted for 53 percent of freshwater anglers and 56 percent of trout anglers. About 3 percent of freshwater anglers and trout anglers lived in households that did not report their income.

At least 22 percent of the freshwater anglers in each income category fished for trout. There appears to be a positive correlation between the participation rate of freshwater anglers in trout fishing and income. The participation rate rises from 22 percent for the lowest income group (under $10,000) to a peak of 34 percent for the $75,000 or more income category. The participation rate for the middle income groupings (between $10,000 and $74,999) showed relatively little variation, ranging from 30 to 32 percent.

Census Geographic Region

The percentage of freshwater anglers fishing for trout bass varied considerably accross the country. Not surprisingly, the highest percentages of freshwater anglers fishing for trout bass were found in the Mountain (79 percent), Pacific (69 percent), and New England regions (67 percent). The Middle Atlantic region also had a relatively high participation rate of 56 percent). New Jersey, New York, and especially Pennsylvania (the Middle Atlantic states) all had relatively high participation rates in trout fishing. The participation rate for the remaining regions ranged from a low of 8 percent in the East South Central region to a high of 17 percent in the South Atlantic region.

Table 8. Income Distribution of the U.S. Population, Freshwater Anglers, and Trout Anglers

(Numbers in thousands. Excludes Great Lakes fishing.)

					Trout Anglers		
	U.S. Population		Freshwater Anglers				Percent of Freshwater
Income Group	Number	Percent	Number	Percent	Number	Percent	Anglers
Total	181,095	100	38,433	100	11,317	100	29
Under $10,000	27,670	15	4,164	11	923	8	22
$10,000 - $19,999	40,768	23	8,632	22	2,567	23	30
$20,000 - $24,999	16,350	9	3,806	10	1,133	10	30
$25,000 - $29,999	25,517	14	6,110	16	1,857	16	30
$30,000 - $49,999	40,255	22	10,015	26	3,092	27	31
$50,000 - $74,999	13,750	8	2,966	8	954	8	32
$75,000 or more	7,520	4	1,445	4	487	4	34
Not Reported	9,264	5	1,295	3	305	3	24

Table 9. Census Geographic Distribution of the U.S. Population, Freshwater Anglers, and Trout Anglers

(Numbers in thousands. Excludes Great Lakes fishing.)

	U.S. Population		Freshwater Anglers		Trout Anglers		
Geographic Region	Number	Percent	Number	Percent	Number	Percent	Percent of Freshwater Anglers
Total	181,095	100	38,433	100	11,317	100	29
New England	9,825	5	1,406	4	943	8	67
Middle Atlantic	28,977	16	2,967	8	1,663	15	56
E. North Central	31,057	17	7,122	19	733	6	10
W. North Central	13,093	7	4,684	12	594	5	13
South Atlantic	31,163	17	6,218	16	1,049	9	17
E. South Central	11,377	6	3,311	9	260	2	8
W. South Central	19,503	11	5,087	13	546	5	11
Mountain	9,444	5	2,732	7	2,160	19	79
Pacific	26,657	15	4,906	13	3,368	30	69

Participation in trout fishing appears to be strongly tied to geography. Where trout fishing is popular, it dominates the fishing in that state or region. Where it is not popular, very low participation were typically present. Of course, the habitat requirements of trout, e.g. cold water, meant that opportunities for quality trout fishing experiences were limited in certain areas of the country. This was undoubtably one of the contributing factors to the widely divergent participation rates in various regions of the country that were observed in 1985.

These regional variations were also present when comparing the composition of the U.S. population, freshwater anglers, and trout anglers. For example, 17 percent of the U.S. population and 16 percent of freshwater anglers lived in the South Atlantic region, but only 9 percent of trout anglers lived there. Another large discrepency occurred in the Pacific region where 15 percent of the population lived, but accounted for nearly one third (30 percent) of the trout anglers in this country. The Mountain region, where 5 percent of the U.S. population lived, was home to 19 percent of U.S. trout anglers. Altogether, about half the trout anglers lived in the Mountain or Pacific regions, but only 20 percent of the U.S. population lived there. The other major concentration of trout anglers occurred in the Middle Atlantic region. About 15 percent of trout anglers lived in this region.

Population Density of Residence

In 1985, the Survey asked respondents whether they considered their place of residence to be in a big city or urban area, a small city or town, or a rural area. These categories were not defined for the respondent (e.g. by big city we mean a city with a population of 500,000 or more). Consequently, one respondent may consider an area to be a big city while another respondent may consider an area of the same size to be a small town. Nonetheless, there were interesting differences between freshwater anglers in general and trout anglers. About 34 percent of the freshwater anglers who said that they lived in a big city or urban area fished for trout. For freshwater anglers who characterized where they lived as a rural area, nearly one in four (24 percent) fished for trout. For those who lived in a small city or town, the participation rate was intermediate at 30 percent, or roughly the national rate of 29 percent. There appears to be a negative relationship between population density and participation in trout fishing.

About 36 percent of the U.S. population would characterize where they live as a big city, but only 28 percent of freshwater anglers would say they lived in a big city. Nearly one third (32 percent) of trout anglers said they lived in a big city. Approximately 20 percent of the U.S. population would say they lived in a rural area, but 28 percent of freshwater anglers would say that

Table 10. Population Density Distribution of the U.S. Population, Freshwater Anglers, and Trout Anglers

(Numbers in thousands. Excludes Great Lakes fishing.)

Population Density	U.S. Population		Freshwater Anglers		Trout Anglers		
	Number	Percent	Number	Percent	Number	Percent	Percent of Freshwater Anglers
Total	181,095	100	38,433	100	11,317	100	29
Big City or urban area	64,946	36	10,731	28	3,650	32	34
Small city or town	74,859	41	16,026	42	4,764	42	30
Rural area	36,474	20	10,947	28	2,646	23	24
No response	4,817	3	729	2	256	2	35

where they lived was a rural area. About 23 percent of trout anglers said they lived in a rural area. The percentages of trout anglers in the big city or urban area and the rural area population density categories fell between the U.S. population percentage and the freshwater angler percentage.

Participation Model

The descriptive statistics presented in the previous section show that trout anglers were different from freshwater anglers in general. These descriptive characterizations of anglers have limititations. First, without conducting the appropriate statistical test, it is impossible to determine whether the observed difference in a characteristic between the groups was statistically significant[4]. Second, even if the difference was statistically significant, the individual effect of the characteristic on an angler's decision to fish for trout cannot be measured. For example, were men more likely to have fished for trout because of their sex or because they were more likely than women to come from households with higher income levels, a factor with which sex was correlated and which was also associated with higher participation in trout fishing?

A participation model may be used to analyze the angler's decision about fishing for trout. In this instance, a probability of fishing for trout model was estimated in order to predict what sort of angler was most likely to fish for trout and to evaluate the individual effects of sociodemographic and other factors on that decision. In participation models the effect of a particular characteristic is calculated in an "other things being equal" context. In the example above, this procedure would remove the confounding effects of the correlation between sex and household income.

The model hypothesizes that a freshwater angler's decision whether or not to fish for trout, given that he or she already fishes in freshwater, depends on the angler's sociodemographic characteristics, whether the angler fished more than average, and the region of the country where he or she resides. For the purposes of the participation model, if an angler fished 20 days or more in 1985, he or she was classified as avid. The region of residence provides a rough measure of the availability of quality trout fishing sites. The dependent variable is either 1 or 0, because the angler either fishes for trout or does not fish for trout.

4 The 1985 National and State reports provide formulas for calculating the standard errors necessary for such tests. However, because of the relatively large sample sizes for national estimates, small differences were statistically significant in many cases. Differences in characteristics that were 2 percent or larger were usually significant at the 90 percent confidence level.

Equation 1 was the probability of fishing for trout model that was estimated..

$$(1) \quad \text{Ln} \frac{p_i}{(1 - p_i)} = \alpha + Bx_i$$

where:

p_i = probability that the ith individual fished for trout
x_i = vector of explanatory variables
B = vector of coefficients to be estimated

The left hand side of equation 1 is the logarithm of the odds that the ith individual fished for trout and is called the logit. The explanatory variables were a combination of binary and continuous variables, as described in Table 11.

Table 11. Independent Variables in the Trout Fishing Probability Model

Variable	Measurement	Mean
AGE	Age of respondent, years	38.2
INCOME	Annual household income, in thousands of dollars	29.6
SEX	1 if female 0 otherwise	.32
RURAL	1 if respondent indicates a rural area 0 otherwise	.28
AVID	1 if fished 20 days or more 0 otherwise	.31
COLLEGE	1 if attended college 0 otherwise	.38
SOUTH (1)	1 if lived in the south 0 otherwise	.22
WEST (2)	1 if lived in the west 0 otherwise	.20
NENG (3)	1 if lived in New England 0 otherwise	.04

(1) SOUTH includes the East and West South Central regions.
(2) WEST includes the Mountain and Pacific regions.
(3) NENG includes the New England region

The means of the binary variables repeat the percentages reported earlier. For example, 32 percent of anglers were women and 28 percent lived in areas that the respondent would say was a rural area. An avidity measure, based on the number of days fished was included. Using 20 days as the cutoff for determining whether an angler was avid or not was based on the average days per freshwater angler, as reported in the 1985 National Report. About 31 percent of freshwater anglers fished 20 days or more.

The model below was estimated with a nationwide sample of 21,580 freshwater anglers[5].

$$\text{Ln} \frac{pi}{(1 - pi)} = -1.342 - .005\text{AGE} - .001\text{INCOME} - .347\text{SEX} - .065\text{RURAL} + .456\text{AVID} + .255\ \text{COLLEGE} - .808\text{SOUTH} + 2.497\text{WEST} + 2.213\text{NENG}$$

Likelihood ratio index = .328

All of the variables were significant at the 1 percent level. The likelihood ratio index can be interpreted in the same way as the muliple correlation coefficient in least squares regression. An index value of .328 indicates that the equation explains about 33 percent of the variation in the logit, which is rather good for recreation models. The equation shows that the probability of fishing for trout decreases with income and age, other things being equal. It also shows that women anglers, those who lived in the south, those who say they live in rural areas were less likely to fish for trout, other things being equal. Anglers who had attended college, fished 20 days or more, or live in the western or New England states have a higher probability of fishing for trout.

The estimated coefficients do not provide a direct measure of how the independent variables affect the probability that a freshwater angler will fish for trout. The coefficients would measure the effect of the independent variable on the logarithm of the odds ratio. This is not a particularly useful statistic. However, the partial derivatives of the estimated equation would yield

5 The model was estimated with SAS's CATMOD procedure.

the effect of a change in the independent variables on the probability that an angler will fish for trout. The partial derivatives, evaluated at the means of the independent variables were calculated and appear in Table 12.

Table 12. Partial Derivatives of the Trout Fishing Probability Model

Variable	Partial Derivative
AGE	-.0010
INCOME	-.0002
SEX	-.0668
RURAL	-.0125
AVID	.0878
COLLEGE	.0491
SOUTH	-.1557
WEST	.4810
NENG	.4263

These derivatives can be used to make statements about how the independent variable affects the participation decision. For example, being a woman decreased the probability of fishing for trout by .07 while being an avid angler, i.e. fishing more than 20 days in a year, increased the probability by .09. The strongest effects on the decision to fish for trout were geographical. Living in the west or in New England had a substantial effect and increased the probability by .48 and .42 respectively.

Summary

The 1985 National Survey of Fishing, Hunting and Wildlife-Associated Recreation showed that fishing for trout appealed to a large number of freshwater anglers. There were over 11 million trout anglers in 1985 and they spent nearly 160 million days fishing for trout, an average of 14 days per trout angler. From a sociodemographic standpoint, there were some interesting differences between freshwater anglers in general and trout anglers. A probability of participation in trout fishing model showed that sociodemographic characteristics had a significant impact on whether someone was a trout angler or not.

These finding of the 1985 Survey underscore the importance of trout for millions of freshwater anglers. Information about who these trout anglers are, their age and sex, where they live and so on, can be used by managers and others to enhance the fishing experiences of many trout anglers. This paper has used basic national summary statistics gathered by the 1985 Survey. Additional analyses of trout fishing on a sub-national level could be done with relative ease. Other measures of avidity could be developed, such as expenditures, degree of specialization in trout fishing, or whether the angler engaged in fly fishing, that might shed additional light on what kind of people trout anglers are. Finally, there is no reason that the analysis must be restricted to trout. Other fish species, as well as game species, could be analyzed using the 1985 Survey data.

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