The 1991 Trout Angler Telephone Survey

Pennsylvania Fish Commission
Bureau of Fisheries
Division of Fisheries Management

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Department of Sociology
and
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Table of Contents

List of Tables

List of Figures

Table of Contents

List of Tables

List of Figures

1. Introduction

The six sections of this report cover the following topics:

1. Overview and background of the report;
2. Demographics of Trout and Non-Trout Anglers;
3. Attitudes and Preferences of Trout Anglers;
4. Analysis of Trout Fishing Trips;
5. Trout Angler Views of the Pennsylvania Fish Commission;
6. Fishing for Non-Trout Species.

We begin with a summary of the main findings of the report.

1.1. Overview

1.1.1. Trout Angler Demographics

Ninety percent of trout anglers are men, with median age of 39 years. The greatest numbers of trout anglers reside in the urban areas of Pittsburgh, Philadelphia, Harrisburg, Erie, and Allentown. However, trout anglers who live in rural areas, particularly in the prime trout regions, are more active than their urban counterparts.

Most trout anglers are married (77%), and 44 percent of trout-angler households have children living at home. Trout anglers are a well educated group, with nearly half graduating from high school, and another 19 percent graduating from college. Trout anglers are most likely to hold upper-level, blue-collar and upper-level, white-collar occupations, and the income distribution for the group is higher than for the general population in Pennsylvania.

Pennsylvania trout anglers are an experienced group, averaging 20 years of fishing for trout.

Trout anglers tend to be younger than those who fish exclusively for non-trout species, and 10 percent more women fish for non-trout species than trout. Trout anglers tend to be slightly more affluent than non-trout anglers. Other than these small differences, trout and non-trout anglers are statistically quite similar.

1.1.2. Attitudes and Preferences of Trout Anglers

Forty percent of trout anglers report that the wild trout fishery is more important to them than the stocked fishery; thirty percent say the stocked fishery is more important than the wild

fishery. Another twenty percent have no preference between wild and stocked fisheries. The importance of the wild fishery and the attitudes it reflects are found in responses to many other questions. For example, more than three-quarters of trout anglers say that catching and releasing wild trout is "important" or "very important," and almost 60 percent respond the same way for fishing limited-kill or no-kill waters for wild trout. There is considerable support for expanding programs for the wild trout fishery. About one third of anglers say "keeping a limit of *hatchery* trout" is "not important," and 62 percent say "catching and releasing hatchery trout" is "important" or "very important."

About equal proportions of trout anglers believe the current minimum size limit of seven inches is "just right" and "too low." Those who believe this limit is "too low" would raise the limit to about nine inches, a value that would exclude most of the wild brook trout in the state. In expressing preferences for creel limits, anglers make a distinction between hatchery and wild fisheries. A significant majority of anglers believe the 8-trout limit is "just right" for hatchery, but 59 percent believe eight trout is "too many" for wild trout. The preferred limit for wild trout is about four trout.

A majority of anglers claim to "always release" or "almost always release" wild brook and brown trout. This preference for releasing trout does not extend to hatchery trout.

Anglers expressed a strong preference for *not publishing* information about stocking numbers of trout, schedules and locations. This preference is probably linked to the fact that: nearly 80 percent of trout anglers believe truck following is a problem.

In general, there is significant support for expanding special regulations areas. However, it was disturbing to learn that only 22 percent of trout anglers were familiar with the Delayed Harvest Program.

The attitudes and preferences of trout anglers are weakly related, if at all, to their demographic, social, and economic characteristics. For example, the wild trout program is "most important" across all social classes of anglers.

1.1.3. Analysis of Trout Fishing Trips

Most fishing trips are made to locations within one hour of home. However, travel-time distribution is skewed, and five percent of trips take more than fours hours. Anglers travel farther to fish in wild or special regulations waters, whereas lake fishing tends to be closest to home. About 23 percent of fishing trips result in the angler staying over night away from home. Virtually all travel for fishing is made in a personal car or truck.

The level of stocking in a watershed has a strong correlation with fishing pressure in a watershed. The correlations between stocking and fishing pressure are weaker at the stream section level of analysis.

The five streams that receive the highest fishing pressure are: Pine Creek, Yellow Breeches Creek, Tulpehocken Creek, Lehigh River, and Kettle Creek. Two of these streams, Pine Creek and Kettle Creek, are in the most remote region of the state.

According to angler reports, about 62 percent of fishing trips are made to stocked streams, seven percent to special regulations waters, 17 percent to wild streams, and 15 percent to lakes. Overall, 63 percent of anglers report they fish for wild trout.

Trout anglers average 20 fishing trips per year. However, this is an extremely skewed distribution. The median is nine trips. Fishing pressure is highest in April, at 0.188 trips per angler-day. Pressure remains at .181 through May, dropping to .085 during the summer, and .024 during the fall. However, the greatest number of fishing trips are made during the summer season. Overall, we estimate that trout anglers make 17.7 million trips per year.[1]

The modal choice of tackle for 39 percent of trout fishing trips is a spinning rod with bait. Casting with bait, spinning with lures, and fly rod with flies are claimed for 27 to 30 percent of trips. Proximity to home or camp and the aesthetics of the fishing environment are the two most important reasons given by anglers for their choice of fishing locations. Finally, a statistical analysis of angler success in catching trout reveals that three variables come into play: hours on the stream or lake, years of angler experience, and fishing a Biomass Class C stream.

1.1.4. Pennsylvania Fish Commission Performance

Only 62 percent of the active trout anglers in this survey reported they had purchased a trout stamp. Moreover, one third persons whose licenses were selected for potential sample points could not be located, and 23 percent of those who were contacted by telephone reported they did not receive the survey introduction letter. These figures suggest that the accuracy and coverage of fishing licenses and stamps in Pennsylvania need review.

Anglers believe that the Commission is doing a good job in providing information about where and how to fish for trout. However, when asked about specific sources of information, anglers do not report Commission sources of information as the most important.

Anglers are quite satisfied with wild and hatchery trout fishing in Pennsylvania, with only about 10 percent saying they are "not at all satisfied." When asked for general advice for the Pennsylvania Fish Commission, the leading types of advice concerned changing creel and minimum-size limits, more law enforcement, stocking more and larger trout, and changing stocking procedures. More than half the anglers had advice about stocking.

1.1.5. Fishing for Species Other Than Trout

More anglers (88.7%) fish for other species than fish for trout. However, fishing pressure for non-trout species is lower than for trout, and anglers make fewer trips, on average. Summer is the prime season for this fishing activity, accounting for 10.5 million out of an estimated 17.7 million total trips. Large and smallmouth bass are the most sought species, and are pursued by about 20 percent of these anglers. Walleye, bluegill/sunfish, and crappie are the next most popular species.

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[1]The methods used to calculate these estimates are presented in Tables 103 and 104 in Section 4.

1.1.6. Comparison with 1974 Study

In 1974, an angler survey was done for the Pennsylvania Fish Commission. It appears that the urban areas have a smaller share of licenses, and that out-of-state anglers are more prevalent today. Fishing activity for trout, as measured by the percentage of anglers who seek trout and the median number of days anglers fish for trout, appears to have been stable. Finally, the environmentally-oriented attitudes expressed by anglers toward the trout program in 1974 are still evident today.

1.2. Background for Report

Pennsylvania has an abundance of water. Compared to other states in the eastern part of the United States, Pennsylvania has a significant cold water fishery. However, as with most other states, the proportion of that fishery that represents quality trout habitat is small. Table 1 and Figure 1 describe the trout resource in Pennsylvania.

Table 1. Trout Stream Resources in Pennsylvania

Resources			Mean Density of Trout, Pounds per Acre		
Stream Biomass Class	Miles of Biomass Class	Percent Miles	Resident Trout	Stocked Trout [2]	Total
A	789.5	6.6	69.9	5.8	75.8
B	1,175.9	9.8	28.9	29.5	58.4
C	1,364.5	11.4	14.7	38.0	52.7
D	8,654.2	72.2	2.5	29.8	32.4
Total	**11,984.0**	**100.0**			

Seven hundred and ninety miles of Pennsylvania's trout waters are Biomass Class A. That means they are capable of supporting naturally reproducing populations of trout, and the resident biomass exceeds 27 pounds per acre for brook trout, and 36 pounds per acre for brown trout. Another 1146 miles of trout water are Biomass Class B, and support fishable populations of resident trout. Together, these Biomass Class A and B waters are the quality fishery of the Pennsylvania Trout Management Program. Figure 1 displays the distributions of combined resident and stocked trout densities for each of the Biomass Classes, and for the whole fishery.

The Biomass Classes C and D and unclassified waters account for 83.5 percent of all trout waters in the state. These waters are primarily put-and-take fisheries, because they will not support resident trout populations.

[2]To estimate the density of stocked trout, it was assumed that stocked trout run three to the pound, and the density in a stream section was computed as (Number Trout Stocked per Stream Section)/(3*Acres per Stream Section).

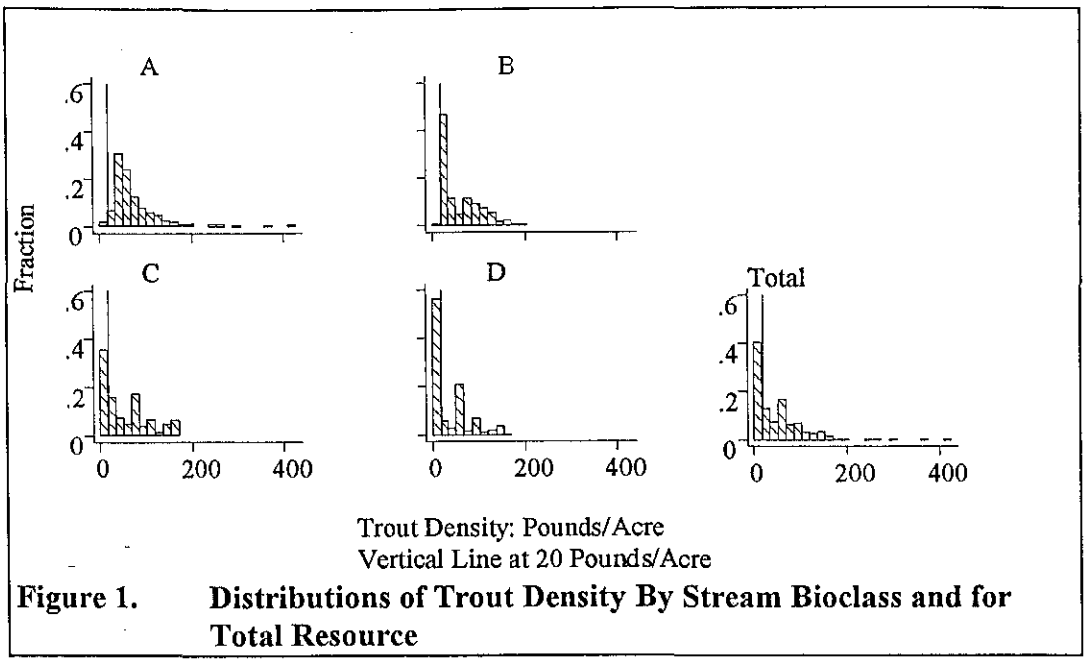


Figure 1. Distributions of Trout Density By Stream Bioclass and for Total Resource

The vertical line in each graph of Figure 1 is at 20 pounds per acre, a density believed to provide good trout fishing. The density distributions of Biomass Classes A, B, and C waters all exceed this 20 pounds per acre value. However, in Biomass Class D waters, which account for 68.8 percent of the total fishery, the modal group of densities is below this 20 pounds per acre level.

The trout anglers of Pennsylvania are seeking quality trout fishing. The wild trout fishery is now "most important" to a plurality of anglers. Yet this part of the total fishery is only 16.5 percent of the stream miles. On an acreage basis, the quality fishery is much smaller still. Thus, the trout program in Pennsylvania is facing the classic environmental management problem: what is most desired by anglers is scare and fragile and precious. Traditional patterns of trout fishing in Pennsylvania cannot be sustained by the quality fishery. There are simply not enough quality stream miles nor trout to provide satisfactory fishing for 800,000 trout anglers fishing an average of twenty times per year.

Fortunately, traditional patterns may be changing. The proportion of anglers who say they practice catch and release trout fishing, even on stocked waters, is substantial. The remoteness of most of the quality trout water reduces pressure much of the time. However, two of the most heavily fished streams, each also heavily stocked, are in the middle of quality trout country.

One of the purposes of this study is to provide information for the 1993 Trout Management Plan. There are clear directions implied in the results of this survey. Yet the balance between the integrity of the resource and the sheer size of the demand for trout fishing will be difficult to attain. It is hoped that these results will make this difficult task easier.

2. Demographic Characteristics of Pennsylvania Trout Anglers

The 1991 Trout Angler Telephone Survey asked respondents several questions concerning their social, economic, and demographic characteristics. This section of the report presents these data. The survey interviewed 1601 anglers who responded positively to the question, "Do you fish for trout?" and 392 additional non-trout anglers who responded negatively. First, we will report on the trout anglers.

2.1. Profile of Trout Anglers

This part of the report describes the age, sex, residence, and social and economic status of Pennsylvania trout anglers.

2.1.1. Age and Sex of Trout Anglers

The mean age of trout anglers is 40.5 years, and the median age is 39 years. The first quartile is 30 years of age, and the third quartile is 50 years of age. Respondents ranged from age 16 to 89. Table 2 presents the distribution of trout-angler ages in five-year cohorts.

Table 2. Age Distribution of Pennsylvania Trout Anglers

Age	Frequency	Percent	Cum. Pct.
15-19	55	3.44	3.44
20-24	119	7.45	10.89
25-29	191	11.95	22.84
30-34	229	14.33	37.17
35-39	241	15.08	52.25
40-44	218	13.64	65.89
45-49	143	8.95	74.84
50-54	120	7.51	82.35
55-59	99	6.20	88.55
60-64	94	5.88	94.43
65-69	64	4.01	98.44
70-74	14	0.88	99.31
75-79	6	0.38	99.69
80-84	3	0.19	99.87
85-89	2	0.13	100.00
Total	**1598**	**100.00**	

Trout anglers sixty-five years of age and older constitute only 5.6 percent of this sample. This percentage is considerably below the percent of elderly in the general population; the 1990 Census reports that seniors comprise 15.4 percent of Pennsylvania's population. This is significant because seniors pay a one-time license fee rather than an annual fee.

The fact that seniors need purchase only a one-time license also accounts for their under representation in the sample. The first stage sample for this study was a simple random sample

of licenses sold in 1990. Thus, only seniors who purchased a license in 1990 were included in the sample frame, while those who had purchased a senior license in previous years were not.

Men account for more than 90 percent of trout anglers in Pennsylvania. Table 3 presents the detailed statistics for this variable.

Table 3. Sex Distribution of Trout Anglers in Pennsylvania

Sex	Frequency	Percent	Cum. Pct.
Male	1460	91.19	91.19
Female	141	8.81	100.00
Total	**1601**	**100.00**	

2.1.2. Where Trout Anglers Live

The Trout Angler Telephone Survey interviewed anglers from all but one of Pennsylvania's 67 counties. The missing county is Forest County which also happens to have the smallest population in the state--only 4802 people according to the 1990 Census. Allegheny County accounts for the most trout anglers, followed by Montgomery, Lancaster, Luzerne, Bucks, and Berks Counties. Table 4 presents the distribution of trout-angler residences. The percents are computed with respect to all 1601 trout anglers in the sample, including those who live out of state (n=130).

Table 4. Distribution of Pennsylvania Trout Anglers by County

County	Freq.	Pct.	County	Freq.	Pct.	County	Freq.	Pct.
Adams	6	0.41	Elk	6	0.41	Montour	2	0.14
Allegheny	113	7.68	Erie	31	2.11	Northampton	41	2.79
Armstrong	18	1.22	Fayette	23	1.56	Northumberland	27	1.84
Beaver	34	2.31	Forest	0	0.00	Perry	14	0.95
Bedford	10	0.68	Franklin	25	1.70	Philadelphia	41	2.79
Berks	42	2.86	Fulton	2	0.14	Pike	5	0.34
Blair	24	1.63	Greene	4	0.27	Potter	5	0.34
Bradford	10	0.68	Huntingdon	10	0.68	Schuylkill	26	1.77
Bucks	54	3.67	Indiana	19	1.29	Snyder	5	0.34
Butler	22	1.50	Jefferson	13	0.88	Somerset	19	1.29
Cambria	23	1.56	Juniata	6	0.41	Sullivan	3	0.20
Cameron	2	0.14	Lackawanna	14	0.95	Susquehanna	8	0.54
Carbon	7	0.48	Lancaster	75	5.10	Tioga	19	1.29
Centre	20	1.36	Lawrence	9	0.61	Union	13	0.88
Chester	39	2.65	Lebanon	11	0.75	Venango	9	0.61
Clarion	8	0.54	Lehigh	37	2.52	Warren	18	1.22
Clearfield	25	1.70	Luzerne	68	4.62	Washington	27	1.84
Clinton	11	0.75	Lycoming	40	2.72	Wayne	5	0.34
Columbia	11	0.75	McKean	11	0.75	Westmoreland	36	2.45
Crawford	13	0.88	Mercer	24	1.63	Wyoming	7	0.48
Cumberland	29	1.97	Mifflin	13	0.88	York	25	1.70
Dauphin	38	2.58	Monroe	12	0.82	*No Response*	*3*	*0.21*
Delaware	24	1.63	Montgomery	77	5.23	**Total**	**1471**	**100.00**

The survey also queried out-of-state anglers who fish in Pennsylvania. These anglers accounted for 8.2 percent of the sample, and most lived in states bordering Pennsylvania.

We define the relative demographic trout fishing rate as the percentage of trout anglers in a county, divided by the percentage of the state's population in a county. If the demographic rate of trout fishing were strictly proportional to population, this ratio would be 1.0. Ratios greater than 1.0 indicate a higher than expected rate of trout fishing, while ratios less than 1.0 indicate a lower than expected rate. Figure 2 presents the map of the relative demographic trout fishing rate by county for the state. The picture is quite clear; trout fishing is an activity more likely pursued by persons living in rural areas. The rates vary by a factor of 19, with the most rural counties exhibiting the highest rates, and the lowest rates found in the most urban counties. Given the nature of trout habitat, this is not surprising.

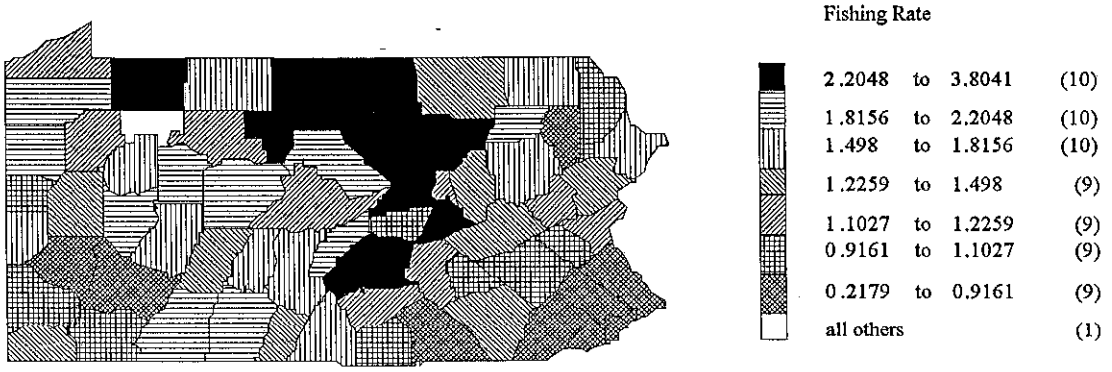


Figure 2. Relative Demographic Fishing Rate by County

2.1.3. Social Status of Trout Anglers

We can describe the social status of trout anglers in several ways. The first is the marital status of trout anglers. Table 5 presents the distribution of marital status of Pennsylvania trout anglers. More than three quarters are married, and the next largest group is single status.

Table 5. Distribution of Marital Status of Trout Anglers

Marital Status	Frequency	Percent	Cum. Pct.
Single	278	17.41	17.41
Married	1236	77.40	94.80
Divorced	55	3.44	98.25
Separated	9	0.56	98.81
Widowed	19	1.19	100.00
Total	**1597**	**100.00**	

Less than half the households of trout anglers have children 15 years of age or younger living at home. Children under 15 are not required to purchase a fishing license or trout stamp. These results are presented in Table 6.

Table 6. Distribution of Children at Home for Trout Anglers			
At Home	**Frequency**	**Percent**	**Cum. Pct.**
Yes	706	44.24	44.24
No	890	55.76	100.00
Total	**1596**	**100.00**	

For those trout anglers who had children 15 and under living at home, we asked how many of these children fished for trout. Table 7 presents the distribution of children in trout-angler households who fish for trout. The mean of this distribution is 1.03 children per household. Thus, for approximately half the sample that is part of a family with young children at home, another young trout fisher is pursuing the sport.

Table 7. Distribution of Children Who Fish for Trout in Families with Young Children			
Number	**Frequency**	**Percent**	**Cum. Pct.**
0	234	33.14	33.14
1	274	38.81	71.95
2	152	21.53	93.48
3	39	5.52	99.01
4	5	0.71	99.72
5	1	0.14	99.86
6	1	0.14	100.00
Total	**706**	**100.00**	

We can combine these sociodemographic results with data on the age of the respondent to construct a variable for households called Stage in Household Life Cycle. The distribution of household types is presented in Table 8. The modal stage is young families, accounting for 37 percent of all trout angler households. Middle-aged families are relatively less involved, but Empty-Nester households (i.e., Middle-Aged, Married, No Children at home) are the second most prevalent group. This suggests that families with young children or no children are most likely to be involved, but families with older children are less likely to be represented.

Table 8. Distribution of Stage in Household Life Cycle of Trout Anglers					
Stage in Household Life Cycle			**Frequency**	**Percent**	**Cum. Pct.**
Age of Householder	***Marital Status***	***Children at Home***			
<=44	Single	No	275	17.56	17.56
<=44	Married	No	168	10.73	28.29
<=44	Married	Yes	576	36.78	65.07
45-65	Married	Yes	88	5.62	70.69
45-65	Married	No	355	22.67	93.36
>=66	Married	No	49	3.13	96.49
>=66	Single	No	13	0.83	97.32
NA	Single	Yes	42	2.68	100.00
		Total	**1566**	**100.00**	

We describe the socioeconomic status of trout angler households using three variables: the educational attainment of the angler, the occupation, and the income level of the household. Table 9 presents the distribution of angler education. Nearly half of trout anglers report high school as their highest level of education. The second largest group reports having some college experience. The 1980 Census reported for all Pennsylvanians 25 and older that 18.4 percent had eight or fewer years of schooling, 16.9 percent had some college, 40.4 percent had completed high school, 10.3 percent had some college education, and 13.6 percent had completed college or more. Based on this comparison, it appears that trout anglers, as a group, attain higher educational levels than the general population, despite the fact that the survey includes young people between 16 and 25 who are excluded from the Census tabulation.[3]

Table 9. Distribution of Educational Attainment of Trout Anglers

Education	Frequency	Percent	Cum. Pct.
None	2	0.13	0.13
Middle School	28	1.76	1.88
Some High School	91	5.71	7.59
High School	756	47.40	54.98
Some College	415	26.02	81.00
College	215	13.48	94.48
Grad. or Prof. School	88	5.52	100.00
Total	**1595**	**100.00**	

Table 10 presents the distribution of trout-angler occupations. The modal category is Craft occupations, followed by Professional-Technical and Managerial-Administrative occupations. Nationally, the 1980 Census reports 22 percent of occupations fall in the Professional-Technical and Managerial-Administrative categories, while in the survey the corresponding figure is 31 percent. Also, nationally, about 13 percent of occupations fall in the Craft category, while in the survey, the corresponding figure is double at 26 percent. Thus, trout anglers, as a group appear to hold higher status jobs than the general population.[4]

[3] Data extracted from Table 215. "Years of School Completed, By Region, Division and State: 1980," *Statistical Abstract of the United States*, 1985, 105th Edition, U.S. Department of Commerce, Bureau of the Census, 1984.

[4] These data were extracted from Table 673. "Occupation for the Work-Experienced Civilian Labor Force, By Sex: 1970 and 1980," *Statistical Abstract of the United States*, 1985, 105th Edition, U.S. Department of Commerce, Bureau of the Census, 1984.

Table 10. Distribution of Occupations for Trout Anglers

Occupation	Frequency	Percent	Cum. Pct.
Military	8	0.54	0.54
Prof./Tech.	242	16.43	16.97
Mngr/Adm.	217	14.73	31.70
Sales	83	5.63	37.34
Clerical	86	5.84	43.18
Crafts	385	26.14	69.31
Operative	153	10.39	79.70
Mining	4	0.27	79.97
Laborers	202	13.71	93.69
Farmers	15	1.02	94.70
Service	78	5.30	100.00
Total	**1473**	**100.00**	

For some comparisons, we aggregate the categories in Table 10 into white-collar and blue-collar jobs. These results are presented in Table 11. Again, we can compare with the national statistics. About 51 percent of jobs nationally are classified as white-collar, a figure higher than the 43 percent in Table 11. We can account for the difference by noting that trout anglers, as a group, are over represented in both upper-level white-collar and blue-collar occupations, and under represented in the more numerous lower-level, white-collar and blue-collar jobs.

Table 11. Distribution of White-Collar and Blue-Collar Jobs for Trout Anglers

Job Type	Frequency	Percent	Cum. Pct.
White-Collar	628	42.63	42.63
Blue-Collar	845	57.37	100.00
Total	**1473**	**100.00**	

Table 12 reports the household income distribution for Pennsylvania trout anglers. The modal income category is $30,000 to $40,000, with the second most important category at $40,000 to $50,000. The mean household income of trout anglers is $38,834.

Table 12. Household Income Distribution for Trout Anglers

Income ($1000)	Frequency	Percent	Cum. Pct.
<10	18	1.24	1.24
10-15	73	5.04	6.28
15-20	119	8.21	14.49
20-25	171	11.80	26.29
25-30	159	10.97	37.27
30-40	398	27.47	64.73
40-50	227	15.67	80.40
50-75	205	14.15	94.55
75-100	51	3.52	98.07
100+	28	1.93	100.00
Total	**1449**	**100.00**	

Table 13 presents the distribution of employment status of trout anglers. Nearly 77 percent of trout anglers report holding full-time jobs, another 4.5 percent report part-time employment, and 9.5 percent are retired. Nationwide, about 60 percent of the civilian population is in the labor force. Thus the trout angler population is economically more active than the general population.[5]

Table 13. Distribution of Employment Status of Trout Anglers

Employment Status	Frequency	Percent	Cum. Pct.
Full-time	1227	76.98	76.98
Part-time	71	4.45	81.43
Not Employed	66	4.14	85.57
Retired	151	9.47	95.04
Disabled	23	1.44	96.49
Student	33	2.07	98.56
Homemaker	23	1.44	100.00
Total	**1594**	**100.00**	

We can combine the variables of education, occupation, and income using scaling techniques. The combined variable measures the socioeconomic status of the angler. Figure 3 presents a histogram of the socioeconomic status (SES) of Pennsylvania trout anglers. The shape of the histogram reflects our observations concerning the component variables. The graph is "fuller" on the right side, reflecting the relatively higher levels of educational and occupational characteristics of trout anglers.

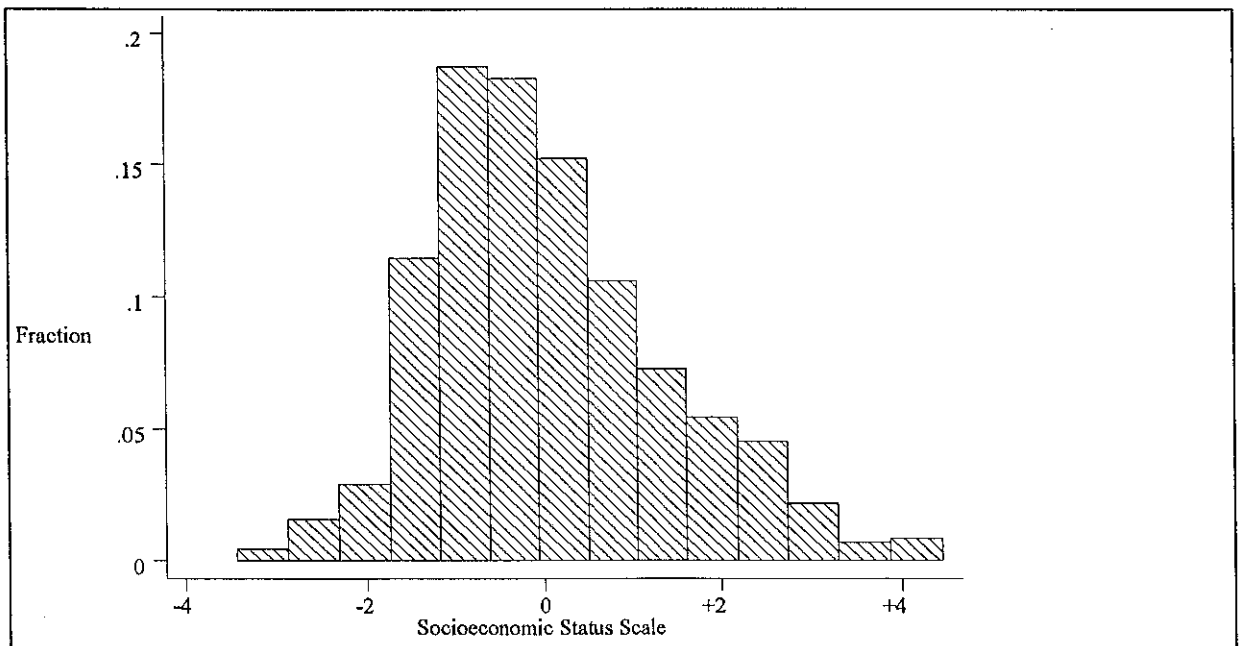


Figure 3. Histogram of Socioeconomic Status of Pennsylvania Trout Anglers

[5] Recall however, that the Trout Angler Telephone Survey sample under represents seniors because of the lifetime license they can purchase.

2.1.4. Angling Experience

One final characteristic of trout anglers is, perhaps, the most salient of all discussed so far. Pennsylvania trout anglers are experienced. The mean number of years of angling experience is 20.1, and the median also 20. Twenty-five percent of Pennsylvania's trout anglers report they have fished for more than 30 years. Figure 4 presents the histogram and order statistics for this critical characteristic.

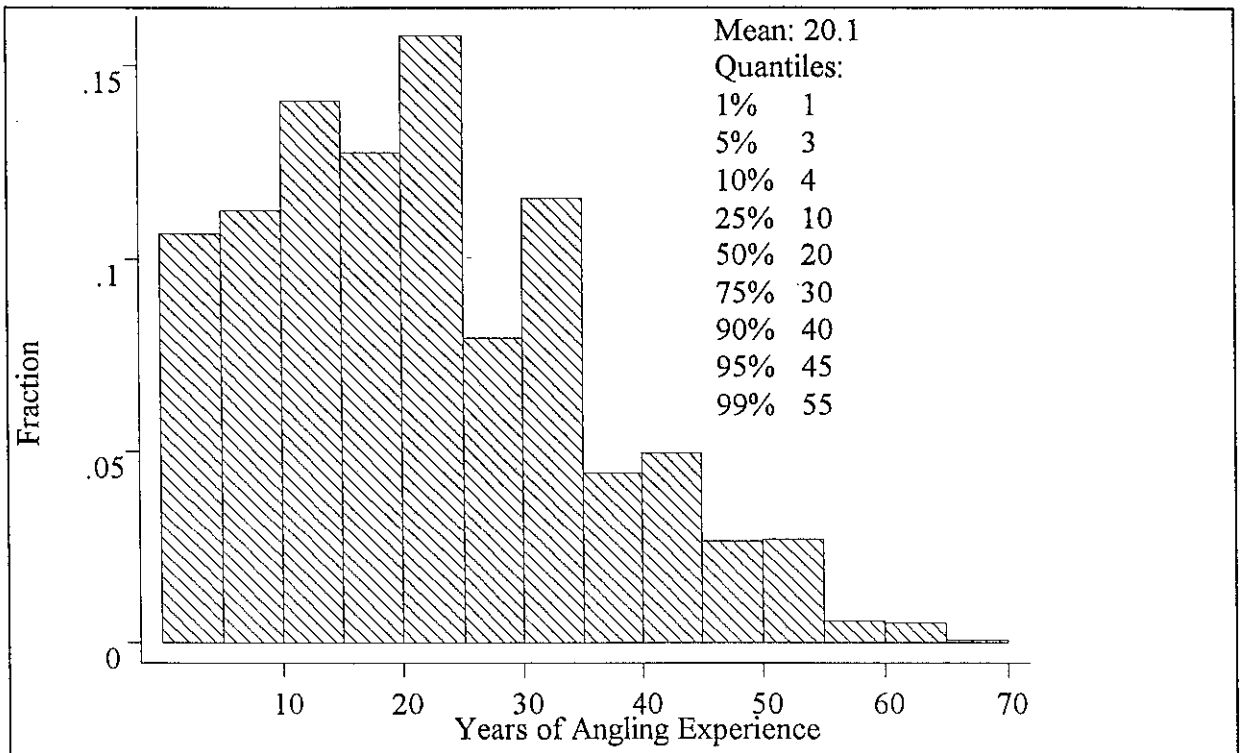


Figure 4. Histogram of Years of Trout Fishing Experience for Pennsylvania Anglers

2.2. Profile of Non-Trout Anglers

In this section, we will present the profile of Pennsylvania anglers who purchase licenses but do not fish for trout, e.g. they fish *only* for *non-trout species*. This definition must be kept in mind, because it is not a description of trout anglers who also fish for non-trout species. The survey includes three sub-populations of anglers: those who fish for both trout and other species (69% of the sample); those who fish only for trout (11% of the sample); and those who only fish for non-trout species (20% of the sample). This section focuses on the 20 percent in this third group.

The age distribution of non-trout anglers is presented in Table 14. The modal group is between 40 and 44 years of age and account for 15 percent of the sub-sample of non-trout anglers. Elderly anglers account for eight percent of this group.

Table 14. Age Distribution of Pennsylvania Non-Trout Anglers			
Age	**Frequency**	**Percent**	**Cum. Pct.**
15-19	8	2.06	2.06
20-24	20	5.15	7.22
25-29	32	8.25	15.46
30-34	48	12.37	27.84
35-39	48	12.37	40.21
40-44	58	14.95	55.15
45-49	48	12.37	67.53
50-54	38	9.79	77.32
55-59	29	7.47	84.79
60-64	28	7.22	92.01
65-69	21	5.41	97.42
70-74	8	2.06	99.48
75-79	1	0.26	99.74
80-84	1	0.26	100.00
Total	**388**	**100.00**	

Eighty-one percent of non-trout anglers are male, a figure about ten percent lower than for trout anglers. These results are in Table 15.

Table 15. Sex Distribution of Non-Trout Anglers in Penna.			
Sex	**Frequency**	**Percent**	**Cum. Pct.**
Male	319	81.17	81.17
Female	74	18.83	100.00
Total	**393**	**100.00**	

Again, Allegheny County supplies the largest proportion of non-trout anglers, as shown in Table 16. These data are quite thin when presented at the county level.

Table 16. Distribution of Pennsylvania Non-Trout Anglers by County								
County	**Freq.**	**Pct.**	**County**	**Freq.**	**Pct.**	**County**	**Freq.**	**Pct.**
Adams	5	1.39	Elk	0	0.00	Montour	1	0.28
Allegheny	34	9.42	Erie	16	4.43	Northampton	1	0.28
Armstrong	5	1.39	Fayette	1	0.28	Northumberland	6	1.66
Beaver	11	3.05	Forest	0	0.00	Perry	5	1.39
Bedford	4	1.11	Franklin	3	0.83	Philadelphia	12	3.32
Berks	12	3.32	Fulton	1	0.28	Pike	2	0.55
Blair	6	1.66	Greene	4	1.11	Potter	1	0.28
Bradford	3	0.83	Huntingdon□	1	0.28	Schuylkill	8	2.22
Bucks	10	2.77	Indiana	4	1.11	Snyder	1	0.28
Butler	9	2.49	Jefferson	1	0.28	Somerset	3	0.83
Cambria	8	2.22	Juniata	2	0.55	Sullivan	0	0.00
Cameron	0	0.00	Lackawanna	8	2.22	Susquehanna	3	0.83
Carbon	3	0.83	Lancaster	19	5.26	Tioga	5	1.39
Centre	3	0.83	Lawrence	5	1.39	Union	1	0.28
Chester	9	2.49	Lebanon	6	1.66	Venango	2	0.55
Clarion	2	0.55	Lehigh	5	1.39	Warren	2	0.55
Clearfield	1	0.28	Luzerne	20	5.54	Washington	7	1.94
Clinton	1	0.28	Lycoming	6	1.66	Wayne	1	0.28
Columbia	2	0.55	McKean	0	0.00	Westmoreland	6	1.66
Crawford	11	3.05	Mercer	10	2.77	Wyoming	2	0.55
Cumberland	5	1.39	Mifflin	2	0.55	York	4	1.11
Dauphin	4	1.11	Monroe	6	1.66	*No Response*	*7*	*1.94*
Delaware	4	1.11	Montgomery	9	2.49	**Total**	**361**	**100.0**

Table 17 shows that 80 percent of non-trout anglers are married, with another 15 percent single.

Table 17. Distribution of Marital Status of Non-Trout Anglers

Marital Status	Frequency	Percent	Cum. Pct.
Single	59	15.21	15.21
Married	309	79.64	94.85
Divorced	13	3.35	98.20
Separated	1	0.26	98.45
Widowed	6	1.55	100.00
Total	**388**	**100.00**	

Results shown in Table 18, below, indicate that nearly 58 percent of non-trout anglers report that no children 15 years of age or younger reside in their households.

Table 18. Distribution of Children at Home for Non-Trout Anglers

At Home	Frequency	Percent	Cum. Pct.
Yes	163	42.01	42.01
No	225	57.99	100.00
Total	**388**	**100.00**	

When we combine these results in Table 19 with the Stage in Household Life Cycle variable, we observe similarities with the trout-angler group: the modal group is young families, and Empty Nesters are the second most common group, while families with older children are relatively rare.

Table 19. Distribution of Stage in Household Life Cycle of Non-Trout Anglers

Stage in Household Life Cycle			Frequency	Percent	Cum. Pct.
Age of Householder	*Marital Status*	*Children at Home*			
<=44	Single	No	49	13.07	13.07
<=44	Married	No	28	7.47	20.53
<=44	Married	Yes	126	33.60	54.13
45-65	Married	Yes	24	6.40	60.53
45-65	Married	No	108	28.80	89.33
>=66	Married	No	23	6.13	95.47
>=66	Single	No	4	1.07	96.53
NA	Single	Yes	13	3.47	100.00
		Total	**375**	**100.00**	

Table 20 shows that high school graduates represent more than half of all non-trout anglers, with "some college" and "college" categories the second and third most important educational groups.

Table 20 shows that high school graduates represent more than half of all non-trout anglers, with "some college" and "college" categories the second and third most important educational groups.

Table 20. Distribution of Educational Attainment of Non-Trout Anglers

Education	Frequency	Percent	Cum. Pct.
Middle School	9	2.33	2.33
Some High School	30	7.75	10.08
High School	196	50.65	60.72
Some College	82	21.19	81.91
College	45	11.63	93.54
Grad. or Prof. School	25	6.46	100.00
Total	**387**	**100.00**	

Tables 21 and 22 describe the occupational statuses of non-trout anglers. Similar to trout anglers, non-trout anglers with craft occupations are the modal group, followed by professional-technical, and managerial-administrative.

Table 21. Distribution of Occupations for Non-Trout Anglers

Occupation	Frequency	Percent	Cum. Pct.
Military	3	0.91	0.91
Prof./Tech	60	18.29	19.21
Mngr/Adm.	41	12.50	31.71
Sales	17	5.18	36.89
Clerical	27	8.23	45.12
Crafts	81	24.70	69.82
Operative	34	10.37	80.18
Laborers	40	12.20	92.38
Farmers	5	1.52	93.90
Service	20	6.10	100.00
Total	**328**	**100.00**	

At 56 percent of the sub-sample, blue-collar occupations form a majority of non-trout angler jobs. These figures are nearly identical to the distribution for trout anglers.

Table 22. Distribution of White-Collar & Blue-Collar Jobs for Non-Trout Anglers

Job Type	Frequency	Percent	Cum. Pct.
White-Collar	145	44.21	44.21
Blue-Collar	183	55.79	100.00
Total	**328**	**100.00**	

Table 23 presents the income distribution for non-trout anglers. Again, the modal group is in the $30,000 to $40,000 range, but the mean income for this group is $35,301, slightly lower than that for trout anglers.

Table 23. Household Income Distribution for Non-Trout Anglers

Income ($1000)	Frequency	Percent	Cum. Pct.
<10	14	4.12	4.12
10-15	22	6.47	10.59
15-20	33	9.71	20.29
20-25	49	14.41	34.71
25-30	31	9.12	43.82
30-40	83	24.41	68.24
40-50	58	17.06	85.29
50-75	35	10.29	95.59
75-100	13	3.82	99.41
100+	2	0.59	100.00
Total	**340**	**100.00**	

As with trout anglers, full-time employment is the mode for non-trout anglers, with retirement the second most important status. These and other results on employment status are presented in Table 24.

Table 24. Distribution of Employment Status of Non-Trout Anglers

Employment Status	Frequency	Percent	Cum. Pct.
Full-time	264	68.22	68.22
Part-time	18	4.65	72.87
Not Employed	18	4.65	77.52
Retired	47	12.14	89.66
Disabled	10	2.58	92.25
Student	10	2.58	94.83
Homemaker	20	5.17	100.00
Total	**387**	**100.00**	

2.3. Comparison of Trout Anglers with Non-Trout Anglers

For several variables, the statistical profile for non-trout anglers is indistinguishable from trout anglers. Because this study focuses on trout anglers, we will present data only for those variables where non-trout anglers differ significantly from their trout-fishing counterparts.

First, trout anglers tend to be younger than non-trout anglers. About two-thirds of trout anglers are less than 45, whereas 55 percent of non-trout anglers fall in this category. Table 25 presents this comparison.

Table 25. Age Distribution by Whether Anglers Fish for Trout

Age	Fish for Trout		
	Yes (% col.)	No (% col.)	Total (% col.)
<=44	1053 (65.89)	213 (55.04)	1266 (63.78)
46-65	483 (30.23)	147 (37.98)	630 (31.74)
>= 66	62 (3.88)	27 (6.98)	89 (4.48)
Total	**1598 (100.00)**	**387 (100.00)**	**1985 (100.00)**
Pearson $\chi^2(2) = 18.3313$ Pr = 0.000			

Next, women are about 10 percent more likely than men to be non-trout anglers. We have no explanation for this difference. These results are presented in Table 26.

Table 26. Sex Distribution by Whether Anglers Fish for Trout

Sex	Fish for Trout		
	Yes (% col.)	No (% col.)	Total (% col.)
Male	1460 (91.19)	319 (81.38)	1779 (89.26)
Female	141 (8.81)	73 (18.62)	214 (10.74)
Total	**1601 (100.00)**	**392 (100.00)**	**1993 (100.00)**
Pearson $\chi^2(1) = 31.6531$ Pr = 0.000			

We found no significant differences in the spatial distributions of trout and non-trout anglers, based on a comparison of 2-digit zip codes. We also found no differences in the distributions for marital status, and the presence of children at home. However, the age difference noted above, carries over to significant differences in the Stage in Household Life Cycle distributions. Table 27 presents these results.

Table 27. Stage in Household Life Cycle By Whether Anglers Fish for Trout

Stage in Household Life Cycle	Fish for Trout		
	Yes (% col.)	No (% col.)	Total (% col.)
Young Single	275 (17.56)	49 (13.10)	324 (16.70)
Young Married	168 (10.73)	28 (7.49)	196 (10.10)
Young Family	576 (36.78)	125 (33.42)	701 (36.13)
Middle Age Family	88 (5.62)	24 (6.42)	112 (5.77)
Empty Nester	355 (22.67)	108 (28.88)	463 (23.87)
Elderly Couples	49 (3.13)	23 (6.15)	72 (3.71)
Elderly Single	13 (0.83)	4 (1.07)	17 (0.88)
Single Parent Family	42 (2.68)	13 (3.48)	55 (2.84)
Total	**1566 (100.00)**	**374 (100.00)**	**1940 (100.00)**
Pearson $\chi^2(7) = 21.1753$ Pr = 0.004			

We found no statistically significant differences when we compared the occupation distributions for trout and non-trout anglers. However, there is a difference in income distributions. Trout anglers tend to be slightly more affluent than non-trout anglers. Table 28 presents this comparison.

Table 28. Distributions of Income By Whether Anglers Fish For Trout

Income ($1000)	Fish For Trout		
	Yes (% col.)	No (% col.)	Total (% col.)
<10	18 (1.24)	14 (4.13)	32 (1.79)
10-15	73 (5.04)	22 (6.49)	95 (5.31)
15-20	119 (8.21)	33 (9.73)	152 (8.50)
20-25	171 (11.80)	49 (14.45)	220 (12.30)
25-30	159 (10.97)	30 (8.85)	189 (10.57)
30-40	398 (27.47)	83 (24.48)	481 (26.90)
40-50	227 (15.67)	58 (17.11)	285 (15.94)
50-75	205 (14.15)	35 (10.32)	240 (13.42)
75-100	51 (3.52)	13 (3.83)	64 (3.58)
100+	28 (1.93)	2 (0.59)	30 (1.68)
Total	**1449 (100.00)**	**339 (100.00)**	**1788 (100.00)**
Pearson $\chi^2(9) = 24.6673$ Pr = 0.003			

This income difference may derive from the next statistical difference. Trout anglers are more economically active than non-trout anglers. This is reflected in a higher percentage in full-time employment, and a lower percentage in the retired category. These results are presented in Table 29.

Table 29. Distributions of Employment Status By Whether Anglers Fish For Trout

Employment Status	Fish For Trout		
	Yes (% col.)	No (% col.)	Total (% col.)
Full-time	1227 (76.98)	264 (68.39)	1491 (75.30)
Part-time	71 (4.45)	18 (4.66)	89 (4.49)
Not Employed	66 (4.14)	18 (4.66)	84 (4.24)
Retired	151 (9.47)	47 (12.18)	198 (10.00)
Disabled	23 (1.44)	10 (2.59)	33 (1.67)
Student	33 (2.07)	10 (2.59)	43 (2.17)
Homemaker	23 (1.44)	19 (4.92)	42 (2.12)
Total	**1594 (100.00)**	**386 (100.00)**	**1980 (100.00)**
Pearson $\chi^2(6) = 26.1191$ Pr = 0.000			

Finally, when we compare the scaled values of socioeconomic statuses (SES) for trout and non-trout anglers, we find no statistical differences. Thus, the small differences in income distributions does not translate into statistical significance when comparing socioeconomic statuses of the two groups.

2.4. Comparison of Anglers with Population Structure in Pennsylvania

How do anglers, as a group, compare demographically with the population of the state of Pennsylvania? We can answer this question using two data sources. First, we can use the approximately 7,500 anglers selected randomly from the set of all 1990 license holders. Second, we can use the information obtained by the 1991 Trout Angler Telephone Survey. These data will be compared to the 1990 Census data.

We first examine the age and sex structures of these three sources. Figure 5 presents the age-sex charts for the Trout Angler Telephone Survey (TATS) sample, the survey sample frame, and the 1990 Census for Pennsylvania for five year age cohorts, starting at age 15. Licenses are not required for persons under age 15. The charts are in the form of percentage distributions, with the total population age 15 and over the denominator for both males and females. Thus about 13 percent of the survey sample is males aged 35 to 39. Figure 5 shows that the population of anglers in Pennsylvania differs from the general population in two significant ways. First, the proportion of people between 20 and 49 in the sample frame and

sample is much greater than in the general population. Second, as already noted above, participation by males greatly exceeds their proportion in the population. The sample and frame age-sex charts are very similar in over all structure, as would be expected of a representative sample. In summary, most anglers are men between the ages of 20 and 49.

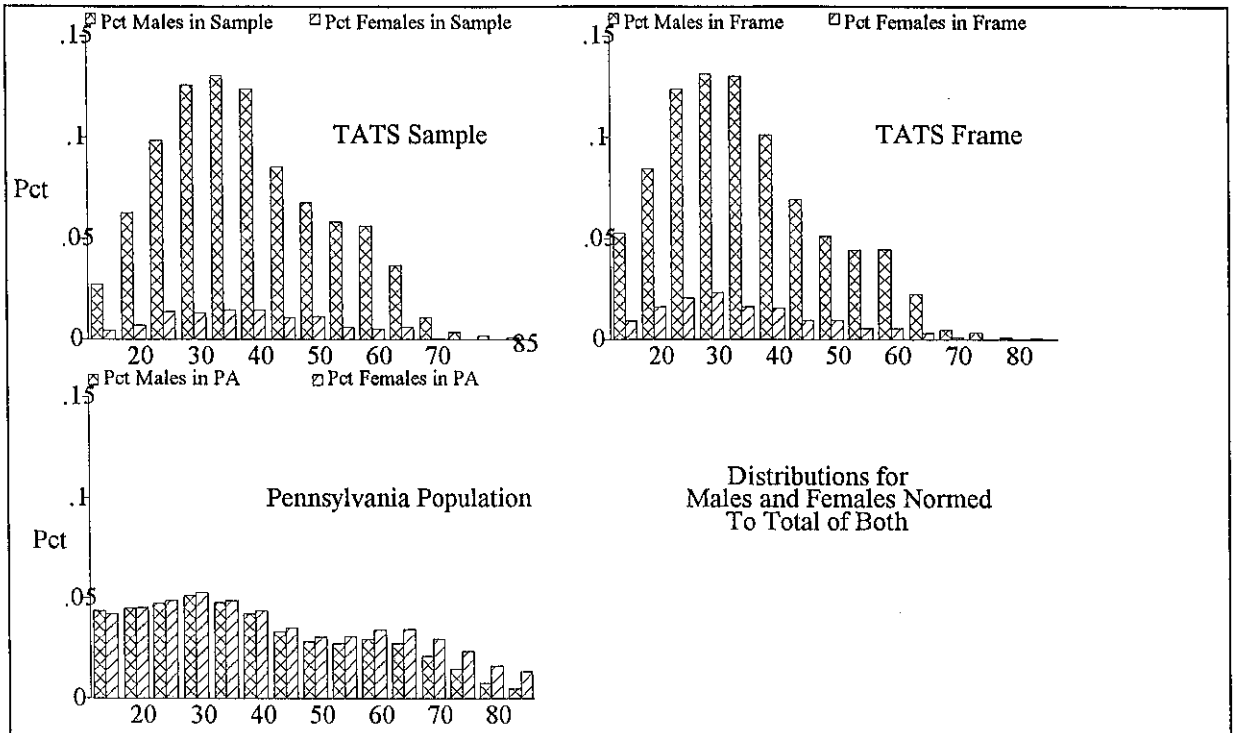


Figure 5. Comparison of Age-Sex Structure for TATS Sample, TATS Frame, and Pennsylvania Population.

Figures 6 and 7 present the age distributions respectively for males and females. First, in the upper, left panel of Figure 6, we see that the proportion of males in the sample is quite close to the proportion in the frame, particularly for the most frequent middle age cohorts. There is a slight tendency to under sample younger anglers, and over sample older anglers, a common problem in telephone surveys. The other two panels in Figure 6 show how participation for men in the cohorts 20 to 24 through 45 to 49 significantly exceed their presence in the population in both the sample and the frame. The upper left panel of Figure 7 shows that there is a small, but systematic undersampling of women in the TATS sample. Also, the remaining two panels demonstrate how women participate at rates much less than their cohort proportions in the population.

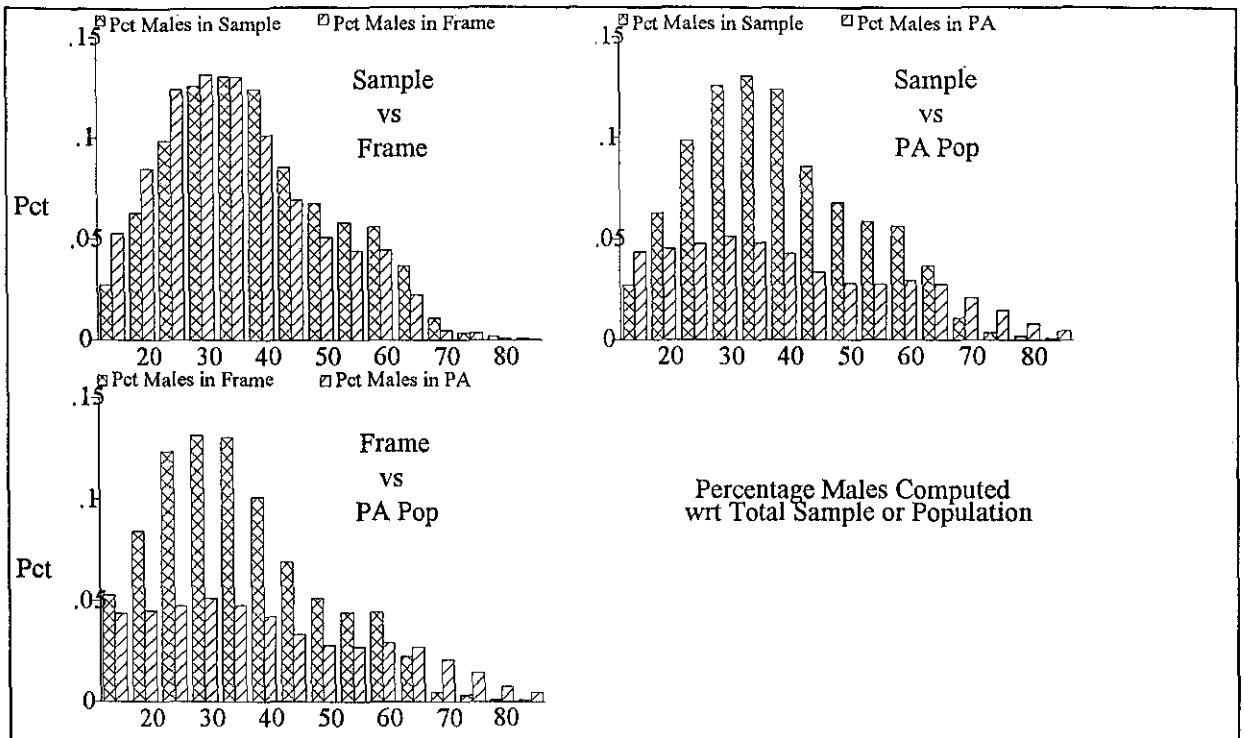


Figure 6. Comparison of Age Distributions for Males Between TATS Sample, TATS Frame, and Pennsylvania Population

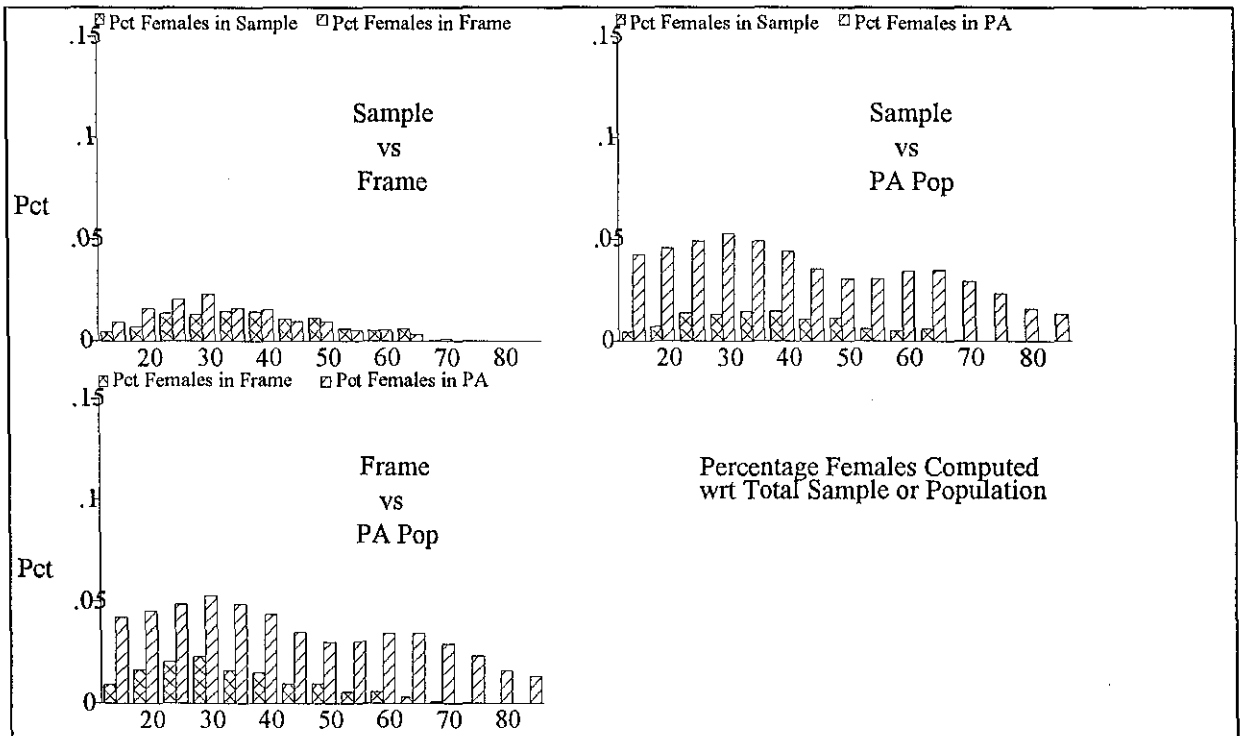


Figure 7. Comparison of Age Distributions for Females Between TATS Sample, TATS Frame, and Pennsylvania Population

Finally, we can compare the TATS sample with the TATS frame and the Pennsylvania population using areas of the state as a basis of comparison. However, we can't use the same areas. To compare the sample with the frame, we use zip codes, and to compare the sample with the state population, we use groups of counties. Figure 8 presents the distributions of three-digit zip codes for the sample and the frame. The sample and frame are quite close across all regions, with the exception of some undersampling in the Philadelphia area. Pittsburgh and Harrisburg contribute the most anglers, and out-of-state anglers comprise about eight percent of all Pennsylvania anglers. On balance, the differences between the TATS sample and the TATS frame are small and statistically insignificant.

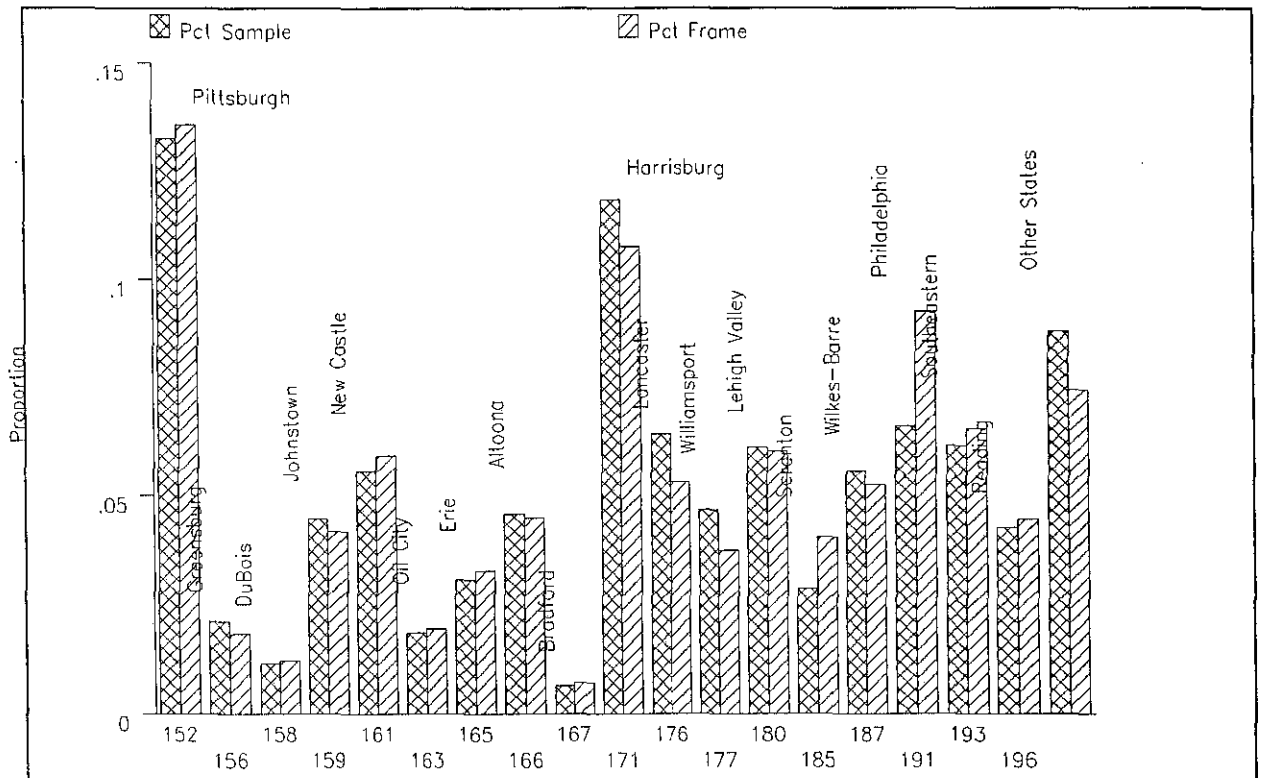


Figure 8. Distribution of Trout Anglers and Population by Zip Code

Figure 9 compares the population of the 67 counties with densities of anglers by county. The labeled counties in Figure 9 exhibit the largest differences in percentage of anglers versus the general population. These counties are also the core of the urban concentrations in the southeastern and southwestern corners of the state, and they account for 50 percent of the total population of the state but only for 28 percent of the anglers. It is also worth noting that these two corners of the state have the most limited fishing opportunities in Pennsylvania, particularly for trout fishing. The remaining counties show a proportional excess of anglers versus population and account for 72 percent of all anglers.

3. Angler Attitudes, Preferences and Participation

This section of the report presents the survey results on Pennsylvania trout anglers' preferences, attitudes, and opinions regarding general trout fishing conditions, and Commission programs and policies. Only those respondents who stated they fish for trout were asked these questions. In addition to the substantive responses, the tables contain other possible responses: DK/DR for "Don't Know" or "Don't Remember"; and NA/Refused for "No Answer" or "Refused."

3.1. General Preferences of Trout Anglers

We asked several questions concerning the general preferences of trout anglers. The trout program provides fishing in both streams and lakes. Table 30 presents the response distribution of preferences for type of water. While stream fishing is clearly the most important form of trout fishing, nearly 26 percent of trout anglers also include lakes, with 13 percent preferring fishing for trout in lakes.

Table 30. Do You Have a Preference for Streams or for Lakes When Fishing for Trout?

Preference	Frequency	Percent	Cum. Pct.
Streams	1182	73.83	73.83
Lakes	207	12.93	86.76
No Preference	211	13.18	99.94
DK/DR	1	0.06	100.00
Total	**1601**	**100.00**	

Pennsylvania provides two types of trout fisheries: a stocked fishery, and a wild trout fishery. These two fisheries often occupy the same streams. Although the wild trout fishery concentrates in the better quality streams, particularly the 787.7 miles of Class A streams, wild trout also inhabit Class B, C, and D streams. The Pennsylvania Fish Commission estimates that wild trout inhabit approximately 10,000 miles of streams. However, the biomass distribution of wild trout favors stream quality, with 39 percent of wild trout in Class A streams, 30.4 percent in Class B streams, 19.5 percent in Class C streams, and 11.1 percent in Class D streams. The stocked fishery contains 4,960 miles of streams of all sizes, plus lakes and reservoirs. Annually over 5.2 million catchable trout are planted in these waters over the course of the season. Thus, the odds are more likely that trout anglers utilize the stocked fishery than the wild fishery in Pennsylvania. The stocked fishery covers nearly 5,000 miles of streams and 80,000 acres of still water, while nearly 70 percent of the wild fishery concentrates in the approximately 2,000 miles of higher quality streams found in the remote regions of the state. Given the relative sizes of these fisheries, the question on relative importance of the two fisheries reported in Table 31 is interesting. About 40 percent of trout anglers state that the wild trout fishery is more important to them, and another 20 percent say both wild and stocked fisheries are important.

Table 31. Which Fishery is More Important to You? Wild Trout or Stocked Trout?

Fishery Type	Frequency	Percent	Cum. Pct.
Wild Trout	637	39.79	39.79
Stocked Trout	480	29.98	69.77
Both	324	20.24	90.01
No Preference	158	9.87	99.88
DK/DR	2	0.12	100.00
Total	**1601**	**100.00**	

When we asked respondents about their experience with the wild trout fishery, Table 32, nearly 63 percent stated they had fished for wild trout in unstocked stream sections. This suggests that, although the opportunity to fish for wild trout is very limited when compared with the stocked fishery, trout anglers are basing their preferences on the experience of wild trout fishing.

Table 32. Do You Fish for Wild Trout on Unstocked Stream Sections?

Response	Frequency	Percent	Cum. Pct.
Yes	1007	62.90	62.90
No	577	36.04	98.94
DK/DR	17	1.06	100.00
Total	**1601**	**100.00**	

3.2. Attitudes Concerning the Stocked Trout Program

We asked a series of questions to learn trout angler preferences and opinions concerning the stocked trout program. These questions were also asked about the wild trout program, reported in the next section.

First, there is a Pennsylvania tradition that measures angling success in terms of keeping a limit of trout. Most of this harvest oriented fishing is based on the stocked trout program. We asked anglers how important this dimension was to their trout fishing experience. Table 33 reports on the importance of keeping a limit of stocked trout. The response distribution is bimodal. About equal numbers, one third of respondents report that it is "Not Important" and "Important." Another 18 percent report this goal is very important. Given Pennsylvania's tradition, it is interesting that one third of anglers respond in the "Not Important" category.

Table 33. Keeping a Limit of Hatchery Trout?

Importance	Frequency	Percent	Cum. Pct.
Not Important	519	32.42	32.42
Somewhat Important	262	16.36	48.78
Important	522	32.60	81.39
Very Important	290	18.11	99.50
Other	1	0.06	99.56
DK/DR	6	0.37	99.94
NA/Refused	1	0.06	100.00
Total	**1601**	**100.00**	

We also asked the contrasting question about catching and releasing stocked hatchery trout. Table 34 reports that catching and releasing hatchery trout is "Important" or "Very Important" to 62 percent of trout anglers. This is further evidence of a fundamental change in attitudes towards harvesting trout.

Table 34. Catching and Releasing Hatchery Trout?

Importance	Frequency	Percent	Cum. Pct.
Not Important	284	17.74	17.74
Somewhat Important	317	19.80	37.54
Important	656	40.97	78.51
Very Important	336	20.99	99.50
Other	3	0.19	99.69
DK/DR	5	0.31	100.00
Total	**1601**	**100.00**	

Table 35 reports on opinions regarding special regulation areas for the hatchery trout program. About half of trout anglers believe that limited-kill or no-kill water is "Important" or "Very Important" for hatchery trout.

Table 35. Fishing Limited-Kill or No-Kill Water For Hatchery Trout?

Importance	Frequency	Percent	Cum. Pct.
Not Important	460	28.73	28.73
Somewhat Important	281	17.55	46.28
Important	571	35.67	81.95
Very Important	251	15.68	97.63
Other	6	0.37	98.00
DK/DR	24	1.50	99.50
NA/Refused	8	0.50	100.00
Total	**1601**	**100.00**	

We asked three questions concerning where anglers prefer to fish for hatchery trout: close to home, in family-type areas, and in walk-in areas. These results are reported in Table 36, Table 37, and Table 38.

Fishing close to home for hatchery trout is "Important" or "Very Important" to 57 percent of the respondents. Another 15 percent say that proximity is "Somewhat Important." About one quarter of the anglers dismiss proximity as "Not Important."

Table 36. Fishing Close to Home for Hatchery Trout?

Importance	Frequency	Percent	Cum. Pct.
Not Important	431	26.92	26.92
Somewhat Important	247	15.43	42.35
Important	602	37.60	79.95
Very Important	314	19.61	99.56
Other	1	0.06	99.63
DK/DR	5	0.31	99.94
NA/Refused	1	0.06	100.00
Total	**1601**	**100.00**	

The response patterns in Table 37 for fishing in family-type areas, and in Table 38 for fishing in walk-in areas are very similar to the pattern for fishing close to home. Between 25 and 30 percent of anglers state these location factors are "Not Important," and the remaining anglers endorse importance in similar degrees.

Table 37. Fishing Family-Type Areas for Hatchery Trout?

Importance	Frequency	Percent	Cum. Pct.
Not Important	484	30.23	30.23
Somewhat Important	214	13.37	43.60
Important	587	36.66	80.26
Very Important	313	19.55	99.81
DK/DR	2	0.12	99.94
NA/Refused	1	0.06	100.00
Total	**1601**	**100.00**	

Table 38. Fishing Walk-in Areas for Hatchery Trout?

Importance	Frequency	Percent	Cum. Pct.
Not Important	414	25.86	25.86
Somewhat Important	272	16.99	42.85
Important	628	39.23	82.07
Very Important	280	17.49	99.56
DK/DR	6	0.37	99.94
NA/Refused	1	0.06	100.00
Total	**1601**	**100.00**	

3.3. Attitudes Concerning the Wild Trout Program

We asked a parallel set of questions about the wild trout program. First, we asked anglers about the importance of keeping a limit of wild trout. Table 39 reports that the modal response is "Not Important" at 38 percent. However, 61 percent of respondents report some degree of importance in keeping a limit of wild trout. This figure is less than the 67 percent reporting some degree of importance for keeping a limit of hatchery trout.

Table 39. Keeping a Limit of Wild Trout?

Importance	Frequency	Percent	Cum. Pct.
Not Important	616	38.48	38.48
Somewhat Important	126	7.87	46.35
Important	456	28.48	74.83
Very Important	394	24.61	99.44
Other	1	0.06	99.50
DK/DR	7	0.44	99.94
NA/Refused	1	0.06	100.00
Total	**1601**	**100.00**	

Catching and releasing wild trout is endorsed by 88 percent of anglers, and fishing special-regulated water for wild trout is endorsed by 74 percent of anglers. Tables 40 and 41

report these statistics. These levels of support for catch and release and special regulations for wild trout are somewhat higher than the corresponding values for hatchery trout at 82 and 69 percents, respectively. In summary, there is considerable support for catch and release and special regulations for both the hatchery program and the wild trout program, with somewhat higher levels of endorsement for the wild trout program.

Table 40. Catching and Releasing Wild Trout?

Importance	Frequency	Percent	Cum. Pct.
Not Important	189	11.81	11.81
Somewhat Important	180	11.24	23.05
Important	641	40.04	63.09
Very Important	581	36.29	99.38
Other	2	0.12	99.50
DK/DR	6	0.37	99.88
NA/Refused	2	0.12	100.00
Total	**1601**	**100.00**	

Table 41. Fishing Limited-Kill or No-kill Water for Wild Trout?

Importance	Frequency	Percent	Cum. Pct.
Not Important	383	23.92	23.92
Somewhat Important	252	15.74	39.66
Important	630	39.35	79.01
Very Important	307	19.18	98.19
Other	2	0.12	98.31
DK/DR	20	1.25	99.56
NA/Refused	7	0.44	100.00
Total	**1601**	**100.00**	

Although it may not be very realistic because most of the wild trout streams are located in the unpopulated regions of the state, 68 percent of anglers report that fishing for wild trout close to home is important in some degree. Similarly, 60 percent of anglers state it is important to fish family-type areas for wild trout, and 74 percent endorse fishing walk-in areas for wild trout. The corresponding figures for the hatchery trout program are: 73 percent for fishing close to home; 70 percent for fishing family-type areas; and 73 percent for walk-in areas. These statistics are quite similar for the two programs, with small differences in the expected directions. Tables 42 through 44 report these results.

Table 42. Fishing close to home for wild trout?

Importance	Frequency	Percent	Cum. Pct.
Not Important	504	31.48	31.48
Somewhat Important	206	12.87	44.35
Important	584	36.48	80.82
Very Important	297	18.55	99.38
Other	6	0.37	99.75
DK/DR	2	0.12	99.88
NA/Refused	2	0.12	100.00
Total	**1601**	**100.00**	

Table 43. Fishing family-type areas for wild trout?			
Importance	**Frequency**	**Percent**	**Cum. Pct.**
Not Important	636	39.73	39.73
Somewhat Important	222	13.87	53.59
Important	542	33.85	87.45
Very Important	194	12.12	99.56
Other	2	0.12	99.69
DK/DR	3	0.19	99.88
NA/Refused	2	0.12	100.00
Total	**1601**	**100.00**	

Table 44. Fishing walk-in areas for wild trout?			
Importance	**Frequency**	**Percent**	**Cum. Pct.**
Not Important	404	25.23	25.23
Somewhat Important	213	13.30	38.54
Important	671	41.91	80.45
Very Important	308	19.24	99.69
DK/DR	5	0.31	100.00
Total	**1601**	**100.00**	

3.4. Trout Angler Attitudes Concerning Minimum Size and Creel Limits

Two of the most important policies of the trout management program concern the minimum size of a creeled trout, and creel limits--the number of trout killed during a day's fishing. Currently under conventional statewide regulations the minimum size limit is seven inches for all species and types of trout, and the regular season limit is eight trout per day for all species and types of trout.

Table 45 reports angler views on the relevance of the current minimum size limit for creeled trout. About half of trout anglers believe the size limit is "Just Right." However, another 46 percent believe the size limit is "Too Low." For all anglers who responded that the current limit is either "Too High" or "Too Low," we asked what they thought the limit should be. Table 46 reports the distribution of these responses. The modal response is nine inches, with a close second at 10 inches. The mean of this distribution is 9.5 inches. This figure is 2.5 inches higher than the current minimum. However, if the minimum size limit were raised to 9 inches, harvest would virtually be eliminated on wild brook trout fisheries in Pennsylvania but would not impact the stocked program as most stocked trout are longer than 9 or 10 inches.

Table 45. Do you feel the 7-inch minimum size limit is...?			
Size Limit	**Frequency**	**Percent**	**Cum. Pct.**
Too High	42	2.62	2.62
Just Right	810	50.59	53.22
Too Low	734	45.85	99.06
No Opinion	15	0.94	100.00
Total	**1601**	**100.00**	

Table 46. What do you think the size limit should be?

Inches	Frequency	Percent	Cum. Pct.
2	1	0.13	0.13
4	1	0.13	0.26
5	6	0.78	1.04
6	21	2.73	3.77
7	1	0.13	3.90
8	89	11.56	15.45
9	294	38.18	53.64
10	253	32.86	86.49
11	12	1.56	88.05
12	78	10.13	98.18
13	1	0.13	98.31
14	10	1.30	99.61
15	2	0.26	99.87
20	1	0.13	100.00
Total	**770**	**100.00**	

Figure 11 summarizes the preferences of trout anglers by combining the data in Tables 45 and 46. Half of Pennsylvania's trout anglers would prefer to keep the current minimum size limit at seven inches. However, almost all of the remaining half would raise the limit to 9 or 10 inches.

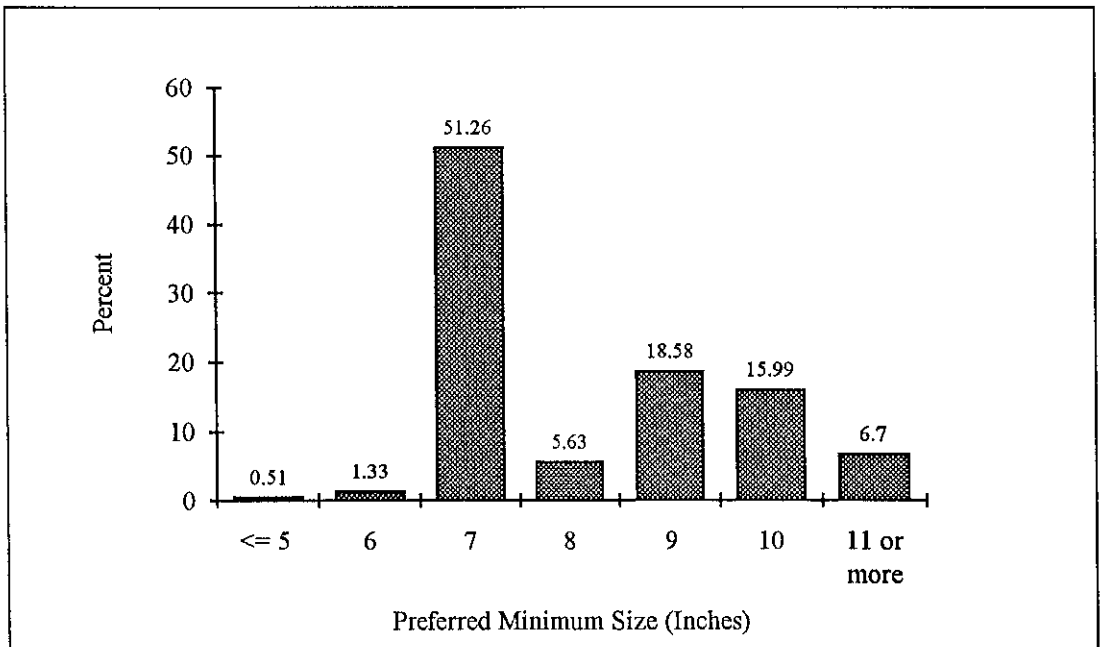


Figure 11. Distribution of Preferred Minimum Size Limits of Creeled Trout

We wondered whether anglers' views on creel limits varied by wild versus hatchery trout. Table 47 presents the results for the preferred hatchery trout limit. Nearly 62 percent say the current limit of eight trout is "Just Right," but another 34 percent say it is "Too Many." We again asked the minority who believe the creel limit is not "Just Right" what they preferred,

and their responses are presented in Table 48. Eighty-six percent of this minority would reduce the creel limit to four, five or six hatchery trout, and the mean minimum creel limit is 5.4 hatchery trout.

Table 47. Considering stocked hatchery trout, do you feel the 8-trout creel limit allows you to harvest...?

Creel Limit	Frequency	Percent	Cum. Pct.
Too Many	547	34.17	34.17
Just Right	988	61.71	95.88
Too Few	36	2.25	98.13
No Opinion	25	1.56	99.69
DK/DR	5	0.31	100.00
Total	**1601**	**100.00**	

Table 48. What do you think the [creel] limit should be on stocked hatchery trout?

Number	Frequency	Percent	Cum. Pct.
0	3	0.52	0.52
2	7	1.21	1.73
3	30	5.18	6.91
4	134	23.14	30.05
5	149	25.73	55.79
6	220	38.00	93.78
7	2	0.35	94.13
8	3	0.52	94.65
9	4	0.69	95.34
10	18	3.11	98.45
12	8	1.38	99.83
50	1	0.17	100.00
Total	**579**	**100.00**	

We repeated these questions for wild trout: Tables 49 and 50 report the responses. Contrary to the response for hatchery trout, 59 percent of trout anglers believe current creel limits are too high for wild trout. When asked what the limit should be, the modal response is four, and the mean preferred creel limit is 4.25 wild trout.

Table 49. Considering wild trout, do you feel the 8 trout creel limit allows you to harvest?

Creel Limit	Frequency	Percent	Cum. Pct.
Too Many	939	58.65	58.65
Just Right	580	36.23	94.88
Too Few	44	2.75	97.63
No Opinion	35	2.19	99.81
DK/DR	3	0.19	100.00
Total	**1601**	**100.00**	

Table 50. What do you think the [creel] limit should be on wild trout?

Number	Frequency	Percent	Cum. Pct.
0	64	6.54	6.54
1	16	1.63	8.17
2	74	7.56	15.73
3	132	13.48	29.21
4	344	35.14	64.35
5	160	16.34	80.69
6	151	15.42	96.12
7	3	0.31	96.42
8	1	0.10	96.53
9	3	0.31	96.83
10	18	1.84	98.67
12	7	0.72	99.39
15	1	0.10	99.49
16	1	0.10	99.59
20	1	0.10	99.69
50	3	0.31	100.00
Total	**979**	**100.00**	

Figure 12 displays the combined results regarding creel limits for hatchery and wild trout. The clear distinction trout anglers make between hatchery and wild trout is evident in this graph. While 63 percent of anglers are satisfied with the current regulations for hatchery trout, 61 percent would prefer to lower the creel limit for wild trout.

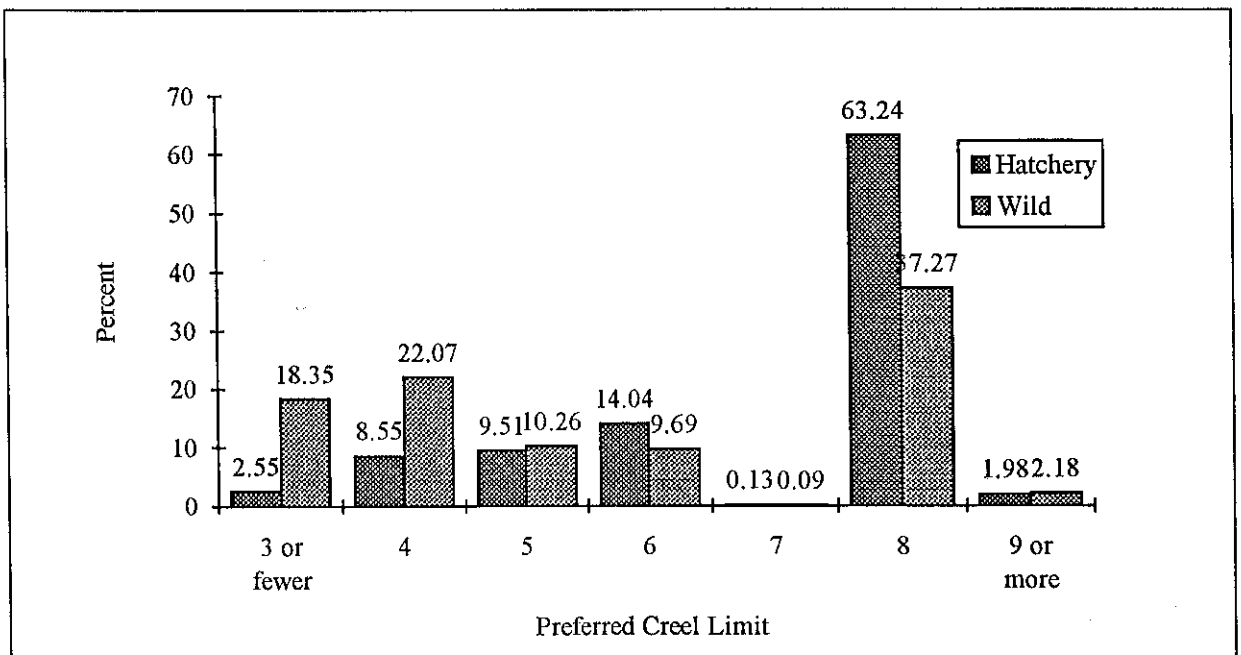


Figure 12. Distribution of Preferred Creel Limits for Hatchery and Wild Trout

We can summarize these results on minimum size and creel limits. About half of trout anglers state the minimum size of seven inches is "Just Right," and those who dissent from the

current policy would raise the minimum size to 9 or 10 inches. Trout anglers have different preferences for creel limits depending on whether they are fishing for hatchery trout or wild trout. A majority of 62 percent believe the current creel limit of eight trout is "Just Right" for hatchery trout. A significant majority of trout anglers believe the current creel limit of eight trout is "Too Many" for wild trout. They would prefer a limit of about four wild trout.

3.5. Trout Angler Attitudes on Current Directions and Proposed Changes in the Trout Management Program

The Pennsylvania Fish Commission is considering several changes in current practice and policy. We asked trout anglers a series of questions concerning current plans and proposed changes.

3.5.1. Proposed Changes in the Wild Trout Program

The first set of questions examines the wild trout program. We asked anglers about expanding the wild trout management program in suitable waters. Specifically, we wanted to know whether anglers "Strongly Agree," "Agree," "Neither Agree Nor Disagree," "Disagree," "Strongly Disagree," or have "No Opinion" with respect to a series of statements. Table 51 presents the first set of results. A majority of the anglers support this statement. However, a sizable minority of 36 percent do not.

Table 51. The Commission should continue to expand wild trout management in suitable waters, but without special regulations.

Agreement	Frequency	Percent	Cum. Pct.
Strongly Agree	124	7.75	7.75
Agree	802	50.09	57.84
Neither	85	5.31	63.15
Disagree	508	31.73	94.88
Strongly Disagree	69	4.31	99.19
No Opinion	13	0.81	100.00
Total	**1601**	**100.00**	

The next statement and response concerns "No-kill" regulations for wild trout. Table 52 presents the results. A significant majority, 62 percent, of anglers support this statement. Another 30 percent disagree with the statement.

Table 52. No-kill regulations on wild trout should be expanded.

Agreement	Frequency	Percent	Cum. Pct.
Strongly Agree	216	13.49	13.49
Agree	783	48.91	62.40
Neither	90	5.62	68.02
Disagree	464	28.98	97.00
Strongly Disagree	16	1.00	98.00
No Opinion	26	1.62	99.63
DK/DR	5	0.31	99.94
NA/Refused	1	0.06	100.00
Total	**1601**	**100.00**	

Table 52 extends the results to "Limited-Kill" regulations for wild trout. Again a significant majority, 68 percent, support this proposal while 26 percent do not. Tables 51, 52, and 53 all exhibit similar response patterns. A majority of trout anglers would like to see the wild trout program expanded, with increased regulation and protection of the fishery. A minority of between 26 and 36 percent do not support these directions in the wild trout program.

Table 53. Limited-kill regulations on wild trout should be expanded.

Agreement	Frequency	Percent	Cum. Pct.
Strongly Agree	174	10.87	10.87
Agree	916	57.21	68.08
Neither	74	4.62	72.70
Disagree	393	24.55	97.25
Strongly Disagree	17	1.06	98.31
No Opinion	23	1.44	99.75
DK/DR	3	0.19	99.94
NA/Refused	1	0.06	100.00
Total	**1601**	**100.00**	

3.5.2. Proposed Changes in Opening Day

We asked two questions about attitudes toward Opening Day of trout season. The first is a general question concerning the overall importance of Opening Day. Table 54 reports that 72 percent of trout anglers believe that Opening Day is an important part of the trout fishing experience. In Table 55, 59 percent of respondents do not want to see Opening Day eliminated, and replaced with year-round trout fishing. Together, these two sets of responses show there is strong support for continuing the tradition of Opening Day in Pennsylvania trout fishing.

Table 54. Opening day of trout season is an important part of the trout fishing experience.

Agreement	Frequency	Percent	Cum. Pct.
Strongly Agree	352	21.99	21.99
Agree	793	49.53	71.52
Neither	56	3.50	75.02
Disagree	313	19.55	94.57
Strongly Disagree	84	5.25	99.81
DK/DR	2	0.12	99.94
NA/Refused	1	0.06	100.00
Total	**1601**	**100.00**	

Table 55. Some anglers want to eliminate opening day and have no closed season; that is, to fish year round.

Agreement	Frequency	Percent	Cum. Pct.
Strongly Agree	124	7.75	7.75
Agree	451	28.17	35.92
Neither	83	5.18	41.10
Disagree	759	47.41	88.51
Strongly Disagree	181	11.31	99.81
DK/DR	3	0.19	100.00
Total	**1601**	**100.00**	

3.6. Angler Preferences and Attitudes with Respect to Handling, Keeping and Releasing Trout

Among Pennsylvania trout anglers, attitudes and behaviors vary greatly with respect to releasing versus killing trout. This series of questions deals with these issues.

First, we asked about releasing wild brook trout. Table 56 reports that 57 percent of trout anglers "Always" or "Almost Always" release wild brook trout. An almost identical response applies to the releasing of wild brown trout (see Table 57).

Table 56. Your attitude towards releasing legal size wild brook trout.

Reported Behavior	Frequency	Percent	Cum. Pct.
Always Release	536	33.48	33.48
Almost Always Release	384	23.99	57.46
Release About Half	415	25.92	83.39
Rarely Release	235	14.68	98.06
DK/DR	23	1.44	99.50
NA/Refused	8	0.50	100.00
Total	**1601**	**100.00**	

Table 57. Your attitude towards releasing legal size wild brown trout.

Reported Behavior	Frequency	Percent	Cum. Pct.
Always Release	512	31.98	31.98
Almost Always Release	396	24.73	56.71
Release About Half	350	21.86	78.58
Rarely Release	269	16.80	95.38
DK/DR	56	3.50	98.88
NA/Refused	18	1.12	100.00
Total	**1601**	**100.00**	

This behavior does not extend to hatchery trout. About 37 percent of anglers "Always" or "Almost Always" release their stocked trout. Also, the modal category is 35 percent of anglers who "Rarely" release a stocked trout (see Table 58).

Table 58. Your attitude towards releasing legal size stocked hatchery trout.

Reported Behavior	Frequency	Percent	Cum. Pct.
Always Release	287	17.93	17.93
Almost Always Release	300	18.74	36.66
Release About Half	445	27.80	64.46
Rarely Release	557	34.79	99.25
DK/DR	10	0.62	99.88
NA/Refused	2	0.12	100.00
Total	**1601**	**100.00**	

We asked one final question about handling trout: "What do you do if a legal-sized trout swallows your hook?" Table 59 reports the responses. About 35 percent of anglers attempt to extract the hook, one-third just cut the leader, and about one-quarter creel the fish.

Table 59. What do you do if a legal-sized trout swallows your hook?

Reported Behavior	Frequency	Percent
Creel It	422	26.52
Cut the Leader	540	33.94
Extract the Hook by the Best Available Means	562	35.32
Other	67	4.21
Total	**1591**	**100.00**

3.7. Angler Opinions and Attitudes on the Trout Stocking Program

In both public hearings and everyday discussions, Pennsylvania trout anglers discuss the pros and cons of the stocking program more than any other trout management topic. We asked an extensive series of questions concerning the stocking program.

First, we asked a general question concerning the methods of in-season stocking. About two-thirds of anglers "Strongly Agree" or "Agree" with the statement that they are satisfied with current methods.

Table 60. You are satisfied with the Commission's current methods of in-season stocking.

Agreement	Frequency	Percent	Cum. Pct.
Strongly Agree	74	4.62	4.62
Agree	1018	63.59	68.21
Neither	79	4.93	73.14
Disagree	330	20.61	93.75
Strongly Disagree	94	5.87	99.63
DK/DR	4	0.25	99.88
NA/Refused	2	0.12	100.00
Total	**1601**	**100.00**	

The Commission has followed the practice of publishing how many trout they stock in each stream for each stocking. Apparently, a majority of anglers would prefer that this practice be stopped. Table 61 reports that 58 percent of anglers "Strongly Agree" or "Agree" with the statement that the numbers of trout to be stocked should not be published.

Table 61. Numbers of trout to be stocked should not be published.

Agreement	Frequency	Percent	Cum. Pct.
Strongly Agree	186	11.62	11.62
Agree	736	45.97	57.59
Neither	179	11.18	68.77
Disagree	457	28.54	97.31
Strongly Disagree	40	2.50	99.81
DK/DR	3	0.19	100.00
Total	**1601**	**100.00**	

Along with the numbers of trout stocked, the Commission has also made public the week that in-season stockings occur. Again, a majority of anglers believe this practice should be stopped. See Table 62.

Table 62. The week of in-season stocking should not be published.

Agreement	Frequency	Percent	Cum. Pct.
Strongly Agree	238	14.87	14.87
Agree	815	50.91	65.77
Neither	93	5.81	71.58
Disagree	417	26.05	97.63
Strongly Disagree	36	2.25	99.88
DK/DR	2	0.12	100.00
Total	**1601**	**100.00**	

An alternative to current practice would be to publish specific days and times of in-season stocking. We asked anglers about such a change in current practice. Table 63 reports that 72 percent of anglers oppose this change.

Table 63. The Commission should return to publishing the specific day and time of in-season stocking.

Agreement	Frequency	Percent	Cum. Pct.
Strongly Agree	47	2.94	2.94
Agree	316	19.74	22.67
Neither	77	4.81	27.48
Disagree	836	52.22	79.70
Strongly Disagree	322	20.11	99.81
DK/DR	2	0.12	99.94
NA/Refused	1	0.06	100.00
Total	**1601**	**100.00**	

Finally, we asked about a policy of only announcing how many times a stream is to be stocked, with no additional release of information about the number of fish stocked, or specific dates and times. This proposal drew support from 70 percent of trout anglers. See Table 64.

Table 64. The Commission should only announce how many times a stream is to be stocked; they should release no other information.

Agreement	Frequency	Percent	Cum. Pct.
Strongly Agree	131	8.18	8.18
Agree	982	61.34	69.52
Neither	80	5.00	74.52
Disagree	370	23.11	97.63
Strongly Disagree	35	2.19	99.81
DK/DR	2	0.12	99.94
NA/Refused	1	0.06	100.00
Total	**1601**	**100.00**	

The pattern across this series of questions concerning information about stocking is clear. A significant majority of trout anglers would prefer that less information be published about the in-season stocking program than is currently the pattern.

We asked a question about whether truck following is a problem. (Truck following is the practice of following Commission stocking trucks and fishing immediately after the fish have been put in the water. It is widely believed this is the easiest way to catch a limit of hatchery trout.) Table 65 reports that 80 percent of anglers believe truck following is a problem; perhaps less information on stocking schedules is viewed as a solution to this problem.

Table 65. Truck following is not a problem.

Agreement	Frequency	Percent	Cum. Pct.
Strongly Agree	11	0.69	0.69
Agree	216	13.49	14.18
Neither	80	5.00	19.18
Disagree	815	50.91	70.08
Strongly Disagree	461	28.79	98.88
DK/DR	18	1.12	100.00
Total	**1601**	**100.00**	

Currently, the Commission stocks a few palomino trout in most stocking locations. We asked whether this practice should be continued. Table 66 states that a majority of anglers support the practice of stocking palomino trout.

Table 66. Palomino trout should not be stocked in Pennsylvania.

Agreement	Frequency	Percent	Cum. Pct.
Strongly Agree	28	1.75	1.75
Agree	190	11.87	13.62
Neither	349	21.80	35.42
Disagree	913	57.03	92.44
Strongly Disagree	91	5.68	98.13
DK/DR	27	1.69	99.81
NA/Refused	3	0.19	100.00
Total	**1601**	**100.00**	

We also asked whether other, new species should be imported from outside Pennsylvania. By a margin of 42 percent to 38 percent, anglers support idea. See Table 67. With a sample size of 1601, this small difference is statistically significant.

Table 67. New species of trout (such as cutthroat) should be imported from outside Pennsylvania.

Agreement	Frequency	Percent	Cum. Pct.
Strongly Agree	69	4.31	4.31
Agree	598	37.35	41.66
Neither	293	18.30	59.96
Disagree	544	33.98	93.94
Strongly Disagree	57	3.56	97.50
DK/DR	37	2.31	99.81
NA/Refused	3	0.19	100.00
Total	**1601**	**100.00**	

On some small streams, the Commission has set up wired or refuge areas for in-season stocking. We asked whether this practice should be extended to all small streams. The response is fairly evenly split, with a three percent advantage to those who support the practice. This is also a statistically significant, though substantively less important difference. See Table 68.

Table 68. In-season stocking on smaller streams should only be done in refuge or wired areas.

Agreement	Frequency	Percent	Cum. Pct.
Strongly Agree	72	4.50	4.50
Agree	686	42.85	47.35
Neither	125	7.81	55.15
Disagree	674	42.10	97.25
Strongly Disagree	30	1.87	99.13
DK/DR	12	0.75	99.88
NA/Refused	2	0.12	100.00
Total	**1601**	**100.00**	

One proposal to deal with truck following and other stocking-related problems is to close a stream or lake after it has been stocked. In Table 69 we find that 72 percent of anglers support this idea.

Table 69. Streams and lakes should be closed for one to several days after stocking.

Agreement	Frequency	Percent	Cum. Pct.
Strongly Agree	235	14.68	14.68
Agree	913	57.03	71.71
Neither	41	2.56	74.27
Disagree	376	23.49	97.75
Strongly Disagree	35	2.19	99.94
DK/DR	1	0.06	100.00
Total	**1601**	**100.00**	

3.8. Attitudes and Opinions about Special Regulations Areas

Special regulations areas, and particularly Delayed Harvest projects are a particularly important and popular component of Pennsylvania's Trout Management Program. We asked a series of questions about these programs.

First, we discovered, in Table 70, that despite the existence of more than 50 Delayed Harvest projects around the state, only 22 percent of trout anglers are familiar with the program.

Table 70. Are you familiar with the Delayed Harvest Program?

Response	Frequency	Percent	Cum. Pct.
Yes	356	22.24	22.24
No	1046	65.33	87.57
Not Sure	198	12.37	99.94
NA/Refused	1	0.06	100.00
Total	**1601**	**100.00**	

For those anglers who were not familiar with the Delayed Harvest Program, we provided a brief description. We then asked all trout anglers for their opinions on the program. First, we wanted to know whether the anglers would support creating more such areas on stocked trout streams. Table 71 shows strong support, 70 percent, for this proposal.

Table 71. More Delayed Harvest Areas Should be Created on Stocked Trout Streams.

Agreement	Frequency	Percent	Cum. Pct.
Strongly Agree	135	8.43	8.43
Agree	987	61.65	70.08
Neither	112	7.00	77.08
Disagree	340	21.24	98.31
Strongly Disagree	16	1.00	99.31
DK/DR	7	0.44	99.75
NA/Refused	4	0.25	100.00
Total	**1601**	**100.00**	

It is interesting to check whether knowledge of the Delayed Harvest Program increases support for creating more such special projects. Table 72 presents the crosstabulation of these two variables. There is clear evidence that those with knowledge of the Delayed Harvest Program are stronger supporters than those who are not familiar with the program. Both χ^2 and the γ measure of association are highly significant.

Table 72. Knowledge of Delayed Harvest Program by Agreement that More Delayed Harvest Areas Should Be Created

Agreement	Knowledge of Delayed Harvest Program		
	Yes (col. %)	**No** (col. %)	**Total** (col. %)
Strongly Agree	60 (16.90)	75 (6.07)	135 (8.49)
Agree	232 (65.35)	755 (61.13)	987 (62.08)
Neither	12 (3.38)	100 (8.10)	112 (7.04)
Disagree	50 (14.08)	290 (23.48)	340 (21.38)
Strongly Disagree	1 (0.28)	15 (1.21)	16 (1.01)
Total	**355** (100.00)	**1235** (100.00)	**1590** (100.00)
Pearson $\chi^2(4) = 61.3522$ Pr = 0.000 $\gamma = 0.3822$ ASE = 0.052			

Currently some Delayed Harvest projects are restricted to artificial lures, including spinning tackle. We asked whether fishing in Delayed Harvest areas should be restricted to flies or streamers. Table 73 indicates that a small majority of 55 percent agree with this restriction, while a minority of 38 percent disagree with the restriction.

Table 73. Only flies or streamers should be permitted in Delayed Harvest Areas.

Agreement	Frequency	Percent	Cum. Pct.
Strongly Agree	95	5.93	5.93
Agree	788	49.22	55.15
Neither	91	5.68	60.84
Disagree	576	35.98	96.81
Strongly Disagree	33	2.06	98.88
DK/DR	15	0.94	99.81
NA/Refused	3	0.19	100.00
Total	**1601**	**100.00**	

Table 74 deals with the same issue from the other perspective. For this version of the question, 61 percent support permitting spinners on delayed harvest projects, and 33 percent disagree. The results of these two questions seem to contradict each other, perhaps because the second statement could have been better phrased.

Table 74. All Delayed Harvest Areas should permit spinners and artificial lures as well as flies.

Agreement	Frequency	Percent	Cum. Pct.
Strongly Agree	61	3.81	3.81
Agree	908	56.71	60.52
Neither	87	5.43	65.96
Disagree	489	30.54	96.50
Strongly Disagree	43	2.69	99.19
DK/DR	9	0.56	99.75
NA/Refused	4	0.25	100.00
Total	**1601**	**100.00**	

Finally, we asked whether the Commission should consider limiting the number of anglers on certain streams. This idea is rejected by 71 percent of trout anglers. (See Table 75.)

Table 75. New regulations should restrict the number of fishermen per day on certain streams.

Agreement	Frequency	Percent	Cum. Pct.
Strongly Agree	36	2.25	2.25
Agree	350	21.86	24.11
Neither	70	4.37	28.48
Disagree	968	60.46	88.94
Strongly Disagree	169	10.56	99.50
DK/DR	8	0.50	100.00
Total	**1601**	**100.00**	

3.9. Attitudes and Characteristics of Trout Anglers

We have presented many results on the attitudes, opinions and preferences of trout and non-trout anglers. Because these results exhibit several systematic patterns with regard to support for the wild trout program, catch and release fishing, information about stocking, and other variables, the question arises: Are these patterns related to the social and economic characteristics of trout anglers? In this section, we address this question.

Before examining the details of this section, we present a summary of our findings. The overall finding is that statistical relations between angler attitudes and characteristics are generally weak and in some instances non-existent. Simple crosstabulations generally do not reveal significant correlations between attitudes and characteristics. We only found statistically significant relations using the multivariate techniques of regression, logistic regression, multinomial regression, and ordered logistic regression.[6] The substantive significance of these multivariate models is limited.

The attitudes we examine are covered in the key questions discussed in Section 3 regarding the wild trout program, catch and release angling, killing a limit of hatchery trout, fishing in family-type areas, expanding no-kill regulations for wild trout, not publishing information about stocking, and knowledge of delayed harvest areas. The independent variables include the angler's sex, age, socioeconomic status, and stage in household life cycle.[7]

Table 76 presents a multinomial regression model of the question: "Which fishery is more important to you? Wild trout or stocked trout?" Two angler characteristics show weak, but significant relations with the response pattern on "Most Important Fishery."

Compared to female anglers, male anglers report that the wild fishery is relatively more important to them than the stocked fishery, and respondents with higher socioeconomic status (SES) report the wild fishery is relatively more important than the stocked fishery. The model also reports no significant relations for those who responded that both fisheries are important, and those who expressed no preference.

[6] The STATA statistical package, Version 3.0 was used for these analyses.

[7] We checked for independent effects of income and education. In every instance, the composite scale of socioeconomic status was more highly correlated than the single measures.

Table 76. Most Important Fishery

Multinomial regression — Number of obs. = 1347; $\chi^2(6)$ = 19.41; Prob > χ^2 = 0.0035; Log Likelihood = -1710.4788; Pseudo R2 = 0.0056

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
Wild Trout						
Sex	-0.7356845	.2774209	-2.652	0.008	[-1.2799120,	-0.1914571]
SES	0.1186656	.0501512	2.366	0.018	[0.0202820,	0.2170491]
Constant	1.0523620	.3015243	3.490	0.000	[0.4608506,	1.6438740]
Both						
Sex	-0.3488201	.3065895	-1.138	0.255	[-0.9502685,	0.2526284]
SES	0.0381440	.0599645	0.636	0.525	[-0.0794907,	0.1557786]
Constant	-0.0216474	.3372289	-0.064	0.949	[-0.6832023,	0.6399074]
No Preference						
Sex	0.4131842	.3205093	1.289	0.198	[-0.2155714,	1.0419400]
SES	0.0779647	.0765079	1.019	0.308	[-0.0721238,	0.2280532]
Constant	-1.6058960	.3706349	-4.333	0.000	[-2.3329850,	-0.8788077]

(Outcome Stocked is the comparison group)

The model in Table 76 tells us the direction of the effect and statistical significance of the variables sex and SES, but does not convey how these relations translate into preferences. We can use the model to predict the probability of endorsing each of the options to the question on "Most Important Fishery." Next we compute the average probability of selection by the sex and SES of the respondent. These results are presented in Table 77. First, we note modest increase in preference due to increasing socioeconomic status; the change is only about 6 percent from low to high. We also note that male anglers prefer the wild trout fishery about 15 percent more than do female anglers in this study.

Table 77. Mean Probability of Selecting Wild Trout as the Most Important Fishery

Sex	Socioeconomic Status			
	Low	*Medium*	*High*	*Total*
Male	.37830609	.40288331	.44391652	.40848561
Female	.22695665	.24967567	.27527003	.25274725
Total	**.3691334**	**.39282095**	**.43108882**	**.39797212**

Table 77 presents the endorsements only for wild trout. Figure 13 presents the relation between all four options and the SES of the angler. We see that the proportion of anglers endorsing the options "Both" and "No Preference" are almost constant across the three categories of SES. Furthermore, the relative shape of endorsements for medium and high SES anglers is almost identical. Only low SES anglers endorse "Wild Trout" relatively less that "Stocked Trout." For all three SES groups, however, the "Wild Trout" option is the modal response. The patterns in Figure 13 are typical of the relations we will describe in this section. There are statistically discernible relations between angler attitudes and characteristics, but overall, they are not pronounced.

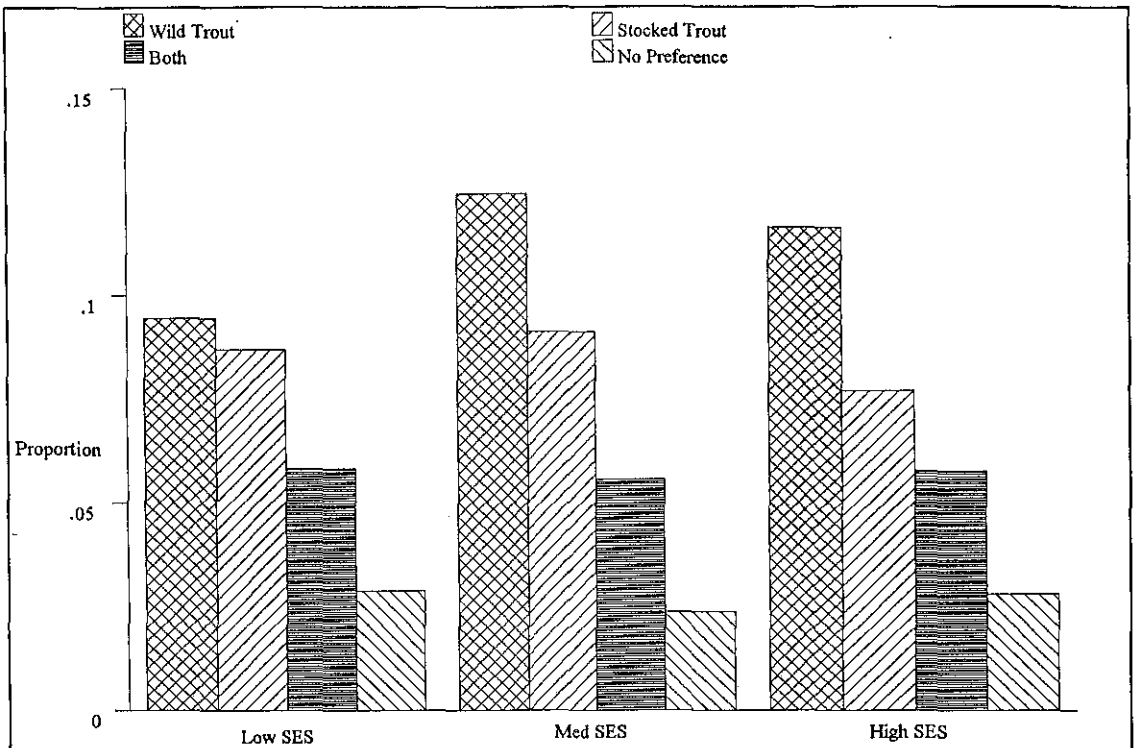


Figure 13. Comparison of Importance of Fishery by Socioeconomic Status

The next question we will consider is: Keeping a limit of Hatchery Trout is "Not Important," "Somewhat Important," "Important," or "Very Important." These responses are ordered by degree of importance, so the appropriate technique is Ordered Logistic Regression. Table 78 presents the model, and Tables 79 and 80 present predicted probabilities of selecting "Important" and "Very Important," respectively. The effects of both age and SES are statistically significant, although the confidence interval on the age parameter nearly includes 0.0, and therefore is barely significant.

Table 78. Ordered Logistic Regression of Importance of Keeping a Limit of Hatchery Trout

Ordered Logit Estimates				Number of obs.	= 1340
				$\chi^2(2)$	= 20.59
				Prob > χ^2	= 0.0000
Log Likelihood = -1780.6528				Pseudo R2	= 0.0057
	Coef.	**Std.Err.**	**t**	**P>|t|**	**[95%Conf. Interval]**
Age	-0.0081398	0.0038134	-2.135	0.033	[-.0156206, -.000659]
SES	-0.1512237	0.0383948	-3.939	0.000	[-.2265443, -.075903]
cut1	-1.0375720	0.1650169			(Ancillary parameters)
cut2	-0.3537520	0.1625298			
cut3	1.1807560	0.1674710			

Tables 79 and 80 clarify the import of this model. The mean probability of selecting "Important" decreases with both increasing age and SES. This relation also holds for the probability of selecting "Very Important." While these relations are statistically significant,

note that the difference between low and high SES is only five percent, and between young and elderly only two percent for "Important," and seven percent and three percent, respectively, for "Very Important."

Table 79. Mean Probability of Responding It Is "Important" to "Keep a Limit of Hatchery Trout"

Socioeconomic Status	Age			
	<=44	45-65	>=66	Total
Low	.34746471	.33472431	.32501628	.34171648
Medium	.33368345	.3159465	.30192093	.3282887
High	.30376213	.28399576	.271283	.29581813
Total	**.32867116**	**.3103136**	**.30930724**	**.32214421**

Table 80. Mean Probability of Responding It Is "Very Important" to "Keep a Limit of Hatchery Trout"

Socioeconomic Status	Age			
	<=44	45-65	>=66	Total
Low	.22325061	.19740175	.18160565	.21188081
Medium	.19503442	.1687379	.15230019	.18713508
High	.15575316	.13535948	.1236476	.14759415
Total	**.19154495**	**.16586305**	**.16380888**	**.18238739**

The next question concerns the degree of importance of fishing for hatchery trout in family-type areas, such as parks. Table 81 presents the model for this question as a function of socioeconomic status and stage in household life cycle. It is encouraging that the Household Life Cycle Stage variable relates to responses concerning fishing family-type areas. Specifically, all three types of families (young, middle-aged and single-parent) are most likely to endorse fishing in family-type areas, while households without children are significantly less likely to endorse this type of fishing. For most household stages, preference for family-type areas decreases with increasing socioeconomic status. However, these differences are smaller than the differences over the household stages.

Table 81. Importance of Fishing Family Type Areas for Hatchery Trout

Ordered Logit Estimates — Number of obs. = 1323; $\chi^2(8)$ = 106.14; Prob > χ^2 = 0.0000; Log Likelihood = -1696.0395; Pseudo R2 = 0.0303

	Coef.	Std.Err.	t	P>|t|	[95% Conf. Interval]	
SES	-0.1187537	.0387856	-3.062	0.002	[-0.194842,	-0.0426653]
Young Single	-1.1484120	.3373217	-3.405	0.000	[-1.810159,	-0.4866644]
Young Couple-	1.0230760	.3493045	-2.929	0.003	[-1.708331,	-0.3378214]
Young Family	-0.0406359	.3213518	-0.126	0.899	[-0.671054,	0.5897822]
Mid-Age Family	-0.5431626	.3762669	-1.444	0.149	[-1.281312,	0.1949863]
Empty Nester	-1.0161240	.3297586	-3.081	0.002	[-1.663034,	-0.3692135]
Elderly Couple	-1.3063330	.4412089	-2.961	0.003	[-2.171883,	-0.4407828]
Elderly Single	1.6827140	.6712479	-2.507	0.012	[-2.999547,	-0.3658798]
cut1	-1.5267470	.3150961			(Ancillary parameters)	
cut2	-0.8802124	.3132872				
cut3	0.8880433	.3135378				

Table 82. Mean Probability of Selecting "Important" in Fishing Family-Type Areas for Hatchery Trout

Household Life Cycle Stage	Socioeconomic Status			
	Low	Medium	High	Total
Young Singles	.33906347	.32195795	.29575287	.32339982
Young Married	.35572205	.3395658	.31004086	.3302525
Young Family	.41434993	.41517392	.409424	.41314031
Middle Age Family	.40452714	.39170487	.36628578	.38273482
Empty Nester	.3582682	.33927533	.3092354	.3356764
Elderly Couples	.32295309	.29811264	.26976624	.30629006
Elderly Single	.26662755	.24618575	.21140407	.25333382
Single Parent Family	.41278349	.41517339	.41131206	.4132095
Total	**.3724427**	**.37448013**	**.35062534**	**.36612822**

Table 83. Mean Probability of Selecting "Very Important" in Fishing Family-Type Areas for Hatchery Trout

Household Life Cycle Stage	Socioeconomic Status			
	Low	Medium	High	Total
Young Singles	.13206329	.11843317	.10111569	.12044685
Young Married	.14741662	.1323649	.11037899	.12593619
Young Family	.31313085	.2886156	.24570921	.28183965
Middle Age Family	.22624089	.19522814	.16006197	.18595049
Empty Nester	.15026284	.13210661	.10995833	.13092463
Elderly Couples	.11944451	.10236625	.0863016	.10869901
Elderly Single	.08466442	.07456633	.0599723	.07865196
Single Parent Family	.32754787	.29807664	.25613403	.30194024
Total	**.20586045**	**.20704015**	**.16606535**	**.19344927**

Table 84 presents the model on agreement with the policy of expanding the "No-Kill" regulations on wild trout waters. The response pattern for this question was recoded so that "Agree" and "Strongly Agree" were coded '1,' and other responses were coded '0.' This binary form calls for binary logistic regression. Again, we see the pattern that higher socioeconomic status increases support for a wild trout policy, and that men value these policies more than women do. Note also, that a majority of all but one group, low SES women, support the expansion of "No-Kill" regulations on wild trout waters.

Table 84. Model of Agreement with Expansion of "No-kill" Regulations on Wild Trout Waters.

Logit Estimates				Number of obs.	= 1343
				$\chi^2(2)$	= 15.66
				Prob > χ^2	= 0.0004
Log Likelihood = -872.2769				Pseudo R2	= 0.0089
	Coef.	**Std. Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**
SES	0.1399135	.0439442	3.184	0.001	[.0537066, 0.2261205]
Sex	-0.5056143	.2200233	-2.298	0.022	[-.9372419, -0.0739867]
Constant	1.1034640	.2428012	4.545	0.000	[.6271524, 1.5797760]

Table 85. Proportion Agreeing with Expansion of "No-Kill" Regulations on Wild Trout Waters

Socioeconomic Status	Sex		
	Male	Female	Total
Low	.60106404	.47144498	.59206609
Medium	.63803781	.51740633	.62793255
High	.69455081	.5663162	.68366297
Total	**.64406026**	**.52125536**	**.63430193**

The questionnaire contained several questions concerning the publication of information on trout stocking times, places, and dates. These items were scaled into a single measure where higher (positive) values mean agreement that the Commission should NOT publish stocking information, and lower values (negative) mean support for publishing such information. This "NotPublish" scale can be used as a dependent variable in a regression model. Table 86 reports the relation between support for not publishing stocking information and the sex and socioeconomic status variables for trout anglers. Table 87 displays how these independent variables effect support for not publishing stocking information. Women exhibit less support for this policy, as do trout anglers in the lower socioeconomic groups. However, the adjusted R^2 for the model accounts for only one percent of the variance to be explained. As with all of these models, the relations are weak.

Table 86. Regression of NotPublish on Sex, SES

Source	SS	df	MS	Number of obs. = 1343
Model	41.1705284	2	20.5852642	F(2, 1340) = 9.11
Residual	3027.4388	1340	2.25928268	Prob > F = 0.0001
Total	3068.60932	1342	2.28659413	R-square = 0.0134
				Adj R-square = 0.0119
				Root MSE = 1.5031

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
Sex	-.4507485	.1631987	-2.762	0.006	[-.7709013,	-.1305957]
SES	.0996427	.0308415	3.231	0.001	[.0391398,	.1601456]
Constant	.5584809	.1790257	3.120	0.002	[.2072797,	.9096821]

Table 87. Predicted Mean Values of NotPublish Scale

Socioeconomic Status	Sex		
	Male	Female	Total
Low	-.02577665	-.49024818	-.05801951
Medium	.08587148	-.35907578	.04859841
High	.26915316	-.21797602	.22779314
Total	**.10812523**	**-.34756724**	**.07191495**

We noted in Table 70 that only 22 percent of trout anglers report knowing about the Delayed Harvest Program. We wondered whether knowledge of this program is predicted by any of the standard angler characteristics. We see in Table 88 that sex and socioeconomic status statistically relate to knowledge of the Delayed Harvest Program. Table 89 presents the estimated probability of knowing about the program from the model. Women are 17 percent

less likely than men to know about the Delayed Harvest Program, and high socioeconomic anglers are about 11 percent more likely to know than low socioeconomic anglers. These are some of the largest differences revealed by any of these multivariate models.

Table 88. Model of Knowledge of Delayed Harvest Projects

Logit Estimates — Number of obs. = 1347; $\chi^2(2)$ = 37.01; Prob > χ^2 = 0.0000; Log Likelihood = -709.33705; Pseudo R2 = 0.0254

	Coef.	Std.Err.	t	P>|t|	[95% Conf. Interval]	
Sex	-1.3465300	.4002029	-3.365	0.000	[-2.1316210,	-.5614400]
SES	0.2188802	.0478325	4.576	0.000	[0.1250457,	.3127148]
Constant	0.1781906	.4164485	0.428	0.669	[- 0.6387693,	.9951504]

Table 89. Mean Probability of Knowing About Delayed Harvest Program

Socioeconomic Status	Sex		
	Male	Female	Total
Low	.18881283	.05555375	.17956220
Medium	.22882789	.07254603	.21573621
High	.30852861	.09736010	.29059921
Total	**.24131619**	**.07629925**	**.2282036**

We examined several other attitudes and preferences to see if they could be predicted by any of the angler characteristics. We estimated a variety of models using age, sex, socioeconomic status as predictor variables. In most cases, these variables were statistically unrelated to the following list of attitudes, preferences, and opinions: 1) the importance of catching and releasing wild trout;[8] 2) the importance of fishing walk-in areas for wild trout; 3) attitudes towards releasing wild brook trout, wild brown trout, and hatchery trout;[9] 4) the overall level of satisfaction with wild trout fishing in Pennsylvania; and 5) the overall level of satisfaction with stocked trout fishing in Pennsylvania.

In summary, an analysis of trout angler attitudes, preferences, and opinions by angler characteristics does not modify the overall conclusions derived from the simple tabulations reported above. There are a few statistically significant relations between these attitude variables and angler characteristics. Specifically the angler's sex and the socioeconomic status are most commonly correlated with his or her attitudes. Importantly, these relations do not modify the conclusions we draw regarding angler views; they only shade the emphasis of meaning. For example, females are less supportive than males of policies protecting or promoting the wild trout fishery. However, in most cases, the majority of female anglers support such programs. Similarly, anglers with lower socioeconomic status are more oriented than higher SES anglers to harvesting stocked trout. Yet the differences are not great, and a somewhat different pattern holds for females.

[8] Men are slightly more likely than women to view this preference positively.

[9] There is a very weak relation between SES and releasing trout.

Figure 14 presents a bar graph of the complete response pattern for male and female anglers in low, medium, and high socioeconomic groups. Among males, the proportion claiming that keeping a limit of hatchery trout is "Not Important" increases with SES. Notice that among the low SES group of males, there are still nearly 30 percent who say keeping a limit is "Not Important." At the other extreme, nearly 20 percent of high SES men report keeping a limit is "Very Important," while only a slightly higher proportion in the low SES group make the same claim. Among female anglers the pattern is even more complex with the modal group being high SES claiming that keeping a limit of hatchery trout is "Important."

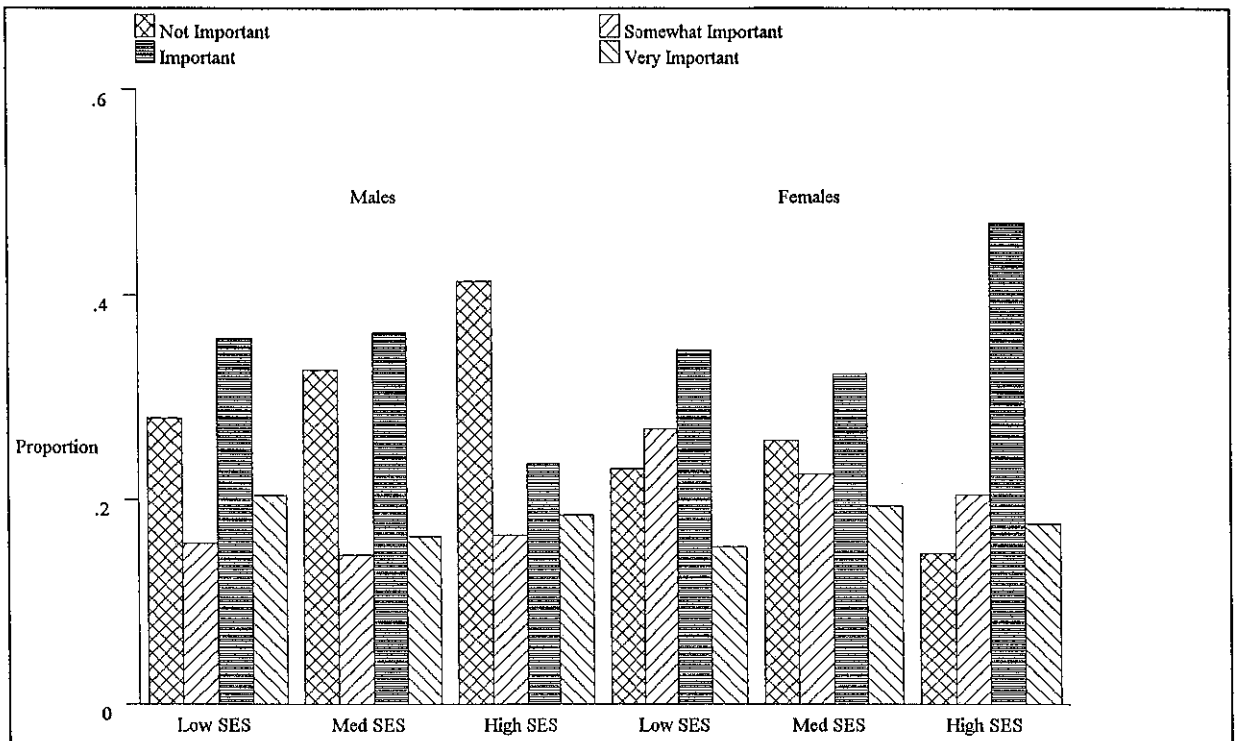


Figure 14. Importance of Keeping a Limit of Hatchery Trout by Socioeconomic Status and Sex of Angler

4. Analysis of Fishing Trips

One section of the questionnaire asked trout anglers whether they had gone fishing for trout during a particular period during the 1991 angling season. If the anglers said they had gone fishing during the designated time period, we asked a series of more detailed questions about their fishing trips. About half of our respondents had gone fishing during the these target periods, and they provide detailed data on 2,069 trips. This section reports on the specifics of fishing trips.

Many of the results on fishing trips will be reported in two ways: weighted and unweighted. Anglers were asked to report on where they fished, and also how many days they fished at that location. Thus, the unweighted statistics are based on fishing-site responses, and the weighted results take into account how many times the angler visited a particular site.

The target time periods used to frame these fishing-trip questions were: April, from opening day to the end of the month; the month of May; the summer season of June, July, and August; and the fall season of September through December.

4.1. Trip Time, and Duration Distributions

We asked how long it took trout anglers to reach their fishing sites. Tables 90 and 91 report the travel time distribution for Pennsylvania trout anglers, unweighted and weighted by number of days fished at site, respectively. Figure 15 presents the same data in graphic form.

These results show that between 63 and 70 percent of all trout fishing trips take place within an hour of the angler's home. The average travel time is 1.17 hours (unweighted) and 1.04 hours (weighted). Figure 15 indicates that the travel time distribution is quite skewed, with a small percentage of anglers willing to travel considerable distances to fish for trout. Nearly seven percent of anglers are willing to travel four or more hours to fish.

Table 90. Travel Time Distribution (Unweighted)

Hours from Home	Frequency	Percent	Cum. Pct.
Less than 1	1307	63.17	63.17
1	245	11.84	75.01
2	241	11.65	86.66
3	132	6.38	93.04
4	95	4.59	97.63
5	35	1.69	99.32
6	10	0.48	99.81
7 or more	4	0.19	100.00
Total	**2069**	**100.00**	

Table 91. Travel Time Distribution (Weighted by Number of Days Fished at Site)

Hours from Home	Frequency	Percent	Cum. Pct.
Less than 1	4263	70.15	70.15
1	569	9.36	79.51
2	606	9.97	89.48
3	323	5.32	94.80
4	219	3.60	98.40
5	69	1.14	99.54
6	19	0.31	99.85
7 or more	9	0.15	100.00
Total	**6077**	**100.00**	

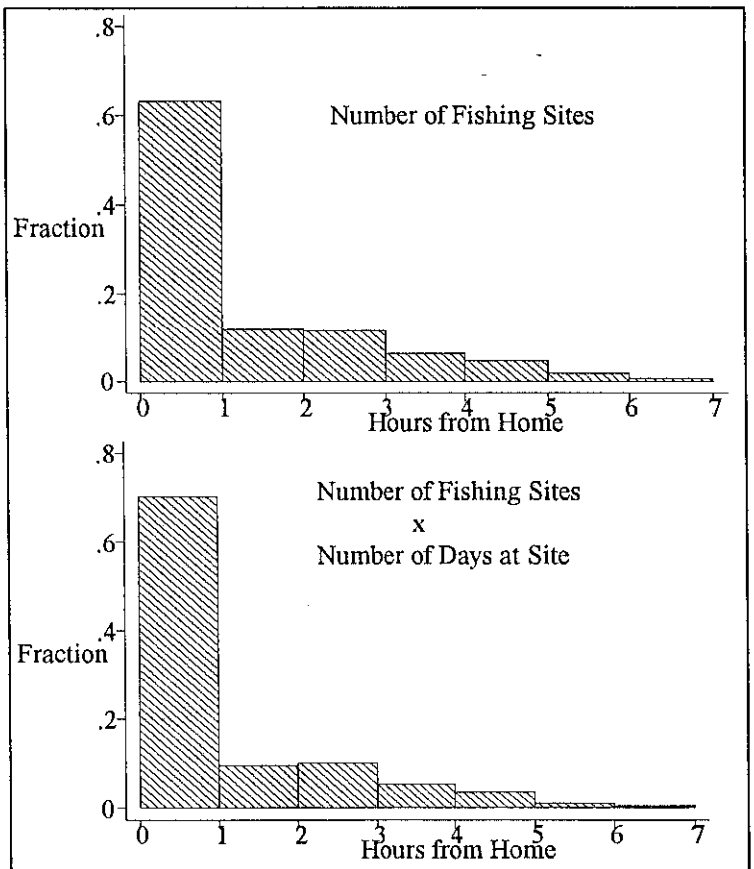


Figure 15. Distributions of Travel Time From Home for Pennsylvania Trout Anglers

4.1.1. Travel Times and Demographic Characteristics of the Angler

We checked whether angler characteristics correlated with the travel time variable. Only one, the angler's socioeconomic status (SES), correlated with travel time. Figure 16 presents the travel time distributions for three socioeconomic groups. Anglers in the low SES group

drive 0.53 hours less, and anglers in the middle SES group 0.28 hours less, on average, than anglers in the high SES group. Thus, higher SES anglers are willing to travel about one half-hour farther than lower SES anglers, and about 15 minutes farther than those in the middle group.

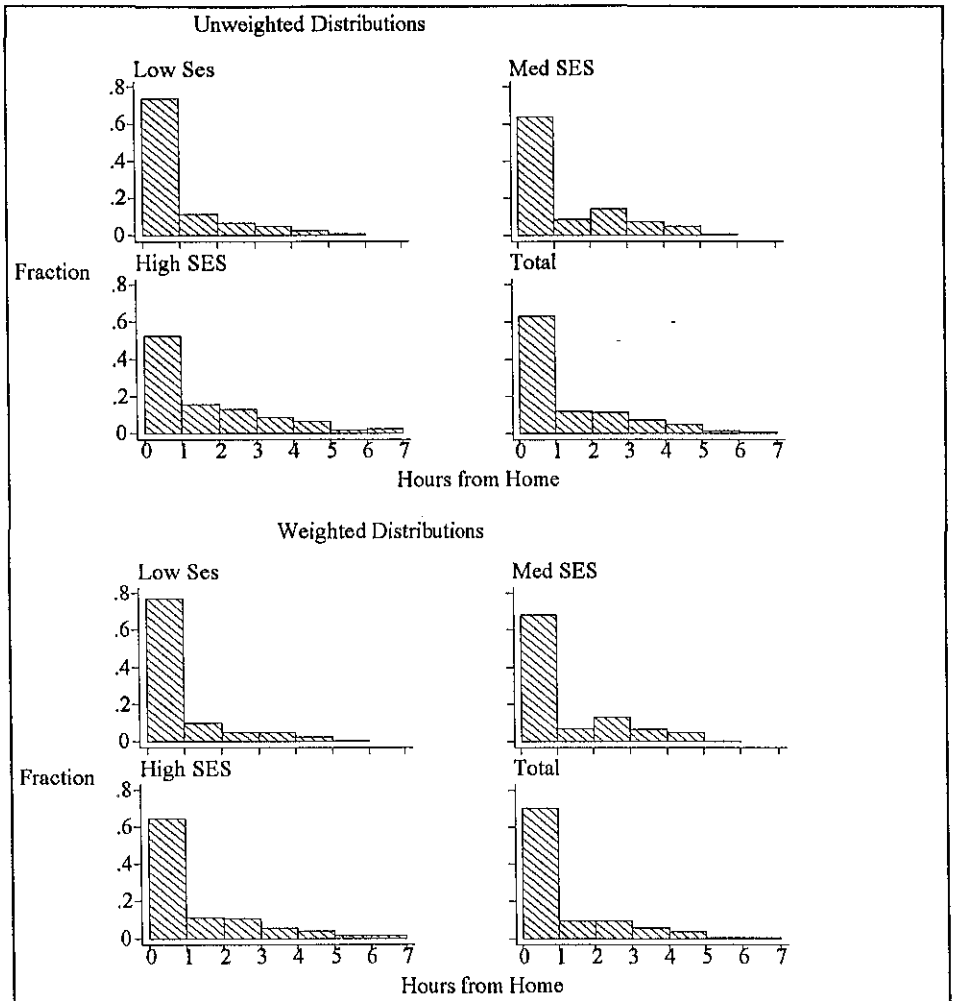


Figure 16. Travel Time Distributions by Socioeconomic Status of Trout Anglers

4.1.2. Travel Times and Type of Fishery: Hatchery, Wild, Special Regulation

We would expect the travel time distributions to vary by the type of fishery: stocked trout, special regulations, wild trout, and lake. Table 92 and Figure 17 present these results. Between 65 and 75 percent of trout fishing for stocked trout occurs within one hour of home. An even higher proportion of lake fishing takes place within one hour. Not surprisingly, trout anglers travel longer times (and distances) to fish in wild trout waters and waters with special

regulations. However, a majority of fishing trips in these waters still are within one hour of home.

Table 92. Travel Time Distributions by Type of Fishing Location

a. Unweighted Frequencies

Hours from Home	Type of Fishing Location				
	Stocked (% col.)	Spec. Regs. (% col.)	Wild (% col.)	Lake (% col.)	Total (% col.)
Less than 1	823 (64.25)	71 (52.99)	182 (52.91)	231 (74.52)	1307 (63.17)
1	147 (11.48)	23 (17.16)	50 (14.53)	25 (8.06)	245 (11.84)
2	153 (11.94)	18 (13.43)	47 (13.66)	23 (7.42)	241 (11.65)
3	78 (6.09)	7 (5.202	32 (9.30)	15 (4.84)	132 (6.38)
4	54 (4.22)	9 (6.72)	22 (6.40)	10 (3.23)	95 (4.59)
5	21 (1.64)	2 (1.49)	7 (2.03)	5 (1.61)	35 (1.69)
6	3 (0.23)	3 (2.24)	3 (0.87)	1 (0.32)	10 (0.48)
7 or more	2 (0.16)	1 (0.75)	1 (0.29)	0 (0.00)	4 (0.19)
Total	**1281** (100.00)	**134** (100.00)	**344** (100.00)	**310** (100.00)	**2069** (100.00)

Pearson $\chi^2(21) = 56.4335$ Pr = 0.000

b. Frequencies Weighted by Number of Days Fished

Hours from Home	Type of Fishing Location				
	Stocked (% col.)	Spec. Regs. (% col.)	Wild (% col.)	Lake (% col.)	Total (% col.)
0	2622 (70.20)	275 (63.07)	521 (60.65)	845 (80.71)	4263 (70.15)
1	340 (9.10)	52 (11.93)	107 (12.46)	70 (6.69)	569 (9.36)
2	398 (10.66)	49 (11.24)	98 (11.41)	61 (5.83)	606 (9.97)
3	192 (5.14)	36 (8.26)	60 (6.98)	35 (3.34)	323 (5.32)
4	127 (3.40)	15 (3.44)	52 (6.05)	25 (2.39)	219 (3.60)
5	44 (1.18)	3 (0.69)	14 (1.63)	8 (0.76)	69 (1.14)
6	5 (0.13)	5 (1.15)	6 (0.70)	3 (0.29)	19 (0.31)
7 or more	7 (0.19)	1 (0.23)	1 (0.12)	0 (0.00)	9 (0.15)
Total	**3735** (100.00)	**436** (100.00)	**859** (100.00)	**1047** (100.00)	**6077** (100.00)

Pearson $\chi^2(21) = 135.5146$ Pr = 0.000

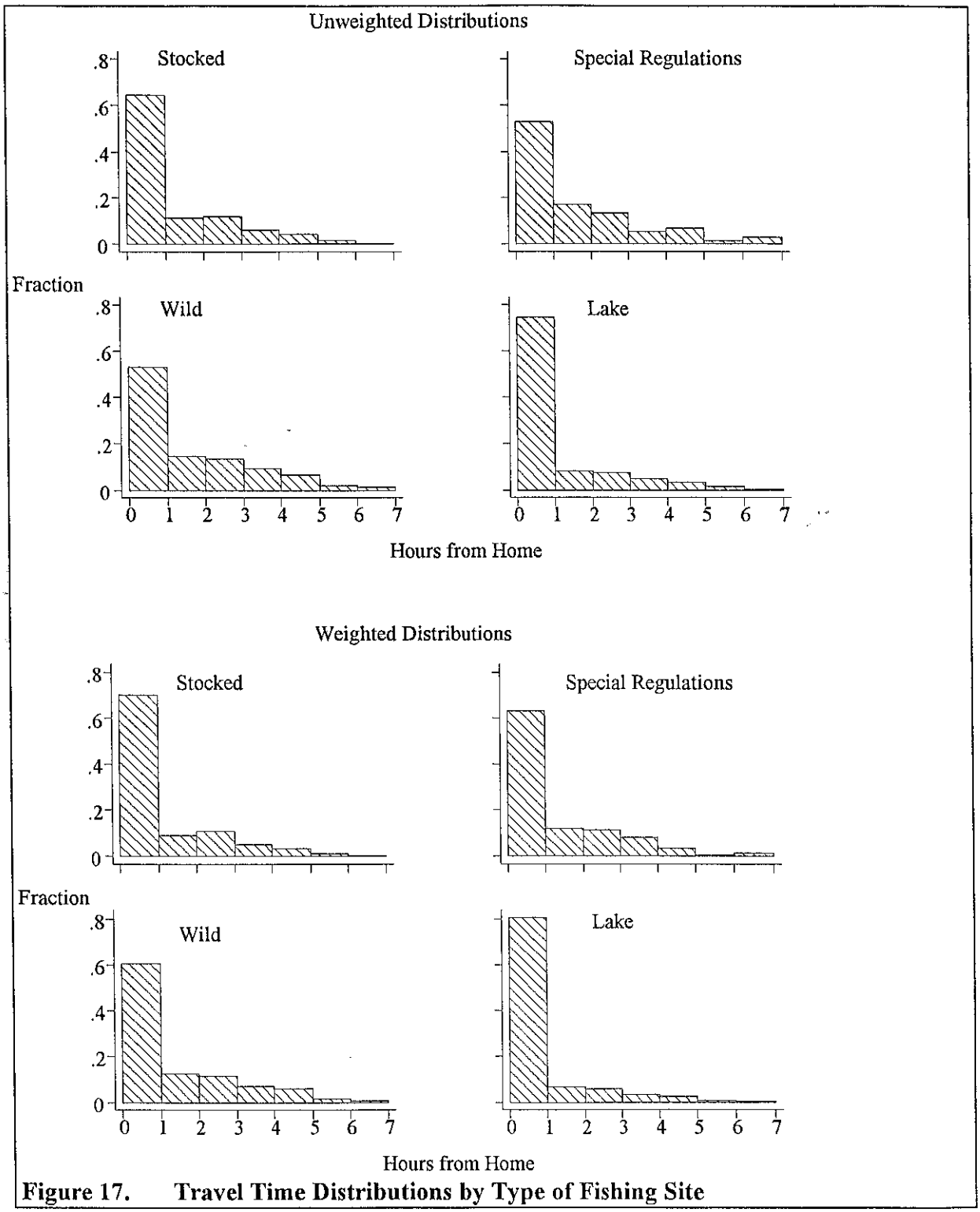


Figure 17. Travel Time Distributions by Type of Fishing Site

4.1.3. Travel Times and Angling Season

Finally, we examine travel time distributions as a function of the angling season. The month of May appears to be the season when trout fishers are most willing to travel for their

trout. When we examine the unweighted distributions, May and the fall season are the most important periods for more distant fishing trips. However, when we examine the distributions weighted by the number of days spent fishing a location, April replaces fall as the second most important period. Thus, frequency of visits to a location change these results. Table 93 and Figure 18 present these results.

Table 93. Travel Time Distributions by Angling Season

a. Unweighted Frequencies

Hours from Home	Survey Period				
	1 (% col.)	2 (% col.)	3 (% col.)	4 (% col.)	Total (% col.)
0	590 (67.20)	528 (59.80)	130 (62.20)	59 (59.60)	1307 (63.17)
1	93 (10.59)	120 (13.59)	20 (9.57)	12 (12.12)	245 (11.84)
2	91 (10.36)	115 (13.02)	26 (12.44)	9 (9.09)	241 (11.65)
3	50 (5.69)	58 (6.57)	12 (5.74)	12 (12.12)	132 (6.38)
4	39 (4.44)	40 (4.53)	11 (5.26)	5 (5.05)	95 (4.59)
5	10 (1.14)	17 (1.93)	7 (3.35)	1 (1.01)	35 (1.69)
6	5 (0.57)	4 (0.45)	0 (0.00)	1 (1.01)	10 (0.48)
7 or more	0 (0.00)	1 (0.11)	3 (1.44)	0 (0.00)	4 (0.19)
Total	**878** (100.00)	**883** (100.00)	**209** (100.00)	**99** (100.00)	**2069** (100.00)

Pearson $\chi^2(21) = 44.1487$ Pr = 0.002

b. Frequencies Weighted by Number of Days Fished

Hours from Home	Survey Period				
	1 (% col.)	2 (% col.)	3 (% col.)	4 (% col.)	Total (% col.)
0	1377 (72.06)	1700 (64.01)	706 (76.99)	480 (80.94)	4263 (70.15)
1	158 (8.27)	313 (11.78)	74 (8.07)	24 (4.05)	569 (9.36)
2	170 (8.90)	317 (11.94)	83 (9.05)	36 (6.07)	606 (9.97)
3	103 (5.39)	175 (6.59)	19 (2.07)	26 (4.38)	323 (5.32)
4	77 (4.03)	107 (4.03)	16 (1.74)	19 (3.20)	219 (3.60)
5	18 (0.94)	34 (1.28)	12 (1.31)	5 (0.84)	69 (1.14)
6	8 (0.42)	8 (0.30)	0 (0.00)	3 (0.51)	19 (0.31)
7 or more	0 (0.00)	2 (0.08)	7 (0.76)	0 (0.00)	9 (0.15)
Total	**1911** (100.00)	**2656** (100.00)	**917** (100.00)	**593** (100.00)	**6077** (100.00)

Pearson $\chi^2(21) = 164.9454$ Pr = 0.000

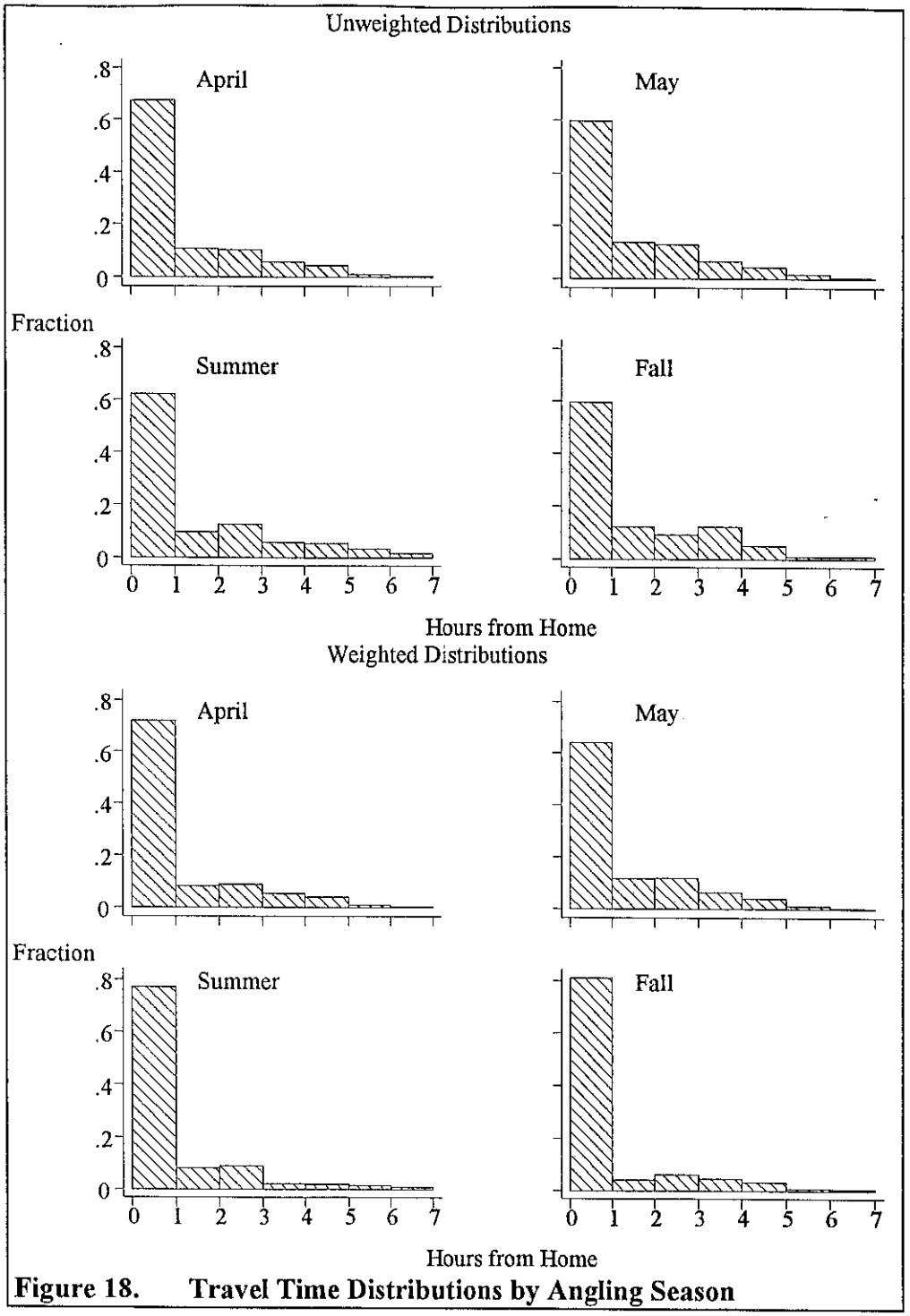


Figure 18. Travel Time Distributions by Angling Season

4.2. Staying Overnight

We asked anglers whether they stayed overnight on each specific fishing trip. Table 94 presents the response to this question. Overall, 23 percent of fishing trips result in overnight stays, but this varies by the type of fishing site. Anglers who seek special regulations and wild

trout fishing stay overnight about 28 and 31 percent, respectively, while those who fish stocked streams and lakes stay overnight 22 and 17 percent of the time, respectively. As indicated in the table, these are statistically significant differences.

Table 94. Anglers Staying Overnight by Type of Fishing Site

Response	Stocked (% col.)	Spec. Regs. (% col.)	Wild (% col.)	Lake (% col.)	Total (% col.)
Yes	280 (21.86)	37 (27.82)	106 (30.81)	54 (17.42)	477 23.07
No	1001 (78.14)	96 (72.18)	238 (69.19)	256 (82.58)	1591 76.93
Total	**1281** (100.00)	**133** (100.00)	**344** (100.00)	**310** (100.00)	**2068** 100.00
Pearson $\chi^2(3) = 19.9542$ Pr = 0.000					

4.3. Travel Mode

We asked anglers how they usually get to a fishing site. Not surprisingly, the overwhelming response, 95 percent, is by personal car or truck. These results are presented in Table 95.

Table 95. Distribution of Travel Modes to Fishing Sites

Transportation	Frequency	Percent
Car/Truck	1966	94.75
Ride with Someone	49	2.36
Walk	47	2.27
Bus	1	0.05
Other	7	0.34
DK/DR	1	0.05
NA/Refused	4	0.19
Total	**2075**	**100.00**

4.4. Fishing Partners

Fishing can be either a social or individual pursuit. We asked trout anglers whether they made specific trips with someone else. If the response was affirmative, we asked with whom they fished. About 72 percent of all angler trips were made with someone else. Table 96 reports percent of social trips made with types of angling partners. A majority of social fishing trips are made with friends, and most of the remaining are made with relatives. Children are present on about one-fifth of these social trips.

Table 96. Percent of Trips Made with Fishing Partners[10]		
Fishing Partner	**Frequency**	**Percent**
Friend	799	53.20
Child	288	19.17
Immed. Family Member	488	32.49
Relative	196	13.05
Other	11	0.73
Total	**1502**	

4.5. Fishing Tournaments

About 15 percent of these active trout anglers who described their detailed fishing trips also say they have participated in fishing tournaments. This is reported in Table 97.

Table 97. Percent of Active Trout Anglers Who Say They Fish in Tournaments		
Response	**Frequency**	**Percent**
Yes	104	15.32
No	575	84.68
Total	**679**	**100.00**

4.6. Level of Stocking of Hatchery Trout

It is commonly believed that the level of stocking in a stream has a direct impact on the fishing pressure on that water. By combining data on stocking levels with the detailed fishing behavior data, we can examine this question. We will analyze the data at two levels of aggregation: 1) the stream section or lake, and 2) the watershed. The state agencies concerned with natural resources use a watershed geography consisting of 104 regions. Typically, a watershed includes a major stream or small river, and all its tributaries. The major rivers are broken into several watersheds.

First, we examined the relation at the more detailed level, a stream section or lake. For each stream section or lake, we aggregated the total number of anglers visiting a stream section or lake, the total angler-days on that water, and total anglers-hours on the water. Seven hundred and seventy-nine (779) of the 1,600 trout anglers in the survey reported fishing for trout during the four target periods. These 779 anglers reported 2,075 trips to streams and lakes, and these trips included 698 bodies of water. Thus, this analysis is based on aggregating the data from these 2,075 trips over the 698 bodies of water.

Figure 19 presents the relations between the fishing pressure variables and the number of stocked trout in a stream section or lake. First, the three measures of fishing pressure correlate in the following pattern: 1) number of anglers correlates .629 with fishing days and .718 with

[10] The percents add to more than 100% because anglers may have identified more than one type of partner.

fishing hours; 2) the number of fishing days correlates .866 with fishing hours. The lower correlations involving number of anglers result from the variability in fishing frequency among anglers; most anglers fish only once or a few times, while a small group goes fishing frequently. More interestingly, the correlations between fishing pressure and the number of stocked trout in a stream section or lake are modest: number of stocked trout correlates .383 with number of anglers, .252 with angler days, and .293 with angler hours. An examination of the vertical axis of these plots shows that a fair proportion of anglers fish water with no stocking; about 29 percent of the fishing locations are unstocked, and 23 percent of the angling pressure is at unstocked sites.

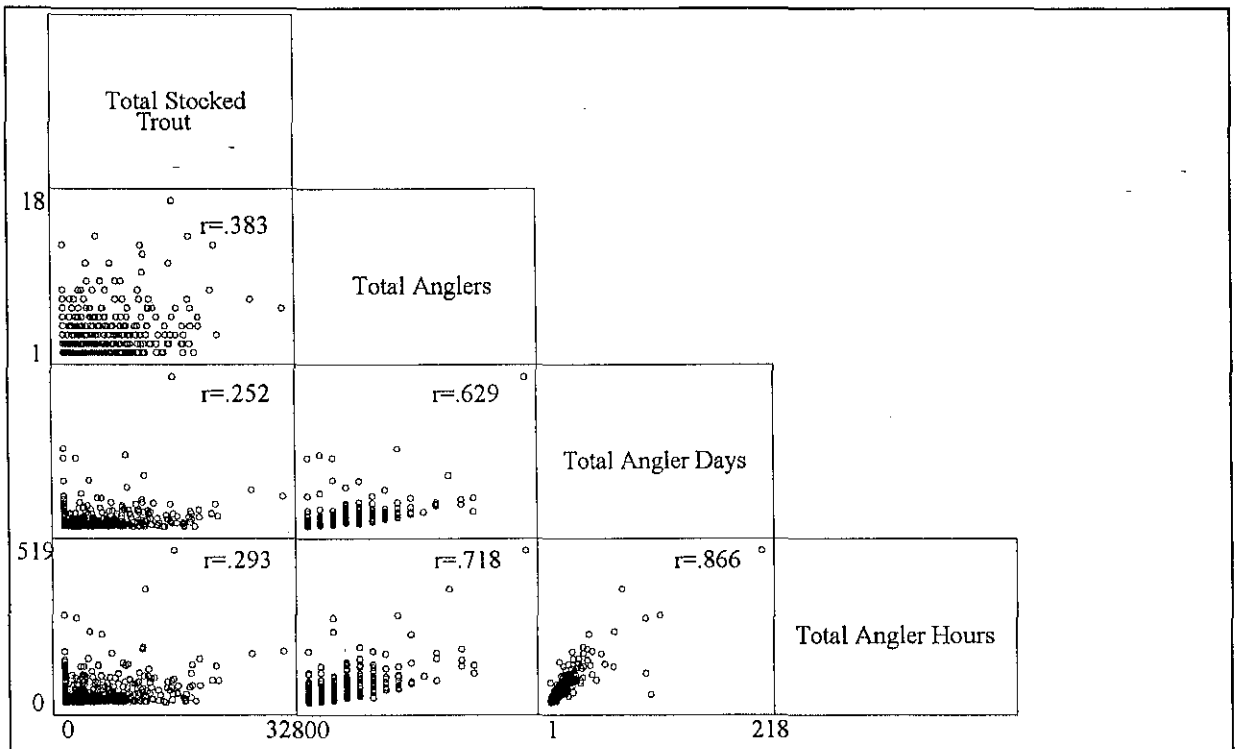


Figure 19. Scatter Matrix of Number of Stocked Trout by Fishing Pressure at Level of Stream Section or Lake

At a higher level of aggregation, these hypothesized relations become more visible. Figure 20 presents the scatter matrix between number of stocked trout and fishing pressure variables at a more aggregated level of the watershed. The three measures of fishing pressure are highly correlated at the watershed level: 1) number of anglers correlates .841 with angler days, and .892 with angler hours; and 2) angler days correlates .933 with angler hours.

For this analysis, we have introduced a new variable--miles of stocked water in the watershed--to compare the importance of the size of the stocked fishery with the numbers of stocked trout. Although size of the stocked fishery correlates .830 with the number of stocked trout, it is clear that the number of stocked trout is systematically more highly correlated with fishing pressure than the size of the fishery: stocked trout correlate .787 with number of anglers, .588 with angler-days, and .660 with angler-hours. All 101 watersheds in this analysis had some stocking, so we cannot assess the relation of unstocked waters with pressure.

The result that stocking levels are more highly correlated with fishing pressure at the watershed level than at the stream section level suggests that general knowledge about stocking in an area is more relevant than specific knowledge about stocking in a section. Perhaps anglers accurately know that Pine Creek receives thousands of stocked trout, but have less accurate information about where those trout are stocked. What may attract anglers is the general reputation of the watershed, not specific knowledge about stocking schedules and locations.

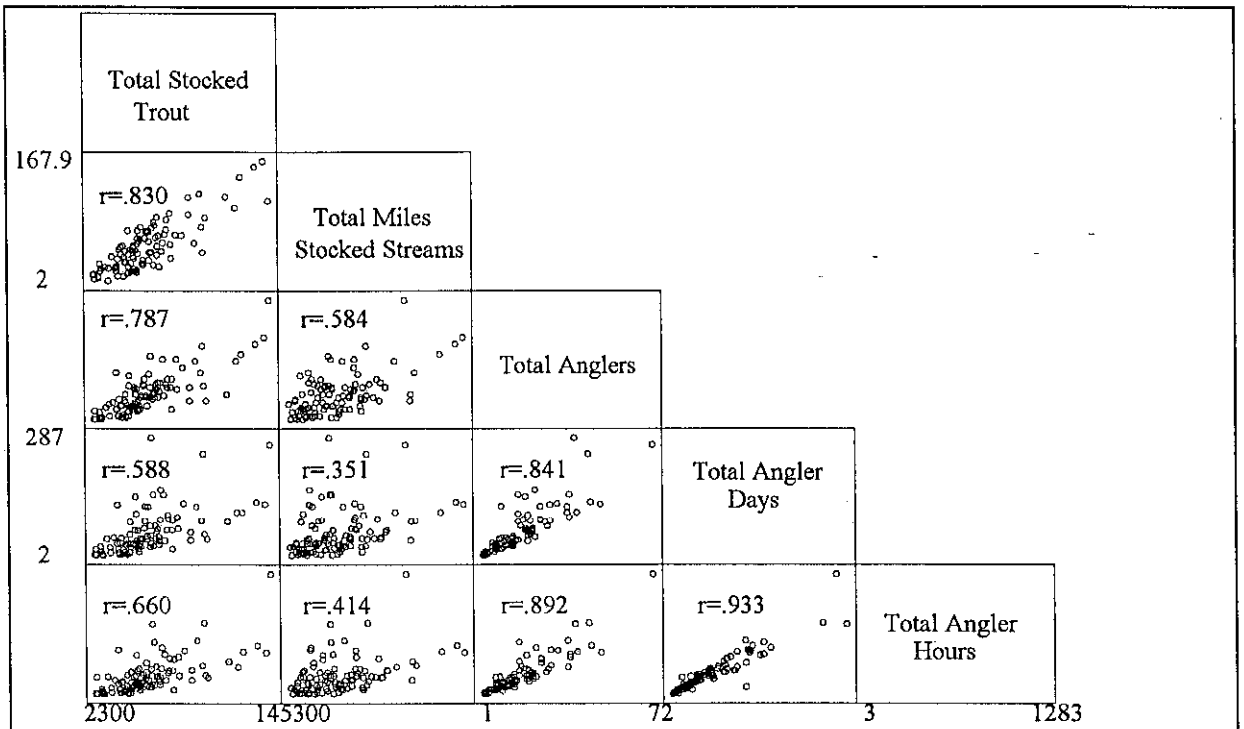


Figure 20. Scatter Matrix of Total Stocked Trout by Fishing Pressure Variables at the Watershed Level of Aggregation

4.7. Trip Destinations

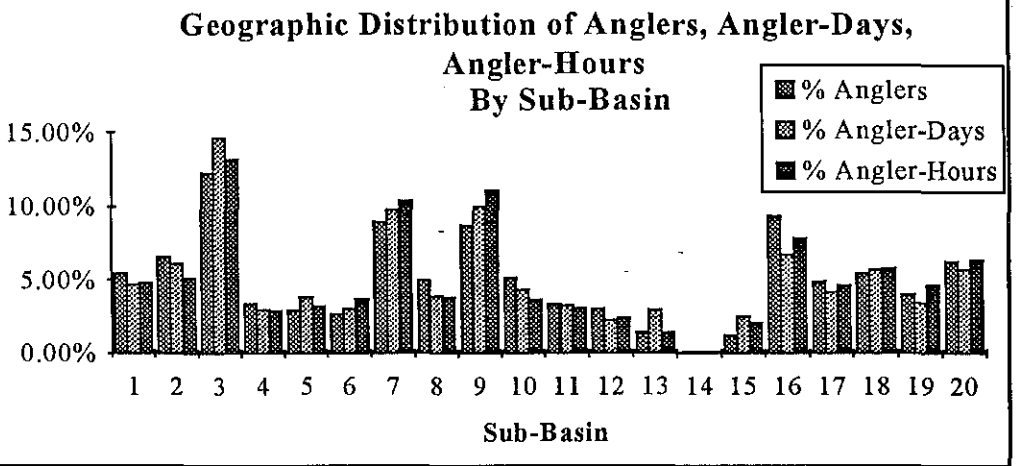
Up to this point, our analysis has focused on trip durations, and numbers. We now turn to trip destinations.

4.7.1. Trip Destinations and Region of the State

For this analysis, we define region as a major watershed sub-basin of the state's riverine system. There are twenty such sub-basins, each comprising three to five major creeks or rivers. These sub-basins are listed below as part of Figure 21.

Four regions receive the highest fishing pressure: (3) the rivers and creeks in the southeastern part of the state surrounding Philadelphia; (7) the rivers and creeks in the Harrisburg area; (9) the watersheds in the North central region of Pine Creek, Kettle Creek, and Bald Eagle Creek; and (16) the creeks and rivers in the Allegheny National Forest region.

It is worth noting that two of these regions are near major population centers of the state. However, the other two are in the least populated and most remote regions of the state. The last three regions in Figure 21 surround Pittsburgh. Despite having the second largest population concentration in the state, these sub-basins receive average to slightly above average fishing pressure. Because of its industrial heritage, the southwestern region of the state has some of the worst trout habitat in the state.



Code	Sub-Basin Name
1	Upper-Middle Delaware R, Lackawaxen R, Wallenpaupack, Bushkill R, Broadhead R
2	Lehigh R, Nockamixon Ck, Lower Delaware, Neshaminy Ck
3	Schuylkill R, Perkiomen Ck, Chester Ck, Brandywine Ck, White Clay Ck, Pennypack Ck
4	Tioga R, Up E.Br. Susqeuhanna R, Towanda Ck, Wyalusing Ck, Starrucca Ck, Tunkhannock Ck, Bowman/Mehoopany Ck
5	Lackawanna R, Fishing Ck, Nescopeck Ck, Catawissa Ck
6	Penns Ck, Shamokin Ck, Mahantango/Wisconisc.Ck
7	Sherman Ck, Condoguinet Ck, Clark/Stony Ck, Swatara Ck, Yellow Breeches, Conewago Ck, Codorus Ck, Muddy Ck, Conestoga Ck, Octorara Ck
8	Sinnemahoning Ck, S Br Susquehanna R, Clearfield Ck, Moshannon Ck
9	Pine Ck, Kettle Ck, Bald Eagle Ck
10	Lycoming Ck, Loyalsock Ck, White Deerhole Ck, Muncy Ck
11	FrankstownBr/Juniata R, Ltl Juniata R, Standing Stone Ck, Dunning Ck, Raystown Br/Juniata R
12	Juniata R, Augwick Ck
13	Wills Ck, Licking Ck, Conocochaegue Ck, Marsh Ck
14	Genesee R
15	Erie
16	French Ck, Brokenstraw/Kinzua Ck, Upper Allegheny, Oil Ck, Tionsta Ck, Sandy Ck
17	Clarion R, Red Bank Ck, Mahoning Ck, Cowanshannock Ck
18	Pittsburgh-Allegheny, Kiskiminetas R, Loyalhanna Ck, Conemaugh Ck, Buffalo Ck
19	Pittsburgh-South, Tenmile Ck, Mid-Upper Monongahela R, Youghiogheny R, Casselman
20	Shanango R, Beaver R, Slippery Rock Ck, Raccoon Ck, Wheeling Ck, Chartiers Ck, Ohio

Figure 21. Distribution of Angling Pressure by 20 Sub-Basins

4.7.2. Trips to Specific Bodies of Water

We can also examine the fishing pressure on specific bodies of water. Table 98 presents the list of the twenty-five most heavily fished trout waters in the state. Pine Creek is the most heavily fished trout water in Pennsylvania, accounting for 2.3 percent of anglers, 3.2 percent of angler-days, and 4.4 percent of all angler hours. Although Pine Creek is a sizable fishery, it is remote from the population centers of the state. Similarly, Kettle Creek the First Fork of the Sinnamahoning and the Loyalsock also rank in the top ten, and are in the same remote North central region. These four streams account for 5.6 percent of all angling pressure.

Many of the remaining bodies of water in Table 98 are located relatively near population centers. These include the Yellow Breeches Creek, Tulpehocken Creek, Lehigh River, Buffalo Creek, Youghiogheny River, and Hereford Manor Lake.

Table 98. Twenty-Five Most Heavily-Fished Trout Waters: Percent of Anglers, Angler-Days, and Angler Hours

Rank	Body of Water	Percent Anglers	Percent Days	Percent Hours
1	Pine Ck	2.32	3.17	4.44
2	Yellow Breeches Ck	1.75	2.11	2.18
3	Tulpehocken Ck	1.44	4.29	3.2
4	Lehigh R	1.44	1.44	1.39
5	Kettle Ck	1.38	1.26	1.74
6	Buffalo Ck	1.25	1.02	1.2
7	Youghiogheny R	1.19	.59	.78
8	French Ck	1.00	1.04	1.41
9	Sinnemah Ck Fst Fk	.94	.8	.9
10	Loyalsock Ck	.94	.57	.72
11	Allegheny River	.94	.55	.77
12	Tionesta Ck	.88	.85	1.12
13	Wissahickon Ck	.88	.74	.62
14	Hereford Manor Lk Lw	.88	.4	.49
15	Penns Ck	.81	.99	1.49
16	Fishing Ck	.81	.8	.89
17	Oil Ck	.81	.74	.95
18	Brodhead Ck	.81	.74	.45
19	Pennypack Ck	.81	.57	.61
20	Bald Eagle Ck	.81	.55	.58
21	Slippery Rock Ck	.75	.85	1.24
22	Jordan Ck	.75	.64	.55
23	Chartiers Ck Ltl	.75	.5	.43
24	Bushkill Creek	.69	.88	.63
25	Mill Ck	.69	.83	.99

4.7.3. Trip Destinations and Type of Fishery

The Pennsylvania Fish Commission manages the trout program with five types of waters: Stocked Streams; Special Regulations Areas; Wild Trout Streams; Unspecified Streams; and Lakes. In the Trout Angler Telephone Survey, we combined the last two groups into a single

category because we believed respondents were not likely to know whether the body of water was an "Unspecified Stream." During the course of the survey, virtually all respondents used this category for reporting fishing in lakes.[11] Thus, when we report results by type of water using angler report, the "Unspecified Streams and Lakes" category will be labeled "Lakes."

Because we asked anglers to identify the specific bodies of water they fished, we attempted to link fishing trips to the Pennsylvania Fish Commission's database on the biological and management characteristics of a body of water. However, this process is not error-free. The survey was conducted by telephone, and it is difficult to collect accurate and proper names, particularly when the telephone interviewer may not know the names of Pennsylvania streams and lakes. Often, the interviewers tried to record stream or lake names phonetically. For example, "Cinamahoning" and "Sinmahoming" might be recorded for Sinnamahoning. In addition to the stream or lake name, we asked for the name of the nearest town or county. This information was often crucial in assigning the correct identification to a body of water. Thus, if the towns of Wharton or Costello were associated with the above phonetic variations of Sinnamahoning, we were able to assign the First Fork of the Sinnamahoning as the body of water. In other instances, interviewers thought they heard English words, instead of the unique proper name. A second example illustrates this problem. One interviewer recorded that an angler had fished Lower Hammond Creek near Ligoneer, Westmoreland County. Phonetically, this is similar to Loyalhanna Creek, but the key to recognition is the place and county. Other problems arose because anglers don't know (or won't report) the names of the streams they fished, or gave "local" names that cannot be identified from the Pennsylvania stream map or other source.[12]

In summary, although these assignments of the Commission's database stream section or lake identifications to angler-reported fishing locations were made as carefully as possible, it must be understood there are errors in these assignments. The greatest chance of error will occur at the stream section level. Often it was difficult, from the angler description to determine what part of a larger stream the angler fished. This was most problematic for special-regulated waters and wild stream sections. However, as the data are aggregated to stream, sub-sub-basin, and sub-basin levels, these errors disappear. Thus a discrepancy occurs because an angler reported fishing the wild trout water on Kettle Creek near Oleona, while the Commission database classifies the section as stocked water. Both descriptions are "correct" because the angler caught wild trout, even though the Commission stocked that section. However, this discrepancy vanishes at the stream level of aggregation, e.g. Kettle Creek, and at the two-watershed levels of aggregation.

Table 99 reports the distributions of fishing pressure in two ways: 1) how anglers described the water they were fishing; and 2) how the Commission defines the same body of water. Both the similarities and differences in these distributions are interesting.

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[11] By checking another question, we determined that 250 out of 251 angler reported trips in the Unspecified Streams and Lakes category are for fishing in Lakes.

[12] This identification task was primarily carried out by the Principle Investigator, who is familiar with many of the trout waters in the state. Those that he couldn't identify were done by staff and Summer Intern Students in the Division of Fisheries Management office at Pleasant Gap.

First, anglers report about 59 to 62 percent of their fishing activity takes place in stocked streams depending on the specific measure of angling pressure. Also, anglers report between 15 and 16 percent of their activity is fishing lakes. These two sets of figures are quite close to those based on Pennsylvania Fish Commission's definition of water types.

Anglers over-report their activities in special-regulated waters by three percent for two of the three measures. While this is a small absolute difference, it is a sizable relative error because, according to the Commission's definition of water types, only four percent of waters reported by anglers are subject to special regulations. It is for the wild trout fishery where the biggest discrepancies exist. Trout anglers report that between 14 and 17 percent of their angling is in wild trout streams. According to the Commission's classifications, only three percent of angling pressure occurs in waters formally designated as wild. Thus anglers *over-report* their wild trout fishing by a factor of five.

Table 99. Percentage Distribution of Fishing Pressure by Type of Fishery

Type of Fishery	Percent Anglers	Percent Days	Percent Hours
Angler Report			
Stocked Streams	62	59	62
Special Regulations	7	10	8
Wild	17	15	14
Lakes	15	16	16
PFC Classification			
Stocked Streams	64	62	61
Special Regulations	4	7	8
Wild	3	3	3
Unspecified Streams	14	14	14
Lakes	15	14	14

Omitting all fishing trips to lakes, Table 100 reports the detailed differences between the two ways of classifying streams. First, 80 percent of trips to stocked streams are reported correctly by anglers. The biggest difference is anglers' reporting fishing in wild trout streams when the Commission manages the same water as a stocked fishery. This is an understandable discrepancy. Class B streams support wild populations of trout and are also stocked. Thus, the angler may be catching what appear to be wild trout in stocked water. The error of missing special-regulated waters on the part anglers could, in part, be coding error, as discussed above. Differences between the Commission's classification and angler descriptions for special-regulated waters could stem from angler ignorance, or from catching wild trout in these waters. This regularly happens in the better quality special-regulated waters. We assumed that angler knowledge about "Unspecified Streams" would be minimal. Apparently, most anglers assume they are fishing in stocked waters, but special-regulated waters and wild streams also receive selections for this category.

On balance, it is probably best to treat these data as representing two separate variables. One is the perception of the type of water fished by the angler. That perception may be accurate, depending on the type of trout caught. However, anglers sometimes reported

uncertainty about the types of water they fished, and therefore these data may include substantial inaccuracies due to ignorance.

Table 100. Comparison of Angler With PFC Stream Classifications

PFC Classification	Angler Report	Number of Cases
Stocked Stream	Stocked Stream	914
	Special Regulations	58
	Wild	171
Special Regulations	Stocked Stream	44
	Special Regulations	37
	Wild	19
Wild	Stocked Stream	28
	Special Regulations	3
	Wild	25
Unspecified Stream	Stocked Stream	156
	Special Regulations	27
	Wild	68

4.7.4. Fishing Pressure and Demographic Characteristics of Angler

An analysis of the three fishing-pressure variables (i.e., number of angler fishing locations, angler-days, and angler-hours) by angler demographic characteristics reveals virtually no significant relations. The demographic variables included: educational level, marital status, employment status, the presence of children at home, sex, age, occupation and socioeconomic status of the angler. Only the sex of the angler shows a weak correlation with these fishing variables; men fish more than women.

We also counted the total number of fishing trips reported by each angler for a whole 12 month period prior to and including the target period. This variable is also uncorrelated with all the same demographic, social, and economic variables listed above. Fishing activity is uncorrelated with the characteristics of the angler.

4.8. Trips By Season of the Year

The Trout Angler Telephone Survey contained four waves of interviews, one for each major part of the trout fishing season. The four seasons are: 1) April, opening day to the end of the month (*17 days*); 2) May (*31 days*); 3) June through August (*92 days*); 4) September through December (*122 days*).

The most straightforward way to measure fishing pressure is to examine the percentage of anglers who actually fished for trout during each season of 1991. Table 101 presents these figures. The percent of trout anglers is quite stable across the four seasons. Only the fall season departs from the 80 percent rate at 86 percent. Moreover, the fall season participation of 86 percent has a margin of error of ±5 percent, a range that almost includes the six percent difference.

It is well known that fishing pressure starts the trout season at its maximum value, and declines throughout the season. During April, 57 percent of trout anglers reported they were active, while during the fall season, the corresponding figure is 26 percent. Thus, trout anglers are about twice as likely to go fishing during April as during the fall. What is perhaps as interesting about these values is the percent of trout anglers who *do not* go fishing for trout during each season. These complementary values are particularly surprising during the early season; 43 percent of trout anglers skip April fishing, and 49 percent skip May.

Table 101. Percentage of Anglers Who Fished for Trout By Season of the Angling Year

Anglers	April	May	Summer	Fall	Total
Total Anglers in Survey	748	760	277	209	1,994
Trout Anglers in Survey	598	598	225	180	1,601
Percent Trout Anglers	80%	79%	81%	86%	80%
Trout Anglers					
Trout Anglers Who Fished During Season	340	304	88	47	779
% Trout Anglers Who Fished During Season	57%	51%	39%	26%	49%

In the design of the survey, we allocated the number of interviews conducted during each season to be proportional to the fishing pressure during that season.[13] To accurately estimate fishing pressure across the year, we must correct for pressure within a season, and for the length of each season. Table 102 reports these calculations using two bases of angler-days: 1) the total number of anglers who fish for trout; and 2) the total number of anglers who actively fish for trout during a specific season.

Table 102. Analysis of Trout Fishing Pressure By Season of the Angling Year

Angler Category	April	May	Summer	Fall	Total
Total Anglers in Survey	748	760	277	209	1,994
Trout Anglers in Survey	598	598	225	180	1,601
Trout Anglers Who Fished During Season	340	304	88	47	779
Trips and Days					
Days in Season	17	31	92	122	262
Number of Trips During Season *(a)*	1,911	2,857	1,016	593	6,377
Angler Days:All Trout Anglers *(b)*	10,166	18,538	20,700	21,960	71,364
Angler Days:All Active Trout Anglers *(c)*	5,780	9,424	8,096	5,734	29,034
Fishing Pressure Rates(Trips/Angler-Day)					
All Trout Anglers *(a÷b, above)*	0.188	0.154	0.049	0.027	0.089
All Active Trout Anglers *(a÷c, above)*	0.331	0.303	0.125	0.103	0.220

The two sets of fishing pressure rates are displayed in Figure 22. Pressure is highest during April, nearly as high in May, and then falls off substantially during summer and fall. The rates for Active Trout Anglers are high. During the early season, these anglers go fishing

[13] The data available to make this allocation were quite crude. As it turns out, we over-allocated interviews to the early seasons, and under allocated to the late season.

about one day in three, and during summer and fall, once every eight to ten days. Also, the rates for active anglers decline proportionately less during the later seasons.

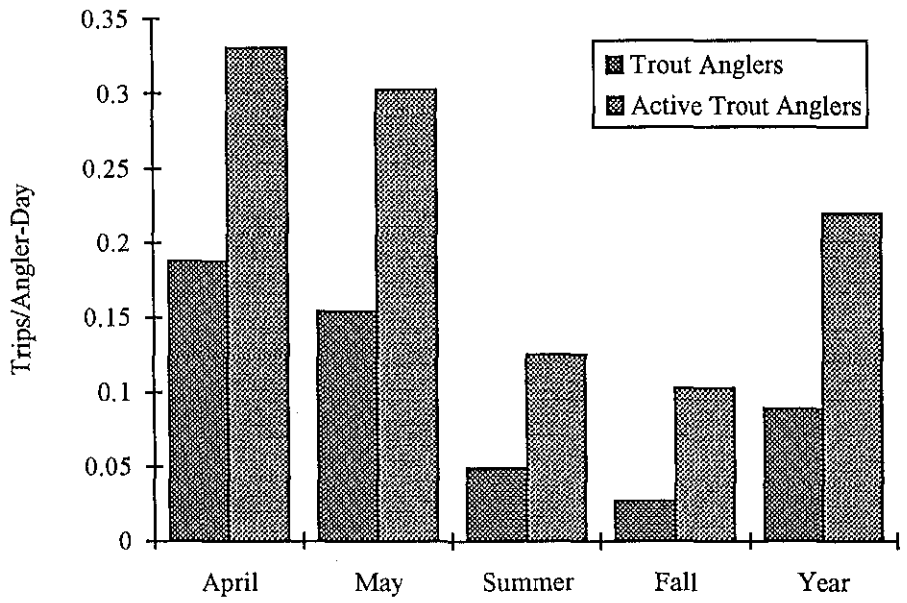

Figure 22. Fishing Pressure by Season

The survey instrument covered fishing pressure in a more general way than in the detailed questions. All trout anglers were asked whether they had gone fishing for trout during each season of the previous twelve months. Thus, those questioned during April of 1991, the first wave of the survey, were asked how many times they had gone fishing for trout during May of 1990, during June through August of 1990, during the fall of 1990 and during the winter season of January to mid-April of 1991. Similarly, the other three waves were asked about the number of times they fished for trout during each season of the previous twelve months. If we combine the counts of fishing trips from the detailed questions, with these more general counts from other seasons, we can derive another set of estimates of fishing pressure for each season of the year. These trip data and estimates of fishing pressure are presented in Table 103.

Table 103. Fishing Pressure Based on Full Season Fishing Trip Data

	Fishing Trips During Season				
Wave	**April**	**May**	**Summer**	**Fall**	**Winter**
1	1911	4151	4417	1608	230
2	1572	2857	5554	2015	466
3	989	889	1016	566	71
4	651	1093	1469	593	157
Pressure					
Trips/Angler Day	.188	.181	.085	.024	.006

The estimates of fishing pressure derived from the combined data are quite close to those calculated from the detailed questions, suggesting the two methods are comparable. The estimates for April for both methods are 0.188 trips per angler-day! The estimate for May using general recall data is somewhat higher than for the detailed trip data; the former is 0.181 trips per angler-day versus 0.154. Similarly, the estimate using general recall data is 0.085 versus the detailed recall data of 0.049 during the summer season. Recall that the general recall data asked about trips made during the previous twelve months. Thus, the general recall data covered the 1990 fishing season as well as the 1991 season. This is important because 1991 was a season of severe drought, while 1990 was an unusually good and wet year. Thus, we would expect more fishing to have occurred during 1990, and these differences are in the expected direction. In fact, the estimates based on the combined data are probably more representative because they include 1990 information. Figure 23 displays the fishing pressure for the entire season.

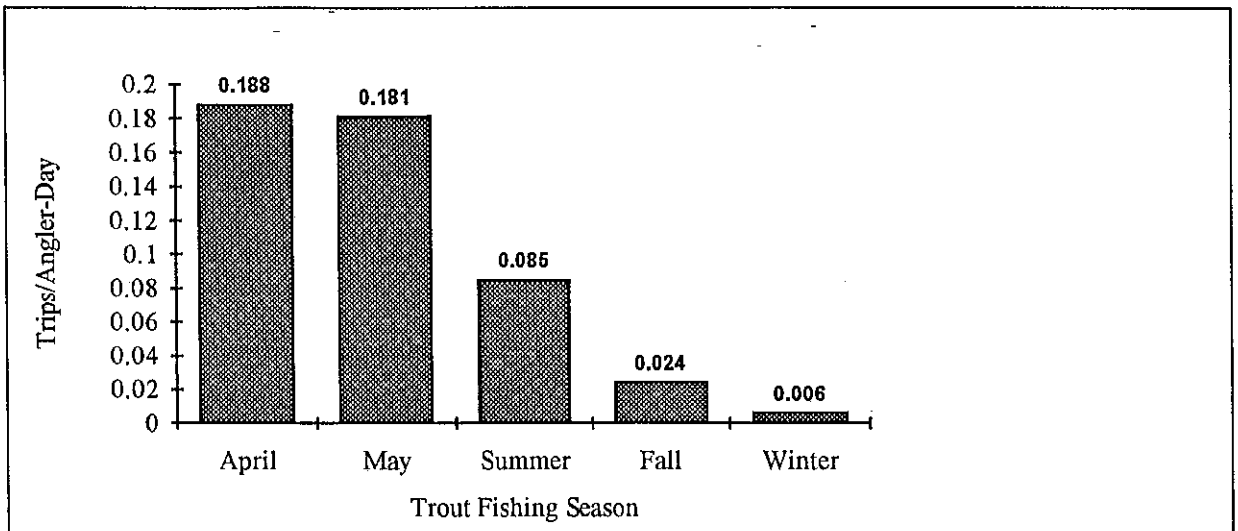

Figure 23. Fishing Pressure by Season

What do these fishing pressure rates mean when applied to the population of trout-fishing anglers in Pennsylvania? We can estimate the total number of trips in two ways, depending on how we define the population of trout anglers. The first is based on the sales of trout and salmon stamps (614,495 in 1990-91). The second is based on the TATS sample, in which 80.3 percent of all licenses anglers report they fish for trout. Applying this percentage to the 1,095,544 anglers who purchased licenses in 1990-91 defines a population of trout anglers of 879,623. Table 104 uses these population figures to estimate the number of trout fishing trips per season and for the year. The two values for the population size of trout anglers in Pennsylvania are quite different. The TATS value yields an annual estimate of the number of trips of 17.7 million, 5.3 million more than the estimate based on the sales of trout and salmon stamps.

Table 104. Estimated Number of Trout Fishing Trips By Season

Trip Base	April	May	Summer	Fall	Winter	Year
TATS	2,814,680	4,939,288	6,843,579	2,627,328	507,664	17,732,539
Stamp	1,966,307	3,450,537	4,780,856	1,835,425	354,649	12,387,774

Figure 24 presents the distribution of the estimated total number of trout fishing trips generated per season for Pennsylvania for the two trout angler populations. Although the greatest fishing pressure occurs during the early season, the greatest number of trout fishing trips are made during the months of June, July, and August. These estimates, that between 4.8 and 6.8 million trout fishing trips are made during the summer months, are almost double the number of trips made during the high pressure month of April.

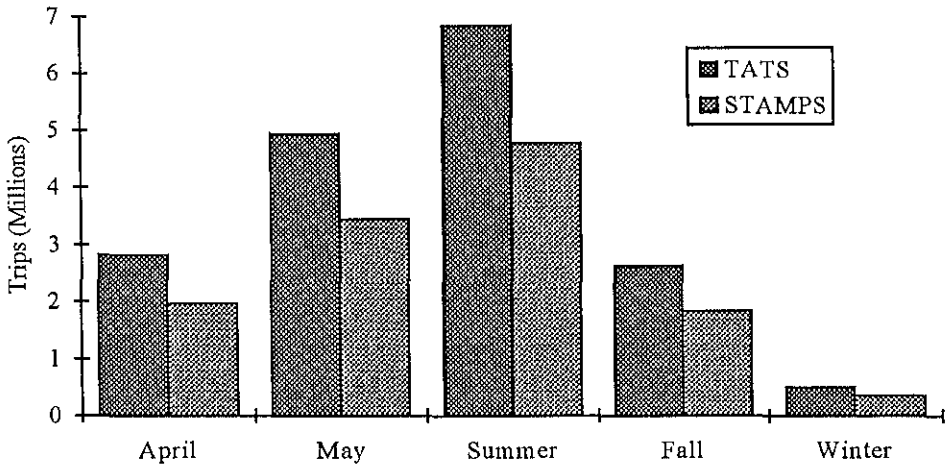

Figure 24. Estimated Distribution of Trout Fishing Trips by Season

The same data used to estimate seasonal fishing pressure and total trout fishing trips can be used to estimate the number of trips made by each angler during the fishing season.

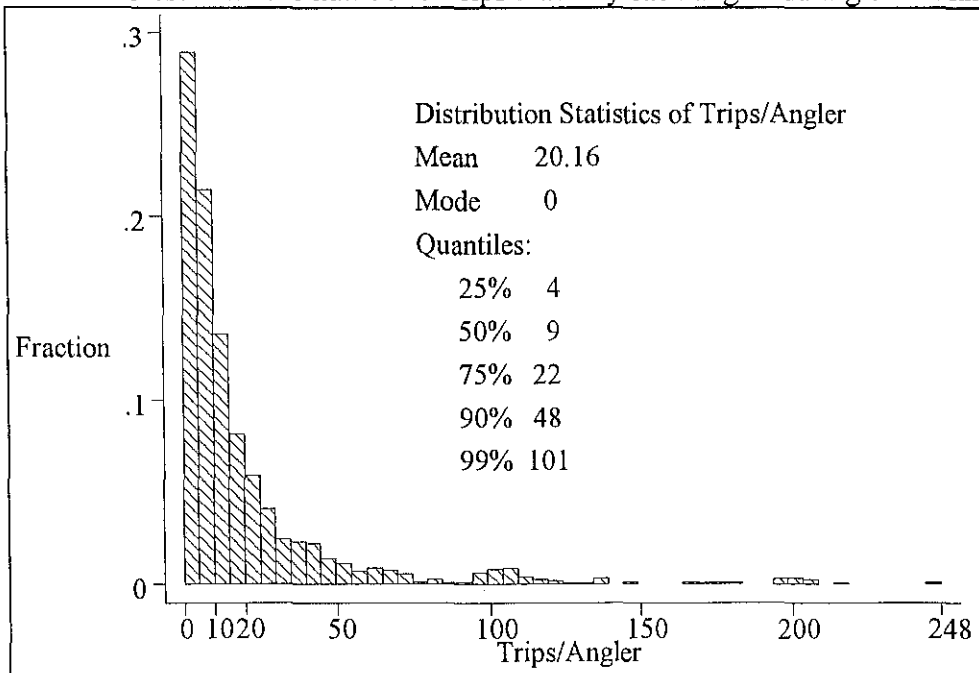

Figure 25. Histogram of Trips/Angler

Figure 25 shows that the frequency distribution of Trips/Angler is very skewed. The modal frequency for the sample of 1601 trout anglers is zero trips and accounts for 10.6 percent of the sample. The mean is 20.16 trips, a value that almost three-quarters of anglers do not exceed. However, there is a small but very dedicated group of trout anglers that fish for trout a a great deal; 10 percent fish 48 or more times per year, and the top one percent goes fishing more than 100 times per year. The maximum reported number of trips for a single (lucky) angler in the Trout Angler Telephone Survey is 248 trips!

4.9. Trips By Tackle Type

One of the detailed questions asked about each trip concerned the type of tackle used by the angler. Figure 26 reports the distribution of tackle choices for trout fishing in the 1991 season. The most common choice is a spinning rod with bait, followed by a spinning rod with lures. Casting with bait and fly fishing with a fly rod are the next choices, being used on 29 and 27 percent of trips, respectively.

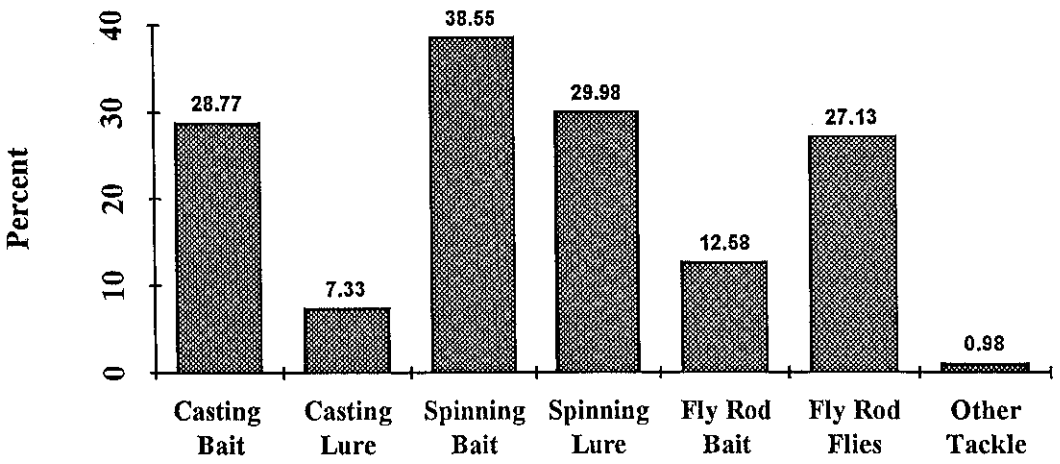

Figure 26. Percent Distribution of Tackle Types for Trout Fishing
(Note: Percents do not add to 100 because more than one tackle choice could be reported per trip.)

4.10. Why Anglers Select Their Angling Sites

For each of the specific fishing locations reported by trout anglers, we asked why the site was chosen. The form of the question was open-ended; we wrote down whatever the angler reported and have coded as many reasons as provided. Thus, a response "I can catch a limit and the stream is close to home," was coded **Catch Trout** and **Close To Home**. This question was asked to provide information on the motivation behind the angling behavior. The response patterns, which are interesting, are reported in Table 105.

Proximity is the most frequently cited reason for selecting a particular trout fishing site. Fully 26 percent of these open-ended responses were "close to home" or a functional equivalent; these are labeled **Close To Home**.

The next set of reasons focus on the quality of the fishing environment and the aesthetics of the experience. The second most frequent type of response concerned the quality of the fishing environment, and is labeled **Nice Environment**. Almost one in five reasons expressed sentiments of the form, "it's a beautiful place," "it's a wilderness area," or "it's scenic." This category of responses was used to characterize the place or area where the angler fished, and not the specific attributes of the stream or lake. Care was taken to code descriptions of the trout fishing waters in another category, **Special Waters**. This category is the third most frequent reason for selecting a fishing site. Attributes such as "clean water" or "good holes" were coded into **Special Waters**. The fourth most cited reason is that a body of water is **Uncrowded**. Fishing in solitude, or in remote areas, was mentioned in about 10 percent of the responses.

The fifth and sixth most cited reasons concerned the actual catching of trout, or the presence of stocked trout in a stream or lake. These reasons, labeled **Stocked Trout**, were cited by 8.5 percent of anglers.

The **Habit** response covers all the responses of the type: "that's where I always go fishing," or "I've been fishing that stream for 30 years." These reasons were given by 7.5 percent of anglers.

Table 105. Distribution of Reasons for Selecting Fishing Site

	Reasons	Frequency	Percent
1.	Close to Home	542	26.32
2.	Nice Environment	395	19.18
3.	Special Waters	307	14.91
4.	Uncrowded	209	10.15
5.	Catch Trout	175	8.50
6.	Stocked Trout	173	8.40
7.	Habit	154	7.48
8.	Close to Camp	133	6.46
9.	Special Trout	113	5.49
10.	Wild Trout	90	4.37
11.	Accessibility	64	3.11
12.	Family	64	3.11
13.	Recommended	62	3.01
14.	Special Regulations	57	2.77
15.	Fly Fishing	41	1.99
16.	New Experience	40	1.94
17.	Other Reasons	33	1.60
18.	Challenge	19	0.92
19.	None	12	0.58
20.	Lake	10	0.49

The remaining thirteen reasons were given by less than 6.5 percent of the anglers, and covered a variety of domains. They include: **Close to Camp**, a second proximity reason; **Special Trout**, a reason associated with special characteristics of the trout in a stream, such as their size or number, or just "nice trout"; **Wild Trout** is similar to **Special Trout**, except that it is reserved for native, wild, brook trout; **Accessibility** refers to the ease with which anglers can fish the stream, including close parking, easy wading or bank access; **Family** includes all reasons of the type "I went there with my father, brother, or their family member"; **Recommended** refers to cases like, "My buddy recommended the stream to me," or "I heard at work that it was good"; **Special Regulations** covers those trips where the angler wanted to fish a delayed harvest project or other water covered by special regulations; **Fly Fishing** covers those situations where the angler chose a stream because he or she believed was good for fly fishing; **New Experience** refers to reasons of the type "I wanted to try a new stream"; **Challenge** covers the few anglers who selected a fishing site because they believed the fish were challenging to catch; and finally, **Lake** covers those anglers who explicitly mentioned they chose their site because it was a lake. The categories **None**, and **Other** refer to no reason given and a miscellaneous set of other reasons, respectively.

We can examine these reasons jointly. One group of reasons it makes sense to aggregate is **Nice Environment**, **Special Water**, **Uncrowded**, and **Wild Trout**. One or more of this **Fishing Environment** set were cited for 32 percent of all fishing trips. Another related set concerns **Proximity**: combining **Close to Home**, and **Close to Camp**, also accounts for 32 percent of all fishing trips. Finally, we can identify a set primarily concerned with the fish: **Catching Trout**, **Stocked Trout**, and **Special Trout**. This **Trout** group accounts for 20 percent of all trips. From these results, it appears that Pennsylvania anglers are more likely to choose where they fish for reasons of convenience or aesthetics, rather than to catch trout, or the characteristics of the trout.

We correlated the types of reasons provided by anglers with their demographic, social, and economic characteristics. As with other behavioral variables, there are no significant correlations.

4.11. Trips and Fishing Success

For each of the detailed fishing sites reported by trout anglers, we asked whether they caught trout. Overall, 82 percent of trout anglers report catching trout. We can use this simple measure of fishing success to assess factors which influence angling success.

Table 106 presents a logistic regression model that predicts angling success as a function of three key factors: 1) angling effort, as measured by the total hours of effort expended at a fishing site; 2) angling experience, as measured by the number of years the angler has fished for trout; and 3) whether the body of water fished by the angler falls into biomass Class C. Many other variables were included in this model and found to be statistically unrelated to angling success. These other variables include: the socioeconomic and demographic characteristics of the angler; the number of trout stocked in the body of water; and the type of tackle used by the angler.

The three variables included in the model require further explanation. A logarithmic transformation is used for both angling effort and angling experience because both variables are quite skewed. The improved fit of the model with these log-transformed variables suggests decreasing marginal returns for increased effort or years of experience. It is somehow reassuring that effort and experience are the most important factors in trout angler success.

The third variable, fishing in a body of water with a biomass class of C, is interesting. We estimated other logistic models including variables representing all biomass class levels for Pennsylvania trout waters, reasoning that the higher quality the water, the greater the angling success. However, only biomass Class C waters contribute significantly to explaining success. What is special about biomass Class C waters? First, many biomass Class C waters are stocked at a high rate. Further, biomass Class C represents an overall average biomass class for the large watersheds that anglers key on: for example, Pine Creek, Kettle Creek, First Fork of the Sinnemahoning Creek and the Lehigh River.

Table 106. Logit Model of Angler Success of Catching Trout

Logit Estimates			Number of obs.	= 2066	
			$\chi^2(4)$	= 231.04	
			Prob > χ^2	= 0.0000	
Log Likelihood = -855.5			Pseudo R2	= 0.1190	
Variable	**Odds Ratio**	**Std. Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**
Log Hours Fished	2.682	0.222	11.9	0.000	[2.284, 3.156]
Log Angling Experience	1.579	0.122	5.9	0.000	[1.357, 1.836]
Biomass Class C	2.982	0.861	3.8	0.000	[1.692, 5.252]

Figure 27 presents graphs of the estimated probability of angling success as a function of these three explanatory variables. The statistical influence for each variable is unique. Angling effort presents a converging envelop, with 10 hours or more of effort producing probabilities of 0.8 or greater. The relation between years of experience and success is more dispersed than the one for effort, with the range for the most experienced anglers covering the interval from about 0.5 to 1.0. Two effects are attributable to fishing in biomass Class C waters. First, the average success rate is about five to eight percent higher. The second effect is more pronounced. Anglers fishing in biomass Class C waters are less likely to have bad days because the lower whisker in the box and whisker plot extends only to about 0.75, where the lower whisker for fishing other classifications of waters extends down to 0.5, with extreme outliers extending to below 0.2.

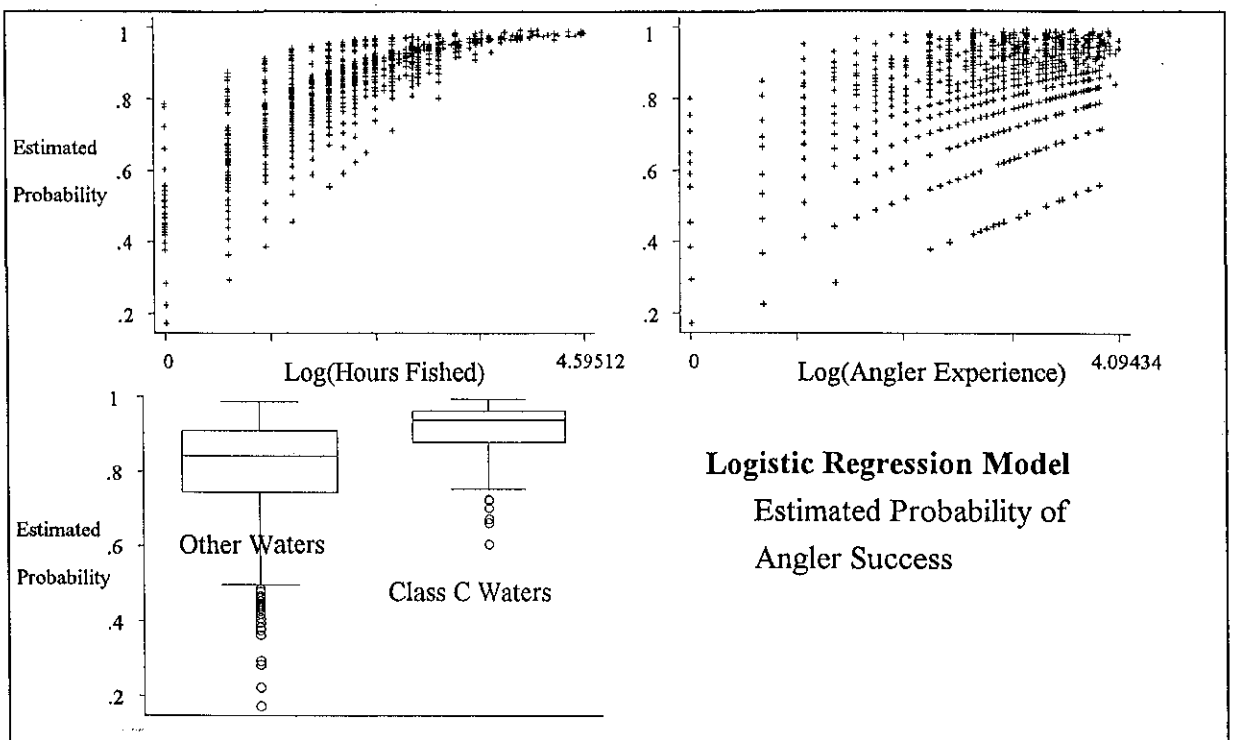

Figure 27. Estimated Probability of Angling Success by Log(Hours Fished) Log(Angler Experience), and Class of Water

4.12. Statistical Relations Between Attitudes and Behavior

In Section 3, we presented numerous results on the attitudes and preferences of Pennsylvania trout anglers. The modal, and often a majority response favored the wild trout fishery over the stocked fishery. This preference runs counter to the relative opportunity to fish for wild trout, because stocked trout fishing is far more available. In Section 4, we presented further results on the behavior of trout anglers. The question immediately arises: Are attitudes and behaviors of trout anglers consistent? Are anglers who claim a preference for a wild fishery more likely to pursue that type of angling experience? To examine this question, we correlated attitudinal responses with where anglers reported actually fishing for trout.

The most direct measure of preference for wild versus stocked trout fisheries was the question: "Which fishery is more important to you?" Recall that we allowed the response that both fisheries are important as well as a "No Preference" response. Among anglers who responded to the detailed behavior questions, 39 percent said the wild trout fishery was more important to them, while 31 percent favored the stocked fishery. Another 23 percent favored both fisheries, and seven percent expressed no preference.

To measure the behavior of trout anglers, we can examine the types of fishing sites actually visited. Specifically, we computed the *proportion* of fishing trips each angler made to: 1) stocked trout fisheries, 2)special-regulations areas, 3) wild trout waters, and 4) lakes.

First, we computed Pearson product moment correlations for these proportions with the simple dichotomous measures of preference. The correlation between preference for the stocked trout fishery and proportion of trips made to stocked trout fisheries is 0.084, and to lakes 0.101. However, the correlation between preference for stocked trout and proportion of trips made to wild fishery is -0.221. Thus, the correlations between preference for stocked fisheries and actually fishing in stocked waters are small but positive, and the correlation with fishing wild trout waters is negative and larger.

Similarly, the correlation between preference for wild trout and proportion of trips made to stocked fisheries is -0.163, and -0.050 to lakes, while the correlation with proportion of trips to wild trout waters is 0.278. Thus, the signs and strengths of these correlations show consistent relations between attitudes and behavior, particularly with regard to the wild trout fishery.

Another, and more accurate method of assessing this issue is by examining the distribution of where anglers fish by importance of the type of fishery. Table 107 tabulates the proportion of trips made to stocked waters by whether anglers expressed a preference for the stocked fishery. The relation in the table is weak, but in a consistent direction. The relation is most evident in the 76 to 100 percent row of the table; nearly half of the anglers who prefer the stocked fishery make more than three-quarters of their trips to such waters.

Table 107. Stocked Trout Fishery Most Important

Proportion of Trips	No (% col.)	Yes (% col.)	Total (% col.)
0 to 25%	105 (19.52)	41 (17.15)	146 (18.79)
26 to 50%	151 (28.07)	46 (19.25)	197 (25.35)
51 to 75%	81 (15.06)	39 (16.32)	120 (15.44)
76 to 100%	201 (37.36)	113 (47.28)	314 (40.41)
Total	**538** (100.00)	**239** (100.00)	777 (100.00)

Pearson $\chi^2(3) = 9.7691$ Pr = 0.021
$\gamma = 0.1567$ ASE = 0.060

Table 108 contains the similar tabulation for those who prefer the wild trout fishery. Recalling that only about 15 percent of all angler trips are made to wild trout waters, we see a fairly strong relation in Table 108. More than twice as many anglers who prefer the wild fishery make more than one-quarter of their fishing trips to wild trout waters than do anglers who do not prefer the wild fishery. This relation is also reflected in the gamma coefficient of 0.49, an ordinal measure of association. The relative strengths of these relations suggest that

anglers who prefer the wild fishery behave more consistently with respect to their preferences than anglers who prefer the stocked fishery.

Table 108. Wild Trout Fishery Most Important

Proportion of Trips	No (% col.)	Yes (% col.)	Total (% col.)
0 to 25%	400 (84.03)	192 (63.79)	592 (76.19)
26 to 50%	67 (14.08)	79 (26.25)	146 (18.79)
51 to 75%	5 (1.05)	13 (4.32)	18 (2.32)
76 to 100%	4 (0.84)	17 (5.65)	21 (2.70)
Total	**476** (100.00)	**301** (100.00)	777 (100.00)

Pearson $\chi^2(3) = 48.7279$ Pr = 0.000

$\gamma = 0.4970$ ASE = 0.063

5. Pennsylvania Fish Commission Performance

5.1. Licenses and Angler Coverage

In the 1991 fishing season, the Pennsylvania Fish Commission sold about 1.1 million licenses. This means that about one in twelve Pennsylvanians fish. The types of licenses are listed in Table 109. According to the official 1991 statistics, 56.1 percent of all anglers purchased the trout/salmon stamp. Recall in Section 2 that about 80 percent of all sampled anglers report they fish for trout. We also know that 8.2 percent of survey respondents live out-of-state, a figure almost identical with the combined categories of **Non-Resident** and **Tourist** in Table 109.

Table 109. Sales of Pennsylvania Fishing Licenses for the 1990-91 Season[14]

Type of License	Number	Percent
Resident	959,686	87.6
Senior Resident	28,718	2.6
Senior Lifetime	16,472	1.5
Non-Resident	71,026	6.5
Tourist	19,642	1.8
Total	1,095,544	100.0
Stamps Purchased		
Trout/Salmon	614,495	56.1 (of Total)

We asked anglers who reported on their detailed trout fishing trips whether they had purchased the Trout/Salmon stamp. Among this group of anglers, 62 percent, reported purchasing the stamp. (See Table 110.)

Table 110. Percent of Anglers Who Purchased the Trout/Salmon Stamp

Response	Frequency	Percent
Yes	373	62.06
No	228	37.94
Total	**601**	**100.00**

During the sampling phase of this study, the Pennsylvania Fish Commission provided the study a list of names and addresses of 8,026 randomly selected fishing licenses. We used 6,600 of these names (again randomly selected) as a sampling frame for the telephone survey. Using a multiphase search protocol, including calling directory assistance, we were able to find the

[14] These statistics are from the *Pennsylvania Angler*, January, 1992. This issue contains the annual report of the Pennsylvania Fish Commission.

telephone numbers of only 4,443 (67.3 percent) of these licensed anglers.[15] Thus, we were unable to find about one-third of the anglers who purchased licenses using the information recorded on those licenses.

One of the first questions we asked in the telephone survey was whether the respondent had received a letter introducing the survey. Table 111 presents the responses to this question. About 23 percent of those reached by telephone reported not receiving our letter. Many of these letters were returned as "Undeliverable as Addressed" meaning the address as given in the PFC fishing license database simply doesn't exist. This suggests that a rather high proportion of the information on fishing licenses is questionable, illegible, or incorrect.

Table 111. Percent of Respondents Receiving Introductory Letter for Study

Response	Frequency	Percent	Cum. Pct.
Yes	1510	77.16	77.16
No	447	22.84	100.00
Total	**1957**	**100.00**	

5.2. Opinions on Information and Education Programs

For many years, the Pennsylvania Fish Commission has run public information and education programs. Among the many information programs is one that informs the angling public on how and where to fish for trout. We asked survey respondents how well they think the Commission is doing in providing such information. Table 112 presents the results on *where* to fish for trout, and Table 113 on *how* to fish for trout. These tables indicate that the Commission's performance is endorsed by 81 percent on *where* to fish and by 62 percent on *how* to fish for trout. Only a small fraction of licensed anglers in Pennsylvania (about 4%) subscribe to the *Pennsylvania Angler*, the Commission's magazine devoted to public information and education.

Table 112. The Commission does a good job in providing information about where to fish for trout.

Agreement	Frequency	Percent	Cum. Pct.
Strongly Agree	102	6.37	6.37
Agree	1194	74.58	80.95
Neither	104	6.50	87.45
Disagree	165	10.31	97.75
Strongly Disagree	19	1.19	98.94
DK/DR	16	1.00	99.94
NA/Refused	1	0.06	100.00
Total	**1601**	**100.00**	

[15] For a detailed discussion of this protocol, confer Dolores E. Fowler, *The 1991 Trout Angler Telephone Survey, Phase 1: Data Collection, Final Technical Report*, University Center for Social and Urban Research, University of Pittsburgh, August, 1992.

Table 113. The Commission does a good job in providing information about how to fish for trout.

Agreement	Frequency	Percent	Cum. Pct.
Strongly Agree	46	2.87	2.87
Agree	953	59.53	62.40
Neither	226	14.12	76.51
Disagree	312	19.49	96.00
Strongly Disagree	26	1.62	97.63
DK/DR	35	2.19	99.81
NA/Refused	3	0.19	100.00
Total	**1601**	**100.00**	

To put these responses in context, we asked anglers an open question: "Where do you get most of your information about trout fishing in Pennsylvania?" We recorded whatever respondents said and then coded the responses into categories. Table 114 reports these results. If respondents cited several sources, all were coded.

Table 114. Source of Trout-Fishing Information for Anglers

Source	Number	Percent
Outdoor Magazines	340	21.25
Newspapers	259	16.19
Friends	220	13.75
Relatives	171	10.69
Pennsylvania Angler Magazine	170	10.63
PFC Summary Regulations Booklet	151	9.44
Word-of-mouth	128	8.00
Experience	120	7.50
Bait and Tackle Shops	107	6.69
Other Anglers	101	6.31
PFC Education and Information	75	4.69
Books	73	4.56
PGC Education and Information[16]	31	1.94
Television	26	1.63
None	21	1.31
Sportsmen Organizations	15	0.94
Outdoor Shows	2	0.13
Total	**1600**	

The most frequently cited sources of information are outdoor magazines--other than the *Pennsylvania Angler*--(21%), and the outdoor columns of local newspapers (16%). Next in order of importance are the social sources of friends and relatives cited by 11 to 14 percent of anglers. About 10 percent of trout anglers cite the Commission's publications of the *Pennsylvania Angler* and the *Summary of Fishing Regulations and Laws* as sources. Between six and eight percent of trout anglers mention word-of-mouth (a less specific version of

[16] This is not a mistake. The Pennsylvania Game Commission is cited by 31 respondents as an important source of trout fishing information. One has to wonder if some members of the angling public views the "Game Commission" as a generic agency responsible for all wildlife management.

friends and relatives), experience, bait and tackle shops, and other anglers. Slightly fewer than five percent cite the Commission's education and information activities, about the same number that identify reading books as an information source. After these sources, the percentages drop below two percent; the education and information activities of the Pennsylvania Game Commission are cited by 1.9 percent, and television by 1.6 percent. Sportsmen's organization, including Trout Unlimited, are mentioned by fewer than one percent of trout anglers.

These results are interesting for several reasons. Trout anglers are readers; outdoor-oriented print media, Commission publications, and books are far more important to them than television and radio. Radio was not even mentioned. Social sources of information are next in importance, including friends, relatives, other anglers, etc. What is curious is the relatively low profile of the education and information programs of the Pennsylvania Fish Commission. Thus, while anglers report satisfaction levels of 60 to 80 percent for the job the Commission is doing in providing information about trout fishing, most of the explicitly-cited sources are not directly associated with these programs.

5.3. Opinions and Advice for the Pennsylvania Fish Commission

We asked four questions on possible Pennsylvania policy options. To provide context for these questions, the interviewer first read the following statement:

> As the cost of raising, transporting, and stocking adult-size trout increases in the future, the Fish Commission will be looking for ways to meet the increased costs. I am going to read a number of different options to fund the Commission's Trout Program. Please indicate your agreement with the following statements.

The first statement was: "The Fish Commission would be justified in asking for future license increases that are tied to the mandatory increased operating costs." Table 115 presents the distribution of agreement for this statement. Nearly two-thirds of respondents agreed with this statement. However, a sizable minority of nearly one-third do not want the Commission to raise license fees, even if they are tied to mandatory cost increases.

Table 115. Agreement on Raising License Fees Tied to Mandatory Increased Operating Costs

Agreement	Frequency	Percent	Cum. Pct.
Strongly Agree	69	4.31	4.31
Agree	924	57.71	62.02
Neither Agree nor Disagree	64	4.00	66.02
Disagree	441	27.55	93.57
Strongly Disagree	74	4.62	98.19
Other	20	1.25	99.44
No Opinion	8	0.50	99.94
NA/Refused	1	0.06	100.00
Total	**1601**	**100.00**	

The next statement read: "The Fish Commission should hold the line on future cost increases in the stocked trout program by reducing the number of trout stocked." Table 116 presents the distribution of agreement to this statement. The primary response is to disagree with this statement. Nearly three-quarters of trout anglers do not want to hold the line with fewer trout. About one-fifth of anglers would, however, reduce the number of trout stocked.

Table 116. Distribution of Agreement on Holding the Line on Costs by Reducing the Number of Trout Stocked

Agreement	Frequency	Percent	Cum. Pct.
Strongly Agree	13	0.81	0.81
Agree	327	20.42	21.24
Neither Agree Nor Disagree	75	4.68	25.92
Disagree	1034	64.58	90.51
Strongly Disagree	134	8.37	98.88
Other	5	0.31	99.19
No Opinion	11	0.69	99.88
NA/Refused	2	0.12	100.00
Total	**1601**	**100.00**	

The third statement was: "If limited trout fishing access could be obtained through easements to private lands that are presently posted, the Fish Commission would be justified in raising fees to pay for the fishing easement program." Table 117 presents these results. This distribution is a weaker version of Table 115. About 58 percent would support higher fees for an easement program, and one-third do not support the program.

Table 117. Distribution of Agreement to Raising Fees to Pay for an Easement Program

Agreement	Frequency	Percent	Cum. Pct.
Strongly Agree	47	2.94	2.94
Agree	843	52.65	55.59
Neither Agree Nor Disagree	84	5.25	60.84
Disagree	533	33.29	94.13
Strongly Disagree	65	4.06	98.19
Other	2	0.12	98.31
No Opinion	26	1.62	99.94
NA/Refused	1	0.06	100.00
Total	**1601**	**100.00**	

Finally, we read the statement: "The Fish Commission should cut costs in other programs to pay for increased costs in the stocked trout program." Table 118 presents these results. About 61 percent of trout anglers would not make cuts elsewhere to pay for stocked trout.

Table 118. Distribution of Agreement to Cutting Costs in Other Programs to Pay for Stocked Trout Program

Agreement	Frequency	Percent	Cum. Pct.
Strongly Agree	22	1.37	1.37
Agree	439	27.42	28.79
Neither Agree Nor Disagree	117	7.31	36.10
Disagree	869	54.28	90.38
Strongly Disagree	114	7.12	97.50
Other	9	0.56	98.06
No Opinion	29	1.81	99.88
NA/Refused	2	0.12	100.00
Total	**1601**	**100.00**	

Taken together, what do these results mean? If we treat as missing the responses of Other, No Opinion, and No Answer/Refused, we can scale these four responses. A factor analysis, using maximum likelihood estimation, uncovers only one dimension. The correlation between this single-scaled dimension and the four items are:1) Increased Fees, .99; 2) Hold-the-Line, -.27; 3) Easements, .29; and 4) Cut Costs, -.30. Thus, the first statement is the dominant theme in the four statements, and the others are variations on that theme. There is agreement about raising license fees to cover costs and, to a lesser extent, for programs like easements. Anglers disagree with reducing the number of trout stocked or making cuts in other programs. This scaled dimension weakly correlates with several socioeconomic variables. Not surprisingly, anglers with a higher level of education are more supportive of raising fees ($r = 0.17$), higher incomes ($r = 0.20$), higher occupational status ($r = 0.12$), and higher socioeconomic status ($r = 0.21$). On balance, there is more support for raising fees to maintain or increase programs, than for maintaining fees and cutting programs.

In addition to these rather specific questions, we asked two general satisfaction questions, one reported in Table 119 on wild trout fishing, and the other in Table 120 on stocked trout fishing. One-half of Pennsylvania trout anglers report being "Very Satisfied" or "Satisfied" with wild trout fishing, and 63 percent report similar satisfaction with stocked hatchery trout fishing. Another third of trout anglers are "Somewhat Satisfied" with wild trout fishing, and 22 percent are similarly satisfied with stocked trout fishing. Overall, the two response distributions exhibit quite similar levels of satisfaction with trout fishing in Pennsylvania.

Table 119. How satisfied are with wild trout fishing in Pennsylvania?

Satisfaction	Frequency	Percent	Cum. Pct.
Very Satisfied	202	12.62	12.62
Satisfied	600	37.48	50.09
Somewhat Satisfied	537	33.54	83.64
Not at all Satisfied	170	10.62	94.25
No Opinion	85	5.31	99.56
DK/DR	5	0.31	99.88
NA/Refused	2	0.12	100.00
Total	**1601**	**100.00**	

Table 120. How satisfied are you with stocked hatchery trout fishing in Pennsylvania?

Satisfaction	Frequency	Percent	Cum. Pct.
Very Satisfied	234	14.62	14.62
Satisfied	781	48.78	63.40
Somewhat Satisfied	348	21.74	85.13
Not at all Satisfied	188	11.74	96.88
No Opinion	47	2.94	99.81
DK/DR	3	0.19	100.00
Total	**1601**	**100.00**	

Finally, we asked an open-ended question: "If you could offer the Pennsylvania Fish Commission one piece of advice to improve trout fishing, what would it be?" This question produced a substantial response, with many anglers offering more than one piece of advice. All responses were coded and are reported in Table 121.

First, nearly 18 percent, the modal group of anglers, had no advice to offer the Commission. Another, perhaps similar group of about four percent felt the Commission was doing a good job.

The most frequently mentioned category of substantive advice concerned changing size and creel limits. An earlier section of the questionnaire had covered this topic in some detail, and perhaps respondents were restating their concerns and preferences while these issues were still fresh in mind. The recommended patterns of size and creel limit change were very similar to those of the earlier section.

The next, most frequently mentioned, category concerned law enforcement. This is a topic not covered in prior sections of the questionnaire. Anglers were concerned with three types of law enforcement: 1) regulations that cover illegally caught trout; 2) laws that cover littering; and 3) laws and regulations that protect trout waters from pollution.

Next in order of importance, anglers want the Commission to stock more and larger trout. These pieces of advice were often expressed together, almost like a mantra. In addition, many anglers offered other advice to improve stocking: stock unannounced; stop truck following; change the stocking schedule, e.g. earlier or later in the season; spread trout out over more water while stocking; close the water after stocking; publish stocking times, dates and places; and a variety of other suggestions not already mentioned. All together, anglers offered 720 pieces of advice on stocking trout, by far the major concern.

Some anglers suggested that the Pennsylvania Fish Commission should do more to improve habitat and do more for wild trout. Others were concerned with costs, particularly rising costs of licenses, stamps, and what they perceive is bureaucracy.

Table 121. Distribution of Types of Advice for the Pennsylvania Fish Commission

Advice to PFC	Number	Percent
No Comment	282	17.61
Change Limit	138	8.62
More Enforcement	133	8.31
Stock More Trout	131	8.18
Stock Bigger Trout	127	7.93
Stock Unannounced	100	6.25
Improve Habitat	80	5.00
Stock Differently	73	4.56
Stop Truck Following	73	4.56
PFC Is Doing Good Job	70	4.37
Special Regulated Areas	67	4.18
Stocking Schedule	63	3.94
Stock More Water	58	3.62
Spread Out Stocking	55	3.44
Other	54	3.37
Change Opening Day	54	3.37
Get Rid of Trout Stamp	46	2.87
Support Trout Stamp	41	2.56
Close Water After Stocking	40	2.50
Angler Education	38	2.37
Better Management	37	2.31
License (Cost too Much)	32	2.00
More Wild Trout (Water)	27	1.69
Better Public Relations	19	1.19
Junior License	15	0.94
Better Access	15	0.94
Publish Stocking Times/Dates	10	0.62

In summary, the general advice to the Pennsylvania Fish Commission reflects the image anglers have of the organization. The Commission is responsible for trout management, law enforcement, and the raising and stocking trout. At present, this image has relatively little to do with conservation, improving habitat and extending the wild fishery.

6. Fishing for Species Other Than Trout

Most of the emphasis of this study focuses on trout fishing. However, we included a few questions on angler experience in fishing for other species. Specifically we were interested in estimating angling pressure for non-trout species.

6.1. Fishing Trips and Fishing Pressure by Season

First, among all 1,994 anglers contacted in the survey, 88.7 percent reported they fish for species other than trout. If anglers responded affirmatively, we asked how many non-trout fishing trips they made during a particular period of the angling season. Table 122 reports the total number of non-trout fishing trips for each of the four seasons and then adjusts these raw numbers to fishing rates of *trips per angler-day* to account for the fact that we interviewed more anglers in April and May than in the summer and fall seasons.

During April, fishing pressure is relatively low at 0.055 trips per angler day, then rises through May to 0.107 and peaks during the summer months at 0.118 trips per angler day. During the fall season, fishing pressure drops off to about half the April rate.

Table 122. Fishing Pressure Rates and Total Number of Trips for Non-Trout Species

Non-Trout Categories	April	May	Summer	Fall	Total
Non-Trout Anglers in Survey	664	677	239	189	1,769
Number of Trips During Season	617	2,237	2,598	636	6,088
Angler-Days	11,288	20,987	21,988	23,058	77,321
Trips/Angler-Day	0.055	0.107	0.118	0.028	0.079
Total Non-Trout Trips	903,129	3,211,514	10,565,103	3,270,603	17,950,349

We can use these rates to estimate the total number of fishing trips made by anglers in Pennsylvania. From Table 109 we know that 1,095,544 anglers purchased licenses in 1990-91 and that 88.7 percent of licensed anglers fish for non-trout species. Applying the seasonal rates of Table 122 to the total number of non-trout anglers, we estimate the total number of trips reported in the last row of Table 122.

We estimate that Pennsylvania anglers make about 17.9 million trips annually to fish for non-trout species.[17] The total trips per season are displayed in Figure 28. The summer season clearly dominates the non-trout fishing year with more than three times the number of trips in either May or the fall season.

[17] Unfortunately, these estimates do not include winter season fishing. Thus they are not strictly annual estimates.

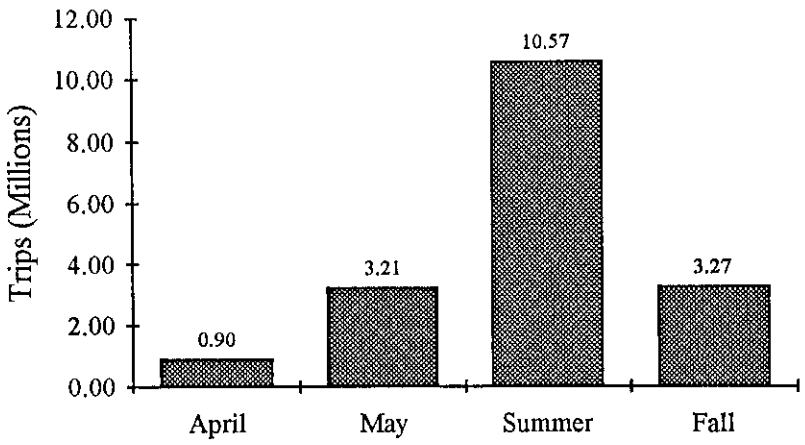

Figure 28. Estimated Distribution of Non-Trout Fishing Trips by Season

6.2. Trips per Angler

Recall that trout anglers average 20.1 trips per year and that the frequency distribution is extremely skewed. We do not have comparable annual data for anglers who fish for species other than trout. However, we can estimate average number of trips per angler for each of the four seasons, and then add these mean values to estimate the synthetic annual rate. Table 123 presents these calculations. We estimate that non-trout anglers make 12.84 trips per year.

Table 123. Mean Trips per Angler by Season, and Estimate of Annual Trips per Angler

Season	Mean	Std. Dev.	Frequency
April	.93	2.32	664
May	1.83	3.92	676
Summer	6.72	12.02	238
Fall	3.36	8.81	189
Annual Mean	12.84		

6.3. Species Sought

We also asked what species of fish anglers were trying to catch, and how many trips they made in pursuit of specific species. These queries were targeted on specific periods of the year. The results are presented in Table 124.

There is clearly a problem with the results in Table 124. A significant number of anglers report making fishing trips for large and smallmouth bass and other species in April and May, periods when these species are not in season. This may be a part of the survey where respondents missed or misinterpreted the survey instructions. We report the detailed

responses, because that is how the questionnaire was written, recognizing there may be problems with these data.

Table 124. Fishing Pressure by Species and Season

APRIL (17 days)		
Species	**Anglers**	**Trips**
Largemouth Bass	53	193
Smallmouth Bass	47	146
Walleye	38	111
Bluegill Sunfish	26	88
Crappie	32	88
American Shad	9	51
Stripped Bass	13	38
Channel Catfish	14	37
Catfish Unspec.	11	31
Yellow Perch	9	30
Northern Pike	6	26
Perch Unspec.	3	22
Carp	6	19
Muskellunge	5	19
Bass (Not Elsewhere Classified)	4	12
Panfish	6	12
Bullhead Catfish	5	10
Pickerel	2	5
Sucker	1	4
King Salmon	1	1
Rock Bass	1	1
MAY (31 days)		
Species	**Anglers**	**Trips**
Smallmouth Bass	76	315
Walleye	62	273
Largemouth Bass	66	268
Crappie	48	199
Bluegill Sunfish	50	197
Bullhead Catfish	13	127
Muskellunge	11	92
Perch Unspec.	12	78
American Shad	11	60
Stripped Bass	13	58
Yellow Perch	12	51
Bass (Not Elsewhere Classified)	18	47
Catfish Unspec.	9	41
Panfish	11	40
Carp	8	31
Pickerel	3	26
Channel Catfish	6	24
Northern Pike	5	20
Other Unspec.	4	9
Multiple Species	1	4
Rock Bass	2	4
Grouper	1	3
Sea Bass	1	1

Table 124. Fishing Pressure by Species and Season (Continued)

SUMMER (92 days)		
Species	**Anglers**	**Trips**
Largemouth Bass	83	772
Smallmouth Bass	71	669
Walleye	41	369
Bluegill Sunfish	24	247
Crappie	14	194
Channel Catfish	10	67
Perch Unspec.	5	61
Carp	7	48
Bullhead Catfish	3	47
Northern Pike	6	42
Yellow Perch	4	40
Muskellunge	7	24
Stripped Bass	4	23
Panfish	2	14
Pickerel	3	14
Bass (Not Elsewhere Classified)	3	11
Catfish Unspec.	2	9
American Shad	1	5
Other Unspec.	1	3
King Salmon	1	2

FALL (122 days)		
Species	**Anglers**	**Trips**
Largemouth Bass	29	318
Smallmouth Bass	37	248
Walleye	21	207
Crappie	7	72
Yellow Perch	10	68
Bluegill Sunfish	7	59
Muskellunge	4	56
Channel Catfish	5	46
Bass (Not Elsewhere Classified)	7	36
Panfish	3	35
Stripped Bass	3	31
Pickerel	1	15
King Salmon	1	12
Bullhead Catfish	1	10
Carp	1	10
Catfish Unspec.	1	10
Sucker	1	10
Northern Pike	3	7
Multiple Species	1	4
Perch Unspec.	1	1

Recall that we first asked respondents how many trips they made for non-trout species during specific periods of the year. The results from this question, reported in Table 122,

make sense. We then followed the general "how many times" question with "for what species" and "how many times for that species" questions. In making that transition, the specific season component of the question may have been lost, and anglers reported a more general level of activity in pursuing specific species. Unfortunately, we don't know who responded with respect to the specific season, and who responded ignoring the season. It may make more sense to aggregate these data across the seasons for interpretation. We report these seasonally-aggregated results in Table 125.

Table 125. Aggregated Distributions of Species by Anglers and Trips

Species	Anglers	Percent of Anglers	Trips	Percent of Trips
Largemouth Bass	231	19.7	1551	22.7
Smallmouth Bass	231	19.7	1378	20.2
Walleye	162	13.8	960	14.1
Bluegill/Sunfish	107	9.1	591	8.6
Crappie	101	8.6	553	8.1
Bullhead Catfish	22	1.9	194	2.8
Muskellunge	27	2.3	191	2.8
Yellow Perch	35	3.0	189	2.8
Channel Catfish	35	3.0	174	2.5
Perch (Not Elsewhere Classified)	21	1.8	162	2.4
Stripped Bass	33	2.8	150	2.2
American Shad	21	1.8	116	1.7
Carp	22	9	108	1.6
Bass (Not Elsewhere Classified)	32	2.7	106	1.6
Panfish	22	1.9	101	1.5
Northern Pike	20	1.7	95	1.4
Catfish (Not Elsewhere Classified)	23	2.0	91	1.3
Pickerel	9	0.8	60	0.9
King Salmon	3	0.3	15	0.2
Sucker	2	0.2	14	0.2
Other Species	5	0.4	12	0.2
Multiple Species	2	0.2	8	0.1
Rock Bass	3	0.3	5	0.1
Grouper	1	0.1	3	0.04
Sea Bass	1	0.1	1	0.01

Large and smallmouth bass are the most frequently sought species, pursued by about one-fifth of Pennsylvania anglers, and accounting for a similar proportion of these trips. Walleye is the third most sought after species, pursued by about 14 percent of anglers. Bluegill/sunfish and crappie are the only other species sought by more than eight percent of anglers. The remaining species all fall below two percent in popularity.

6.4. Comparison of Trout with Non-Trout Fishing

It is interesting to compare the results in Table 125 with comparable trout fishing evidence. In Pennsylvania, 80 percent of the anglers contacted in this survey fish for trout, and make an average of 20 trips per season. The next most sought after species are small and

largemouth bass, with about 20 percent of anglers seeking these species. Those who fish *only* for *non-trout species* make an average of about 13 trips per year. We have estimated that trout anglers make about 17.7 million trips per year, while non-trout anglers make about 17.9 million trips per year. Combined, Pennsylvania anglers make about 35.6 million fishing trips per year, about three trips for every person in the state.

7. Comparison with 1974 Pennsylvania Fishing Study

During the mid-1970s, Daryl K. Heasley, and Margaret E. Cawley published *Activity and Preferences of Pennsylvania Fisherman: 1974*. This study was conducted by telephone, and interviewed a random sample of 2,748 Pennsylvania anglers. Respondents were selected from license applications. Although the 1974 study used a quite different approach, it is interesting to compare some of the more important findings from the 1974 study with the current study.

We will first consider methodology. The earlier study was designed to cover all anglers. Thus it does not have the trout angler focus of the current study. In 1974, researchers had the same problems as the current study reaching potential sample points using only fishing licenses. In fact, the earlier study reports that 55 percent of sampled licenses could not be located. For this study, we could not find telephone numbers for one-third of potential licenses holders. Both studies found that respondents, once reached, were cooperative, interested, and sincere. Both studies had very low refusal rates.

In 1974, Allegheny County also accounted for the most licenses, (9.9%), followed by Westmoreland (3.9%), Erie (3.8%), Luzerne (3.5%), Bucks (3.1%), Montgomery (3.1%), York (3.0%), Dauphin (2.8%), Berks (2.8%). Out-of-state anglers purchased 1.4 percent of the fishing licenses. While the same counties still account for the most licenses today, their percentages are lower. Allegheny County now provides 7.68 percent, Westmoreland 2.45 percent, etc. In general, it appears that the share of anglers from urban areas has dropped. Also, out-of-state anglers accounted for 8.2 percent of 1991 Pennsylvania fishing licenses, a significant rise from the 1.4 percent registered in 1974.

In 1974, 73 percent of anglers fished for warm water species, and the median number of days fished was twelve. In 1991, 88.7 percent of anglers fished for warm water species, and the mean number of days is 12.8. Given the skewness of these trips-per-angler distributions, it would appear that 1991 anglers are fishing fewer days for non-trout species than did 1974 anglers.

Also, in 1974, 73 percent of respondents reported they fished for trout and in 1991 the corresponding figure is 80 percent. The median number of trout-fishing days in 1974 was 10, while in 1991 it was nine. These figures are quite close, given the span of time and the different methodologies.

The 1974 survey asked "how much" anglers liked to fish for various species. The following percentages of anglers said they like to fish for the species "very much": 70 percent for trout; 61 percent for bass; 32 percent for walleye; 25 percent for pike; 22 percent for muskie; and 17 percent for pickerel. The 1991 survey has no directly comparable results. However, the current survey asked about fishing *trips* for these species. Trout, bass, and walleye are still the top three species. However, pan fish are mentioned more frequently in 1991, and pike and pickerel are well down the list. Another difference is the relative importance of trout and bass. In 1974, they are quite close on the "very much" scale.

However, in actual number of trips in the 1991 study, trout is sought by far more anglers than is bass.

In 1974, tackle preferences were asked for *all types of fishing*. Flies were endorsed by 10 percent, artificial lures by 17 percent, either files or lures by 13 percent, and "natural bait" by 58 percent. Among trout anglers in 1991, bait is less common, and flies and lures are more popular. However, because of the methodological differences between the studies, it is difficult to know whether there has truly been a shift in tackle preferences.

Some of the most important results from the 1974 study concerned angler attitudes with respect to Pennsylvania Fish Commission programs. Anglers were asked whether the Commission should expand, maintain, or reduce each listed program, If respondents were not familiar or had no opinion, this was also recorded. Table 126 reproduces these results.

Table 126. Attitudes Toward 1974 Pennsylvania Fish Commission Programs

Program	Percent Expand	Percent Maintain	Percent Reduce	Not Familiar No Opinion
Trout Stocking	48	42	3	8
Stream Improvement	70	23	1	6
Develop Stream Rights	49	35	2	14
Develop Lakes & Reservoirs	50	36	2	12
Warm Water Stocking	48	32	2	18
Wild Trout Program	49	18	2	32
Water Quality Checks	64	25	1	11
Fish Violations	56	38	1	6
Fish Information Services	39	50	2	10

In 1974, there was considerable support for environmentally-oriented trout management, including stream improvement, wild trout program, and water quality checks. All of these received more "expand" support than the trout-stocking program. The general tone of these attitudes matches the 1991 survey. In 1974, improvement in law enforcement received a majority of endorsements, and this notion was also supported in the 1991 survey in the "advice to the Pennsylvania Fish Commission" question. Finally, it is clear that, in 1974, anglers wanted to the Commission to "do more" rather than less. This is also the thrust of the answers to the "tradeoff" questions asked in 1991. In several ways, the attitudes expressed in the 1974 survey are still being expressed today.

8. References

1. Fletcher, James E. and Michael King, *Attitudes and Preferences of Inland Anglers in the State of California, Final Report,* The Survey Research Center, University Foundation, California State University, Chico, 1988.

2. Fowler, Dolores E., *The 1991 Trout Angler Telephone Survey, Phase 1: Data Collection, Final Technical Report*, University Center for Social and Urban Research, University of Pittsburgh, August, 1992.

3. Heasley, Daryl K. and Margaret E. Cawley, *Activity and Preferences of Pennsylvania Fishermen: 1974*, Department of Agricultural Economics and Rural Sociology, College Agriculture, The Pennsylvania State University, University Park, Pennsylvania, January, 1977.

4. *Management of Trout Fisheries in Pennsylvania Waters*, Bureau of Fisheries, Pennsylvania Fish Commission, July 1986, 2nd edition May, 1987.

5. *Pennsylvania Angler*, January, 1992.

6. *Statistical Abstract of the United States, 1985*, 105th Edition, U.S. Department of Commerce, Bureau of the Census, 1984.

7. Wiley, Robert, W., Don Anderson, and Clynn Phillips, *Fishing in Wyoming: A Statewide Study of Angler Preferences and Fishing Patterns*, The Wyoming Game and Fish Department and the University of Wyoming, The Wyoming Cooperative Fishery & Wildlife Research Unit, Laramie, Wyoming, 1988.