MONTANA BIOECONOMICS STUDY:

RESULTS OF THE TROUT STREAM ANGLER PREFERENCE SURVEY

Prepared for
Montana Department of Fish, Wildlife and Parks

By

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PREFACE

In 1985, the Montana Department of Fish, Wildlife and Parks embarked on a two-year survey study to uncover the economic value of sport fishing in Montana and to discover the attitudes and preferences of the anglers who fish for trout in the state's varied rivers and streams. The information generated through the surveys will help us to gain a better understanding of the types of experiences anglers expect when they lay plans to fish for trout in a Montana river or stream. Ultimately, the use of this information will help us design resource management strategies to maintain or to enhance the types of opportunities that anglers have come to expect in Montana.

The initial attitude and preference survey was directed at trout stream anglers because those anglers appear to represent a broad demographic spectrum and have demonstrated that they place a high value on the quality of their fishing experiences. Trout streams were also addressed before other fishery resources because we believe that trout stream habitat, which is so important to the continued existence of our wild trout fisheries, is often in more immediate peril of being adversely impacted.

This is the first time we have attempted to group anglers into categories to help evaluate management preferences and attitudes. This was done in recognition of the fact that not all anglers derive the same experience nor hold the same attitudes about a particular fishing opportunity. Anglers may express widely different attitudes and preferences when they fish in different waters or when they fish for different types of species. Additional surveys will be conducted to uncover these specific attitudes and preferences. This type of information will be helpful in the development of management plans for the various waters in Montana, and to follow the change in angler perceptions and expectations in the years to come.

Patrick Graham
Chief, Fisheries Division

EXECUTIVE SUMMARY

The Montana Bioeconomics Study was designed to estimate the economic value of trout fishing in Montana using travel cost and contingent valuation methods. This report summarizes the noneconomic results of the Angler Preference Survey conducted in Summer and Fall 1986. It is a companion paper to the economic findings reported by John Duffield (1987). The survey had three goals:

1. To clearly specify the projects (trout fishing opportunities) for which economic values were estimated;

2. To learn more about the people who fish for trout on 19 Montana rivers and streams including where they're from, why they're fishing that particular river, what types of experiences they had on their most recent fishing trip, and how they viewed existing and potential fisheries management options;

3. To identify subgroups of trout anglers or angler "types" who obtained similar benefits from trout angling.

Sample Design

The Montana Department of Fish, Wildlife and Parks defined the study population as anglers using 19 Montana rivers and streams. The sampling frame was a list of residents and nonresidents who purchased Montana fishing licenses and were contacted in DFWP's annual fishing pressure survey in 1985. The desired sample size was approximately 200 people who fished each of the 19 streams (Beaverhead, Big Hole, Bighorn, Bitterroot, Blackfoot, Boulder, Upper Clark Fork, Lower Clark Fork, Flathead, South Fork Flathead, Gallatin, Kootenai, Madison, Missouri, Rock Creek, Smith, Stillwater, Upper Yellowstone, and Lower Yellowstone).

The questionnaire asked anglers for information about their most recent fishing trip to the specific target river, so an additional sampling element was the most recent trip. Because the survey was conducted during Summer and Fall 1986, trips taken during that time period were likely oversampled.

An adaptation of Dillman's (1978) Total Design Method was used to conduct the mail survey. A questionnaire booklet, cover letter, and addressed, stamped return envelope were mailed to the sample followed by a postcard reminder and a second letter and booklet to nonrespondents. The mailing was conducted in waves throughout the survey period to obtain data about use of the target rivers over the entire summer season.

Results

The response rate was excellent, averaging 81 percent across the study rivers. Here are some key features of the 2,173 anglers who responded and their most recent fishing trips (these results differed widely depending on what river was fished as shown in the main report):

* 69 percent lived in Montana

* 87 percent were men, and their average age was 38

* 31 percent were members of fishing, sport, or environmental organizations

* They had been fishing for 25 years

* They fished a median of 25 days per year, 20 in Montana

* 24 percent said trout fishing was their favorite activity, 50 percent said it was one of their favorite, and 23 percent said it was one of many outdoor recreation activities they do

* 9 percent were making their first visit to the river; the median years fishing the target river was six

* 59 percent fished for one day or less on the most recent trip while 15 percent fished for two days, eight percent for three, and four percent for four days

* They fished for four hours a day (median)

* 40 percent used flies (46 percent tied their own), ten percent bait, ten percent lures, and 40 percent a combination

* 70 percent fished from shore, nine percent from a boat, and 18 percent from both

* 4 percent had hired a fishing guide on the trip

* 79 percent caught a trout, 19 percent caught one or two, 16 percent three or four, and 12 percent five or six; the median number caught was four, and 30 anglers reported catching more than 100 trout on their most recent trip

* 43 percent caught a large trout; 18 percent caught one, and ten percent two. A large trout about 18 inches (median) was considered large

* The median amount personally spent on the trip by respondents was $15, but the mean was $143 with 20 percent spending $100 or more

* 76 percent said the trip was worth the amount spent

* 25 percent fished alone, 38 percent with one other angler, 22 percent with two others, and nine percent with three others

* 21 percent didn't see any anglers except for their own party 35 percent saw between one and five others, and 20 percent saw between six and ten others

* 51 percent said this was the number of others they'd expected to see, 15 said it was more, 15 percent said it was fewer, and 17 percent said they didn't have any expectations about number of encounters

* 82 percent said the other anglers seen did not affect their own fishing

* If anglers were affected by others, the most common reason was competition for good fishing spots (31 percent of the responses) followed by negative comments about floaters (20 percent), less solitude (15 percent), the area getting fished out (9 percent), and not enough space or seeing others (7 percent each)

Anglers said the most important reasons for making the trip were being outdoors, getting away from it all, and enjoying the scenery. Reasons directly related to fishing were close behind, especially the opportunity to catch wild trout. Catching large trout and testing fishing skills were generally more important than catching many trout or catching trout to eat.

Forty-three percent said they thought there were major problems with how the river was managed, 34 percent said there weren't, and 23 percent said they weren't sure. When presented with a list of possible problems:

* 16 percent said there were too few fish

* 14 percent said water levels were too low

* 13 percent said there were too many boats

* 12 percent said there were too many anglers

* 11 percent said access was inadequate

* 10 percent said the fish were too small

* 7 percent said water quality was poor

* 4 percent said the trout habitat was poor

* 3 percent said there was to much access

* 1 percent said scenic quality was poor

The other management questions presented anglers with a list of different approaches to fisheries management. Anglers were asked to rank their top two choice on three separate questions.

Of the four listed general management strategies, far more anglers favored protecting trout habitat than favored enacting special fishing regulations, the second most preferred option. Stocking streams was one of the two top priorities for about one third of the anglers while improving fishing access was favored by one fifth.

When asked how what type of restrictions they favored to increase in the number of large trout in the stream, anglers preferred reducing limits on number kept to limiting the size of fish kept. This was consistent because 57 percent had said that catching large trout was very important or important while catching many trout was that important for just 34 percent of the anglers.

Close behind reducing limit on numbers kept was gear restrictions, followed by reducing limits on the size of trout that could be kept. Very few anglers favored shortening the season or limiting fishing access sites, both fairly severe restrictions on not just the style of fishing but the ability to fish at all.

Comparing among the four types of special regulations that could be enacted to increase the number of larger trout, more anglers favored a slot limit. Reducing the total limit followed with catching-and-releasing all trout and keeping only small trout, favored by far fewer anglers.

Angler Types

A cluster analysis was conducted on the 17 reasons for choosing to fish a given river on their last trip. The resulting four clusters (angler types) consisted of people who had similar patterns of responses across the 17 items. Two of the angler types (clusters 1 and 2) appeared to be generalists, interested in many aspects of fishing. The third angler type was less serious about angling, and the fourth was composed of highly specialized anglers.

Cluster 1 could be called Nature Generalists. They tended to rate all 17 reasons for trout fishing as important, but the aspects of the experience most important to them were being outdoors, getting away from it all, catching large trout, catching wild trout, and for the solitude. Fishing close to home also was important, suggesting the group contained a high proportion of locals.

Anglers in Cluster 2 could be called Fishing Generalists. The reasons they checked as being most important were catching large trout followed by catching wild trout, being outdoors, having success there before, eating trout, and catching many trout. Fishing close to home was less important, suggesting that many were nonresidents, residents fishing distant waters, or people who lived near a preferred stream.

Cluster 3 could be called Casual Anglers. This was the only group not to highly value opportunities to catch wild trout (although six percent said it was one of their three most important reasons for fishing where they did). In fact, this group tended to rate everything as relatively unimportant except fishing close to home. Their top five reasons for fishing where they did were to be outdoors, getting away from it all, fishing close to home, for the solitude, and to be with their families. None of these related directly to fish populations or catching fish; these anglers seemed to be using fishing as a vehicle to just get outdoors and enjoy themselves, and catching fish may be a pleasant but not necessary bonus.

Anglers in Cluster 4 could be called Specialists. They said their most important reasons for fishing were being outdoors, fishing for wild trout, getting away from it all, testing fishing skills, fishing for large trout, and solitude. This group rated learning about trout as being more important than did any other group.

The four angler types differed on other characteristics as well such as the proportion of residents or fly fishermen, and the management regulations they favored. The results demonstrated that different types of anglers were indeed seeking different experiences from trout fishing and attached different levels of economic value of their angling experiences.

Conclusions

The findings provided a clear description of what was being valued by anglers and why. The full report contains many other results including separate descriptions of the responses for each of the study rivers.

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INTRODUCTION

The Angler Preference Study was designed to estimate the economic value of trout fishing in Montana using travel cost and contingent valuation methods. This draft report summarizes the noneconomic results of the Angler Preference survey, conducted in summer and fall, 1986. It is a companion paper to the economic findings reported by Duffield (1987). The Angler Preference Study had three main goals:

1. To clearly specify the products (trout fishing opportunities) for which economic values were estimated;

2. To learn more about the people who fish for trout on 19 Montana rivers and streams, including where they're from, why they're fishing that particular river, what types of experiences they had on their most recent fishing trip, and how they viewed existing and potential fisheries management options;

3. To identify subgroups of trout anglers or angler "types" who obtained similar benefits from trout angling and had similar perceptions of the trip's economic value.

BACKGROUND

When estimating the economic value of a nonmarket product such as a trout fishing opportunity, it's critical to define the product you're valuing (Driver, 1985). The trout are important, but so are other aspects of the places people go to fish, such as the scenery, how the river is managed, and how many other people are there. In other words, the product of managing streams for trout fishing is not just the trout, but the whole trout fishing setting (defined by its physical, social, and managerial components) and the diverse experiences people seek there.

Recreational activities such as fishing are done in so many different styles, on so many different rivers, and by so many different people, that you can't lump them all together under an activity called "fishing" (Graham, 1985).

Fishing is an experience defined by the angler, but a good deal of research suggests several ways to develop a reasonable number of angler "types," people who are seeking the same types of experiences through fishing. It makes sense to attach dollar values not just to fishing, but to specific types of fishing experiences found on Montana trout streams.

Hobson Bryan's (1979) research on angler specialization paved the way for this area of research. By observing and interviewing anglers on several trout streams in Montana and Idaho, Bryan developed a typology of anglers, from the occasional angler to technique-setting specialists.

Bryan defined specialization as a developmental spectrum. Anglers just introduced to the activity were typically concerned most with just being outdoors, and, perhaps, catching lots of fish, regardless of size or species. As anglers learned more about fishing, they became interested in catching particular species of fish, or big ones. As their techniques were refined, they became more specialized, seeking new types of challenges that depended more on specific characteristics of the resource.

Not every angler progresses orderly across this spectrum from Occasional to Generalist to Technique Specialist to Setting-Technique specialist. However, the typology is useful because it describes the types of outcomes desired by anglers in each group. It's reasonable to hypothesize that the economic value would be higher for some types of experiences and lower for others, because anglers define the psychological products differently.

Angler subgroups also should differ on how they would prefer to see the stream managed, because different experiences are supported (or prohibited) by different management programs. An angler fishing primarily for food may not support the catch-and-release policy favored by an ardent fly-fisher. Occasional anglers may not care how the fishery is managed -- as long as they continue to have river access and some type of fish is present.

Past researchers have had success using cluster analysis to develop subgroups of anglers who fish for similar reasons. Cluster analysis uses a set of variables, such as reasons for fishing or sources of fishing satisfaction, to group together anglers having similar patterns of responses across all the variables. The technique also has been used to identify subgroups of hunters.

Hautaluoma and Brown (1978) used data collected in Washington state to identify ten hunter types, each having a different pattern of satisfactions across five dimensions: nature, harvest, equipment, out-group contact, and skill. The resulting types differed on many other variables, such as commitment to the sport, the importance of harvest, and solitude. Brown, Hautaluoma & McPhail (1977) conducted a cluster analysis to identify eight types of deer hunters in Colorado. Their clustering variables were four dimensions of satisfaction: easy hunt, harvest, out-group contact, and nature. Hautaluoma, Brown & Battle (1981) identified between five and seven hunter types among Colorado elk hunters (depending on license type, such as archery vs. rifle hunters).

One problem with these studies is that they all derived clusters (hunter types) statistically, instead of using an a priori framework or theory to guide cluster number and identification. One result of this is the typically large numbers of clusters that emerged (because they were statistically significant), which may be difficult for management applications.

This has been called the Angler Preference Survey, but we really measured a full range of anglers' beliefs. attitudes, and behaviors. The next section reviews the questionnaire content in more detail, as well as describing how we chose the sample of anglers and how the survey was administered.

METHODS

Sample Design

The Montana Department of Fish, Wildlife and Parks defined the study population as anglers using 19 Montana rivers and streams. The sampling frame was a list of residents and non-residents who purchased Montana fishing licenses and were contacted in DFWP's annual fishing pressure survey in 1985. The desired sample size was approximately 200 people who fished each of the 19 streams.

The questionnaire asked anglers for information about their most recent fishing trip to the specific target river, so an additional sampling element was most recent trip. Because the survey was conducted during the summer and fall, 1986, trips taken during that time period were likely oversampled.

Questionnaire Content

Driver (1985) said that wildlife use opportunities should be defined not just by physically defined attributes of the fish or animal (such as size and species), but by the physical, social, and managerial attributes of the setting (such as regulations, number and type of users, or river size and access) and the recreation users' expected and desired psychological consequences -- why they fish.

To collect this type of information, we asked anglers about their reasons for fishing, past fishing experiences, perceptions of river management problems, responses to possible fisheries management programs, and demographic information. This information helped to specify how different subgroups of anglers defined the trout fishing experience -- how they defined the products of fishery and river management.

The questionnaire (Appendix A) first asked how long and how much the respondent had fished, how fishing compared to other activities they do, and what type of water they fished. The next section asked about specific aspects of their most recent trip to the river in question, including length of trip, equipment used, trout caught and kept, and whether a guide was employed. This was supplemented by questions on past and planned use of the river and comparisons with other Montana streams.

Anglers also were asked whether that was the main river they were fishing on this trip and whether fishing was the main reason for taking the trip. These questions were used to refine the sample for travel cost analyses.

Anglers were then asked to rate the importance of 17 reasons for choosing to fish the river that trip, to identify the types of experiences anglers were seeking. Although these responses were given for a specific river trips, they suggested the experiences anglers desired from fishing in general.

The clustering procedure analyzed anglers' responses to these reasons and grouped together those who responded similarly across all 17 items. The resulting subgroups of anglers were compared on other variables (such as type of equipment used and place of residence) to better understand the basis for the hypothesized subgroup differences in economic value.

Information was collected on anglers' perceptions of the social setting: how many other anglers the respondent saw and how they affected his or her fishing experience.

Anglers also were asked if they had experienced any of 10 possible conflicts or management problems during the trip. A later section, based on Bryan's research, asked for reactions to different management strategies.

Data needed for the economic analyses included distance traveled, time and money spent to reach the river, and the maximum amount people said they'd be willing to pay for the trip beyond actual expenses. Two variations asked the maximum willingness to double the chance of catching a large trout or to catch twice as many trout as they did (if they caught at least one). Information on substitute sites was collected for the travel cost estimates.

Background information collected included age, gender, residence, employment status, membership in fishing, sport, or environmental clubs or organizations, educational level, and household income.

Questionnaire Administration

An adaptation of Dillman's (1978) Total Design Method was used to conduct the mail survey. A carefully designed questionnaire booklet, cover letter, and addressed, stamped return envelope were mailed to the sample. The mailing was conducted in waves throughout the survey period, to obtain data about use of the target rivers over a longer time span, rather than have all anglers report about trips made, for example, in the early summer.

All anglers were sent a postcard reminder one week later. Two weeks after that, a second cover letter urging participation in the study was mailed to people whose questionnaires had not been received. A second copy of the questionnaire booklet and another return envelope were provided. This method typically yields response rates of over 70 percent.

RESULTS

The available DFWP angler data did not allow us to meet the target sample size on many rivers. This was offset somewhat by the excellent rate of response, which averaged 81 percent across rivers. Table 1 shows the number of questionnaires mailed and returned, by river. Response rates were uniformly high, an indication not only of the survey methodology but of trout anglers' level of interest in fisheries management issues.

The results are first reported for the total sample and then individually by river. Following is a discussion of the cluster analysis and the resulting four subgroups' responses.

Description of the Sample

This section describes the 2,173 anglers who responded--where they're from, their fishing history, and some basic demographic information such as education, income, and work status.

* 69 percent lived in Montana
* 87 percent were men and their (median) age was 38
* 31 percent were members of fishing, sport, or environmental organizations
* They had been fishing for 25 years (median)
* They fished a median of 25 days per year, 20 in Montana

Table 1. Number of Questionnaires Mailed and Returned, By River.

River	Number Mailed	Number Returned	Rate of Response
Beaverhead	151	125	83%
Big Hole	185	158	85%
Bitterroot	160	132	82%
Blackfoot	134	107	80%
Boulder	93	77	83%
Bighorn	197	172	87%
Upper Clark Fk	38	35	92%
Lower Clark Fk	182	146	80%
Flathead	107	84	78%
South Fk Flathead	15	14	93%
Gallatin	200	162	81%
Kootenai	107	79	74%
Madison	216	174	81%
Missouri	201	165	82%
Rock Creek	124	101	81%
Smith	62	50	81%
Stillwater	176	136	77%
Upper Yellowstone	179	140	78%
Lower Yellowstone	145	115	79%
TOTALS:	2,672	2,173	81%

* 24 percent said trout fishing was their favorite activity, 50 percent said it was one of their favorite, and 23 percent said it was one of many outdoor recreation activities they do.

* They spent 10 percent of their fishing time at large lakes, 14 percent at small lakes, 31 percent fishing large rivers, 25 percent on small rivers, 14 percent on creeks, and 3 percent on spring creeks (median figures)

* 64 percent were employed full-time, 10 percent part-time, 13 percent retired, and 3 percent unemployed

* 22 percent finished high school, 27 percent attended college, 18 percent obtained a degree, 9 percent did some postgraduate work, and 14 percent had a postgraduate degree.

* Their household income before taxes varied widely, with 4 percent under $5,000 and 6 percent over $75,000. The median income bracket was $25-30,000

Some of these variables are summarized by river in Tables 2-6. This information should help managers to better understand the people who fish a specific river and compare that to the other rivers in the sample. Following are some of the highlights (because of its small sample size, the South Fork of the Flathead is not included in the text description of these and subsequent tables, even though these results <u>are</u> in the tables).

Thirty-one percent of the total number of anglers surveyed were non-residents; the percent per river varied from six percent on the Yellowstone to 66 percent on the Madison (Table 2). The Beaverhead, Kootenai, Lower Clark Fork, and Rock Creek samples contained the next highest proportion of non-residents; the next lowest proportions were on the Upper Clark Fork, Stillwater, and Missouri. Between 18 and 51 percent of the anglers fishing a given river said they belonged to one or more fishing, sport, or environmental organizations (Table 3). Over half of the anglers sampled about their trip to the Madison said they belonged to such groups, compared to 18 percent of those surveyed about the Upper Clark Fork. Over 35 percent of the anglers fishing the Bighorn, Flathead, Gallatin, Smith, Upper Yellowstone, or Rock Creek said they belonged to one or more groups.

The number of years anglers had fished also varied across rivers (Table 4); 22 percent of the anglers on either the Stillwater or the Upper Yellowstone had been fishing for 1-10 years, compared to 11 percent on the Madison and 12 percent on Rock Creek. About 13 percent of the Boulder River anglers and 11 percent of the Bitterroot anglers had been fishing more than 50 years, compared to about 2 percent of the Upper Yellowstone or Bighorn anglers.

Table 2. The number of residents and nonresidents in the sample (reported in percent).

River	Residents	Non-residents	Number of Responses
Beaverhead	56.8	43.2	125
Big Hole	70.3	29.7	158
Bitterroot	73.5	26.5	132
Blackfoot	77.6	22.4	107
Boulder	75.3	24.7	77
Bighorn	67.4	32.6	172
Upper Clark Fork	85.7	14.3	35
Lower Clark Fork	61.4	38.6	145
Flathead	71.4	28.6	84
S. Fork Flathead	50.0	50.0	14
Gallatin	67.3	32.7	162
Kootenai	58.8	41.3	80
Madison	33.5	66.5	179
Missouri	82.3	17.7	164
Rock Creek	63.7	36.3	102
Smith	76.5	23.5	51
Stillwater	84.7	15.3	137
Upper Yellowstone	69.5	30.5	141
Lower Yellowstone	93.9	6.1	115
TOTAL			2,180

Number of missing observations = 3

Table 3. Anglers who belong to a fishing, sport, or environmental organization or group (reported in percent).

River	Yes	No	Number of Responses
Beaverhead	33.1	66.9	121
Big Hole	26.1	73.9	157
Bitterroot	23.8	76.2	130
Blackfoot	20.0	80.0	105
Boulder	32.0	68.0	75
Bighorn	47.3	52.7	165
Upper Clark Fork	17.6	82.4	34
Lower Clark Fork	20.4	79.6	142
Flathead	36.7	63.3	79
S. Fork Flathead	50.0	50.0	14
Gallatin	36.9	63.1	160
Kootenai	23.4	76.6	77
Madison	50.9	49.1	175
Missouri	31.5	68.5	162
Rock Creek	38.1	60.8	97
Smith	35.4	64.6	48
Stillwater	16.9	83.1	130
Upper Yellowstone	35.4	64.6	130
Lower Yellowstone	17.1	82.9	111
TOTAL			2,112

Number of missing observations = 74

Table 4. Number of years anglers have fished (reported in percent, by river).

River	Number of Years						Number of Responses
	1-10	11-20	21-30	31-40	41-50	75 or over	
Beaverhead	16.8	24.8	24.0	18.4	9.6	6.4	125
Big Hole	9.6	23.3	25.0	12.8	18.6	5.1	156
Bitterroot	13.8	26.9	24.6	11.5	11.5	11.5	130
Blackfoot	17.8	21.5	23.4	19.6	9.3	8.4	107
Boulder	18.4	26.3	18.4	18.4	5.3	13.2	76
Bighorn	8.9	26.0	34.3	21.3	7.7	1.8	169
Upper Clark Fork	14.7	14.7	20.6	17.6	26.5	5.9	34
Lower Clark Fork	12.0	19.7	31.0	21.8	11.3	4.2	142
Flathead	17.9	21.4	27.4	10.7	14.3	8.3	84
S. Fork Flathead	21.4	14.3	35.7	14.3	14.3	0.0	14
Gallatin	15.4	24.1	29.0	12.3	12.3	6.8	162
Kootenai	20.0	24.0	18.7	21.3	10.7	5.3	75
Madison	10.8	21.6	23.3	21.0	17.0	6.3	176
Missouri	15.3	15.3	29.4	22.7	11.0	6.1	163
Rock Creek	11.9	21.8	25.7	17.8	13.9	8.9	101
Smith	14.0	22.0	26.0	18.0	8.0	12.0	50
Stillwater	22.4	25.4	22.4	14.9	8.2	6.7	134
Upper Yellowstone	18.0	20.9	25.9	12.2	13.7	9.4	139
Lower Yellowstone	21.9	25.4	25.4	17.5	7.9	1.8	114
TOTAL							2,151

Number of missing observations = 35

The number of days per year anglers fished also varied by river (Table 5). Thirty-two percent of the Boulder anglers and 30 percent of the Blackfoot and Yellowstone anglers fished 10 or fewer days per year, while the proportion for anglers on most other rivers was closer to 20 percent. Over 20 percent of the anglers on the Upper and Lower Clark Fork, Kootenai, and Madison fished 50 or more days a year, compared to five percent of the Big Hole and six percent of the Beaverhead anglers.

When asked if fishing was their favorite outdoor recreation activity, 34 percent of the Madison anglers said it was, compared to 16 percent of the Kootenai River anglers (Table 6). Thirty-nine percent of the Smith River anglers and 37 percent of the Lower Yellowstone anglers said fishing was one of many activities they do, compared to 16 percent of the anglers surveyed about the Bighorn, Gallatin, and Madison. Despite these differences, the anglers on all rivers tended to rate fishing as at least one of their favorite activities.

Most Recent Fishing Trip

Much of the questionnaire asked about their most recent fishing trip on the river in question. Here's a summary of their most recent trip and other responses regarding the target river:

* 80 percent had fished the river within the last six months, showing that the sampling method was successful in reaching anglers; another 12 percent fished the target river within about 1 year

* 9 percent were making their first visit to the river; the median years fishing the target river was 6

* 71 percent said that fishing was the main reason for taking the trip away from home and 20 percent said fishing was one of several main reasons

* 83 percent said that the one river was the main stream fished on the trip, while 12 percent said it was one of several fishing locations

* 59 percent fished for one day or less on the most recent trip, while 15 percent fished for 2 days, 8 percent for three, and 4 percent for 4 days

* They fished for four hours a day (median)

* 40 percent used flies (46 percent of whom tied their own), 10 percent bait, 10 percent lures, and 40 percent a combo

Table 5. Number of days per year anglers fish (reported in percent, by river).

River	Number of Years						Number of Responses
	1-10	11-20	21-30	31-40	41-50	75 or over	
Beaverhead	21.0	27.4	16.1	8.9	8.9	17.7	124
Big Hole	19.9	29.5	18.6	6.4	10.9	14.7	156
Bitterroot	27.5	18.3	26.7	7.6	6.1	13.7	131
Blackfoot	30.5	22.9	22.9	2.9	4.8	16.2	105
Boulder	32.0	21.3	17.3	5.3	10.7	13.3	75
Bighorn	19.2	27.5	18.6	9.0	8.4	17.4	167
Upper Clark Fork	20.6	20.6	26.5	5.9	5.9	20.6	34
Lower Clark Fork	25.0	16.4	26.4	6.4	5.7	20.0	140
Flathead	20.2	20.2	25.0	9.5	8.3	16.7	34
S. Fork Flathead	23.1	38.5	7.7	15.4	7.7	7.7	13
Gallatin	25.9	25.9	19.1	8.6	6.8	13.6	162
Kootenai	19.7	25.0	19.7	7.9	3.9	23.7	76
Madison	20.7	24.7	21.3	4.6	7.5	21.3	174
Missouri	22.1	31.3	21.5	5.5	4.9	14.7	163
Rock Creek	21.0	21.0	23.0	12.0	7.0	16.0	100
Smith	23.5	33.3	23.5	5.9	3.9	9.8	51
Stillwater	30.6	23.1	23.9	5.2	8.2	9.0	134
Upper Yellowstone	25.9	25.9	17.8	5.2	10.4	14.8	135
Lower Yellowstone	30.4	17.0	26.8	2.7	5.4	17.0	112
TOTAL							2,136

Number of missing observations = 50

Table 6. Importance of fishing compared to other outdoor recreation activities (reported in percent, by river).

River	Favorite	One of My Favorites	One of Many	I Prefer Others	Total Responses
Beaverhead	26.0	51.2	22.8	0.0	123
Big Hole	27.2	43.0	26.6	3.2	158
Bitterroot	24.2	42.4	29.5	3.0	132
Blackfoot	23.4	50.5	23.4	1.9	107
Boulder	23.7	53.9	21.1	1.3	76
Bighorn	26.9	55.1	16.8	1.2	167
Upper Clark Fork	14.7	50.0	35.3	0.0	34
Lower Clark Fork	23.9	54.9	21.1	0.0	142
Flathead	19.0	53.6	25.0	2.4	34
S. Fork Flathead	14.3	57.1	21.4	7.1	14
Gallatin	24.7	55.6	16.7	3.1	162
Kootenai	15.8	60.5	21.1	2.6	76
Madison	33.7	49.4	15.7	1.1	178
Missouri	20.2	55.8	22.7	1.2	163
Rock Creek	29.6	52.0	18.4	0.0	98
Smith	29.4	31.4	39.2	0.0	51
Stillwater	18.9	56.8	22.7	1.5	132
Upper Yellowstone	24.1	46.7	25.5	3.6	137
Lower Yellowstone	18.8	44.6	36.6	0.0	112
TOTAL					2,146

Number of missing observations = 40

* 70 percent fished from shore, 9 percent from a boat, and 18 percent from both

* 4 percent had hired a fishing guide on the trip

* 79 percent caught a trout, 19 percent caught 1 or 2, 16 percent 3 or 4, and 12 percent 5 or 6; the median number caught was 4 and 30 anglers reported catching more than 100 trout on their most recent trip

* 43 percent caught a large trout; 18 percent caught 1, and ten percent 2. A trout about 18 inches (median) was considered large

* The median amount personally spent on the trip by respondents was $15.00 but the mean was $143.00, with 20 percent spending $100.00 or more

* 76 percent said the trip was worth the amount spent

* 95 percent planned to continue fishing the river, 57 percent as frequently as they do now, 20 percent more, and 5 percent less; 17 percent were not sure

These responses also differed by river, as shown by Tables 7-15. Seventy-one percent of the anglers said the main reason for taking this trip away from home was to fish, but the figures per river ranged from a low of 59 percent on the Smith to a high of 87 percent on the Bighorn (Table 7). The percent of anglers who said the target river was the main river fished this trip varied from 68 percent on the Madison to 99 percent on the Missouri (Table 8). This is partly an indication of the proportion of local use; many anglers who fished the Madison, for example, also fished other southwestern Montana trout streams.

Trip length varied from an average of six hours of fishing on the Gallatin River to 20 hours on the Madison (Table 9). Anglers on just four rivers said that they fished less than eight hours on their most recent trip.

Altogether, 27 percent of the anglers fished from a boat at least some of the time on their most recent trip (Table 10). The highest proportion of boat use by far (61 percent of the anglers) was on the Bighorn, followed by the Smith (28 percent), the Madison (26 percent) and the Upper Yellowstone (25 percent). The highest proportions of shore anglers were found on the Boulder (98 percent), the Gallatin (96 percent), Rock Creek (95 percent), and the Stillwater (92 percent).

Table 7. Importance of fishing as reason for taking this trip away from home (reported in percent, by river).

River	Main Reason	One of Several Reasons	Less Important Than Other Reasons	Number of Responses
Beaverhead	79.0	8.9	12.1	124
Big Hole	73.9	16.6	9.6	157
Bitterroot	69.0	19.8	11.1	126
Blackfoot	64.4	21.8	13.9	101
Boulder	64.0	25.3	10.7	75
Bighorn	87.2	10.4	2.4	164
Upper Clark Fork	74.2	16.1	9.7	31
Lower Clark Fork	73.4	20.9	5.8	139
Flathead	63.5	25.7	10.8	74
S. Fork Flathead	50.0	33.3	16.7	12
Gallatin	74.7	20.1	5.2	154
Kootenai	68.4	18.4	13.2	76
Madison	65.5	24.3	10.2	177
Missouri	75.2	16.1	8.7	161
Rock Creek	66.7	24.0	9.4	96
Smith	59.1	25.0	15.9	44
Stillwater	60.8	32.3	6.9	130
Upper Yellowstone	67.7	17.7	14.6	130
Lower Yellowstone	77.6	21.5	0.9	107
TOTAL				2,078

Number of missing observations = 108

Table 8. Was this the main river fished on the trip? (reported in percent)

River	Main Reason	One of Several Reasons	Less Important Than Other Reasons	Number of Responses
Beaverhead	73.0	21.3	5.7	122
Big Hole	73.0	13.5	6.5	155
Bitterroot	82.0	12.5	5.5	128
Blackfoot	86.1	8.9	5.0	101
Boulder	78.7	17.3	4.0	75
Bighorn	92.1	6.7	1.2	164
Upper Clark	87.1	6.5	6.5	31
Lower Clark Fork	87.6	10.2	2.2	137
Flathead	87.8	10.8	1.4	74
S. Fork Flathead	66.7	16.7	16.7	12
Gallatin	74.4	15.4	10.3	156
Kootenai	94.7	1.3	4.0	75
Madison	67.6	26.7	5.7	176
Missouri	98.8	0.6	0.6	160
Rock Creek	76.8	15.8	7.4	95
Smith	91.1	8.9	0.0	45
Stillwater	89.2	7.7	3.1	130
Upper Yellowstone	85.4	10.0	4.6	130
Lower Yellowstone	80.4	11.2	8.4	107
TOTAL				2,073

Number of missing observations = 113

Table 9. Mean lengths of fishing trips on each river (reported in hours)

River	Mean	Number of Cases
Beaverhead	11.5000	122
Big Hole	12.0533	150
Bitterroot	8.3583	120
Blackfoot	7.5446	101
Boulder	15.6447	76
Bighorn	13.6727	165
Upper Clark Fork	7.4138	29
Lower Clark Fork	10.2835	127
Flathead	11.8133	75
S. Fork Flathead	30.1538	13
Gallatin	6.4872	156
Kootenai	9.4110	73
Madison	20.0983	173
Missouri	9.5897	156
Rock Creek	13.4845	97
Smith	13.0000	46
Stillwater	7.2283	127
Upper Yellowstone	16.9154	130
Lower Yellowstone	18.0515	97
TOTAL		2,183

Number of missing cases = 150

Table 10. Number of anglers who fished from a boat, on shore, or both on their most recent trip to the river (reported in percent)

River	Shore	Boat	Both	Number of Responses
Beaverhead	68.3	14.6	17.1	123
Big Hole	71.3	16.6	12.1	157
Bitterroot	75.4	9.2	15.4	130
Blackfoot	82.4	8.8	8.8	102
Boulder	98.7	0.0	1.3	77
Bighorn	30.9	8.5	60.6	165
Upper Clark Fork	87.1	6.5	6.5	31
Lower Clark Fork	78.7	9.2	12.1	141
Flathead	58.7	21.3	20.0	75
S. Fork Flathead	61.5	0.0	38.5	13
Gallatin	96.2	1.3	2.5	158
Kootenai	77.6	5.3	17.1	76
Madison	64.6	9.7	25.7	175
Missouri	66.3	17.5	16.3	160
Rock Creek	94.8	2.1	3.1	97
Smith	61.7	10.6	27.7	47
Stillwater	92.4	2.3	5.3	131
Upper Yellowstone	61.7	13.5	24.8	133
Lower Yellowstone	74.0	5.8	20.2	104
TOTAL				2,095

Number of missing observations = 91

Although just three and a half percent of the sample used an outfitter on their trip, the actual proportion varied from 12 percent on the Madison and nine percent of the Upper Yellowstone down to one percent on four other rivers (Table 11).

The proportion of anglers who used flies on their most recent trip varied from six percent on the Lower Yellowstone (although 63 percent said they used a combination) to 69 percent of the Madison anglers (Table 12). This partly reflects the different fishing regulations in place, but also anglers' preferences for equipment type on different streams. Only three percent of the Rock Creek anglers used bait, compared to 18 percent of the Kootenai anglers.

Of the anglers who reported using flies, 57 percent of the Bighorn anglers and 57 percent of the Lower Yellowstone anglers said they tied their own, compared to 34 percent of the Smith River anglers (Table 13). The 46 percent average across all rivers reflects the importance of off-site aspects of fishing to many anglers.

Catch rates were calculated by dividing the number of trout caught by the number of hours fished. Anglers' trout catch rates varied considerably by river (Table 14); 28 percent of the Boulder River anglers caught four or more trout per hour, compared to 9 percent of those fishing the Gallatin. About half of the Lower Yellowstone anglers caught a fish, compared to 92 percent of the Boulder River anglers. Another difference among rivers was the size a trout had to be before it was considered "large" (Table 15). The highest proportions of anglers who said a trout had to be 20" or more to be large were those fishing the Beaverhead, Bighorn, Madison, Missouri, and Upper Yellowstone.

Social Setting

Another set of questions asked about characteristics of the social setting on their last trip, an important issue for a number of reasons. Anglers can affect not only the fish population size and structure, but can affect each other by competing for fish, disrupting their fishing, or intruding on their search for solitude. The DFWP already has conducted social carrying capacity research on one stream, Nelson's Spring Creek (Allen, 1986).

Here are some of the social conditions present on anglers' most recent trip to the target river:

* 25 percent fished alone, 38 percent with one other angler, 22 percent with 2 others, and 9 percent with 3 others

Table 11. Anglers who used a fishing guide or outfitter on their most recent trip (reported in percent).

River	Yes	No	Number of Responses
Beaverhead	6.5	93.5	123
Big Hole	5.2	94.8	154
Bitterroot	3.8	96.2	130
Blackfoot	1.0	99.0	103
Boulder	0.0	100.0	77
Bighorn	4.8	95.2	166
Upper Clark Fork	0.0	100.0	31
Lower Clark Fork	0.0	100.0	140
Flathead	2.6	97.4	78
S. Fork Flathead	8.3	91.7	12
Gallatin	0.0	100.0	159
Kootenai	1.3	98.7	75
Madison	12.0	88.0	175
Missouri	0.6	99.4	159
Rock Creek	1.0	99.0	97
Smith	2.1	97.9	47
Stillwater	2.3	97.7	131
Upper Yellowstone	9.1	90.9	132
Lower Yellowstone	0.9	99.1	107
TOTAL			2,096

Table 12. Type of equipment used (reported in percent, by river)

River	Bait	Lures	Flies	Combination	Number of Responses
Beaverhead	16.1	12.9	30.6	40.3	124
Big Hole	10.8	9.6	43.3	36.3	157
Bitterroot	13.7	6.9	41.2	38.2	131
Blackfoot	11.7	9.7	30.1	48.5	103
Boulder	9.1	14.3	32.5	44.2	77
Bighorn	4.8	9.7	59.4	26.1	165
Upper Clark Fork	12.9	9.7	38.7	38.7	31
Lower Clark Fork	10.0	5.7	37.9	46.4	140
Flathead	16.0	21.3	22.7	40.0	75
S. Fork Flathead	0.0	7.1	64.3	28.6	14
Gallatin	7.6	9.5	52.5	30.4	158
Kootenai	18.4	7.9	23.7	50.0	76
Madison	3.4	4.5	69.5	22.6	177
Missouri	12.5	7.5	26.9	53.1	160
Rock Creek	3.1	8.2	66.0	22.7	97
Smith	6.4	14.9	42.6	36.2	47
Stillwater	9.9	6.9	33.6	49.6	131
Upper Yellowstone	7.6	9.8	43.2	39.4	132
Lower Yellowstone	15.4	15.4	5.8	63.5	104
TOTAL					2,099

Number of missing observations = 87

Table 13. If anglers used flies, did they tie their own? (reported in percent).

River	Yes	No	Number of Responses
Beaverhead	42.6	57.4	68
Big Hole	43.8	56.2	105
Bitterroot	46.2	53.8	78
Blackfoot	41.0	59.0	61
Boulder	37.5	62.5	48
Bighorn	56.8	43.2	125
Upper Clark Fork	50.0	50.0	18
Lower Clark Fork	47.9	52.1	94
Flathead	38.2	58.8	34
S. Fork Flathead	58.3	41.7	12
Gallatin	47.6	52.4	105
Kootenai	45.2	54.8	31
Madison	46.9	53.1	143
Missouri	47.7	52.3	88
Rock Creek	42.2	57.8	83
Smith	34.4	65.6	32
Stillwater	45.5	54.5	77
Upper Yellowstone	37.7	62.3	77
Lower Yellowstone	56.7	43.3	30
TOTAL			1,309

Number of missing observations = 877

Table 14. Trout caught per hour of fishing (reported in percent, by river).

River	None	1-2 per Hour	2-3 per Hour	3-4 per Hour	More Than 4 per Hour	Number of Responses
Beaverhead	9.7	18.5	25.0	25.8	21.0	124
Big Hole	14.3	22.7	17.5	24.0	21.4	154
Bitterroot	23.6	15.4	22.0	21.1	17.9	123
Blackfoot	23.4	14.0	21.5	20.6	19.6	107
Boulder	7.9	22.4	17.1	25.0	27.6	76
Bighorn	16.3	26.7	21.5	20.9	14.5	172
Upper Clark Fork	24.2	21.2	9.1	18.2	27.3	33
Lower Clark Fork	27.5	11.6	18.8	18.8	21.7	138
Flathead	42.9	13.1	16.7	9.5	17.9	84
S. Fork Flathead	28.6	42.9	7.1	7.1	14.3	14
Gallatin	21.3	22.5	27.5	19.4	8.8	160
Kootenai	26.9	15.4	15.4	21.8	20.5	78
Madison	10.2	21.0	28.4	22.7	17.6	176
Missouri	19.9	11.8	17.4	21.7	28.6	161
Rock Creek	18.8	22.8	28.7	14.9	13.9	101
Smith	22.0	24.0	28.0	14.0	12.0	50
Stillwater	27.6	22.4	17.2	14.9	17.9	134
Upper Yellowstone	20.9	18.0	16.5	21.6	22.3	139
Lower Yellowstone	50.9	6.3	8.0	10.7	23.2	112
TOTAL						2,136

Number of missing observations = 50

Table 15. Anglers' perceptions of the size of trout considered "large" (reported in percent).

River	15" or less	16"-19"	20" or more	Number of Responses
Beaverhead	11.2	25.9	62.9	116
Big Hole	26.4	41.9	31.8	148
Bitterroot	42.5	42.5	15.0	127
Blackfoot	44.6	38.6	16.8	101
Boulder	44.4	34.7	20.8	72
Bighorn	9.3	33.3	57.4	162
Upper Clark Fork	35.5	35.5	29.0	31
Lower Clark Fork	29.4	55.1	15.4	136
Flathead	21.6	58.1	20.3	74
S. Fork Flathead	36.4	36.4	27.3	11
Gallatin	36.8	44.5	18.7	155
Kootenai	47.3	36.5	16.2	74
Madison	13.9	46.4	39.8	166
Missouri	20.3	44.4	35.3	153
Rock Creek	29.5	54.5	15.9	88
Smith	26.1	50.0	23.9	46
Stillwater	42.7	42.7	14.5	124
Upper Yellowstone	23.0	38.1	38.9	126
Lower Yellowstone	29.2	39.6	31.3	96
TOTAL				2,006

Number of missing observations = 117

* 21 percent didn't see any anglers except for their own party, while 35 percent saw between 1 and 5 others and 20 percent saw between 6 and 10 others

* 51 percent said this was the number of others they'd expected to see, 15 percent said it was more, 15 percent said it was fewer, and 17 percent said they didn't have any expectations about number of encounters

* 82 percent said the other anglers seen did not affect their own fishing

* If anglers were affected by others, the most common reason was competition for good fishing spots (31 percent of the responses), followed by negative comments about floaters (20 percent), less solitude (15 percent), the area getting fished out (9 percent), and not enough space or seeing others (7 percent each)

As expected, these results also varied by river (Table 16). Although 16 percent of the whole sample said they saw more anglers than they expected to, the proportions varied from five percent of the Boulder anglers up to 33 percent of the Bighorn anglers, 28 percent of the Rock Creek anglers, and about 23 percent of the Madison and Smith River anglers. The proportion who saw fewer anglers than expected varied from about 12 percent on the Bighorn, Big Hole, Bitterroot, Upper Clark Fork, Rock Creek, and the Lower Yellowstone, to over 20 percent on the Boulder and Kootenai. The proportion who didn't have any expectations about how many other anglers they'd see varied from eight percent on the Bighorn to over 20 percent on the Big Hole, Blackfoot, Upper Clark Fork, Flathead, Smith, and Lower Yellowstone.

Anglers on the Bighorn were most likely to say they'd been affected by other anglers; 37 percent reported being affected (Table 17). About 28 percent of the Rock Creek anglers and 25 percent of the Madison anglers said that other anglers' presence affected their own fishing. Just five percent of the Kootenai anglers said they were affected by anglers not in their party, as did 10 percent of the Lower Clark Fork or Boulder River anglers.

Anglers who reported being affected were asked how in an open-ended format. The results were grouped into eight categories (Table 18); percents should be interpreted cautiously because of the low sample size for some rivers on this question.

Table 16. Whether anglers saw about the same, more, or fewer anglers than they expected to see (reported in percent, by river).

River	More	About Same	Fewer	No Expectation	Number of Responses
Beaverhead	17.2	50.8	18.9	13.1	122
Big Hole	17.4	47.7	12.3	22.6	155
Bitterroot	14.7	58.9	11.6	14.7	129
Blackfoot	9.7	48.5	18.4	23.3	103
Boulder	5.3	52.0	22.7	20.0	75
Bighorn	33.1	46.4	12.0	7.8	166
Upper Clark Fork	9.4	56.3	12.5	21.9	32
Lower Clark Fork	7.1	55.7	18.6	18.6	140
Flathead	13.2	46.1	18.4	22.4	76
S. Fork Flathead	30.8	46.2	15.4	7.7	13
Gallatin	12.1	58.0	15.3	14.6	157
Kootenai	6.8	51.4	27.0	14.9	74
Madison	23.9	50.0	13.6	12.5	176
Missouri	13.0	50.3	17.4	18.6	161
Rock Creek	27.8	43.3	11.3	17.5	97
Smith	23.3	41.9	14.0	20.9	43
Stillwater	9.2	58.8	16.0	16.0	131
Upper Yellowstone	17.1	50.4	14.0	18.6	129
Lower Yellowstone	14.2	49.1	12.3	24.5	106
TOTAL					2,085

Table 17. Did the other anglers seen affect respondent's fishing? (reported in percent).

River	Yes	No	Number of Responses
Beaverhead	22.8	77.2	123
Big Hole	17.4	82.6	155
Bitterroot	21.9	78.1	128
Blackfoot	12.7	87.3	102
Boulder	10.7	89.3	75
Bighorn	36.8	63.2	163
Upper Clark Fork	12.9	87.1	31
Lower Clark Fork	10.1	89.9	139
Flathead	16.0	84.0	75
S. Fork Flathead	15.4	84.6	13
Gallatin	13.5	86.5	155
Kootenai	5.4	94.6	74
Madison	24.7	75.3	174
Missouri	12.4	87.0	161
Rock Creek	28.4	71.6	95
Smith	11.4	88.6	44
Stillwater	13.2	86.8	129
Upper Yellowstone	15.3	84.7	131
Lower Yellowstone	11.3	88.7	106
TOTAL			2,073

Number of missing observations = 113

Table 18. If other anglers affected the respondent's fishing, what was the specific reason? (reported in percent, by river).

River	Competition For Holes	Impact On Fish	Other Anglers	Decrease of Solitude	Floating Related	Other Responses	No Special Reason	Number of Responses
Beaverhead	22.2	11.2	7.4	11.1	33.3	11.1	3.7	27
Big Hole	28.6	10.7	10.7	17.9	17.9	10.7	3.6	28
Bitterroot	18.5	0.0	7.4	22.2	25.9	18.5	7.4	27
Blackfoot	25.0	8.3	8.3	16.7	25.0	16.7	0.0	12
Boulder	12.5	12.5	12.5	25.0	0.0	37.5	0.0	8
Bighorn	50.8	4.6	3.1	10.8	18.5	9.2	3.1	65
Upper Clark Fork	50.0	25.0	0.0	25.0	0.0	0.0	0.0	4
Lower Clark Fork	21.4	7.1	7.1	14.3	21.4	28.6	0.0	14
Flathead	7.7	23.1	7.7	15.4	30.8	15.4	0.0	13
S. Fork Flathead	0.0	50.0	0.0	0.0	0.0	50.0	0.0	2
Gallatin	28.6	19.0	19.0	28.6	0.0	4.8	0.0	21
Kootenai	33.3	33.3	33.3	0.0	0.0	0.0	0.0	3
Madison	27.9	9.3	4.7	11.6	23.3	16.6	7.0	43
Missouri	40.0	10.0	0.0	0.0	25.0	25.0	0.0	20
Rock Creek	20.7	13.8	6.9	13.8	24.1	17.2	3.4	29
Smith	66.7	0.0	0.0	16.7	0.0	16.7	0.0	6
Stillwater	44.4	5.6	5.6	22.2	5.6	16.7	0.0	18
Upper Yellowstone	29.4	0.0	11.8	17.6	35.3	0.0	5.9	17
Lower Yellowstone	18.2	9.1	18.2	18.2	18.2	9.1	9.1	11
TOTAL								368

Number of missing cases = 1,815

The most common reported effect was having to compete with other anglers for good fishing holes, the reason cited by 51 percent of the Bighorn anglers and 28 percent of the Madison anglers. Eighteen percent on the Bighorn and 23 percent on the Madison made negative comments about floaters. Over 10 percent of the anglers on each river said anglers detracted from solitude.

Resource Substitutes

The availability and use of substitute fishing locations was a critical factor in the economic analysis. The issue of resource substitutability has been a focus in the recreation literature for nearly two decades (Moss and Lamphear, 1970; Christensen and Yoesting, 1977; Baumgartner and Heberlein, 1981).

In one of the better studies on substitutability, Shelby (undated) studied fishing on New Zealand rivers to see if they were true substitutes based only not on physical characteristics but in the beliefs, attitudes, and behaviors of the angler populations. He compared two salmon fishing rivers to assess whether they on physical characteristics such as geology, location, proximity to population centers, river flows, fish populations, facilities. He also asked anglers on both rivers if the other was considered an acceptable substitute fishing location, and why or why not.

A full study of substitutability was not the goal of this study, but some information was collected. We asked anglers if they were fishing their favorite stream, and whether there were any other streams or rivers in Montana comparable to the river they were fishing. Of course, this does not necessarily mean that these streams are substitutes; they also could be considered complements. Anglers who live far away may consider a set of streams as a package of angling opportunities, and may not have made the trip for one river alone.

* 19 percent said they were fishing their favorite stream in Montana, 41 percent said it was one of their favorites, 29 percent said it was one of many places they fish, and 11 percent said they prefer to fish elsewhere

* 67 percent said there were other Montana trout streams that provided a comparable fishing experience

* 44 percent named one comparable river, 30 percent named two, 15 percent three, and six percent four other rivers

The proportion of anglers who said they were fishing their favorite river varied from 30 percent of the Boulder anglers (and 26 percent on the Madison and 25 percent on the Bighorn) to six percent of the Lower Yellowstone and Upper Clark Fork anglers

(Table 19). Twenty-four percent of the Lower Yellowstone anglers, 19 percent of the Bitterroot anglers, and about 16 percent of the Blackfoot and Flathead anglers said they preferred to fish elsewhere.

About two-thirds of the anglers said one or more comparable trout streams existed in Montana, but the range was from 46 percent of the Kootenai anglers and 54 percent of the Bighorn anglers up to 80 percent of the Gallatin anglers and 79 percent of those fishing the Bitterroot (Table 20).

It would be incorrect to interpret these proportions as indicators of river quality, however, because different anglers had different contexts. In other words, some anglers knew about more rivers, so they had a broader basis for comparison.

These results viewed substitute settings in an unconstrained format; it would be better to know what other river(s) they might actually have visited, presumably constrained by the same factors as the trip they actually took. It's also important to know where the other river is located relative to the actual river visited, because travel cost is viewed as one determinant of behavior.

* Median travel time from home to the actual (target) river was 1 hour but the mean was 4 3/4. 14 percent took 1/2 hour to reach the river, 28 percent 1 hour, 8 percent 1 1/2 hours, and 10 percent took 10 or more hours (these percentages include 0 as a legitimate response)

* Median distance traveled was 45 miles, with a mean of 224 miles because 13 percent traveled more than 500 miles (again assuming 0 is a valid response)

* When asked where they would have fished instead if they couldn't have fished the target river, the anglers named nearly 350 streams

* Median distance from home to the alternate river was 40 miles (mean was 179), close enough to the actual distance traveled for the rivers to be considered realistic substitutes

* 26 percent said the alternate river was comparable to the target river, 18 percent said it was worse, 21 percent said it was better, and 21 percent said there were trade-offs between the two (such as the fishing's better but it's more crowded).

Studying these results by river revealed some interesting differences. For example, anglers' perceptions of alternate river comparability were shown by the relative proportions of anglers who made general statements that the alternate river was

Table 19. Anglers' ratings of river fished, compared to other Montana streams (reported in percent, by river).

River	Favorite	One of my Favorites	One of Many	I Prefer Others	Total Responses
Beaverhead	17.2	49.2	27.0	6.6	122
Big Hole	23.3	42.0	29.3	5.3	150
Bitterroot	13.5	40.5	27.0	19.0	126
Blackfoot	10.7	43.5	30.1	15.5	103
Boulder	30.3	36.8	27.6	5.3	76
Bighorn	24.6	42.5	22.8	10.2	167
Upper Clark Fork	6.3	40.6	43.8	9.4	32
Lower Clark Fork	19.4	34.5	31.7	14.4	139
Flathead	14.7	25.3	44.0	16.0	75
S. Fork Flathead	0.0	69.2	7.7	23.1	13
Gallatin	17.8	40.8	31.8	9.6	157
Kootenai	21.1	43.4	23.7	11.8	76
Madison	25.6	47.0	20.2	7.1	168
Missouri	20.8	44.0	28.3	6.9	159
Rock Creek	23.2	38.9	29.5	8.4	95
Smith	14.9	40.4	38.3	6.4	47
Stillwater	14.4	37.9	34.8	12.9	132
Upper Yellowstone	19.7	41.7	30.7	7.9	127
Lower Yellowstone	6.4	32.1	37.6	23.9	109
TOTAL					2,073

Number of missing observations = 113

Table 20. Are there comparable trout streams in Montana? (reported in percent).

River	Yes	No	Number of Responses
Beaverhead	70.6	29.4	119
Big Hole	70.7	29.3	147
Bitterroot	78.6	21.4	117
Blackfoot	74.2	25.8	93
Boulder	70.4	29.6	71
Bighorn	54.1	45.9	159
Upper Clark Fork	75.9	24.1	29
Lower Clark Fork	66.7	33.3	129
Flathead	57.1	42.9	70
S. Fork Flathead	53.8	46.2	13
Gallatin	80.3	19.1	152
Kootenai	46.4	53.6	69
Madison	66.4	33.6	152
Missouri	60.1	39.2	153
Rock Creek	69.6	30.4	92
Smith	73.3	26.7	45
Stillwater	70.7	29.3	123
Upper Yellowstone	56.8	43.2	125
Lower Yellowstone	68.3	31.7	102
TOTAL			1,962

Number of missing observations = 224

worse/much worse, the same, or better/much better. Across all rivers, 26 percent said the alternate was the same, 18 percent said it was poorer or much poorer, and slightly more, 21 percent, said the alternate river was better or much better.

On five rivers, more anglers said the alternate river was worse than said it was better (the Beaverhead, Bighorn, Rock Creek, Missouri, and Kootenai). The alternate river was considered to be better than it was worse by anglers on eight rivers (the Bitterroot, Upper and Lower Clark Fork, Flathead, Gallatin, Stillwater, Upper and Lower Yellowstone). On the remaining five rivers, equal proportions of anglers (within five percent) considered the alternate river better or worse (The Big Hole, Blackfoot, Boulder, Madison, and Smith).

These results can be interpreted many ways; they don't mean the same thing on each river, and you'd have to know what specific alternate rivers were mentioned to have a context for comparison. But no matter what their reasons, peoples' overall evaluations of the river they fished compared to a possible alternate provides a general index of perceived substitutability.

The results suggested that at least 20 percent of the anglers did not consider the alternate rivers to be effective substitutes. The fairly large proportion of anglers (about one-quarter of the total sample) who said that there were trade-offs involved shows the uncertainty associated with perceived substitutability.

Desired Experiences

Anglers' fishing behavior and management preferences should be strongly related to the type of experience they're seeking. Our operational definition of this was anglers' reasons for choosing the target river for their last trip.

Table 21 shows the importance of 17 possible reasons for choosing the target river to fish on the most recent trip. Anglers said the most important reasons were being outdoors, getting away from it all, and enjoying the scenery. Reasons directly related to fishing were close behind, especially the opportunity to catch wild trout. Catching large trout and testing fishing skills were more important than catching many trout or catching trout to eat.

The sample was divided on the importance of fishing a river close to home; many residents and non-residents had traveled some distance to the river, while local residents were also well-represented. The results suggest that the sampling method yielded a good cross-section of trout anglers.

Table 21. Importance of 17 reasons for choosing fishing location (reported in percent).

Reason	Very Important	Important	Not Very Important	Not At All Important
Catch wild trout.	34	44	17	4
For the solitude.	30	50	14	5
Catch many trout.	9	28	43	20
Learn about trout	9	36	31	22
Get away from it all.	37	46	11	5
Catch large trout.	24	37	29	9
Fish close to home.	17	33	20	29
To be outdoors.	50	45	4	1
Catch trout to eat.	12	25	30	32
View the scenery.	27	55	13	5
Special regulations.	3	10	28	49
Test fishing skills.	17	40	27	15
Be with family.	19	32	20	28
Where friends were going.	3	15	23	56
Avoid other anglers.	14	35	30	19
Fished here before.	21	47	17	13
To fish a new place.	4	19	30	44

The cluster analysis discussed in the next section divided the total sample into subgroups based on these 17 reasons, so it's important to understand how they are related to each other. Studying the intercorrelations showed these relationships, and a factor analysis revealed their underlying patterns.

Factor analysis studies the correlation matrix and searches for variables that are strongly intercorrelated with each other, but not with the rest of the variables. The resulting factors are variables that fit together; when one reason was rated as important, so were the others. The factors are independent (uncorrelated with each other).

A principal components analysis with varimax rotation yielded four factors having eigenvalues greater than 1.0, and accounting for about 50 percent of the variance.

The first factor to emerge was loaded by catching large trout (.71), wild trout (.70), testing fishing skills (.63), learning about trout (.62), catching many trout (.62), fished here before (.54), and special regulations (.51). We could call this factor Fishing, because the various fishing-related aspects, not surprisingly, were all interrelated -- except fishing for food.

The next factor was loaded by getting away from it all (.75), solitude (.75), viewing the scenery (.72), and being outdoors (.68). This is a more generic outdoor recreation factor, commonly found in similar analyses of other activities. In other words, people fish for many of the same reasons they do many other outdoor activities in Montana. (The numbers in parentheses are factor loadings, a kind of item-factor correlation coefficient).

The third factor was loaded by two variables, fishing close to home (.62) and catching trout to eat (.60). This combination defined a fishing experience for many local residents.

The final factor was social, loaded by where friends were going (.66), fishing somewhere new (.57), and to be with my family (.49). The factor loadings and variables suggest that this is not a particularly strong factor, and it accounted for the least variance of the four.

Factor analysis is useful because it groups variables together based on their correlations, summarizing interrelationships nicely. The cluster analysis will be even more valuable by grouping anglers, not variables.

Management Preferences

Several questions addressed river and fisheries management issues and recreational conflicts experienced during the last trip. This was useful to provide a broad context only, because perceptions varied widely on different rivers.

Forty-three percent said they thought there were major problems with how the river was managed, 34 percent said there weren't, and 23 percent said they weren't sure. When presented with a list of possible problems, the anglers responses showed that there wasn't a consensus:

* 16 percent said there were too few fish
* 14 percent said water levels were too low
* 13 percent said there were too many boats
* 12 percent said there were too many anglers
* 11 percent said access was inadequate
* 10 percent said the fish were too small
* 7 percent said water quality was poor
* 4 percent said the trout habitat was poor
* 3 percent said there was too much access
* 1 percent said scenic quality was poor

Obviously, this information is more useful when discussed by river. "Too few fish" was the most commonly checked item on seven rivers (Bitterroot, Blackfoot, Boulder, Flathead, Stillwater, and Lower Yellowstone. Anglers who didn't check this item may either not have cared about the number of fish in the river, or may have cared but believed there were plenty. Nonetheless, the relative position of the the concern reflected central management issues. The absolute level, of course, also was important, and even this item, the most common concern, was checked by only 16 percent of the total sample.

Water levels were the commonly-checked concern on four rivers -- the Beaverhead, Gallatin, Kootenai, and Missouri -- and the second most common concern on the Big Hole, Bitterroot, and Flathead. This should not be too surprising on these dam-controlled or irrigation-affected streams, but reflected the relatively high level of angler concern for water quantity.

"Too many boats" was the most common concern on the Big Hole, Madison, Smith, and Upper Yellowstone, and the second-most important concern on the Bighorn, Blackfoot, and Missouri. It's also instructive to see on which rivers anglers rated too many boats as more important than too many anglers (and vice-versa). Anglers on the Bighorn and Rock Creek checked "Too many anglers" more than they checked any other item, while this was the second most-checked concern on the Madison.

Inadequate access was not the most-commonly checked item on any river and the the secondmost concern on just one -- the Lower Yellowstone. "Fish are too small" was the second most frequently checked management issue on the Blackfoot, Gallatin, Rock Creek, and the Stillwater.

The other management questions presented anglers with a list of different approaches to fisheries management, such as what methods anglers favored to increase the number of large trout in a stream. The specific management options included on the questionnaire were provided by the Department of Fish, Wildlife and Parks, so the results should be useful immediately to fisheries and recreation managers.

Anglers were asked to rank their top two choices on three separate questions. Many just checked two categories, while others ranked them 1 and 2. The responses were lumped into two categories for analysis: checked (or ranked); and not checked.

Figures 1-3 show the percent of anglers who favored each of the listed options. Of the four listed general management strategies, far more anglers favored Protecting Trout Habitat over Special Fishing Regulations, the second most-favored option (Figure 1). Stocking streams was one of the two top priorities for about one-third of the anglers, while Improving Fishing Access was favored by one-fifth.

This suggested that most anglers on these 20 Montana trout streams favored the management strategies also favored by Bryan's (1979) specialist anglers. Nearly three-quarters of the anglers favored Protecting Trout Habitat.

When asked how what type of restrictions they favored to increase the number of larger trout in the stream, anglers preferred reducing limits on number kept to limiting the size of fish kept (Figure 2). This was consistent because 57 percent had said that catching large trout was very important or important, while catching many trout had the same level of importance for just 34 percent of the anglers. Of course, this question doesn't ask whether or not they favor management to produce larger trout, but responses to several other questions suggest that a majority of the anglers did.

Favored Overall Management Strategy

- 31% - Stocking Streams
- 72% - Protecting Trout Habitat
- 46% - Special Fishing Regulations
- 19% - Improving Fishing Access

FIGURE 1

% Who Ranked This Option as 1st or 2nd Choice

If Restrictions Are Needed To Increase the Number of Larger Trout in a Stream

- 47% - Gear Restrictions
- 56% - Reduce Limit on Number of Trout Kept
- 39% - Reduce Limit on Size of Trout Kept
- 11% - Shorten Fishing Season
- 7% - Limit Fishing Access Sites

FIGURE2

% Who Ranked This Option as 1st or 2nd Choice

Close behind was gear restrictions, followed by reducing limits on the size of trout that could be kept. Very few anglers favored shortening the season or limiting fishing access sites, both fairly severe restrictions on not just the style of fishing, but the ability to fish at all. It's not surprising that these two options were opposed by nearly all anglers.

Because three of the possible restrictions were checked by 39 to 56 percent of the anglers, it's helpful to see how many times each was ranked as the top option to see if a better distinction emerges. Reducing bag limits and gear restrictions were each ranked first by about 10 percent of the anglers, while reducing size limits was ranked first by five percent.

Comparing among the four types of special regulations that could be enacted to increase the number of larger trout, more anglers favored a slot limit (Figure 3). Reducing the total limit followed, with catch-and-release all trout, and keep only small trout, favored by far fewer. The slot limit may have been most appealing because it represents a compromise among the other, more restrictive, options. Another possibility, especially to anglers less familiar with slot limits, is that they simply thought it sounded less restrictive.

The anglers also could check a box saying they needed more information to make a decision. Thirteen percent said they needed more information about general management strategies, compared to 18 percent who needed more information on restrictions and 20 percent for special regulations. Because these proportions are fairly low, most anglers felt they had sufficient information to rate the management options.

It's difficult to interpret the exact meaning of these responses because people could have many reasons for doing so. In some cases, anglers probably needed better definitions, such as what specific gear restriction would be needed, or what the specific size or slot limits would be out of the many possible options. In other cases, anglers may have felt they lacked sufficient information on the consequences of each management action, even though they knew what it meant. However, the low proportion of "Need More Information" responses suggests that most anglers were able to rate their top choices.

Tables 22-24 present these results by river. Although the results generally followed the same patterns described above, some exceptions occurred. The different mix of preferred options on each river provides managers with specific information about likely angler support for the various management strategies.

If Special Regulations Are Needed To Increase the Number of Larger Trout in a Stream

- 28% - Catch and Release All Trout
- 12% - Keep Only Small Trout
- 47% - Reduce Total Limit
- 64% - Slot Limit

FIGURE 3

% Who Ranked This Option as 1st or 2nd Choice

Table 22. Anglers' management preferences (number of times each option was checked as one of their top two choices).

River	Stocking	Habitat Protection	Special Regulations	Improved Access	Need Mor Informati
Beaverhead	22	99	73	25	10
Big Hole	50	116	81	31	10
Bitterroot	51	100	49	28	15
Blackfoot	50	72	32	16	20
Boulder	32	49	28	24	10
Bighorn	36	122	98	38	17
Upper Clark Fork	10	24	16	7	4
Lower Clark Fork	40	117	66	17	22
Flathead	42	50	28	11	16
S. Fork Flathead	7	12	9	0	0
Gallatin	34	123	91	27	19
Kootenai	34	55	27	9	16
Madison	24	147	112	33	18
Missouri	69	125	62	32	23
Rock Creek	18	79	55	13	13
Smith	14	38	23	8	6
Stillwater	49	88	55	28	19
Upper Yellowstone	41	95	62	27	17
Lower Yellowstone	62	67	27	40	15

Table 23. Number of anglers who checked each item as one of their top two choices for ways to increase number of large trout (number of times each option was checked).

River	Catch & Return All Trout	Keep Small Trout Only	Reduce Total Limit	Slot Limit	Need More Information
Beaverhead	33	12	48	102	22
Big Hole	55	14	78	103	23
Bitterroot	32	27	62	87	23
Blackfoot	25	12	55	67	24
Boulder	15	11	32	46	21
Bighorn	55	30	81	109	27
Upper Clark Fork	8	2	16	22	10
Lower Clark Fork	39	11	70	95	32
Flathead	16	8	37	49	21
S. Fork Flathead	8	2	5	7	2
Gallatin	60	27	77	88	32
Kootenai	11	15	35	51	18
Madison	87	24	83	112	16
Missouri	30	17	91	119	27
Rock Creek	46	8	41	56	17
Smith	18	6	22	25	13
Stillwater	27	13	67	84	32
Upper Yellowstone	37	17	67	93	28
Lower Yellowstone	20	10	52	71	40

Table 24. Number of anglers who checked each item as one of their top two choices for increasing the number of trout.

River	Gear Restrictions	Limit Number	Limit Size Kept	Shorter Season	Limit Access	Need More Informatio
Beaverhead	57	76	56	16	7	17
Big Hole	77	83	61	29	11	19
Bitterroot	57	76	53	23	14	21
Blackfoot	45	63	49	9	11	16
Boulder	27	41	27	11	6	19
Bighorn	96	102	73	12	8	22
Upper Clark Fork	16	16	17	2	2	7
Lower Clark Fork	63	80	54	16	10	32
Flathead	29	35	29	8	7	24
S. Fork Flathead	10	8	4	3	1	0
Gallatin	83	102	59	14	12	25
Kootenai	31	42	31	11	4	18
Madison	116	111	64	6	6	28
Missouri	54	107	79	18	11	30
Rock Creek	64	56	34	5	8	12
Smith	28	24	18	4	4	11
Stillwater	47	66	48	26	11	33
Upper Yellowstone	74	73	54	15	7	20
Lower Yellowstone	46	60	34	13	10	29

Angler Types

The cluster analysis was designed to identify how subgroups of anglers defined the products of fisheries and river management, so we would understand anglers' bases for economic values. This was a compromise between lumping all anglers together (which we know is incorrect because it assumes all anglers define angling products the same way), and analyzing each anglers' responses individually, which would have no generalizeability. We attempted to find meaningful subgroups of anglers who, because they all chose to fish a stream for a particular set of reasons, had specific definitions of the type of recreational experience they were seeking.

The cluster analysis was conducted on the 17 reasons for choosing to fish a given river on their last trip. The resulting clusters (angler types) consisted of people who had similar patterns of responses across the 17 items. When interpreting the results, remember that the angler types are specific to this set of variables. In other words, using a different set of questions to run the clustering procedure could have resulted in a different set of angler types.

The "Not Sure" responses were treated as missing values for the cluster procedure, resulting in a sample size of about 1,500 for clustering. This trade-off was accepted because there was really no basis for including "Not Sure" responses in the interval level scaling system needed for the cluster analysis.

The SPSSx Quick Cluster program was used because of the large number of cases analyzed. This method, designed for use on large data files, uses a nearest centroid sorting technique to assign cases to clusters based on Euclidean distance from the case to the cluster centers. Cluster centers were not chosen a priori, but were selected from well-distanced cases in the data.

Quick Cluster does not select any specific number of clusters statistically; the programmer must pick the desired number. The procedure was run for cluster sizes of 3, 4, 5, 6, and 7 to see which cluster size provided the best division of subgroups. Subgroups thus were chosen based on the past research and on the specialization framework. There were three main criteria for choosing the final number of clusters:

1) The number of cases in each cluster had to be large enough (100 or so) to permit economic analysis;

2) The clusters had to make sense conceptually and define distinct angler subgroups; and

3) A parsimonious solution was preferred (the fewer clusters the better).

A final cluster size of four was chosen. This offered a better distinction among subgroups than fewer clusters, while more clusters did not add critical information. Analyzing four angler types also corresponded well to Bryan's four levels of angler specialization.

Graph 1 shows the scores of each angler subgroup on each of the 17 clustering variables. The vertical axis contains the range of responses labelled by number and verbal anchor and the horizontal axis contains the 17 questions. The points on the graph are the mean of each angler subgroup on each question.

When scanning this graph, it's important to pay attention to both the absolute location of each cluster center on the scale (Very Important to Not At All Important) and the position of each subgroup relative to the other three.

Clusters 1 and 2 seemed to fall into Bryan's Generalist category, with Cluster 2 being a little more serious about trout fishing -- closer to being Specialists. Cluster 3 corresponded to Bryan's Occasional anglers, who may fish frequently but weren't all that concerned with fish populations, while Cluster 4 best fit Bryan's description of the Specialist.

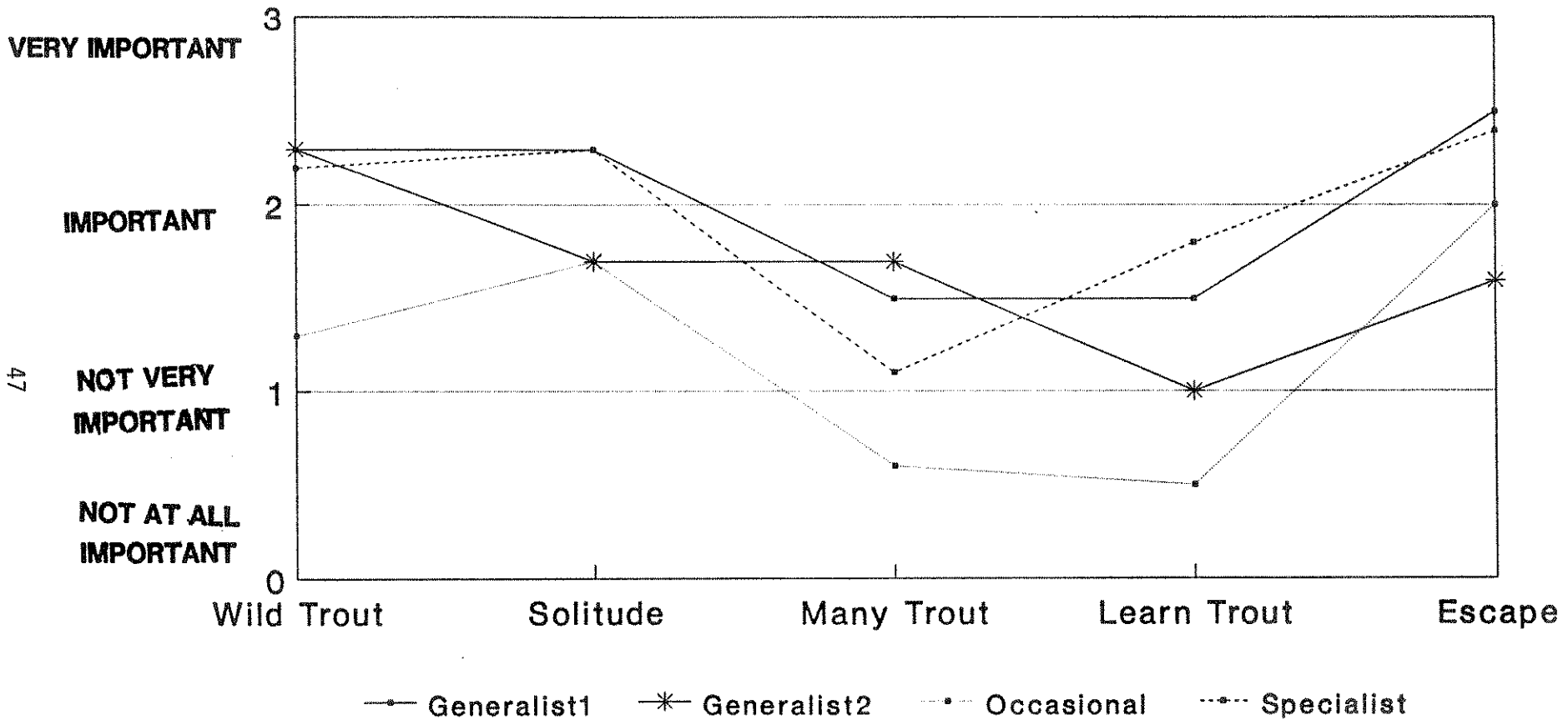
Following is a detailed description of each angler type identified. One especially useful analysis for describing differences among the four clusters was the three reasons (out of the 17) they checked as being the most important. The following descriptions rely heavily on the three reasons checked by each angler. However, once these results were analyzed in the aggregate, it seemed more useful to list the top five reasons to anglers in each cluster. In other words, the percentages reported in the following descriptions refer to the three checked responses, not the numbers in Graph 1.

Cluster 1 could be called Nature Generalists. They tended to rate all 17 reasons as important, but the aspects of the experience most important to them were reflected by which three of the 17 reasons they said were most important. The five most popular reasons to this cluster were being outdoors (checked by 16 percent of the anglers), getting away from it all (11 percent), catching large trout (11 percent), catching wild trout (9 percent), and for the solitude (8 percent). Fishing close to home also was important, suggesting the group contained a high proportion of locals.

Anglers in Cluster 2 could be called Fishing Generalists. They valued catching large trout more than any other reason (checked as one of their top three reasons by 17 percent), followed by

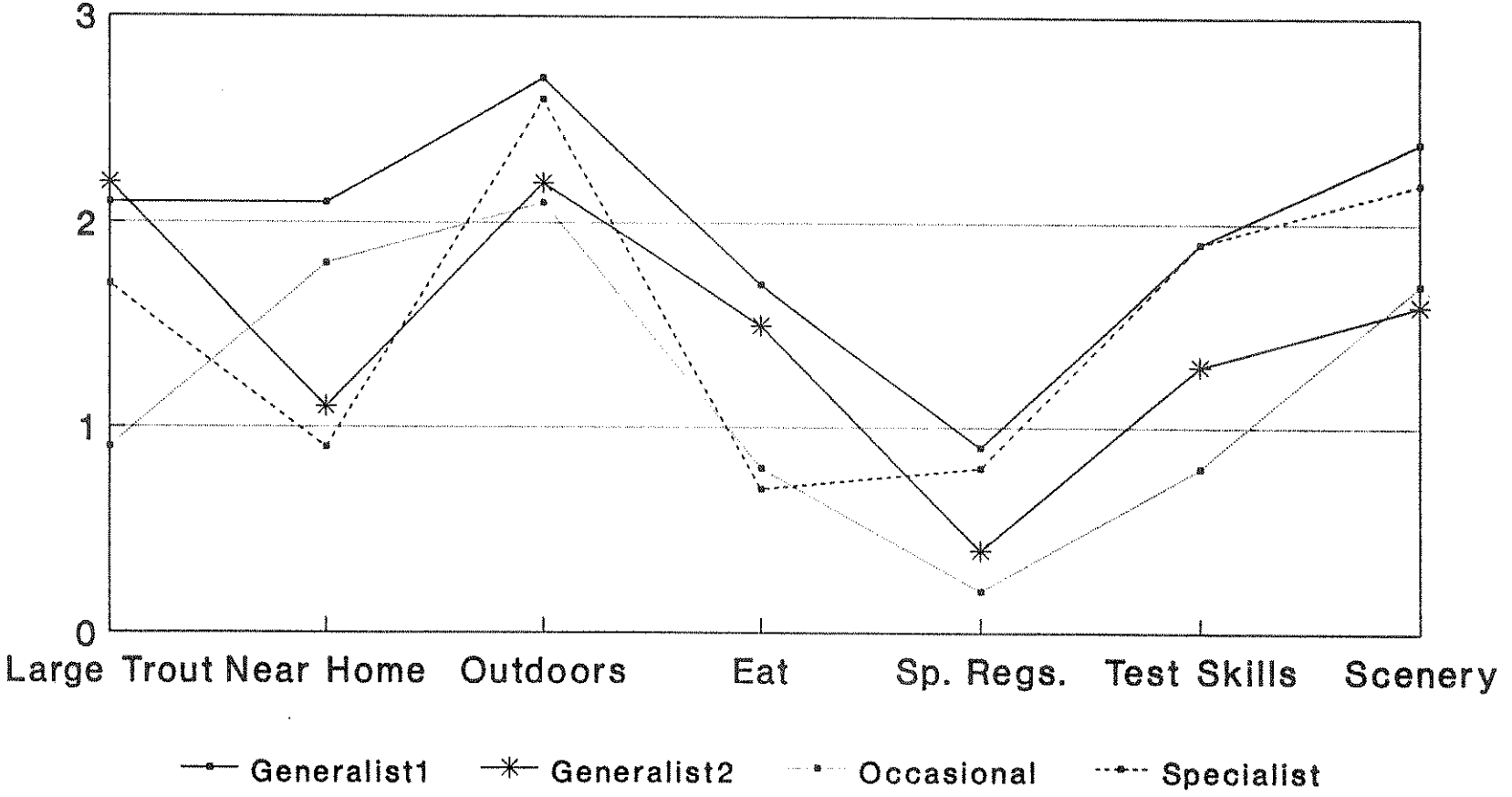
GRAPH 1: Part 1

Importance of 17 Reasons for Fishing by Four Angler Types (Part 1)



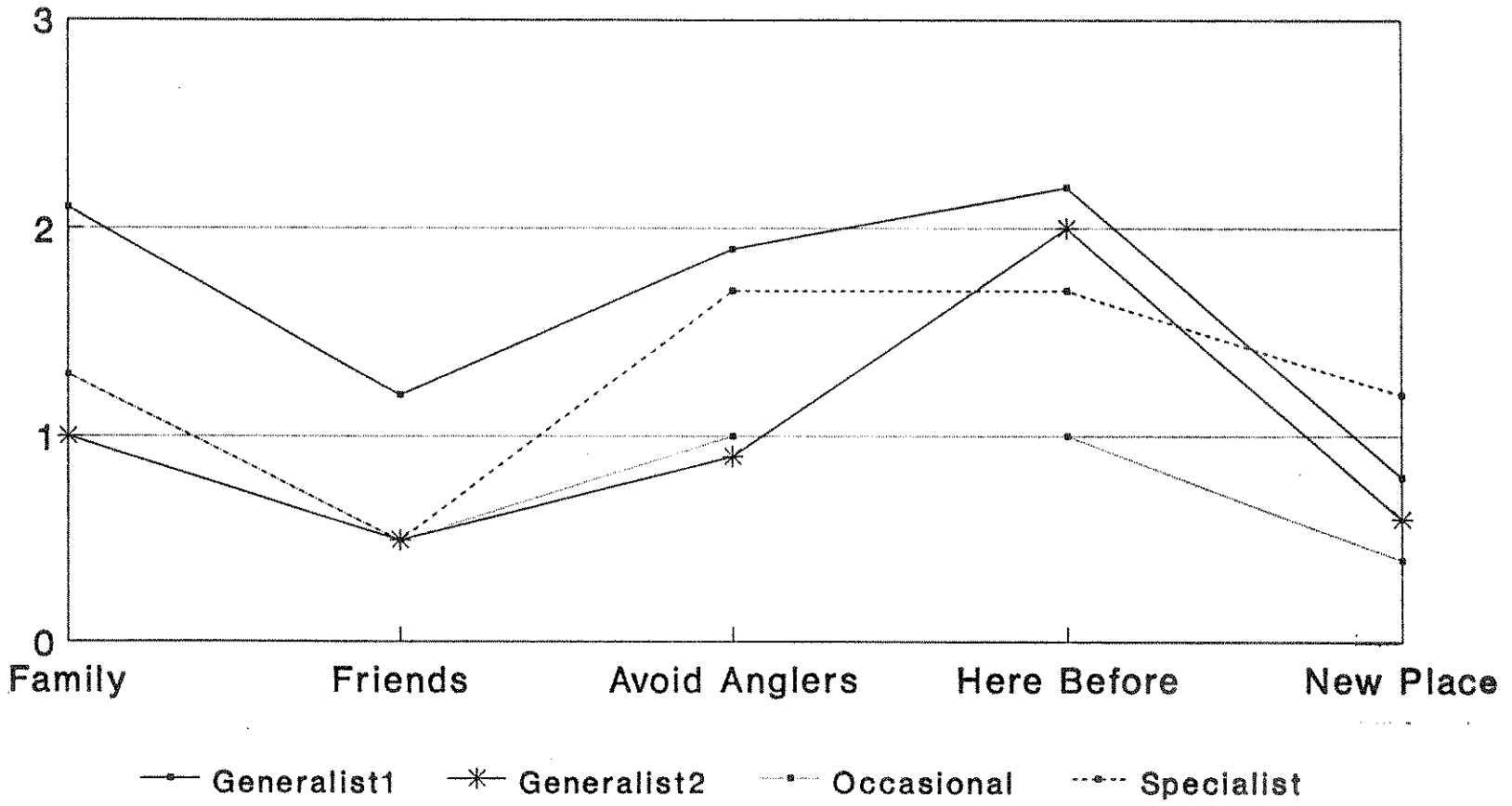
GRAPH 1: Part 2

Importance of 17 Reasons for Fishing by Four Angler Types (Part 2)



GRAPH 1: Part 3

Importance of 17 Reasons for Fishing by Four Angler Types (Part 3)



catching wild trout (14 percent), being outdoors (11 percent), having success there before (10 percent), eating trout (9 percent), and catching many trout (8 percent). Fishing close to home was less important, suggesting that many were non-residents, residents fishing distant waters, or people who lived near a preferred stream.

Solitude, being outdoors, getting away from it all, and enjoying the scenery were all less important than for Cluster 1 anglers. Cluster 2 Generalists were more concerned with aspects of the experience directly related to fish populations, although both valued opportunities to catch wild trout and large trout more than did Clusters 3 and 4.

Cluster 3 could be called Occasional Anglers. This was the only group not to highly value opportunities to catch wild trout (although six percent said it was one of their three most important reasons for fishing where they did). In fact, this group tended to rate everything as relatively unimportant except fishing close to home. Their top five reasons for fishing where they did were to be outdoors (a top reason for 19 percent), getting away (15 percent), fishing close to home (14 percent), for the solitude (9 percent), and to be with their families (8 percent).

None of these related directly to fish populations or catching fish; these anglers seemed to be using fishing as a vehicle to just get outdoors and enjoy themselves, and catching fish may be a pleasant but not necessary bonus.

Anglers in Cluster 4 could be called Specialists. They said their most important reasons for fishing were being outdoors (17 percent), fishing for wild trout (12 percent), getting away (11 percent), and testing fishing skills, fishing for large trout, and solitude (9 percent each). This group rated learning about trout as being more important than did any other group. When coupled with a lack of emphasis on catching many trout, eating trout, or being with their family, this set of characteristics describes Bryan's specialist anglers. Dividing this group into two would likely yield an even more highly specialized subgroup of Technique-Setting Specialists.

It's desirable when doing cluster analysis to check on how well-defined and separated the clusters are. One recommended way to explore and validate cluster analyses is to see if the resulting groups differ on external measures -- ones not used directly for the clustering procedure. (Aldenderfer and Blashfield, 1984). Because the development of angler types was based on a specific framework, we would expect many of these additional characteristics to fit well with past descriptions, helping to define each cluster more precisely.

Table 25 shows some key similarities and differences among the four clusters. Clusters 1 and 2 are close on many of the items, while Clusters 3 and 4 vary the most widely. The responses to management options are especially interesting. Some of the options, however, are preferred by all four groups, indicating potential widespread acceptance of those actions. Even though these anglers were clustered into subgroups, they were all fishing Montana trout streams so some similarities should be expected.

The two Generalist groups were similar on many items, but the slight differences present were in the expected direction. For example, the Fishing Generalists were slightly more likely to: belong to fishing and outdoors groups; fish more than 50 days per year; use flies; say that fishing was their favorite activity; and say that fishing was their main trip purpose.
Most of the differences were among the Generalists (both groups), Occasional Anglers, and Specialists.

The four groups' management preferences fit the same pattern, with the two Generalist groups agreeing most of the time (Figures 4-6). However, the Occasional and Specialist groups differed on many items -- again in ways predicted from Bryan's framework. For example, Occasional Anglers were far more likely than Specialists to favor stocking streams with hatchery trout, and far less likely to favor special fishing regulations, as a general management program. Both groups, however, said that protecting trout habitat was the preferred option -- somewhat surprising, perhaps, but very supportive of Montana's current management direction.

Specialists were more likely than Occasional Anglers to favor bag limits and gear restrictions -- presumably because this would improve opportunities for their style of fishing. Both groups tended not to favor shortening the fishing season or limiting fishing access, another area of consistency. If these two very distinct groups agree on a fisheries management option, then widespread support likely exists.

Specialists were the group most likely to favor catch and release regulations for all trout as a strategy to increase the number of larger trout in a stream, but all four groups agreed that the best option was a slot limit.

Analyzing the results further by angler type will help the Department to better understand the needs of its diverse clientele. It's important to remember, however, that the four groups were identified based on the angling population as a whole. To report the cluster analysis results separately for each

Table 25. Some Key Similarities and Differences Among Anglers in the Four Clusters on Fishing Preferences and Behavior Variables.

Characteristic	Generalist 1	Generalist 2	Occasional Anglers	Specialis
Percent Residents	81	72	83	58
Percent Who Said Fishing Was Their Favorite Activity	20	22	14	30
Percent Who Fish Over 50 Days Per Year	18	20	7	20
Percent Who Said Fishing Was Main Trip Purpose	74	77	68	69
Percent Who Used Flies	30	34	29	60
Percent Who Caught 0 Trout	15	14	34	15
Percent Who Caught More Than 2 1/2 Trout Per Hour	24	21	16	19
Percent Who Didn't Catch A Large Trout	51	50	73	54
Percent Who Were Fishing On Their Favorite River	22	23	14	15
Percent Who Said They Would Not Pay To Catch Twice As Many Fish Because That Wasn't Important To Them	26	30	37	51
Percent Who Belong To Fishing, Sport, or Environmental Groups	23	28	19	43
Percent With Household Incomes over $75,000	2	5	4	9
Percent With College Degree Or More Education	37	43	39	52

Favored Overall Management Strategy

	Gen 1	Gen 2	OCC	Spec
Stocking	38	34	67	21
Habitat	73	75	69	82
Regulations	38	46	35	61
Improve Access	25	21	25	14

FIGURE 4

% Who Ranked This Option as 1st or 2nd Choice

If Restrictions Are Needed To Increase the Number of Larger Trout in a Stream

	Gen 1	Gen 2	OCC	Spec
Gear	42	48	39	59
Limit Number	56	55	53	67
Limit Size	42	40	43	42
Shorten Season	15	13	13	6
Limit Access	8	8	10	5

FIGURE 5

% Who Ranked This Option as 1st or 2nd Choice

If Special Regulations Are Needed To Increase the Number of Larger Trout in a Stream

	Gen 1	Gen 2	OCC	Spec
Catch & Release	21	21	26	44
Keep Small Trout	9	14	10	14
Reduce Total Limit	53	47	52	48
Slot Limit	73	73	56	64

FIGURE 6

% Who Ranked This Option as 1st or 2nd Choice

river would require conducting the analysis just using the anglers sampled on each river. This could be done, especially for rivers where a large sample size of anglers was present, but was not part of this study.

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APPENDIX A

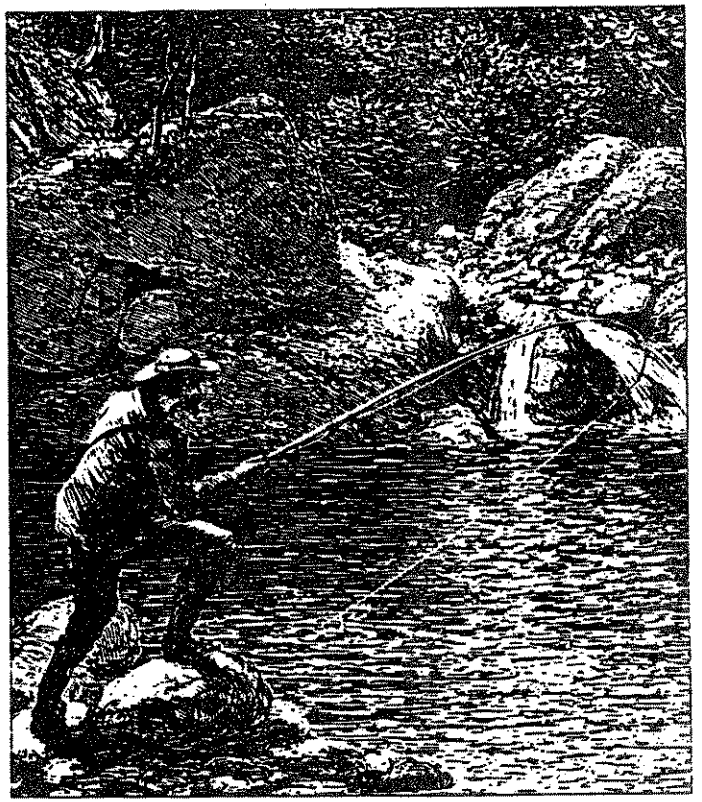
QUESTIONNAIRE AND CODING MANUAL

Thank you for your help. Is there anything else you'd like to tell us about fishing this river? We would appreciate any comments.

Thanks again. If you would like to receive a copy of the survey results, please write "Results requested" and your address on the back of the return envelope (not on this questionnaire).

FLATHEAD RIVER ANGLER SURVEY

Summer 1986



Montana Department of Fish, Wildlife & Parks

I. FIRST, WE HAVE SOME GENERAL QUESTIONS ABOUT YOUR FISHING.

1. How many years have you been fishing? _____ Years

2. About how many days a year do you fish for trout? _____ Days

3. About how many of these days are spent in Montana? _____ Days

4. How would you rate trout fishing compared to other outdoor recreation activities you do? (please check one)

___ It's my favorite outdoor recreation activity

___ It's one of my favorite outdoor recreation activities

___ It's just one of several outdoor recreation activities that I do

___ I prefer to participate in other outdoor recreation activities

5. About what percent of your fishing time do you spend at each of these types of water?

Large lakes	_____	%
Small lakes	_____	%
Large rivers	_____	%
Small rivers	_____	%
Creeks	_____	%
Spring creeks	_____	%
Total:	100	

II. THE NEXT FEW QUESTIONS ASK ABOUT YOUR MOST RECENT FISHING TRIP TO THE FLATHEAD (BETWEEN THE LAKE AND THE CONFLUENCE OF THE NORTH AND MIDDLE FORKS) AND YOUR EVALUATION OF THE FISHING THERE.

1. Approximate date(s) of this last trip: _____

(a trip could be anything from an hour to several or more days)

2. On this trip, did you fish a section of the Flathead that has special fishing regulations? (Please check one)

___ Yes

___ No

___ I'm not sure

3. How many days did you fish the Flathead on this trip?

___ Days

4. About how many hours per day were you fishing?

___ Hours per day

5. What type of fishing equipment did you use?

___ Bait

___ Lures

___ Flies (6. Did you tie your own? ___Yes ___No)

___ Combination

7. About how many trout did you catch on this most recent trip?

___ Trout caught

8. How many of these trout did you keep?

___ Trout kept

9. Did you use a fishing guide or outfitter on the Flathead?

___ Yes ___ No

10. Did you fish from shore, from a boat, or both?

___ Shore ___ Boat ___ Both

11. How many other anglers were in your party?

___ Other anglers came with me

12. Was the Flathead the main (or only) river you fished on this trip, or did you fish other rivers? (Please check one)

___ The Flathead river was the main (or only) river I fished on this trip away from home

___ Fishing at other rivers was just as important as fishing on the Flathead on this trip.

___ Fishing at other rivers was more important than fishing the Flathead this trip.

13. Was fishing the main purpose of your trip away from home when you fished the Flathead or did you make the trip for other reasons such as business or a family vacation?

___ Fishing was the main purpose of this trip

___ Fishing was one of several reasons for making the trip

___ The main purpose of this trip was not to fish, but for other reasons.

14. Was this your first visit to the Flathead?

___ Yes

___ No

15. If not, how many years have you been fishing the Flathead ?

___ Years

16. How many separate trips did you make from your home to the Flathead this year?

___ Separate trips from home this year

17. People fish for many reasons. We'd like to know some of the reasons you fished the Flathead this trip, to help us understand different types of anglers and their preferences.

Following is a list of possible reasons for fishing. Please check the box that says whether that reason was a very important reason, an important reason, not an important reason, or not at all important a reason you fished the Flathead this trip.

	Very Important	Important	Not very Important	Not at all Important
1. To catch wild trout	☐	☐	☐	☐
2. To experience solitude	☐	☐	☐	☐
3. To catch many trout	☐	☐	☐	☐
4. To learn more about trout	☐	☐	☐	☐
5. To get away from it all	☐	☐	☐	☐
6. To catch large trout	☐	☐	☐	☐
7. It's close to home	☐	☐	☐	☐
8. To be outdoors	☐	☐	☐	☐
9. To catch trout to eat	☐	☐	☐	☐
10. To view the scenery	☐	☐	☐	☐
11. Because of the special regulations	☐	☐	☐	☐
12. To test my fishing skills	☐	☐	☐	☐
13. To be with my family	☐	☐	☐	☐
14. It's where my friends were going	☐	☐	☐	☐
15. To get away from other anglers	☐	☐	☐	☐
16. I've had good fishing here before	☐	☐	☐	☐
17. To fish somewhere new	☐	☐	☐	☐

18. Could you please look back over this list and circle the numbers of the <u>three</u> most important reasons you fished the Flathead?

9. Based on your experience fishing the Flathead, do you feel that there are any major problems with how it is managed?

___ Yes ___ No ___ Not sure

20. If you said yes, please check any of the following problems you feel exist on the river:

___ Too many anglers
___ Too many boats
___ Too few fish
___ Fish are too small
___ Water levels
___ Access not adequate
___ Poor fish habitat
___ Poor scenic quality
___ Too much access
___ Water quality
___ Other: _____

1. About how many other anglers did you see while you were fishing the Flathead on this trip?

___ Other anglers seen while fishing the Flathead

2. Was this number more than you expected to see, less than you expected to see, or about as many as you expected?

___ More than I expected to see
___ About as many as I expected to see
___ Fewer than I expected to see
___ I didn't have any expectations

3. Did other anglers present affect your fishing?

___ Yes ___ No

24. If yes, please explain how:

25. Do you plan to continue fishing the Flathead?

___ Yes ___ No

26. If yes, about how frequently do you plan to fish the Flathead? (please check one)

___ As frequently as I do now
___ More frequently than I do now
___ Less frequently than I do now
___ I'm not sure

27. How does the Flathead compare to other trout streams in Montana? (please check one)

___ It's my favorite place to fish
___ It's one of my favorite places to fish
___ It's one of many places where I fish
___ I prefer to fish other places

28. Are there any other rivers or streams in Montana that you feel provide a fishing experience comparable to the Flathead?

___ Yes ___ No

29. If yes, please name them:

30. If you could not have fished the Flathead, where might you have fished instead?

_____ Name of stream or river

31. About how far is it from your home to this alternative fishing location?

___ Miles

32. How does it compare to fishing the Flathead?

III. THE NEXT FEW QUESTIONS WILL HELP US TO UNDERSTAND THE VALUE PEOPLE PLACE ON FISHING THE FLATHEAD.

WE REALIZE YOU AREN'T USED TO CONSIDERING FISHING THIS WAY, BUT PLEASE THINK ABOUT IT AND GIVE US YOUR BEST ESTIMATE!

1. About how far is it from your home to where you fished the Flathead this trip?

_____ Miles (one-way)

2. How long did it take to travel from your home to the Flathead?

___ Hours (include any stops made en route)

3. If you drove, how many anglers were in the vehicle with you?

___ Other anglers

4. About how much did you personally spend on this trip? Include expenses such as gas and oil, food and beverages, any lodging or camping fees, car rentals, airfares, equipment purchased just for this trip, fishing access fees, and other trip expenses. If you can't recall the exact amount, please give your best estimate.

_____ Total amount I spent on this trip

5. Was this trip worth more than you actually spent?

___ Yes

___ No

6. If YES, would you still have made the trip if your share of the expenses had been $250 more?

___ Yes

___ No

7. What is the maximum increase in your actual trip cost you would have paid to fish the Flathead instead of having to fish elsewhere?

_____ Dollars

8. If your answer was zero, could you briefly explain why?

9. About how big would a trout you caught on this trip have to be before you would consider it to be large?

_____ Inches

10. How many large trout did you catch on this trip to the Flathead?

___ Large trout caught

11. Imagine that everything about this last trip were the same, except that your chance of catching a large trout was twice as great AND that your trip costs were $20 more than your actual costs. Would you still have made the trip under these circumstances? (Please check one)

___ Yes, I would still have made the trip

___ No, I would not have made the trip

12. What is the maximum increase in actual trip costs you would pay to double your chances of catching a large trout?

_____ Dollars increase in trip cost

13. If your answer was zero, could you briefly explain why?

14. If you caught at least one trout, imagine that everything about this last trip were the same, except that you caught twice as many trout as you actually did AND that your trip costs were $20 more than your actual cost. Would you still have made the trip under these circumstances?

___ Yes, I would still have made the trip

___ No, I would not have made the trip

15. What is the maximum increase in actual trip costs you would pay to catch twice as many trout as you actually did?

_____ Dollars increase in trip cost

16. If your answer was zero, could you briefly explain why?

IV. THE NEXT FEW QUESTIONS ASK YOUR OPINION ON DIFFERENT STATEWIDE FISHERIES MANAGEMENT OPTIONS.

1. In general, which two of the following management programs do you favor the most for managing Montana trout streams? (Please rank your top two choices)

___ Stocking rivers with hatchery trout

___ Protecting trout habitat

___ Special fishing regulations

___ Improving fishing access

___ Would need more information

2. If restrictions are needed to increase the number of larger trout in a stream, which two of the following regulations would you prefer? (Please rank your top two choices)

___ Gear restriction (such as artificial lures only)

___ Reduce limit on number of trout kept

___ Reduce limit on size of trout kept

___ Shorten fishing season

___ Limit fishing access sites

___ Would need more information

3. If special regulations are needed to increase the number of larger trout in a stream, which two of the following regulations would you prefer? (Please rank your top two choices)

___ Catch and release all trout

___ Keep only small trout

___ Reduce total limit

___ Slot limit (catch and keep trout under a minimum size and one trout over a maximum size)

___ Would need more information

V. THESE LAST FEW QUESTIONS WILL HELP UNDERSTAND YOUR RESPONSES BY KNOWING SOME BASIC INFORMATION ABOUT YOU.

1. Where are you from? City: _____ State: _____

2. What is your age? _____ Years

3. Are you: ___ Male ___ Female

4. Are you a member of any fishing, conservation, or sport organizations?

___ Yes ___ No

5. If so, which ones?

6. What is the highest year of formal education you completed?

___ Some grade school
___ Finished grade school
___ Finished junior high school
___ Finished high school
___ Some college
___ Finished college
___ Some postgraduate work
___ Finished postgraduate

7. If you had not gone fishing this trip, would you have been working instead?

___ Yes ___ No

8. During the fishing season this year, were you: (check one)

___ Employed full time
___ Employed part time
___ Unemployed
___ Retired
___ Homemaker
___ Other: _____

9. Please check your household's income before taxes last year:

___ Under 5,000
___ 5,000 - 9,999
___ 10,000 - 14,999
___ 15,000 - 19,999
___ 20,000 - 24,999
___ 25,000 - 29,999
___ 30,000 - 34,999
___ 35,000 - 39,999
___ 40,000 - 49,000
___ 50,000 - 74,999
___ 75,000 - 100,000
___ over 100,000