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**No-kill fishing regulations: An assessment of the social and recreational characteristics and behaviors of Michigan stream trout anglers with special consideration of anglers on selected sections of the Au Sable River**

Gigliotti, Larry Mark, Ph.D.

Michigan State University, 1989

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300 N. Zeeb Rd.  
Ann Arbor, MI 48106





**NO-KILL FISHING REGULATIONS: AN ASSESSMENT OF THE  
SOCIAL AND RECREATIONAL CHARACTERISTICS AND BEHAVIORS OF  
MICHIGAN STREAM TROUT ANGLERS WITH SPECIAL CONSIDERATION  
OF ANGLERS ON SELECTED SECTIONS OF THE AU SABLE RIVER**

by

**LARRY MARK GIGLIOTTI**

**A DISSERTATION**

Submitted to  
**MICHIGAN STATE UNIVERSITY**  
in partial fulfillment of the requirements  
for the degree of

**DOCTOR OF PHILOSOPHY**

**Department of Fisheries and Wildlife**

**July 1989**

## **ABSTRACT**

### **NO-KILL FISHING REGULATIONS: AN ASSESSMENT OF THE SOCIAL AND RECREATIONAL CHARACTERISTICS AND BEHAVIORS OF MICHIGAN STREAM TROUT ANGLERS WITH SPECIAL CONSIDERATION OF ANGLERS ON SELECTED SECTIONS OF THE AU SABLE RIVER**

**By**

**Larry Mark Gigliotti**

Early in 1985, interest and controversy arose over the idea of establishing no-kill regulations on the Au Sable River Mainstream (the "Holy Waters"). In response to a large amount of support for no-kill, the Natural Resources Commission (NRC) established catch-and-release regulations for the "Holy Waters", effective April 26, 1986. However, a citizen group in the Grayling area filed a suit against the NRC opposing the new regulation. A restraining order was issued and the controversy was settled in court over the next three years with the eventual establishment of the catch-and-release regulation on April 28, 1989.

There is growing pressure on the Fisheries Division both favoring and opposing the establishment of more no-kill regulations. One objective of this research was to provide a thorough understanding of the issue and its participants. Future studies can use the data base to explore changes and trends in Au Sable River anglers after the implementation of catch-and-release regulations. Catch-and-release areas (as well as other management efforts) will benefit some anglers but be opposed by other groups, therefore, these different groups must be managed separately. For this reason this research took a market segmentation approach. Another objective was to explore the developmental nature of trout fishing to determine whether different groups of anglers reflect different developmental stages.

A site intercept interview was used to collect data from Au Sable River anglers (n=742) in the spring and summer of 1986. Follow-up surveys were mailed in the fall of 1986 (n=610; 82.2% return rate). A mail survey of statewide trout anglers in the spring and summer of 1987 produced 1,056 usable surveys (70.8% return rate). A third mail survey was sent to a subsample of Au Sable River

anglers and statewide stream trout anglers in early 1988 to study attitudes towards and compliance with trout fishing regulations.

Three potential segmentation bases were identified as being useful for the study and management of stream trout anglers: fly-fishing specialization, non-consumptive orientation, and trout fishing intensity. These segmentation variables can be used by fisheries managers as quick summaries of the socio-psychological characteristics of anglers at various sites and to identify market segments of stream trout anglers. A segmentation approach was also useful in analyzing the Au Sable no-kill issue. A major finding was that the Au Sable River no-kill disagreement was between specialized fly anglers that were different on their degree of non-consumptive orientation. One other contribution was the idea that anglers can develop in more than one way, i.e., development may not always lead to use of fly fishing equipment, rather some anglers develop to dedicated and skilled bait or lure trout anglers.

*To My Very Dear Friend,  
Lori Greening McCartney*

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## Chapter 1

### INTRODUCTION

No-kill or catch-and-release refers to fishing regulations that permit fishing but require that the fish be released after capture. No-kill regulations control human behavior and are often useful solutions to situations where: (1) the resource is facing intense fishing pressure, (2) chemical contamination is considered a health threat, and/or (3) increasing the number of larger fish is desired. No-kill regulations are thus aimed at controlling human behavior for biological, ecological or social reasons.

Catch-and-release fishing is most often used as a management response to intense fishing pressure which threatens the fish population and ecosystem. This problem was identified in Yellowstone National Park during the 1960's. For example in 1969, approximately 2.5 million people visited the park in five months and there was an estimated 370,000 man-days of fishing in an 80-day period (Anderson 1977). Management changes were adopted in the mid-1960's which included stream closures and restriction of some streams to fly fishing only, but by 1969 there was general consensus that a major change was needed to prevent a steadily declining cutthroat (Salmo clarki) fishery.

Numerous meetings were held by management and members of the scientific community. Specific objectives for the management of the Yellowstone sport fishery program were identified (Anderson 1977):

1. To maintain or restore aquatic environments and native fish populations in as near natural state as possible.
2. To provide regulations for fishing that will ensure high quality angling for wild fish as part of the visitor experience without altering natural conditions.
3. To encourage visitor participation in the park program to preserve native species and high quality angling for wild fish in natural environs.



High quality angling is defined as, "having an opportunity to fish for rare native species or wild trout in pristine settings where angling removals do not exceed natural replenishment rates or, on a year-to-year basis, reduce fish biomass, numbers, sizes and age groups from that which would exist in the absence of fishing." The Yellowstone managers decided that to accomplish these objectives a distinction between "catching" and "killing" fish must be made.

An important difference between the philosophy of park management and that of most other fisheries management is that from the park's point of view the clients are the fish themselves and/or their natural predators, rather than the sportsmen (Anderson 1977). This allows the park management to adopt more restrictive regulations than those found in other places.

Catch-and-release was not introduced initially, but was part of a staged management program implemented over three years. The first step banned all bait fishing in the park. Studies showed a hooking mortality of 50-70% on baited hooks but less than 8% for lures and flies (Anderson 1977). A prerequisite of the catch-and-release concept is a low mortality of the released fish. The prohibition of bait fishing decreased angling pressure for a few years and attracted many anglers who voluntarily released their catch. Gear restrictions were followed by closed areas and increased minimum size restrictions.

In 1972 a catch-and-release program was fully implemented on the Yellowstone River, Slough Creek and the Lamar. Positive responses were noted after one year and within four years, these three streams were considered to have some of the best fishing in North America (Anderson 1977). Size and number of fish were reported to have increased dramatically over the four year period. There is now more angling on the waters restricted to catch-and-release than on those where fish can be kept. Most importantly, the public has enthusiastically accepted this management program.

The Yellowstone catch-and-release program, as well as other western programs, is often cited by anglers to pressure their fisheries agency into adopting such measures in their states. However, the support for no-kill regulations is not unanimous. There are still large numbers of anglers for whom taking home a fish is an important component of the fishing experience. The fisheries division thus faces the dilemma of how to supply both groups with the fishing experiences they seek. Any attempt

to set aside special no-kill fishing areas will likely be met with some resistance because they must be established in areas which currently permit taking of fish.

Organized clubs are currently pressuring the Fisheries Division of the Michigan Department of Natural Resources to implement catch-and-release fishing in Michigan. The attempted implementation of catch-and-release regulations for a section of the Au Sable River is the setting for this dissertation (Figure 1.1).

### SOCIO-PSYCHOLOGICAL DIMENSIONS OF NO-KILL FISHING

For no-kill regulations to be accepted and utilized requires that anglers adopt the attitude that "killing" a fish is no longer an important component of the fishing experience. This attitude or value orientation is relatively new to the sport of fishing, especially in the United States. Since the settling of this country the utilitarian attitudes towards fish and game have been dominate (Petulla 1980). A major goal of fishing was to catch fish for the table and success was measured by the number of fish in the creel. However, for an increasing number of anglers, "catching" a fish is no longer synonymous with "killing" a fish.

There appear to be two likely forces responsible for this change of increasing nonconsumptive values towards fish resources. One has been the depletion of our natural resources or the realization of the myth of unlimited fish and game populations. The second possible force is the growing importance of fishing as a recreation activity for a growing number of anglers. This is probably the result of an expansion in leisure time and the urbanization process. And as fishing becomes more important to these anglers the realization occurs that other aspects of the experience are more important than killing a fish. These two forces lead to the belief held by these anglers that their sport can survive and actually improve by simply not "killing" their sport.

Human dimensions theory suggests that anglers develop or move through stages and thus, many anglers who are now advocating the no-kill philosophy began their fishing careers as "worm-dunkers" and killed their share of trout at some time. Bryan (1977) proposed that anglers become more specialized as involvement in the sport increases. The proposed changes involve increased "specialization" (changing from bait to lures to fly fishing), increased commitment to the sport (as

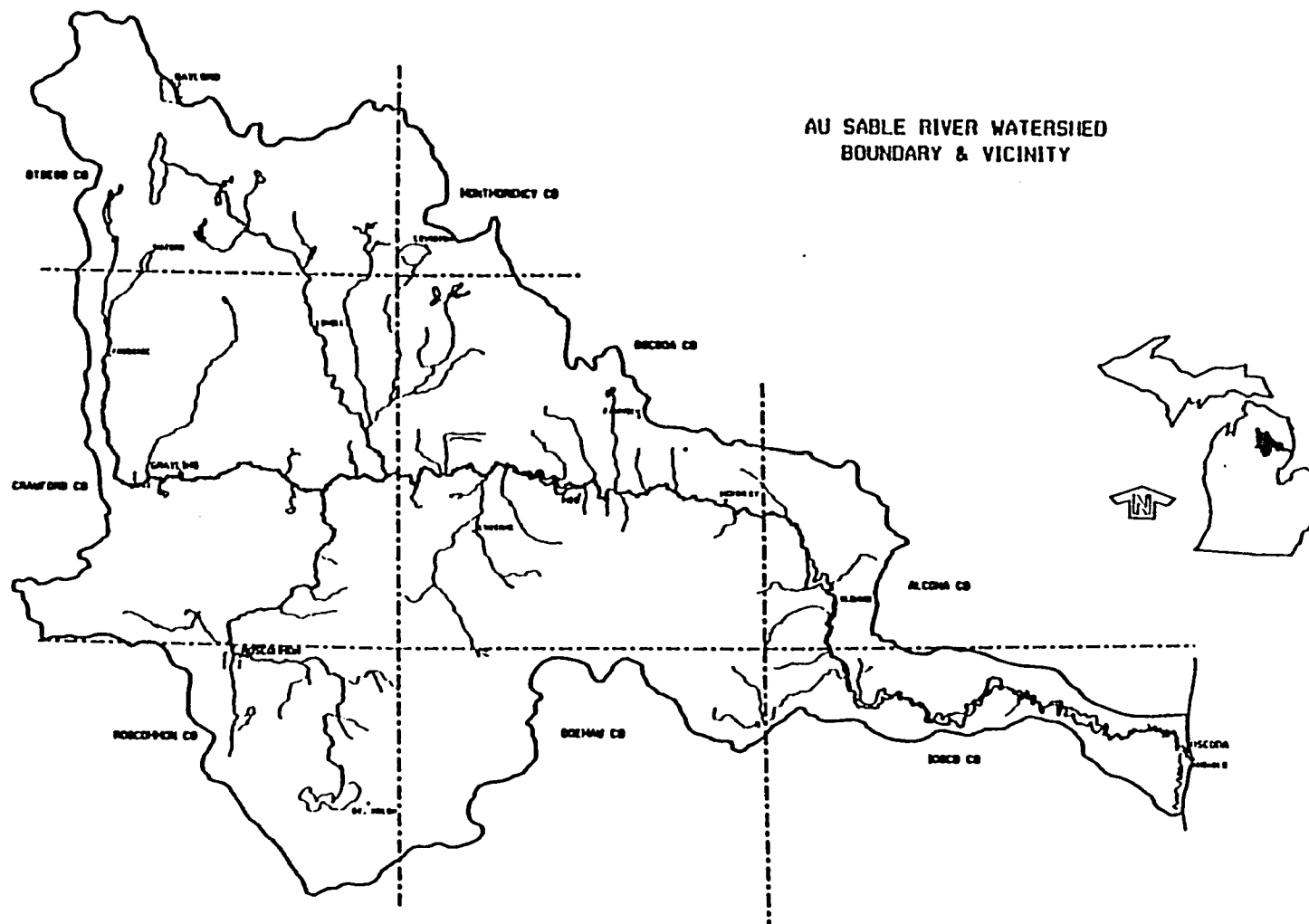


Figure 1.1. Location of AuSable River.

measured by a number of variables such as time spent fishing, importance of fishing, amount of equipment, etc.) and philosophical changes (particularly an increase in interest in catch-and-release fishing). It was also proposed that hunters go through similar stages in which earlier stages are more concerned with taking home game (Jackson et al. 1979, Jackson and Norton 1980). According to the current stage theory, sportsmen must pass through each of the stages, spending time in each stage until "maturing" to the next stage. However, some anglers may begin as fly fishing specialists with an interest in no-kill fishing while other anglers may start with bait fishing and never switch to new methods. Thus, more advanced models of angling behavior must be proposed to account for these discrepancies. Certainly some types of internal changes do take place as an angler gains more experience with the sport. Discovering and classifying these changes can add greatly to understanding the socio-psychological dimensions of anglers.

Other theories may explain why some trout anglers are opposed to no-kill regulations. There may be a number of reasons besides the obvious utilitarian reason, "for food". For some anglers the keeping of fish has become part of the tradition and as Langenau (1979) indicated, tradition can be a powerful component of the experience. For example, the traditional fish fry at the end of the season or on special holidays; the traditional campfire breakfast of trout on the "opener" weekend; or traditional contests which have become a major component of the fishing experience for which no-kill regulations could significantly impact on satisfactions.

A number of other reasons for being opposed to no-kill regulations have been voiced. Some of these reflect a distrust of fisheries management, such as a belief that no-kill regulations will not improve the fishery or a belief that most anglers will not obey the regulations. Other reasons reflect different aspects of the consumptive value (that of displaying or showing-off their abilities), such as a desire to keep a trophy fish or a concern that young children won't have the opportunity to keep their first trout (note: this reason is also often cited by proponents of no-kill regulations, i.e., concern about their children's opportunity to "catch" fish). Another reason reflects an ethical issue; the concern about releasing injured fish. And another reason reflects a basic cultural value; the idea that releasing or keeping fish is a personal choice that each angler should be able to make.

Thus, it appears that the opponents of no-kill regulations have a number of good reasons for

opposing catch-and-release areas and are not simply a group of anglers who have not yet matured to higher stages as stage theories would suggest. Rather their values are well established and for one reason or another, killing a fish is an important component of the fishing experience and will likely be so for some time.

## HISTORY OF THE AU SABLE RIVER ISSUE

Because of decreased numbers of large brown trout in the Au Sable River, special restrictive regulations were implemented during the 1970's to increase the number of large brown trout (Clark and Alexander 1984). In April 1979, experimental fishing regulations were imposed on the Mainstream from Burton's Landing to Wakeley Bridge. The most important regulation was a slotted size limit which allowed harvest of trout between 8 and 12 inches and over 16 inches. The slotted size limit regulation was a controversial issue at the time.

Early in the 1985 trout fishing season, interest and controversy again arose over the fishing regulations on the Mainstream of the Au Sable River from Burtons Landing to Wakeley Bridge. This 8.7 mile stretch is sometimes called the "Holy Waters". The current debate started with a petition calling for no-kill rules posted in Gates Lodge and Orvis Shop on the Au Sable River and gathered momentum following a pro-no-kill column in the Detroit Free Press. Although initial response showed the majority of letters received by the Fisheries Division favored no-kill, the issue had strong local opposition. Therefore, the Fisheries Division decided not to recommend no-kill until an opinion poll of their own could be conducted.

A strategy for measuring public opinion was outlined in a September 23, 1985 memo to the Natural Resources Commission (NRC). After carefully reviewing public opinion and the available research relating to quality fishing regulations the Fisheries Division recommended:

- 1) Continuation of the research on the South Branch of the Au Sable River to determine effects of catch-and-release trout fishing regulations and annual updating of results from the study.
- 2) Continuation of the present 8 - 12-inch slot size limit on the Burtons Landing to Wakeley Bridge section of the Mainstream of the Au Sable River until April, 1987.
- 3) Adoption, in 1987, of a slot size limit permitting harvest of trout between 8 - 10 inches and those over 16 inches.

However, in response to the large amount of support for no-kill fishing, the NRC established catch-and-release regulations for the "Holy Waters" in February, 1986 and ordered the Fisheries Division to initiate a study of the biological and social impacts of the regulation during its 5 year trial period. These regulations were to take effect April 26, 1986 -- the opening day of trout season.

A citizen group in the Grayling area (The Committee To Oppose Mandatory Catch-and-Release) and others filed a suit against the NRC opposing the new regulations. A restraining order, issued April 24, 1986 by 46th Circuit Court Judge Alton T. Davis, halted the new catch-and-release rule. As a result the previous slot size limit (8 - 12 and over 16 inches) was in effect for the 1986 fishing season. In April 1987, a permanent injunction was issued against the catch-and-release regulation. The issue was appealed to a higher court and settled over the next two years with the establishment of the catch-and-release regulation on April 28, 1989.

#### STATEMENT OF THE PROBLEM

Catch-and-release fishing or no-kill fishing is an existing issue in Michigan and has reached the disruptive stage for the proposed no-kill regulation on the Au Sable Mainstream. There is growing pressure on the Fisheries Division both favoring and opposing the establishment of more no-kill areas. A thorough understanding of the no-kill issue including the attitudes of the participants, their beliefs about the no-kill regulations and important values impinging on the no-kill issue would help the Fisheries Division manage in the best interest of the public. This study focuses on a group of anglers that might be considered a single group (segment), Au Sable trout anglers. However, anglers fishing the Au Sable are not a homogeneous group. The need to further segment this group of anglers is demonstrated by the disruptive controversy over the use of no-kill fishing regulations. Fisheries managers are faced with the problem of how to satisfy the group of anglers who want catch-and-release areas while minimizing the impact on those who do not want no-kill regulations.

In addition, a serious threat to the anticipated biological response of a no-kill regulation is any illegal harvest of the trout fishery. Compliance depends on a number of factors including angler knowledge of the regulations, visibility of enforcement efforts, and angler acceptance of regulation goals. Some indication of the nature of noncompliance behaviors and associated angler

characteristics will enable the biological response to be better interpreted and provide insight into factors influencing effective management by regulations.

The Au Sable River no-kill controversy provides an opportunity to analyze a fisheries management problem while advancing our understanding of socio-psychological processes which influence recreation behaviors and attitudes. The Au Sable River no-kill controversy also provides an opportunity to incorporate the human dimensions into fisheries management which Voiland and Duttweiler (1984) say are so often lacking. Probably the major gap between fisheries managers and social scientists is the difficulty for biologically trained fisheries managers to see the practical side of social theories of recreational behavior (or put the other way, the lack of practical research by social scientists). A function of this dissertation will be the practical application of human dimensions research. One such practical application of social research is market segmentation. Recreation specialization, satisfactions and motivations, and developmental theory can be incorporated into market segmentation by using these theories to develop a segmentation scheme.

#### **A MARKET SEGMENTATION APPROACH FOR MANAGING MICHIGAN'S STREAM TROUT ANGLERS**

While the concept of market segmentation is not new, it has gained renewed attention in recent literature (Mahoney and Kikuchi 1985). The market segmentation strategy may be defined as the process of dividing a total market into subgroups that have relatively similar product needs for the purpose of designing a marketing mix that more precisely matches the needs of individuals in a selected segment or segments (Pride and Ferrall 1983). This strategy is based on four assumptions: (1) the market is composed of distinguishable segments or consumer groups with distinctive needs and preferences, (2) these different people can be identified and aggregated into relatively homogeneous and distinguishable market segments, (3) a single product will not be maximally appealing or satisfying to the entire market, and (4) that this effort of designing products to appeal to specific market segments will increase both the effectiveness and efficiency of a firm's/agency's marketing/management effort (Mahoney and Kikuchi 1985). Application of the market

segmentation strategy to fisheries management is made difficult by the need to identify appropriate segmentation criteria/bases.

The Au Sable River issue illustrates that even among fly-anglers on the Au Sable River who are a subset of Michigan stream trout anglers, there exist different segments with distinctive needs and preferences. A single product (e.g., a regulation) will not necessarily be equally appealing or satisfying to the entire market of Au Sable River fly-anglers. Furthermore, it is clearly inefficient for an agency to have their management efforts challenged in court. Thus, 3 of the 4 assumptions for application of a market segmentation strategy are present in the Au Sable River no-kill issue. The final assumption that needs to be met before a market segmentation approach can be implemented is that these different anglers can be identified and aggregated into relatively homogeneous and distinguishable market segments. This was a major emphasis of this study.

One additional point in the application of market segmentation to fisheries management is the comparison of a tangible product to an intangible regulation. For the most part, supply of a tangible product to one segment of the market is unaffected by the supply of a related product to a different market segment. But the supply of fishing resources is largely fixed and application of a regulation to one area to satisfy a segment of anglers will affect other segments of anglers. Thus, a market segmentation approach will not eliminate conflict among user groups nor the value of good public involvement procedures.

A fisheries agency has the responsibility to provide anglers with satisfying fishing experiences. This is accomplished through habitat, fish population, and people management. People management is accomplished largely through the use of regulations which may greatly effect the angler's satisfaction. Thus, an appropriate segmentation model should predict satisfaction levels with various types of regulations as well as other angler wants and needs.



## **GOALS and RESEARCH OBJECTIVES**

The overall goal of this study was to develop segmentation strategies to characterize Au Sable River and Michigan stream trout anglers, and to increase understanding of the socio-psychological dimensions of catch-and-release fishing and behaviors towards no-kill regulations.

Specifically, research objectives were to:

1. Collect baseline data on Au Sable River anglers.
2. Identify segments of anglers using the Au Sable River and trout anglers in general according to their recreational preferences and behaviors and other social characteristics.
3. Investigate attitudes, beliefs and values held towards no-kill regulations by angler segments.
4. Explore the notion of developmental stages in trout anglers.

## **LIMITATIONS**

The results of this survey pertain to anglers fishing in Michigan for stream trout and may not be applicable to other states. Application to other states will be most related to the degree to which stream trout fishing opportunities are similar to Michigan. No-kill stream trout fishing regulations are relatively new for anglers fishing in Michigan with most of the anglers' experience with catch-and-release regulations coming from out-of-state fishing.

The results pertain to "stream" trout fishing and may not be applicable to "lake" trout fishing. Currently in Michigan, pressure has been applied to establish catch-and-release sections on streams. It is uncertain how the angling public feels about catch-and-release for trout on inland lakes or the Great Lakes. Also, this study is not generally applicable to other species of fish. Largemouth bass and smallmouth bass are two common species for which catch-and-release fishing regulations are often considered, however, few other fish species (at least in Michigan) are considered at present for catch-and-release regulations.

The Au Sable River sampling method used site intercepts to contact anglers, however, many sections of the river have private access. Thus, many anglers with potentially different attitudes from those using public access may not have been contacted. A large sampling effort was conducted to minimize this effect. This effort contacted a sample of private landowners who use both private and public access. This sample can be used to estimate the attitudes of those anglers using private access. Nonresponse bias is thoroughly discussed in Chapter 4.

An additional problem of this study is the reliability and validity of responses. Au Sable River anglers were contacted during a disruptive stage of the no-kill controversy and may have over-reacted to the issue and expressed more extreme positions than they actually held. Many anglers in the statewide sample may have never thought about how they feel about no-kill regulations, therefore this survey may have produced opinions which are not strongly held. Also, respondents were asked to recall information, namely, days of fishing during the past year, which is probably difficult for a number of anglers to do accurately.

Attempts were made to minimize these effects. First, a number of different measures were used to assess attitudes towards no-kill regulations to provide a more reliable measure. Second, "don't know" responses were available for many of the questions so that respondents were not forced to give an opinion. Third, many responses permitted a range of agreement or disagreement so that strength of opinion could be measured. Again, this does not force a respondent to give an all or nothing response. Finally, the statewide sample of anglers rated the accuracy of their response to the number of their fishing days to provide an estimate of the value of this item.

## **Chapter 2**

### **REVIEW OF THE RELATED LITERATURE**

This chapter is sub-divided into four parts. Part one addresses restrictive regulations and no-kill regulations in particular. The intent is not to make a biological decision on effectiveness of no-kill regulations but, rather, to sample the scientific literature because many anglers have attitudes based on what they believe the scientific literature shows. Part two covers the literature on market segmentation. Part three deals with the literature on angler motivations and satisfactions. And, part four is on the topic of developmental theories of recreational behavior.

#### **Part One**

##### **RESTRICTIVE ANGLING REGULATIONS**

The trend in fishing regulations has been towards more restrictive and complex laws of which no-kill rules are considered the most restrictive, short of closing the fishery. No-kill regulations permit fishing but require that all fish be released after capture. No-kill regulations thus represent an end point in certain types of regulations such as bag sizes (which specify the number of fish which may be kept) and size limits (which specify the size of fish which may be kept).

Some restrictive angling regulations will be reviewed to show how no-kill regulations are a subset of restrictive regulations. This review shows that there are many regulations available for managers to achieve a diverse set of objectives. Also, the social problems with establishing no-kill regulations are similar to establishing other restrictive regulations.

Hunt (1970) summarized 13 years of evaluating experimental angling regulations applied to a wild brook trout fishery in Lawrence Creek, Wisconsin. Four general types of regulations were tested: bag limits, size limits, fish refuges and restrictions on fishing methods.

**Bag Limits:** Daily bag limits set upper limits on the allowable catches of individual anglers. Presumably by limiting the catches of individuals, the total harvest will be limited. This would allow more trout to survive and spawn, increasing numbers or to continue growing so that larger catch sizes result than would be true if no bag limits existed (Hunt 1970). Bag limits have also been proposed for non-biological reasons such as: (1) distributing the total catch more evenly among anglers, (2) arbitrary goals for the anglers to attain, and (3) a means to prevent fish-hogging and waste.

Bag limits provide no protection until the limit is reached and as Hunt (1970) points out, few anglers actually catch their limit of trout. Most of the catch of wild brook trout consisted of one or two trout per trip and 50% of the anglers did not catch any trout. Thus, it would require very restrictive bag limits to substantially reduce the total catch. For example, if angling effort remained unchanged, cutting the bag limit from 10 to 5 would probably reduce the total catch by only 20%, not 50%. Hunt also reported that most of the limit catches were taken by a few skilled anglers who fished several times each season at Lawrence Creek.

Although the experiments at Lawrence Creek were not designed to evaluate the psychological reactions of anglers to various bag limits, circumstantial evidence suggested that angling effort (behavior) was influenced by bag limits (Hunt 1970). First, it was suggested that among the skillful anglers the bag limit acted as a stimulus to keep fishing until reaching the limit because more limit catches were observed than catches of one or two less than the allowable limit. Second, it was suggested that even though few anglers were able to catch a limit of ten trout, the opportunity to catch only five rather than ten per trip may have caused part of the decline in observed fishing pressure that occurred after the bag limit of five was adopted.

One problem with bag limits not mentioned by Hunt is that anglers can continue fishing after a bag limit is reached and if a fish larger than the smallest fish currently in the bag is caught then the smaller (and usually dead) fish can be tossed out and the larger fish substituted. This likely would not be a problem with liberal bag limits but could seriously limit resource protection under very restrictive bag limits.

**Size Limits:** Size limits cause anglers to release trout that they might keep if it were legal to do so. Presumably, enough of these undersized trout will survive long enough to contribute to the fishery by being caught at a larger size or by adding to subsequent generations by spawning (Hunt 1970). Unlike bag limits which provide no protection until the limit is reached, size limits apply to every trout caught. According to Hunt (1970), "the size limit, if wisely applied, is the best single regulation for preventing excessive angler harvest of brook trout populations." Size limits are now recognized as the best regulation, biologically, for managing fish populations. While minimum size limits are most common other types of size limits include slotted size limits where fish within a specified range may be kept (Clark and Alexander 1984) and maximum size limits where fish up to a specified size may be kept (Brousseau and Armstrong 1987).

In their evaluation of regulations for brook and brown trout in Michigan streams Clark et al. (1981) reported that "Total yield (defined as weight of trout caught and harvested plus weight of trout caught and released) increased as size limit increased and was maximum with a no-kill regulation. As size limit increased, the number of larger trout harvested increased but, at the same time, total number of trout harvested declined." However, simply increasing a minimum size limit may not always work to increase the sustained yield of larger fish. Dunning et al. (1982) reported a case where an increase in minimum size for northern pike resulted in a decrease in yield due to more harvest of the older, more productive females.

**Fish Refuges:** Fish refuges close certain areas to fishing to insure the survival of some spawning trout which will produce a surplus of progeny that will immigrate to the adjacent fishing water and bolster the depleted fish population there (Hunt 1970). Hunt reported that brook trout refuges were a failure at the Lawrence Creek experiments, since large-scale emigration did not occur. Most of the trout born in the refuge stayed there throughout their life.

**Restrictions on Fishing Methods:** Most sport fishing is limited to some type of hook and line gear which in itself represents a radical limitation on the efficiency of capture compared to available

technology. Any further restriction on the various methods of hook and line fishing will further tend to reduce the total catch of trout from a body of water regardless of what methods are eliminated (Hunt 1970). This is because, over the course of a fishing season, the variable conditions of weather and water make each method more efficient on some days than other methods. Also, most anglers are more proficient at a particular method of fishing and if their favored method is prohibited, they must choose to fish elsewhere or fish less proficiently. Turner (1986) reported that prohibiting the use of natural bait at the North Fork of White River trophy trout area reduced angler use by about 20%. However, numbers of brown and rainbow trout caught increased dramatically. Snider and McKee (1982) also reported a drop in use with the prohibition of bait.

Hunt (1970) reported that the "fly fishing only" area was popular among fly fishermen. But there were no detectable responses by the trout populations that could be attributed to the presence or absence of the flies-only restriction. Anglers in the this area did have a consistently higher catch/hour compared to anglers in the any-lure zone, which may be due to the possible attraction of better-than-average fly fishermen to the flies-only area. If such a regulation does attract expert fly anglers, and if nearly all of them keep the legal trout they catch, as they did at Lawrence Creek, then a flies-only regulation may not, by itself, prevent over-exploitation (Hunt 1970).

## NO-KILL REGULATIONS

The most common reason for no-kill regulations is to produce "quality" fishing, usually measured in terms of catching larger fish. The major biological question becomes, "How well and under what conditions does it work?" Brook trout are less catchable than cutthroat trout but more catchable than brown trout and rainbow trout. Thus, restrictive regulations, including no-kill rules, will likely change species composition of the waters. For easily caught fishes, no-kill regulations may be necessary given even modest fishing pressure.

Anderson (1977) stated that while the highly gullible native cutthroat trout responded immediately to low or no-kill rules in Yellowstone Park, the brown trout and rainbow trout did not respond similarly. Although the biomass and the number of older, larger brown and rainbow trout

increased, angling quality, as measured by the landing rate, did not improve except for expert anglers. This suggests stockpiling of large, uncatchable brown and rainbow trout in these waters.

Anderson and Nehring (1984) reported that the catch rate of trophy-sized rainbow and brown trout (longer than 38 cm) was 28 times greater in the catch-and-release area than in the harvest area. While there are numerous other reported successes with catch-and-release regulations (Anderson 1977, Weithman et al. 1977, Deinstadt 1977, Pettit 1977, and Burkett 1981), some failures have also been reported (Hunt, 1977 and Graff and Hollender, 1977). Graff and Hollender (1977) state that a "catch-and-release regulation does effect trout populations but not always in a predictable manner, nor in the way often anticipated by advocates of "quality" angling." They caution about the danger signals of overprotection: an increase in numbers with an accompanying decrease in condition factor and a decrease in growth rate.

Catch-and-release regulations are desirable in the following situations if hooking mortality can be minimized: (1) when high catch rates are desirable; (2) when fishing for food is of low priority; and (3) when length and creel limits are not adequate to prevent stock depletion (Weithman et al. 1977). Hunt (1977) adds that: "Successful catch-and-release fisheries for stream trout are more likely to develop if natural recruitment is low in or into specially managed sectors of the stream, or if recruitment can be controlled by adjusting stocking rates of domestic trout so that: a) trout densities do not reach levels at which compensatory decreases in growth rates occur; b) the fishable stock is not dominated by yearlings having little sporting value because of their small size; and c) the reduced rates of angling mortality can be advantageously utilized to progressively stockpile greater than normal abundances of older-age trout having greater sporting value."

Hooking mortality is a crucial factor when considering any type of catch-and-release fishing. Hooking mortality is influenced by a number of variables (species of fish, size of fish, type of bait used, hook size, site of hooking, angling and handling techniques, depth of catch, and water temperature) and reported values have a large range among studies (Wydoski 1977).

Since water temperature is an important variable, hooking mortality is likely to change throughout the season. When increasing water temperature causes higher hooking mortality later in the season, catch-and-release should be mandatory early and voluntary later in the season

(Alexander 1985). This maximizes use of the resource by allowing fish to be caught more than once early in the season by anglers that value catching fish and later (when hooking mortality is high) making the resource available to anglers that value the fish more as food. Also the fish will have the early season as additional growing time before they may be caught and removed.

Probably the most studied hooking mortality parameter has been the type of terminal gear used. Overall, higher mortality usually results with baited hooks (Warner 1978 and Warner and Johnson 1978). Shetter and Allison (1955, 1958) have shown hooking mortality rates with artificial flies to be only 2% compared to 5% for other artificial lures such as spoons and spinners, and 40% for natural baits. Anderson (1977) reported a hooking mortality of less than 8% for lures and flies and from 50-70% on baited hooks. Thus, gear restrictions are often considered necessary before catch-and-release rules are implemented.

Often a baited hook is taken well inside the mouth by the fish thus increasing the chance that it will penetrate a vital organ. Research by Mason and Hunt (1967) and Warner (1979) showed a much higher survival rate for deep hooked fish when the leader was cut and the hook left in place. Also, contrary to the belief of many anglers, much research shows that the use of barbless hooks does not significantly reduce losses (Hunsaker et al. 1970, Falk and Gillman cited in Wydoski 1977).

The method of handling has been shown to be important in the survival of fish caught by angling (Wydoski 1977). The adverse affects of handling fish during capture by anglers can be reduced by minimizing the handling time and taking care not to damage vital organs by squeezing a fish or holding the fish by the gills. The anatomical site of hooking is also related to mortality with the gill/gill arch and the esophagus area causing the highest mortality.

## HISTORY OF REGULATIONS ON THE AU SABLE RIVER

The Au Sable River attracted anglers as early as 1873 when the railroad line to the present day town of Grayling was completed (Clark and Alexander 1984). In those days anglers came to catch the Michigan grayling which was the only member of the Salmonidae (salmon-trout) family native to the river. Early lumbermen called the grayling "white trout" or "Crawford County trout" (Hendrickson 1966). In 1874, when the fish were identified as grayling local residents changed the name of



their town from Crawford to Grayling. Grayling were abundant in the Au Sable as late as the 1880's but became scarce by 1893. The last known grayling was caught in the East Branch of the Au Sable River about 1915. Timber removal from the banks, destruction of spawning grounds by floating logs, depletion of fish by heavy fishing, and competition from the newly introduced trout were considered as factors in the demise of the grayling in the Au Sable River.

Rainbow trout and probably brook trout were privately planted in the Au Sable River in the 1870's and in 1885 the State of Michigan began planting the river with brook trout (Clark and Alexander 1984). Brown trout were the last species to be introduced but today they dominate the river, making up 80 to 90 percent of the total weight of trout collected in recent biological surveys (Gowing and Alexander 1980). The introduced trout multiplied rapidly and in the early days (around 1900) it was said that anglers could catch 40 to 50 nice trout in a day (Hendrickson 1966). While trout are still highly-prized and abundant today, few of today's trout catches could equal the take of those early days.

Today fishermen crowd the Au Sable at the opening of the season and again during important fly hatches, especially the "caddis" or Mayfly hatch (Hendrickson 1966). During these times in many areas, anglers may stand so close together that the back-cast of one entangles the forward-cast of another. However, at other times numbers of anglers are more moderate and from mid- through late summer there are often times when anglers are quite scarce.

The Au Sable has a long history of special regulations. The first quality-fishing regulation was established on the Au Sable River in 1901 raising the size limit on trout from 6 inches (then in effect statewide) to 8 inches (Clark and Alexander 1984). The first artificial flies-only rule was adopted in 1907 on the North Branch. Currently, 44 miles of the river are restricted to flies-only fishing and another 14 miles to fishing with artificial lures only. There also has been a long history of trout research on the Au Sable and nearby rivers. The accumulated research probably represents the most extensive and longest series of data on trout streams anywhere in the world (Clark and Alexander 1984).

A decline in the number of large brown trout in the Au Sable River threatened quality fishing in the Mainstream (Clark and Alexander 1984). No single factor was identified as the cause for the

decline in growth of brown trout, but there were two leading hypotheses. The first stated that a considerable decrease in productivity of the river due to the closing of the Grayling Hatchery (mid-1960's) and an end to discharging sewage effluent from the city of Grayling into the river in 1971. The second hypothesis was based on a principle of population genetics that suggests that fishing under a minimum size limit removes the larger, faster growing trout and leaves behind the smaller trout to reproduce.

Clark and Alexander (1984) discussed the effects of the slotted size limit on the Au Sable Mainstream fishery. The slotted size limit increased the harvest of smaller brown trout (8 to 12 inches) but the growth rate of brown trout did not change significantly and it did not significantly improve the catch of larger trout. This brings us to the current issue facing this section of the Au Sable Mainstream -- no-kill fishing regulations. Proponents hope that no-kill fishing regulations will increase the number of larger brown trout in the Au Sable Mainstream fishery.

## Part Two

### MARKET SEGMENTATION

#### SEGMENTATION

Market segmentation is defined as the process of dividing a total market into subgroups of people or organizations that have relatively similar product needs. The purpose then is to design a marketing mix of products that more precisely matches the needs of individuals in selected segments (Pride and Ferrall 1983). Segmentation is based on the theory that goods are chosen either singly or in combination to yield characteristics which provide utility to the consumer, and that different groups seek different characteristics (Adams 1979). Segmentation was introduced to marketing in the 1950's and became a central topic of marketing research and a common marketing strategy during the 1960's. Market segmentation has a solid theoretical base, having been derived from microeconomic models of price discrimination (Arndt 1974). It offers a strong demand- or customer-orientation and provides guidelines for improving resource allocations.

A segmentation base is a variable, dimension or characteristic of individuals, groups or organizations which serves as the basis for dividing a total market into more homogeneous submarkets. These bases may be classified into four groups: (1) socioeconomic-demographic, (2) geographic, (3) product-related, and (4) psychographic (Pride and Ferrel 1983). Segmentation of recreation markets has often been tailored to characteristics of the recreation products or services (Stynes 1985). Many researchers used attribute or benefit segmentation while some used geographic, psychographic and socioeconomic segmentation of recreation markets.

The same benefits from segmentation of markets in the business environment apply to natural resources management and specifically to fisheries management. Segmentation more precisely defines the market in terms of consumer needs and wants. Michigan's sport fishing market is quite fragmented and dynamic, and all fisheries managers now realize that there is no "average angler". If continuously applied, segmentation can greatly improve fisheries managers' ability to meet changing market demands. For instance, decisions for managing fish population (species, size, location) and for setting of regulations can be made according to varying market demands. Further, promotion or information dissemination efforts can be more easily coordinated and targeted once market segments are clearly defined.

From a less applied perspective, segmentation is concerned with the appropriate way of classifying and aggregating data for a particular analysis (Stynes 1985). There is no one "best" segmentation. According to Stynes (1985), "better" or "worse" depends upon the purposes to which the segmentation is to be applied. Determination of segmentation variables, number of segments, and most suitable segmentation methods should be based on a clear understanding of the intended use of the segmentation and the advantages and disadvantages of the alternatives.

Segments may be formed a priori or via cluster analysis. In the a priori approach segments are based on theoretical considerations or simple crosstabulations and Venn diagrams. Cluster analysis is an empirical method (Stynes, 1985). According to Stynes, the a priori method is usually the best approach, particularly for the novice. Segments formed in this manner generally are easier to identify and interpret compared to the cluster analysis approach.

Bryan's (1977) work provides one example of the a priori approach. Using semi-structured interviews with trout anglers, he sorted anglers into four categories according to their frequency of fishing, the type of fishing setting they preferred, the fishing technique they used, and the level of their commitment to fishing. Manfredo and Anderson (1982) provide a second example of this approach combining preferred method of fishing with preferred setting to generate six categories of trout anglers.

Driver et al. (1984) applied the cluster analysis approach using survey data on the preference of Wyoming anglers for settings and for outcomes from fishing. Their analysis produced seven segments: outdoors, yield, solitude, social, general recreational, trophy and wild. However, these clusters did not define discrete groups of anglers. Buchanan et al. (1981) provides an example of the application of cluster analysis to form discrete groups of anglers. Their work used survey items that measured the "perceived benefits" of fishing as reported by Wyoming anglers. This cluster analysis approach produced three categories of anglers: trophy, wild and yield.

The ultimate test of any segmentation rests on how useful the segmentation is for developing and implementing management and marketing strategies (Bieda and Kassarian, cited in Kikuchi 1986). A number of criteria have been suggested for evaluating market segments. I present those used by Kikuchi:

Identifiability: Segments must be recognizable and accessible. This is reasonably measured by socioeconomic characteristics and media habits.

Substantiality: Segments must be substantial in size - there must be a sufficient number of people within each segment to justify designing distinct marketing efforts for each subgroup.

Variation in Market Response: Segments must differ with respect to their needs/wants and market behavior so that distinct marketing programs can profitably be designed to serve them.

Exploitability: Distinguishing characteristics of the segments must lend themselves to marketing appeals or offerings that will achieve the intended results (1986; p. 37).

## APPLICATION OF SEGMENTATION TO FISHERIES MANAGEMENT

Kavanagh (1968) reported that it is possible to segment anglers on the basis of demographic characteristics (e.g., income) which correspond to the types of fishing experiences (e.g., salmon fishing, bottom fishing, or clam digging). While this approach has the advantage of utilizing identifiable demographic characteristics of anglers, it does not measure the benefits which the angler expects to enjoy as a result of his/her participation in a particular type of fishing activity.

Driver and Cooksey (1977) described the advantages and methodology of segmenting anglers by multiple demographic characteristics and by preferred psychological outcomes. These same methods were used in studies of hunters (Brown et al. 1977, Hautaluoma and Brown 1978). Driver and Cooksey proposed that recreationists engage in a particular activity to realize the preferred psychological outcomes that are somewhat unique to that activity. Anglers choose fishing because they value and expect to realize a bundle of four to eight more highly preferred psychological outcomes. Through market segmentation, the preferences and characteristics of subgroups of fishermen can be identified. Specific types of fishing opportunities can then be geared to the preferences of these different subgroups.

Graefe (1980) presents an argument for segmenting anglers based on their frequency of fishing. He found that the level of participation was related to motivations for fishing and to satisfactions derived from fishing. He reported that:

...fishermen in the low-participation category placed greater importance on catching fish to eat, catching at least something, and catching a greater number of fish than fishermen in the high-participation category. Fishermen in the high-participation category viewed the challenge of seeking and catching fish as relatively more important than low participants (1980).

Fedler and Ditton (1986) proposed segmenting anglers into three groups based on levels of consumptive orientation (low, medium, and high). However, on the Au Sable River, both groups of anglers (those supportive and those opposing catch-and-release regulations) desire high catch rates. The conflict over these regulations evolves from the desire of the opposition group to retain the catch. The model proposed by Fedler and Ditton (1986) measures only the importance of catching fish, not eating or keeping fish (consumption). Therefore, it is not applicable to segmenting the

groups of anglers using the Au Sable River.

Adams (1979) segmented anglers on fishing attributes and fishing party composition. Her research suggested two distinct fishing experiences with respect to party composition: (1) a general demand for fishing trips without companions of any type, and (2) a specific demand for fishing trips without unrelated companions in particular.

Benefits derived from the solitary experience include: (1) no obligation to confine fishing activities to family type areas, (2) an opportunity to interact with other individuals who share a common interest in fishing, (3) the thrill of competing with nature by catching wild fish, and (4) a chance to escape from family and/or social pressures (Adams 1979). Benefits derived from the "no friends" experience might include: (1) enjoying the conveniences of a family type area, (2) not feeling compelled to compete with friends who catch large fish, and (3) not being exposed to social pressures. Thus, party composition can be used to segment anglers because the different segments seek different benefits from the fishing experience.

Kikuchi (1986) describes the segmentation process using Michigan's sport fishing market. Several candidate segmentation bases were selected: (1) species fished, (2) species fished and the corresponding fishing locations, (3) modes of fishing, (4) methods of fishing, (5) fishing attributes sought, and (6) fishing benefits sought. The first four bases represent a segmentation approach based upon anglers' actual fishing behavior (use/purchase) and the last two represent a segmentation approach based upon anglers' behavioral predispositions (psychological factors). Kikuchi's study compares these two popular approaches to segmenting a market via cluster analysis.

Kikuchi reported that:

The attribute segmentation produced eight angler segments with differing attribute seeking orientation, ranging in size from 8% to 17% of the sample. The species-location segmentation yielded eight segments with distinguishable fishing participation patterns, varying in size from 4% to 22%. The attribute sought segments were slightly more identifiable, while both yielded segments of substantial size. The attribute sought approach yielded more exploitable differences on behavioral predispositions (e.g. fishing benefits and attributes sought), while the species-location segments better discriminated actual behavior (e.g. fishing participation patterns). Management evaluation of the two approaches slightly favored the attribute sought approach (1986).

He concluded that: Michigan's sport fishing market is a heterogeneous mixture of angler subgroups; socioeconomics were not very useful for identifying angler segments defined by either approach; and both attribute and species-location variables are useful bases for segmenting the market.

One convenient way to classify anglers is according to species sought. However, Fedler and Ditton (1986) found that there is little evidence to support this approach. Preference for catching a particular species does not appear to be a major objective for most anglers (Hiatt et al. 1983). The 1979 Atlantic and Gulf Coast Marine Recreational Fisheries Statistics Survey (U.S. Department of Commerce 1980) found substantial proportions of anglers who reported seeking no particular species while Ditton et al. (1981) reported that anglers often seek multiple species.

### Part Three

#### ANGLER SATISFACTIONS and MOTIVATIONS

This section focuses on research on angler motivations and satisfactions. It is not intended as a comprehensive review of angler attitudes. This literature is useful for the identification of potential segmentation bases.

#### MOTIVATIONS and SATISFACTIONS

Although many studies have described recreational satisfactions, few studies have identified the determinants of satisfaction. Ditton et al. (1981) suggested that discrepancy theory was one of the most promising explanations for recreational satisfaction. Discrepancy theory states that satisfaction is determined by the differences between the outcomes one wants or thinks he/she should receive (motivations) and the perceived outcomes the person actually receives (fulfillment of motives) (Lawler 1973). Thus, motivations may be the basis for evaluating the fishing experience.

Lawler proposed the following principles as critical aspects of satisfactions:

1. Satisfaction is essentially an evaluative judgment made by individuals on the difference between what a person feels he/she should receive and what he/she perceives he/she actually receives.

2. Satisfaction is a multi-faceted concept; numerous factors enter the satisfaction decision.
3. These factors are differentially important (i.e., weighted differently) in evaluating overall satisfaction (1973).

In their study of hunters, Hultsman and Hultsman (1988) reported that making a successful kill was the best predictor of hunting satisfaction but that expectation greatly mediated satisfaction. For hunters who expected a high success rate, the relationship between success and satisfaction was strong. For hunters who did not expect a high success rate, the success-satisfaction relationship was weaker. Thus, if this relationship holds true for anglers, fisheries managers could improve satisfaction for certain situations by simply giving anglers a more realistic expectation for success.

Much early research on satisfactions attempted to link specific satisfactions with various specific activities (Buchanan 1983). However, recent attention has focused upon variability of satisfactions within individual activities. It is well documented that within any activity there may exist subgroups of users who receive different satisfactions (Hautalaoma and Brown 1978). Clearly it may be beneficial to management to identify these subgroups.

Some researchers have suggested that variability in satisfactions within activities may be the product of varying levels of commitment to that activity (Bryan 1977, 1979 and Jacobs 1980). Haas (1979) has suggested that variability in angler satisfaction within activities is the effect of environmental attributes on activities occurring at different recreation sites. Buchanan (1983) believes that a large amount of the variability of satisfactions results from failure by researchers to consider the entire package of activities that a recreationist might engage in on a particular trip.

Taking the activity packages approach, Buchanan (1983) studied people who identified fishing as their primary reason for visiting a site. As expected, catching fish was the dominant satisfaction desired by all anglers. Other important satisfactions were related to an overall relaxation/stress reduction dimension and an intra-group affiliation dimension. Buchanan's results indicated that secondary activities also effect the satisfactions attributed to fishing (the primary activity in this instance).

Buchanan (1983) showed that three of the top five satisfactions attributed to fishing (physical rest, escaping personal and social pressures, and being with friends) had significant positive



correlations to secondary activities. Some secondary activities included: (1) visiting with others, (2) going to town, (3) relaxing, (4) sitting around campfire, (5) going for a walk, (6) hiking, (7) taking photos, (8) power boating, and (9) sailing. These results, as well as most research on fishing satisfactions, show that fishing is a multidimensional experience encompassing considerably more than casting a line into the water to catch a fish. What the research suggests is that, "greater attention must be paid to the level of specificity at which data are collected and the appropriate level of specificity to which a specific study will be generalized" (Buchanan 1983).

Knopf et al. (1973) used a "behavioral approach" to explore the question of why people fish. Their model of recreation behavior was based on a "problem solving" model of human behavior which stated that, "the choice of recreation environments and/or activities is strongly influenced by problem states that either cannot be, or for some reasons are not resolved in nonrecreational environments." Thus, anglers fish for different reasons based on their "unmet needs" and these motivations not only differentiate fishing from other recreational activities but also influence the choice of fishing method and environmental setting.

Knopf et al. (1973) concluded that fishermen were strongly motivated by four unmet needs: temporary escape, achievement, exploration and experience of natural settings. For example, they demonstrated that the closer the fishermen lived to an urban area, the more the fishermen reported a need to escape. Also, they demonstrated a difference between anglers on the importance of achievement as a motivation for fishing. Low-income anglers attached more importance to achievement as a reason for fishing than did high-income anglers. According to their model, low-income groups might be more frustrated in fulfilling achievement needs in nonrecreation pursuits and might find greater fulfillment in fishing than high income groups.

Knopf et al. demonstrated the value of their model to understand resource user conflicts. They explored the underlying cause of conflicts between fishermen and canoeists on Michigan's Au Sable River. They showed that the importance of companionship (affiliation) was high for many Au Sable canoeists while it was low for the Au Sable anglers. Anglers who expressed a high need to experience nature were the most affected by canoeists. This further demonstrates that motivations for fishing vary among different types of anglers.

Motivations for fishing represent a potential basis for segmenting anglers into homogeneous groups. Managerial practices then can be implemented to serve the various angler segments with specific unmet needs. And, fisheries managers can implement practices which spatially or temporally separate these users who have incompatible motives.

Importance of Motivations / Satisfaction: "Identifying the diverse reasons why people fish, what they expect from their fishing experiences, and sources of satisfaction and dissatisfaction all tie closely to the perceived quality of fishing opportunities and the marketing of recreational fishing" (Fedler 1984). Ley (1967) reported that fishing provides escape from the pressures of everyday life, a chance to seek relaxation, and an opportunity to be close to nature. Success related variables are usually considered less important as motivations for fishing. In a study of Michigan stream trout anglers, Fenske (1983) reported that "number of fish caught" and "size of fish caught" ranked fifth and sixth among eight factors important to a fishing trip.

However, fisheries managers often consider the main benefits of fishing to be catching fish and disagree with these psychological benefits of fishing (Nielsen 1976, Ditton 1977). Ditton and Graefe (1975) explained:

Traditionally, management has focused on the fishery resource itself, based apparently on the assumption that greater harvest produces greater satisfaction. Under this approach, the goal of management is to increase supply, to cut down the time between bites. And fishing satisfaction is often measured in terms of total harvest, catch of a particular species, or catch per unit effort (1975).

Fenske (1983) demonstrated this point when she stated:

In an attempt to measure angler satisfaction with the quality of fishing, respondents were asked to rate fishing as excellent, good, average, poor or very poor. Great Lakes anglers were the most satisfied with their sport with 58.9% indicating fishing was better than average... (1983).

In Fenske's study satisfaction was not directly measured; the assumption was made that fishing quality equated with satisfactions.

This controversy over the benefits of recreation fishing continues to exist today despite considerable evidence supporting the greater importance of psychological benefits. Hendee and Bryan (1978) reviewed 30 studies on recreational fishing. Nature, relaxation, escape and

companionship were reported most frequently as motives for going fishing. The importance of catching fish was clearly secondary to many other psychological benefits derived from recreational fishing.

In a national survey of saltwater fishermen, the number of fish caught was associated with reported satisfaction (Hiatt et al. 1983). Very satisfied fishermen tended to catch more fish than fishermen who were slightly or not at all satisfied. When asked what their reasons were for their reported level of satisfaction, fishermen with high satisfaction indicated that being with other people and "other" reasons were important. Less satisfied fishermen mentioned the number of fish caught as the most important reason. These findings suggest a multi-dimensional nature of satisfaction where specific satisfactions contribute to produce total satisfaction for a fishing experience. Even when "success" is rated low in importance it is still considered in evaluating satisfaction.

In a study of Maryland charter boat fishermen Fedler (1984) confirmed that fishermen place high priority on relaxation, interaction with nature, social interaction and escape from the daily routine or demands of life while placing a relatively low priority on catching fish. However, since fulfillment of relaxation, nature and escape motivations for fishing were not found to be important indicators of satisfaction, it was assumed that they were generally obtained by charter fishermen in the study. Few situations would normally arise during the fishing experience that would block their fulfillment.

Fedler (1984) found that specific aspects of the fishing experience appear to be most important in determining fishing satisfaction as suggested by discrepancy theory. Apparently, charter fishermen have unique standards by which they measure their fishing experience. Helpfulness of the crew was one such important aspect which is not relative to other types of fishing.

While catching and eating fish were relatively unimportant motivations for charter fishing, when all factors are considered simultaneously, the number and kinds of fish caught played a major role in determining satisfaction. Further, the importance of the number of fish caught seemed to be a subjective evaluation on the part of the fishermen since neither differences in the number of fish caught by individual fishermen or their fishing group had any relation to overall satisfaction.

Fedler (1984) concluded that the major general reasons for fishing are fulfilled by the

experience. It is the relative lack of fulfillment of minor reasons for fishing or specific aspects that can cause dissatisfaction. Thus, while size and number of fish caught are relatively unimportant they do contribute to the fishing experience and most importantly, the fisheries manager has more control over these factors than many of the other psychological benefits from fishing. Stoffle et al. (1984) had similar conclusions in their study of Lake Michigan salmon and trout anglers. They reported that the number of fish caught was important as a public indicator of success but not in the total evaluation of the fishing experience.

## FLY FISHING and ATTITUDES RELATED TO FLY FISHING

Katz (1981) reported that:

Fly fishing, as a leisure pursuit prior to the decades of the 1950s and 1960s, was a rather elitist sport. After World War II, the development of synthetic rod-building materials (notably solid fiberglass, later followed by hollow glass) and the advent of synthetic fly line which replaced costly silk lines, created a technology in the hands of the masses. Improved transportation, especially the family automobile, opened the hinterland to the general public. Although fly fishermen in contemporary society remain a minority faction among sport fishing participants, the sport has appreciated a renaissance during the decades of the 1960s and 1970s. This rebirth was marked by a proliferation of periodical publications dealing with the sport of fishing in general, and much later with an abundance of special interest publications... The decade of the 1970s was marked by an explosion of new literature by contemporary writers, who dealt with every aspect of the sport (1981; p. 9).

During this period there was also a proliferation of private conservation organizations such as Trout Unlimited, The Federation of Fly Fishermen, Theodore Gordon Flyfishers, and The Anglers of the Au Sable. Probably the most significant effect of the increase in fly fishing is the development of new attitudes and values towards fishing, the resource and management. As Bryan stated:

As levels of angling specialization increases, attitudes and values about the sport change. Focus shifts from consumption of the fish to preservation and emphasis on the nature and setting of the activity (1977).

With the increase in fly fishing and development of new values, "quality fishing" became the buzz-word among fisheries managers during the 1970s (Carpenter et al. 1977). Carpenter et al. defined quality as, "what every angler seeks in an angling experience" and stated that, "having a definition of quality is what a fishery biologist needs to insure that he maintains fishery attributes

important to anglers." This led to studies to determine if quality meant the same thing for all anglers, and if not, to identify and segment the various groups for management purposes based on definitions of quality.

Carpenter et al. (1977) studied stream trout anglers to determine if quality was the same for anglers under different types of stream trout management. They specifically compared anglers using streams managed as wild trout fisheries to anglers using streams managed as catchable fisheries. They concluded that quality was not the same for the two groups of anglers sampled and that management systems attract anglers who's philosophy is consistent with the management philosophy underlying the systems. The catchable trout stream is yield oriented. Emphasis on products of fishing and catching fish is often improved by stocking hatchery-reared trout. The wild trout system is not yield oriented. Emphasis is on the act of fishing, not necessarily catching fish. The opportunity to catch fish in a wild trout system is maintained by natural recruitment and in most instances require that anglers do not kill many fish to maintain the system.

Probably one benefit from fly-only regulations, which many fly anglers are often hesitant to mention, is being segregated from other anglers (especially bait and lure anglers). Butler and Dolsen (1988) stated; "Conflicts between dissimilar angler sub-typologies (e.g., fly fishermen and bait fishermen do not share the same pools well) are known to diminish the recreational experiences, while conversely, positive interactions with other anglers of similar philosophy and experience expectation will prove to enhance the angling experience." This benefit should not be overlooked, but instead should be considered a legitimate benefit of special regulations and its contribution to anglers' satisfactions should be researched.

#### Part Four

#### DEVELOPMENTAL PHENOMENA

Research suggests that many anglers who are now spouting the no-kill philosophy began their fishing careers as "worm-dunkers" and killed their share of trout at some time (Bryan 1977). Bryan stated that anglers become more specialized as involvement in the sport increases. Bryan defined

specialization as increasing use of fly fishing, or changing from bait and lures to fly fishing. He proposed a philosophical change of an increase in catch-and-release fishing along with specialization. A similar pattern of attitude changes was observed in hunters who also go through stages in which the earlier stages are more concerned with taking home game (Jackson et al. 1979, Jackson and Norton 1980).

The stage concept maintains that a sportsman passes successively through each of the stages. However, the apparent support for the stage concept may be due also to the "changing times". For example, Kellert (1980) reported that older people in his sample had stronger utilitarian attitudes. This may not mean that people become more utilitarian as they age. It is more likely that older peoples' attitudes were formed during a time when utilitarian attitudes were more common. Becoming interested in no-kill fishing or progressing on to fly fishing may be due to the "time in history" aspect rather than to a progression through attitude or behavior stages. It is possible that beginning anglers can start with fly fishing and an interest in no-kill fishing. At present both theories are possible and the stage concept can not be discounted.

Certainly attitude changes take place as an angler gains more experience with the sport. Discovering and classifying these changes can add greatly to our understanding of the socio-psychological dimensions of anglers. A brief summary of the literature which guided this research on the developmental nature of trout fishing is presented here.

## DEVELOPMENTAL STAGES

Jackson et al. (1979) identified specific developmental stages that most hunters appear to pass through from beginning years to final stage. Satisfactions, motivations and hunting behavior fell into a predictable pattern of development. Five distinct stages were identified:

1. Shooter Stage: satisfactions were closely tied to being able to "get shooting".
2. Limiting-Out Stage: satisfactions were dependent upon killing game or obtaining bag limits.
3. Trophy Stage: emphasis of activity is directed towards selectivity of game, reflecting the hunter's idea of a trophy (quality versus quantity of game).
4. Method Stage: characterized by an increased intensity about hunting and emphasis is on method of hunting and specialized skills.
5. Sportsman Stage: satisfaction is obtained by the total hunting experience.

It was implied that many unethical and illegal behaviors were common among hunters in the early stages. Incidence of these behaviors might be reduced if hunters advanced more quickly through the early stages or if more opportunities for shooting and success were provided for those in the earlier stages. Thus, identifying the hunter stage of clientele could provide managers with valuable information on how best to manage a resource for the public. The stage theory not only suggests that different groups have different motivations but proposes how they might change in predictable ways. The stage theory can probably be applied to a number of recreation forms.

Attempts have been made to show that anglers also move through predictable stages. Bryan (1977) proposed that trout anglers "tend to become more specialized over time" moving in predictable ways on a number of variables. These variables include:

1. Equipment preferences
2. Time spent fishing
3. Importance of fishing
4. Species preference
5. Amount of equipment
6. Orientation to fish
7. Management philosophy
8. Attitudes towards consumption

Bryan (1977) developed a fishermen typology based on degree of specialization (specifically, amount of participation, technique and setting preference). The types were:

1. Occasional Fishermen -- those who fish infrequently because they are new to the activity and have not established it as a regular part of their leisure activity, or because it has not become a major interest.
2. Generalists -- fishermen who have established the sport as a regular leisure activity and use a variety of techniques.
3. Technique Specialists -- anglers who specialize in a particular method, largely to the exclusion of other techniques.
4. Technique-Setting Specialists -- highly committed anglers who specialize in method and have distinct preferences for specific water types on which to practice the activity.

Bryan stressed that the concept of recreational specialization refers to a continuum of behavior from the general to the specialized. Bryan proposes that fly fishermen are the most specialized among anglers. However, this neglects the possibility that bait or lure anglers can also become specialized; or the possibility that a beginning angler may start at the highest level (fly fishing) yet lack the experience that the definition implies for that level.

Research by Katz (1981) showed that as the level of involvement (activity) increased among fly fishermen their concern about the environment increased and that there were differences in attitudes about management philosophies between fishermen in high versus low involvement levels. In other words, there may be changes within fly anglers also. What the findings of Bryan and Katz suggest is that anglers do appear to go through changes over time in relation to their sport. Whether these changes are unique for specific types of trout anglers or apply to all trout anglers is unknown.

Formally, cognitive development refers to growth in ability to acquire, organize, and use information -- as a cognitive skill acquired with time and experience (Williams 1984). According to Flavell (1972) the three requirements for a developmental analysis of any behavior include: (1) specifying a set of acquisitions (what it is that develops), (2) identifying the order and processes involved, and (3) defining the time dimension of the sequence. For Flavell (1972) the items in a developmental sequence may refer to a structure, skill, concept, belief, attitude, bit of knowledge, or any other type of cognitive unit that a developmental psychologist might define and study. Skill or knowledge may be most useful to measure trout fishing development.

If the stage theory is valid, Kohlberg's (1971) finding of the importance of one's peers in moral development may be useful in understanding the development of ethical behavior among sportsmen. Kohlberg states that to effectively raise the individual from one level of ethical behavior to a higher level, requires that the person become involved with an individual or group already at that higher level of development. The vehicle whereby modification of ethical behavior or the adoption of new values is achieved is by gaining group approval. Similarly, the influence of fishing organizations on the development of ethics, motivations and ultimate acceptance of catch-and-release fishing may be of great importance.



## Chapter 3

### RESEARCH METHODS

In April 1986, the Fisheries and Wildlife Department of Michigan State University began a study to collect baseline data on the characteristics and behaviors of anglers on the Au Sable River. This project used a sample of Au Sable River anglers and a statewide sample of Michigan stream trout anglers to study attitudes, motivations, preferences and fishing behaviors (Figure 3.1). The two samples were also used to explore compliance behaviors and associated attitudes.

#### AU SABLE RIVER ANGLERS

##### FIELD INTERVIEW

Anglers entering or leaving the stream at public access sites along the Au Sable River were asked to respond to one of two questionnaires. The long form (Appendix A) required about eight to ten minutes to complete. Questionnaires were color coded to indicate the collection location. A short form (Appendix B) was available for anglers in a hurry or to be used if there were too many anglers at the site to permit using the long survey. When anglers could not be intercepted, an envelope containing a short form, a letter explaining the study (Appendix C), a complimentary pencil and a stamped, addressed envelope were left on the car windshield. Anglers who filled out this short survey were sent the remainder of the field interview in the mail (Appendix D). A second mailing with a cover letter was sent to non-respondents (Appendix E). All questionnaires were coded with a four-digit number so that questionnaires could be identified and matched with a follow-up questionnaire. Anglers were never approached while fishing in the stream in so as to not disturb their fishing experience.

# MICHIGAN TROUT ANGLER STUDY: AUSABLE RIVER USERS AND STATEWIDE SAMPLES

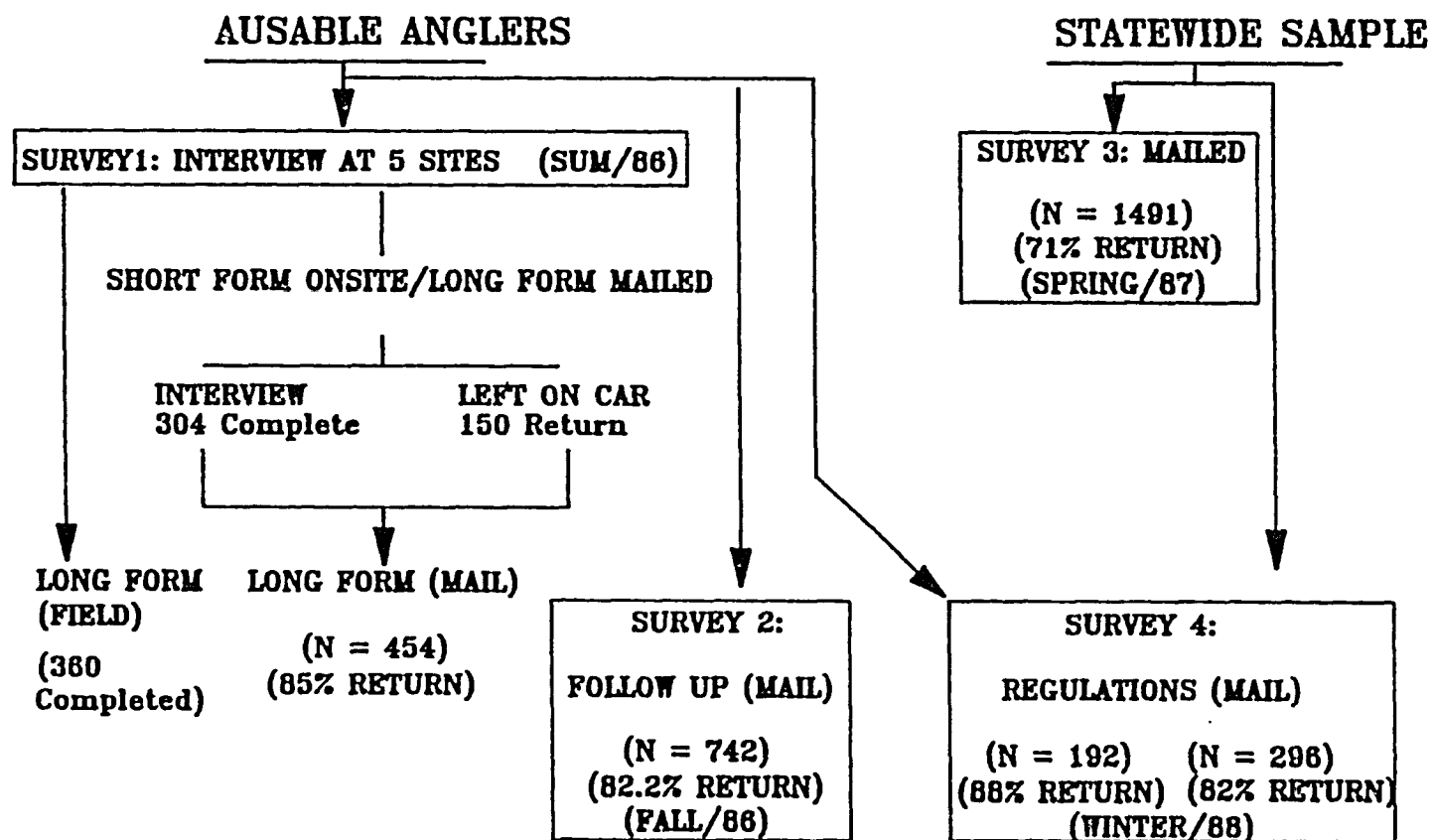


Figure 3.1. Sampling scheme of AuSable River anglers and Michigan statewide trout anglers used for this research.

**Sampling Areas & Schedule:** Interviews on the Au Sable River were conducted at access points in five different river sections (Figure 3.2):

Section 1: The proposed no-kill section from Burtons Landing to Wakeley Bridge on the Au Sable River Mainstream

Section 2: Au Sable River Mainstream from Wakeley Bridge to McMasters Bridge

Section 3: North Branch from Sheep Ranch to Kellogg Bridge

Section 4: South Branch no-kill section

Section 5: South Branch downstream of no-kill section to Smith Bridge

The study began April 26, 1986, opening day of trout season, and continued through October 5, 1986. Interviews were conducted on weekends till June and on most weekdays during the summer (Appendix F). Interviewers worked all weekends and holidays. Sampling times (8 am - 6 pm or 2 pm - midnight) and sample sections were randomly selected. The two South Branch sections were sample together.

#### **FOLLOW-UP SURVEY**

All participants who completed the interview, either in the field or by return mail, were sent a follow-up survey in the late fall and early winter 1986. This mailing included additional questions that emerged during the study (Appendix G). Two mailings of the follow-up survey were conducted to achieve adequate return rates (Appendix H).

#### **INSTRUMENT DEVELOPMENT, VALIDITY and RELIABILITY**

Survey items were considered for inclusion in the instrument if they met one of the following criteria:

1. Does the item shed some light on the catch-and-release controversy?
2. Can the item be useful in segmenting stream trout anglers?
3. Does the item have useful management implications for Au Sable River anglers?

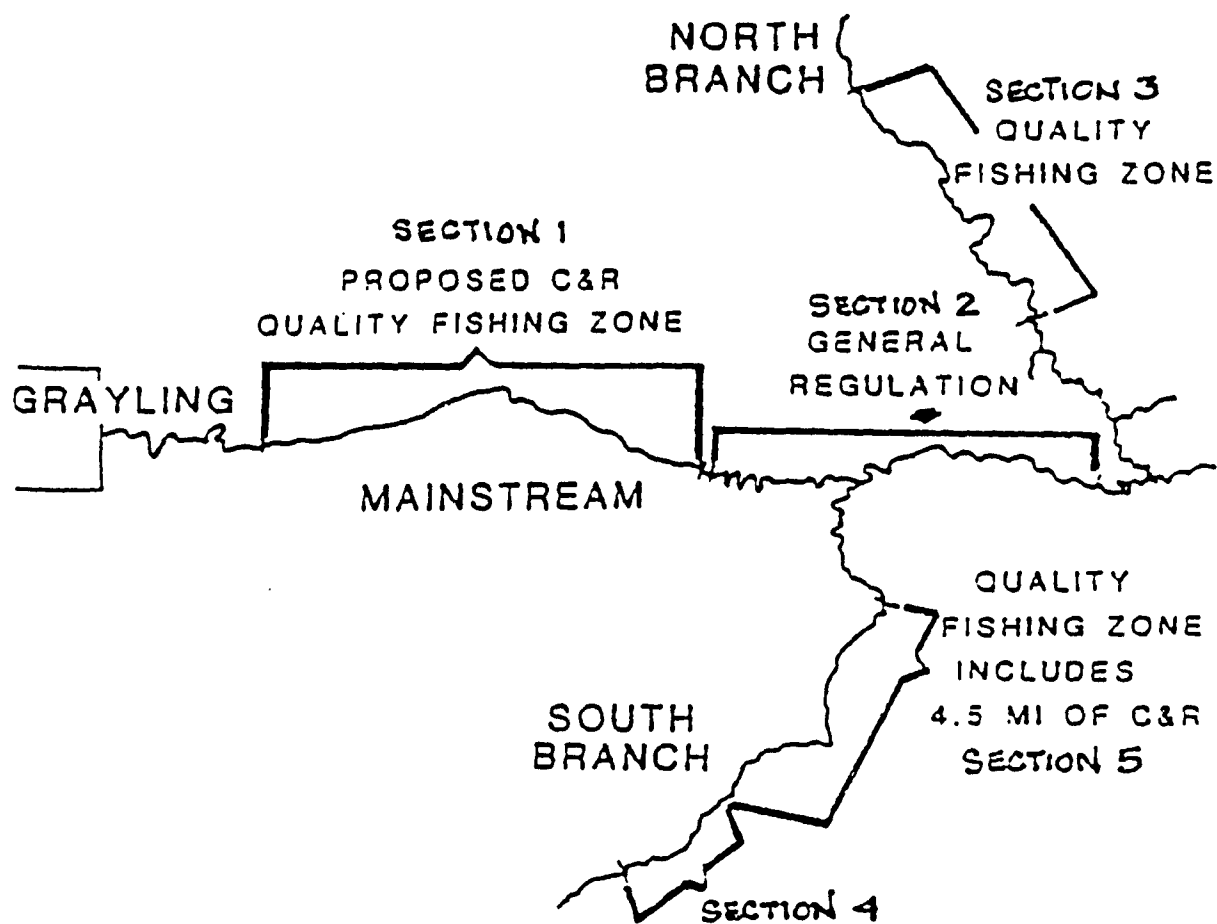


Figure 3.2. Location of AuSable River study sections, 1986.

Item questions were also assessed for clarity and understanding. Ambiguous questions were either reworded or omitted.

The first weekend (April 26-27, 1986) was used to pre-test the preliminary field instrument. Revisions were made after the pre-test to produce the field instrument. Additional items that emerged during the study were included in the follow-up survey developed at the end of the field season.

## DESCRIPTION OF THE AU SABLE RIVER FIELD INTERVIEW

Fishing Related Items: Fishing related items were included to determine the relationship of success to satisfaction for Au Sable River anglers (items 1-3).

Site Attributes: Site attributes were included to get an understanding of which site attributes Au Sable River anglers consider important (item 8).

No-Kill Issue: Items 9 - 13 sampled attitudes towards special regulations and the proposed no-kill regulation for the Mainstream. Most other items in the survey were useful for describing the differences in attitudes towards the proposed no-kill regulation.

Compliance: Items 14 - 17 were exploratory questions on compliance which was Phase II of this project. These items are not discussed in this report.

Potential Segmentation Variables: Number of fishing days (item 18), fishing method (# 19), preferred fish species (# 20), motivations for trout fishing (# 21), trout releasing behavior (# 23), membership in fishing organizations (# 24), fly tying (# 25), years of trout fishing experience (# 26) and self-reported experience (# 27), importance of trout fishing (# 28), and money invested in trout fishing equipment (# 29) were all considered as potential segmentation variables.

Miscellaneous Other Items: Au Sable River areas fished in (item 22), trout fishing after dark (# 30), party size (# 5), and number of fishing days at site (# 6) were items potentially important for management of Au Sable River anglers.

Demographics: Demographic variables are potentially important in the identification of market segments (items 1-6, pg. 6).

**Address:** Participants were asked to supply their mailing address so that follow-up surveys could be mailed to them if they agreed.

#### DESCRIPTION OF FOLLOW-UP SURVEY TO AU SABLE RIVER ANGLERS

Items important to the understanding of the no-kill controversy included: preferred Au Sable River area (item 1), intended response to a mandatory catch-and-release regulation (# 2), property ownership (# 3-6), reasons for approving the proposed no-kill (# 9-14), reasons for disapproving the proposed no-kill (# 15-24), and beliefs related to the proposed no-kill (# 25-34). Item 7, importance of catching trout, was potentially a segmentation variable. Participants were also given the opportunity to exclude themselves from a future survey dealing with attitudes towards and compliance with trout fishing regulations and an opportunity to receive a summary copy of the project's results.

#### ESTIMATE OF NON-RESPONSE BIAS

An estimate of non-response bias for those who completed the short field interview but not the remainder mailed to them later was based on the nearly 100% response rate by those who completed the field interview. An estimate of non-response bias for the follow-up survey was made based on the completed field interview. Interviewer bias was also considered.

#### STATEWIDE MICHIGAN STREAM TROUT ANGLERS

##### SELECTION OF SAMPLE

Anglers were selected from the pool of anglers who purchased a 1986 Michigan trout stamp. This stamp is required by all anglers who fish for and keep trout or salmon in Michigan waters. The 1986 sample was the most current sample available since this study began just before the beginning of the 1987 fishing season (April 1). A sample size of 1,600 was randomly selected from the 370,494 trout stamps sold in 1986 (Jamsen, MDNR, Fisheries Division, personal communication).

## ADMINISTRATION OF MICHIGAN TROUT ANGLER SURVEY

All questionnaires were mailed out at the same time (March 9, 1987) by bulk rate mailing (Appendix I). Research has shown that bulk rate mailing reduces returns in some cases but the difference is small (Linsky 1975). Address correction was requested to assure return of all undeliverable mailings with correct addresses where possible. This allowed a better estimate of non-response due to undeliverable questionnaires. There were four mailings of questionnaires with each mailing consisting of three enclosures: 1) a survey, 2) a cover letter, and 3) a pre-paid return envelope. The non-response mailings were sent out on April 27, 1987; June 1, 1987; and July 6, 1987 (Appendix J). The cover letters explain the purpose and value of the study and the importance of their participation in the study. The questionnaire was coded with a four-digit number to allow for repeat mailings to nonrespondents. These procedures follow recommendations of Dillman (1978).

Half of the sample group was sent a pre-postcard (March 2, 1987) which informed anglers that they would receive a survey in the mail while the other half were sent a reminder postcard two weeks after the first mailing of the survey (Appendix K). The return rate at the time of the second mailing of the questionnaire was almost identical for both sub-samples (pre-postcard vs. reminder postcard). Thus, both techniques appeared to be equally effective in encouraging return of the questionnaires. Participants also were informed that those who returned their completed surveys would be entered in a random drawing for a prize (about \$50 worth of gear) donated by a major tackle manufacturer.

## INSTRUMENT DEVELOPMENT, VALIDITY and RELIABILITY

Items for the survey instrument were based on principles of market segmentation, developmental stage theories, and angler motivations and attitudes. Survey items were considered for inclusion in the instrument if they met one of the following criteria:

1. Can the item be compared with the sample of Au Sable River anglers?
2. Can the item be useful in segmenting stream trout anglers?
3. Does the item clarify developmental stage theories for anglers?
4. Does the item have useful management implications for Au Sable River anglers or stream trout anglers in general?

Item questions were reviewed by peers for clarity and understanding. Ambiguous questions were either reworded or omitted.

The draft instrument was pre-tested by randomly selecting 30 anglers from the sample pool of anglers. A 31.6% (n=6) return rate was obtained (1 undeliverable survey). The returned surveys were examined for responses and potential clarity problems. The draft instrument was then revised accordingly.

## DESCRIPTION OF THE MICHIGAN TROUT ANGLER SURVEY

The survey (Michigan Trout Angler Survey) was identified to anglers as a project of Michigan State University, Department of Fisheries and Wildlife. The complete survey is included in Appendix I. Because the main interest of the study was in stream trout anglers, a filter question was used to exclude non-stream trout anglers from most of the questions since their responses would not be appropriate (item 3).

Items For Comparison With Au Sable River Sample: Variables used to compare Au Sable River anglers with a sample of Michigan stream trout anglers included: number of fishing days (item 1), preferred fish species (# 2), fishing methods (# 4), years of trout fishing experience (# 7), self-reported experience (# 8), motivations for trout fishing (# 10), importance of trout fishing (# 11), trout releasing behavior (# 12), importance of trout fishing (# 13), attitudes towards proposed no-kill regulation on Au Sable River (# 25, 26), attitudes towards special regulations (# 31-33), membership in fishing organizations (# 41) and demographic variables (# 43-47). Many of these items were also important in segmenting trout anglers.

Items For Developmental Stages Of Anglers: Items considered important for determining the developmental nature of trout fishing included: preferred method for stream trout fishing (# 5), preferred stream trout species (# 6), method of stream trout fishing first used (# 9), years of trout fishing experience (# 7), and trout fishing phases (# 37).

Items With Management Implications: Items considered to have potential management implications for Au Sable River anglers and Michigan stream trout anglers in general included: favorite Michigan trout stream (# 14), important attributes of preferred trout fishing sites (# 15,



16), 1986 trout fishing data (# 17-24), and compliance with regulations (# 34-36).

Miscellaneous Items: Great Lakes fishing (# 38), motivations for Great Lakes fishing (# 39), Great Lakes fishing phases (# 40), and hunting (# 42) were miscellaneous items added to test some ideas. Also, an item which categorized an angler's response to number of fishing days was included which asked the participant to describe his/her answer as either: (1) accurate, (2) close approximation, or (3) just a guess. Participants were also given the opportunity to exclude themselves from a future survey dealing with attitudes towards and compliance with trout fishing regulations.

#### ESTIMATE OF NON-RESPONSE BIAS

Although no non-response bias study was conducted, the cover letters with the third and fourth mailings of surveys to non-respondents included a short list of reasons for not responding. Anglers were encouraged to check off their reason and return the letter if they did not wish to participate in the study. This permitted a rough estimate of the nature of non-response bias.

#### TROUT FISHING REGULATIONS SURVEY

Beattie (1981) stated that regulations would intuitively appear to have a great influence on hunting satisfactions. He reported that, "Conservation officers are plagued with questions about why certain laws exist, game departments are chastised on occasion for not responding to the wishes of hunters, and some hunters have quit hunting because of what they perceive as excessive regulation of sport hunting." This survey explores trout anglers attitudes and behaviors towards trout fishing regulations (Appendix L).

#### SELECTION OF SAMPLE

Au Sable River Sample: Of the 610 Au Sable River anglers, 571 (93.6%) agreed to receive a questionnaire about compliance with fishing regulations. Two hundred of these anglers were randomly selected (systematic random-start selection).

Statewide Michigan Stream Trout Angler Sample: Of the 727 stream trout anglers, 626 (86.1%) agreed to receive a questionnaire about compliance with fishing regulations. Three hundred of these anglers were randomly selected (systematic random-start selection). Because a lower return rate was expected for this group, a larger sample size was used to assure adequate returns.

#### ADMINISTRATION OF MICHIGAN TROUT FISHING REGULATIONS SURVEY

All questionnaires were mailed out at the same time (January 18, 1988) by bulk rate mailing. Address correction was requested. A reminder postcard followed one week later (January 25, 1988). Two follow-up mailings of questionnaires were made to non-respondents on March 1, 1988 and April 15, 1988. The first mailing consisted of three enclosures: 1) a survey, 2) a cover letter, and 3) a pre-paid return envelope, while the last two mailings also included a check-off list of reasons for not participating in the study for those not wishing to return a completed survey (Appendix M).

#### INSTRUMENT DEVELOPMENT, VALIDITY and RELIABILITY

Survey items were chosen to meet one of the three criteria:

1. Satisfaction with trout fishing regulations
2. Attitudes towards trout fishing regulations
3. Compliance with trout fishing regulations

Each item was discussed accordingly in addition to being reviewed for clarity and understanding. Ambiguous questions were either reworded or omitted. The instrument was not pre-tested.

#### DESCRIPTION OF MICHIGAN TROUT FISHING REGULATIONS SURVEY

The survey (Your Opinions About Michigan Trout Fishing Regulations) was identified to anglers as a project of Michigan State University, Department of Fisheries and Wildlife. The complete survey is included in Appendix L. Only the parts of this survey that pertain to potential segmentation variables identified from the previous surveys are analyzed and discussed in this report. Additional analysis will be contained in a report to the Michigan Department of Natural Resources, Fisheries Division.

Items 2-5 and 46 measure satisfactions with fishing regulations. Attitudes towards fishing regulations are measured by items 6-25. Intended compliance with trout fishing regulations is measured with items 29-37. Self reported compliance with regulations is measured by items 41-45 and 47.

#### ESTIMATE OF NON-RESPONSE BIAS

Non-response bias was not studied. However, nonrespondents were asked to check their reasons why they did not wish to participate. This list of reasons was included in the last two mailings to non-respondents. This permitted an estimate of the nature of non-response bias.

#### DATA ANALYSIS

Data were entered into the IBM mainframe computer by Michigan State University (MSU) Key Punch Services. Data were analyzed with descriptive and inferential statistics utilizing the Statistical Package for the Social Sciences (SPSSX) software. A significance level of  $\alpha = 0.05$  was used to determine significance. A discussion of the statistical treatment is included with the description of the results.

#### MARKET SEGMENTATION VARIABLES

Segmentation variables were developed from an a priori approach rather than an empirical (cluster) analysis of the data. The data were used to determine the type and degree of relationships between the proposed segmentation variables and other angler characteristics.

Five criteria were used to select the potential segmentation variables. One criterion used in selecting the segmentation bases was that they would form a measurable continuum. A second criterion was that the segmentation variables contribute to an understanding of the Au Sable River "no-kill" issue as well as predict catch-and-release attitudes in general. A third criterion was that segmentation should be related to attitudes, intentions and actual behavior towards fishing

regulations. A fourth criterion was that the segmentation bases predict various angler preferences. A final criterion was that the segmentation bases be easily measured.

Three potential segmentation bases were proposed for Michigan stream trout anglers: (1) fly-fishing specialization, (2) non-consumptive orientation, and (3) trout fishing intensity. These variables are described below:

1. A fly-fishing specialization scale was created based on frequency of fly fishing versus use of bait and/or lures. The scale is divided into five segments of stream trout anglers:

- LEVEL 1: NEVER fly fish
- LEVEL 2: SOMETIMES fly fish
- LEVEL 3: OFTEN fly fish and OFTEN use bait and/or lures
- LEVEL 4: OFTEN fly fish and SOMETIMES use bait and/or lures
- LEVEL 5: OFTEN fly fish and NEVER use bait and/or lures

2. The non-consumptive orientation variable is based on the importance of "eating fish" as a reason why an angler trout fishes. Anglers rated the importance of "eating fish" on a scale of 0 (NOT A REASON) to 9 (VERY IMPORTANT REASON) from which five non-consumptive levels were defined as follows:

<u>IMPORTANCE</u>	<u>SCALE</u>	<u>VALUE</u>	<u>NON-CONSUMPTIVE</u>	<u>ORIENTATION</u>
		9		LEVEL 1
	7 -	8		LEVEL 2
	4 -	6		LEVEL 3
	1 -	3		LEVEL 4
		0		LEVEL 5

3. The trout fishing intensity scale was created using a sum of two variables: (1) the number of days of trout fishing and (2) the percent of trout fishing days relative to total days of fishing:

ABSOLUTE NUMBER OF TROUT FISHING DAYS

	<u>ASSIGNED VALUE</u>
LESS THAN 10 DAYS -	1
10 TO 19 DAYS -	2
20 TO 29 DAYS -	3
30 TO 39 DAYS -	4
40 DAYS OR MORE -	5

PERCENT OF TROUT FISHING DAYS RELATIVE TO TOTAL FISHING DAYS

	<u>ASSIGNED VALUE</u>
LESS THAN 30 PERCENT -	1
30 TO 49 PERCENT -	2
50 TO 69 PERCENT -	3
70 TO 89 PERCENT -	4
90 TO 100 PERCENT -	5

SUM OF THE ABOVE TWO SCALES

<u>(# &amp; % TROUT FISHING DAYS)</u>	-	<u>TROUT FISHING INTENSITY</u>
2		LEVEL 1
3 - 4		LEVEL 2
5 - 6		LEVEL 3
7 - 8		LEVEL 4
9 - 10		LEVEL 5

## Chapter 4

### ANALYSIS OF RESULTS

The following chapter begins with summaries of the response rates for the various Au Sable River surveys, the statewide trout angler survey and the trout fishing regulations survey with considerations of non-response bias. Next a description of Au Sable River anglers with comparisons to the statewide trout angler sample is presented. Part three is an analysis of attitudes towards catch-and-release regulations and part four is an analysis of potential segmentation variables. This chapter ends with an analysis of the developmental nature of trout fishing.

#### Part One

#### SURVEY RESPONSE RATES AND NON-RESPONSE BIAS

##### AU SABLE RIVER ANGLER SURVEYS

A total of 848 Au Sable River anglers were contacted in the study locations during the 1986 trout fishing season. Anglers were interviewed only once during the season. Anglers were interviewed in the field and completed either the full survey (6-pages) or the first 2 pages and were sent the remainder in the mail. For some, the two-page interview was left on car windshields with a stamped, addressed envelope and those returning the two-page interview were mailed the remainder of the survey.

Complete Field Interview: Complete field interviews (n=360) were conducted on the Au Sable River study areas. Less than 1 percent of all anglers contacted refused to participate.

**Short Field Interview:** Short field interviews (n=314) were conducted on the Au Sable River study areas. Ten of these short interviews did not include mailing addresses, the rest (n=304) were sent the remainder of the survey in the mail. An 82.2 percent return rate was obtained giving a total of 250 complete surveys.

**Short Interview Forms Left on the Car Windshields:** Short interview forms were left on 181 cars, of which 120 parties (cars) responded (66.3% return rate) producing 174 short surveys since more than one survey was left on each car. Twenty-four of these short surveys did not include mailing addresses, the rest (n=150) were sent the remainder of the survey in the mail. A 90 percent return rate was obtained giving a total of 135 complete surveys.

**Follow-up Survey to Au Sable River Anglers:** Follow-up surveys (n=742) were mailed out in the fall of 1986 to collect additional information. A total of 610 usable surveys were returned for a return rate of 82.2 percent.

#### BIAS -- AU SABLE RIVER ANGLER SURVEYS

**Survey Method Bias:** Three types of methods were used: (1) complete survey conducted in the field (99% response rate); (2) short survey conducted in the field and the remainder of the survey was sent by mail (82% response rate); and (3) short survey left on car to be filled out by the angler and returned by mail (66% return rate) and then the remainder of the survey was sent by mail (90% response rate). The overall return rate for the survey left on the car was 59%.

There are two possible reasons for any differences found between these surveys: (1) non-response bias, and (2) survey method used (personal interview vs. written survey). Non-response bias is not a problem for the survey completed in the field since less than 1% of the anglers contacted refused to participate. Non-response is probably not a large problem with the short survey conducted in the field since an 82% return rate was obtained. Dillman (1978) suggests that a return rate of 80% or better is adequate enough to minimize the effects of non-response bias. Non-response bias may be more of a problem with the third survey method -- leaving the short survey on the car -- since only a 59% return rate was obtained from this method. This method may be biased

in favor of more motivated respondents since a second contact to increase responses was not possible.

These three methods must be compared holding location constant since they were not used equally in all Au Sable River locations. For example, 36% of the car surveys were from the no-kill section (since this area was difficult to sample the car survey method was necessary to increase sample size) while only 8% of the long field surveys and 14% of the short field surveys were from the no-kill section. Those in the no-kill section were more favorable towards no-kill regulations.

Two locations were picked to compare survey method biases: (1) the Mainstream Quality Section and (2) the South Branch No-kill Section. For other locations the car survey method had sample sizes too small to make adequate comparisons.

Twenty-three variables were compared for survey method biases:

1. total days fished
2. number of trout fishing days
3. number of days spent fishing in no-kill areas
4. money invested in fishing equipment
5. education
6. income
7. age
8. years of experience
9. attitude towards the proposed no-kill regulation
10. importance of trout fishing
11. estimated percent of anglers keeping trout illegally
12. number of Au Sable River areas fished in
13. fish releasing behavior
14. tie flies
15. frequency of keeping trout from no-kill areas
16. self-rated experience
17. membership in fishing organizations
18. six motivations for trout fishing:
  - a. to eat fish
  - b. for fun and excitement
  - c. for companionship
  - d. to relax
  - e. to enjoy nature
  - f. to use fishing equipment

Only one variable was significantly different when compared between the two survey methods on the Mainstream Quality Section. Anglers in the complete field survey method fished in an average of 3.2 areas while anglers in the short field survey and the car survey averaged 3.7 areas ( $F = 3.4984$ ,  $df = 2$ ,  $p = .0317$ ).



Two variables showed significant differences from the South Branch No-kill Section: (1) the motivation for trout fishing, "to eat fish", and (2) estimated percent of anglers keeping trout. Anglers in the complete field survey gave "to eat fish" a 1.4 rating (on a scale of 0, NOT A REASON, to 9, VERY IMPORTANT REASON), anglers in the short field survey gave it a 2.0 rating and anglers in the car survey gave it a 0.8 rating ( $F=3.2277$ ,  $df=2$ ,  $p=.0436$ ). Thus, the main difference was between the two short surveys. Anglers in the complete field survey estimated that about 14% of the anglers in the no-kill section were keeping trout, anglers in the short field survey estimated 17% and anglers in the car survey estimated 27% ( $F=3.8517$ ,  $df=2$ ,  $p=.0263$ ).

Survey method bias is not a problem with this study. Only three of 46 statistical tests (23 variables for two locations) showed significant differences between methods used. For the three significant variables the differences among survey methods were very small.

Interviewer Bias: Two interviewers were used to collect interviews. Since interviewer bias is a possible problem in studies of this type a number of variables were examined for interviewer bias:

1. attitude towards the proposed no-kill regulation
2. frequency of keeping fish from a no-kill area
3. membership in fishing organization
4. Au Sable River areas fished in
5. importance of trout fishing
6. fish releasing behavior
7. importance of fly-fishing only areas
8. importance of no-kill areas
9. total days fished
10. motivations for trout fishing
  - a. to eat fish
  - b. for fun and excitement
  - c. for companionship
  - d. to get away and relax
  - e. to enjoy nature
  - f. to use fishing equipment

Three variables had significant differences -- means, F-values and significance are listed below:

1. Au Sable River areas fished in: 3.1 vs. 2.7 ( $F=4.4626$ ,  $df=1$ ,  $p=.0353$ )
2. Motivation -- to enjoy nature: 8.6 vs 8.3 ( $F=6.0128$ ,  $df=1$ ,  $p=.0128$ )
3. Motivation -- to use fishing equipment: 5.6 vs. 4.5 ( $F=10.8316$ ,  $p=.0011$ )

These differences are not large and may be more due to regional differences than interviewer biases since one interviewer spent more time on the South Branch (mean list first above) and the other

interviewer more time on the North Branch (mean listed second above). This was checked by looking at these three variables by interviewer holding location constant.

Two locations had large enough samples from both interviewers to make good comparisons: (1) Mainstream Quality Section and (2) North Branch. These six tests yielded two with significant results: (1) Au Sable River areas fished in was significant for the North Branch (mean=3.1 vs. 2.3,  $F=5.2425$ ,  $df=1$ ,  $p=.0246$ ), and (2) motivations -- "to use fishing equipment" was significant for the Mainstream (mean=5.4 vs. 3.6,  $f=10.7455$ ,  $df=1$ ,  $p=.0013$ ).

Only two of 30 statistical tests (15 variables for two locations) showed significant differences between methods used. Considering that the two significant variables were only significant at one location each, interviewer bias is not a problem with this study.

Non-response Bias -- Follow-up Au Sable River Angler Survey: Six variables were compared for non-response bias. Two comparisons were conducted with each variable. First a chi-square test of significance was conducted between the original sample ( $n=742$ ) and those that responded to the follow-up survey ( $n=610$ ) to determine whether the response rate is high enough to adequately reflect the same attitudes and behaviors of the original sample, i.e., a measure of non-response bias. Second, a chi-square test was conducted between the respondents ( $n=610$ ) and the non-respondents ( $n=742-610=132$ ) to the follow-up survey to determine the difference between respondents and non-respondents.

The follow-up survey was found to adequately represent the original sample on all variables tested as no significant differences were found between the follow-up survey and the original survey on any of the variables tested:

1. attitude towards the proposed no-kill regulation for the Mainstream Quality Section ( $X^2=1.538$ ,  $df=6$ ,  $p=.9569$ )
2. membership in fishing organizations ( $X^2=0.191$ ,  $df=1$ ,  $p=.6623$ )
3. tie flies ( $X^2=1.082$ ,  $df=1$ ,  $p=.2983$ )
4. self-rated experience ( $X^2=1.943$ ,  $df=3$ ,  $p=.5843$ )
5. importance of trout fishing ( $X^2=4.253$ ,  $df=3$ ,  $p=.2354$ )
6. trout releasing behavior ( $X^2=0.754$ ,  $df=3$ ,  $p=.8604$ )

However, the non-respondents were found to be different from respondents on four of these variables (significant variables are marked with an asterisk (\*) below):

- \* 1. attitude towards the proposed no-kill regulation for the Mainstream Quality Section ( $X^2=15.247$ ,  $df=6$ ,  $p=.0184$ )
- 2. membership in fishing organizations ( $X^2=2.140$ ,  $df=1$ ,  $p=.1435$ )
- \* 3. tie flies ( $X^2=11.352$ ,  $df=1$ ,  $p=.0008$ )
- \* 4. self-rated experience ( $X^2=18.328$ ,  $df=3$ ,  $p=.0004$ )
- \* 5. importance of trout fishing ( $X^2=36.395$ ,  $df=3$ ,  $p<.0001$ )
- 6. trout releasing behavior ( $X^2=7.327$ ,  $df=3$ ,  $p=.0622$ )

Non-respondents had a greater percentage of anglers who were undecided about no-kill (23.2%) than respondents (14.9%) and there were fewer non-respondents who strongly approved of no-kill (27.6%) compared to respondents (39.1%) (Table 4.1). More respondents tied flies (65.5%) compared to non-respondents (49.2%) (Table 4.2); there were fewer "beginners" (8.6%) in the respondent sample than in the non-respondent sample (20.8%) (Table 4.3); and there were far fewer anglers who ranked trout fishing relatively low in importance in the respondent sample (3.9%) than in the non-respondent sample (17.7%) (Table 4.4). Therefore, the follow-up survey is biased towards the more experienced, dedicated trout angler.

Surprisingly, respondents and non-respondents were similar on membership and trout releasing behavior. It was expected that members were more likely to respond to a survey. Apparently, non-members were motivated to respond to this survey in order to get their opinions counted. The controversial nature of the proposed Au Sable River no-kill likely stimulated a better than normal response per effort. Thus, this analysis suggests that non-response is associated more with strength of attitude than actual position on the catch-and-release issue.

Table 4.1. Attitude towards the proposed Au Sable River no-kill regulation analyzed by respondents vs. non-respondents to the follow-up mail survey to Au Sable River anglers.

ATTITUDE TOWARDS PROPOSED NO-KILL REGULATION	RESPONDENTS		NON-RESPONDENTS	
	#	%	#	%
STRONGLY DISAPPROVE	84	13.9	20	14.9
DISAPPROVE	51	8.4	11	8.2
SLIGHTLY DISAPPROVE	36	5.9	3	2.2
UNDECIDED	90	14.9	31	23.2
SLIGHTLY APPROVE	20	3.3	9	6.7
APPROVE	88	14.5	23	17.2
STRONGLY APPROVE	<u>237</u>	<u>39.1</u>	<u>37</u>	<u>27.6</u>
TOTAL	606	100.0	134	100.0

CHI-SQUARE=15.247, DF=6, P=.0187

Table 4.2. Fly tying analyzed by respondents vs. non-respondents to the follow-up mail survey to Au Sable River anglers.

TIE FLIES	RESPONDENTS		NON-RESPONDENTS	
	#	%	#	%
YES	389	65.5	64	49.2
NO	<u>205</u>	<u>34.5</u>	<u>66</u>	<u>50.8</u>
TOTAL	594	100.0	130	100.0

CHI-SQUARE=11.352, DF=1, P=.0008

Table 4.3. Self-rated experience analyzed by respondents vs. non-respondents to the follow-up mail survey to Au Sable River anglers.

SELF-RATED EXPERIENCE	RESPONDENTS		NON-RESPONDENTS	
	#	%	#	%
BEGINNER	51	8.6	27	20.8
SOMEWHAT EXPERIENCED	166	27.8	38	29.2
EXPERIENCED	202	50.7	50	38.5
EXPERT	<u>77</u>	<u>12.9</u>	<u>15</u>	<u>11.5</u>
TOTAL	596	100.0	130	100.0

CHI-SQUARE=18.328, DF=3, P=.0004

Table 4.4. Importance of trout fishing analyzed by respondents vs. non-respondents to the follow-up mail survey to Au Sable River anglers.

IMPORTANCE OF TROUT FISHING	RESPONDENTS		NON-RESPONDENTS	
	#	%	#	%
MOST IMPORTANT ACTIVITY	187	31.4	43	33.1
MORE IMPORTANT THAN MOST OTHER ACTIVITIES	260	43.7	44	33.8
IMPORTANT	125	21.0	20	15.4
SOMEWHAT to NOT VERY IMPORTANT	<u>23</u>	<u>3.9</u>	<u>23</u>	<u>17.7</u>
TOTAL	595	100.0	130	100.0

CHI-SQUARE=36.395, DF=3, P<.0001

#### STATEWIDE MICHIGAN TROUT ANGLER SURVEY

Sixteen hundred surveys were sent with 109 undeliverable, giving a sample size of 1491, of which 1056 usable surveys were returned for a response rate of 70.8 percent. In addition, 87 (20.0%) of the 436 non-respondents used the postcard to indicate their reasons for not responding to the trout angler survey.

In a study of anglers who fish for trout in Michigan, Fenske (1983) obtained a 63% return rate from 1981 trout stamp purchasers. Fenske used only two mailing of questionnaires each time followed by a postcard reminder. This study included four mailings of the questionnaire with only the first mailing followed by a postcard reminder. It appears that the extra mailings increase response rate only slightly and that more effort will be needed to increase response to above 80 percent.

#### NON-RESPONSE BIAS -- STATEWIDE MICHIGAN TROUT ANGLER SURVEY

Although a 71% return rate is considered very good there is some concern for non-response bias with this sample (Dillman 1978). Survey research consistently shows that non-respondents have a lower level of interest in the subject and are less likely to have opinions on the topic of the survey (Suchman 1962, Fillion 1975, Kanuk and Berenson 1975, Gigliotti 1983). Thus, one possible reason

for non-response to this survey may have been lack of interest in this topic. The bulk of the survey was about stream trout fishing, yet the sample was chosen from 1986 trout stamp purchasers without regard to type of trout fishing. Thus, anglers who do not stream trout fish may have decided that the survey did not apply to them and did not respond. This was strongly suggested by the non-respondents who returned a non-response card indicating their reasons for not participating in the survey (Table 4.5).

Non-respondents to the first and second mailings of the Michigan trout angler survey were asked to return their cover letter if they did not wish to participate in the study and to indicate why they did not wish to participate by checking-off their reasons on a list of five possible reasons plus an open-ended choice. Eighty-seven (20.0%) of the 436 non-respondents responded to the cover letter survey for their reasons for non-response to the trout angler survey. Only 10 (11.5%) gave no reason for their non-response, 44.8% gave one reason, 29.9% gave two reasons, and 13.6% gave three or more reasons.

The open-ended choice was selected most often by the non-respondents (41.4%) (Table 4.5). With this choice anglers nearly always focused on their lack of fishing or trout fishing during the past season and the subsequent belief that their input would be "unimportant". This means that low intensity users are likely to be under-represented. However, this bias is not great since the response rate may represent only about 12% of the sample (29.2% non-response rate times 41.4% picking this reason for non-response). While respondents indicated that little or no fishing was a major reason for not returning their survey, it did not necessarily follow that fishing or trout fishing was unimportant to them since these reasons were checked by only 18.4% and 26.4% of the respondents, respectively.

"I do not like filling out surveys," was picked by the second largest group of non-respondents (34.5%). This reason and the reason, "I do not have the time to fill out a survey," (26.4% of the non-respondents) are reasons that do not necessarily reflect biases in the parameters measured in the Michigan trout angler survey. Few (12.6%) non-respondents indicated a mistrust in the survey.

Table 4.5. Reasons given by anglers for not participating in the Michigan trout angler survey.\*

REASONS	NUMBER OF RESPONSES	% OF CASES
1. Fishing is not important to me.	16	18.4
2. Trout fishing is not important to me.	23	26.4
3. I do not have the time to fill out a survey.	23	26.4
4. I do not like filling out surveys.	30	34.5
5. I really don't trust this survey or its use.	11	12.6
6. Other:	36	41.4
TOTALS	139	159.7

\*Number of cases = 87.

One area of concern in the use of surveys to collect data on participation frequencies is "recall" (Chase and Harada 1984). In this study, anglers were asked to recall "number of fishing days" for an entire fishing season (1 year). Wyner (1980) reported that social desirability was related to response error and Sudman and Bradburn (1974) suggested that since leisure activities are generally perceived as socially desirable activities it is likely that they will be over-reported, especially when they are frequently occurring activities. Chase and Godbey (1983) reported that self-reports of participation frequency at a tennis club and a swimming club were greatly overestimated. For this study anglers were asked to describe their answers to the fishing frequency questions as: (1) accurate, (2) close approximation or (3) just a guess. Most (58.8%, n=607) described their answers as a "close approximation" while 38.0% (393) described their answers as "accurate" and only 3.2% (33) described their answers as "just a guess". Anglers reporting less participation were more likely to describe their reported participation rates as accurate (Table 4.6). Since the data were categorized into levels of participation, recall accuracy should not greatly bias this study.

Table 4.6. Total days fished during the 1986 fishing season by the statewide sample of trout stamp purchasers analyzed by self-reported level of accuracy.\*

SELF-REPORTED ACCURACY	MEAN NUMBER OF DAYS FISHED	STD DEV	NUMBER
ACCURATE	29.6	32.95	392
CLOSE APPROXIMATION	48.6	48.06	605
JUST A GUESS	52.3	64.30	<u>33</u>
TOTAL	41.5	44.54	1030

\*F=23.6768, DF=2/1027, P<.0001, ETA SQUARED=.044

### TROUT FISHING REGULATIONS SURVEY

A survey on opinions about Michigan trout fishing regulations and compliance with regulations was sent out in early 1988 to a sub-sample of anglers from both the Au Sable River sample and the statewide stream trout angler sample. Overall, 500 surveys were sent with 13 undeliverable giving a sample size of 487, of which 413 were returned for a response rate of 84.8%. In addition, 18 (24.3%) of the 74 non-respondents to this survey returned a postcard listing their reasons for not responding to this questionnaire.

Au Sable River Sample: Of the 610 Au Sable River anglers, 571 (93.6%) agreed to be sent a questionnaire about compliance with fishing regulations. Two hundred of these anglers were randomly selected (systematic random-start selection) and sent a survey with 9 undeliverable giving a sample size of 191, of which 171 were returned for a return rate of 89.5%.

Statewide Michigan Trout Angler Sample: Of the 727 stream trout anglers, 626 (86.1%) agreed to be sent a questionnaire about compliance with fishing regulations. Three hundred of these anglers were randomly selected (systematic random-start selection) and sent a survey. Four were undeliverable giving a sample size of 296. Returns equaled 242 for a return rate of 81.5%.

### NON-RESPONSE BIAS -- TROUT FISHING REGULATIONS SURVEY

While the return rates for the compliance survey were quite good (89.5% for Au Sable River anglers and 81.5% for the statewide sample) it must be remembered that first, this sample was



drawn from anglers who completed the previous surveys and thus includes that type of non-response bias and second, these anglers were given a chance to exclude themselves from this survey and thus are self-selected. The overall response rate is thus:

**AU SABLE RIVER SAMPLE:**

93.6% (self-selected) X 91.5% (completing field survey) X 82.2% (completing follow-up survey) X 89.5% (completing compliance survey) = 63.0%

**STATEWIDE SAMPLE:**

86.1% (self-selected) X 70.8% (completing survey) X 81.5% (completing compliance survey) = 49.7%

The most significant difference between anglers who agreed to be sent a survey on trout fishing regulations and those anglers who did not want to be sent a survey was their rating of the importance of trout fishing. On a scale of 1 (MOST IMPORTANT) to 6 (NOT VERY IMPORTANT) Au Sable River anglers who agreed to be sent a compliance survey rated trout fishing as 1.9 compared to a 3.0 for those not wishing to receive a survey on trout fishing regulations ( $F=38.1799$ ,  $df=1/568$ ,  $p<.0001$ ,  $ETA\ SQUARED=.063$ ). Michigan stream trout anglers who agreed to receive the compliance survey rated trout fishing as 3.2 compared to 4.0 for those not wishing to receive the survey ( $F=29.2653$ ,  $df=1/710$ ,  $p<.0001$ ,  $ETA\ SQUARED=.040$ ).

The two main reasons for not returning the compliance survey were "I do not like filling out surveys" (50.0% of cases) and "I do not have the time to fill out this survey" (38.9% of cases) (Table 4.7). Only one non-respondent (5.6%) reported that they did not trust this survey.

Non-response bias is not an important factor in this study. Variables from this survey are not reported as representing specific populations such as Au Sable River anglers or stream trout anglers. They are used only to demonstrate the usefulness of the identified segmentation bases.

Table 4.7. Reasons given by anglers for not participating in the compliance survey.

REASONS	NUMBER OF RESPONSES	% OF CASES*
1. Fishing is not important to me.	1	5.6
2. Trout fishing is not important to me.	2	11.1
3. I am not interested in this particular topic.	2	11.1
4. I do not have the time to fill out a survey.	7	38.9
5. I do not like filling out surveys.	9	50.0
6. I really don't trust this survey or its use.	1	5.6
7. Other:	2	11.1
TOTALS	24	133.4

\*Number of cases = 18.

## Part Two

### DESCRIPTION OF AU SABLE RIVER ANGLERS

#### COMPARISON WITH MICHIGAN STREAM TROUT ANGLERS

**Demographics:** The Au Sable River sample was 96.6% males which was significantly greater than the Michigan trout angler sample (92.6%) ( $X^2=10.896$ ,  $df=2$ ,  $p=.0010$ ). The Au Sable River sample had significantly higher education levels and income levels than the Michigan trout angler sample (Appendix N, Tables 1 and 2). Mean age of Au Sable River anglers (41.1 years) was similar to the Michigan trout angler sample (40.2 years) ( $F=1.7784$ ;  $df=1/1462$ ;  $p=.1826$ ).

**Fishing Methods Used for Stream Trout:** In general, fly fishing is used for stream trout fishing by Au Sable River anglers far more often than the sample of Michigan trout anglers while lures and especially bait are used less often than the Michigan trout angler sample (Appendix N, Table 3). As expected, a much greater percent of Au Sable River anglers tie flies (62.6%) than the general Michigan trout angler sample (13.6%) ( $X^2=370.066$ ,  $df=1$ ,  $p<.0001$ ).

**Preferred Fish Species:** This question was open-ended -- Of all fish species, what one species do you most prefer to fish for? Au Sable River anglers mainly preferred fishing for trout (87.3%) while the statewide sample preferred fishing for species other than trout (71.5%) ( $X^2=518.091$ ,  $df=1$ ,  $p<.0001$ ). However, the statewide sample of trout anglers who preferred trout were more likely to name a specific trout species (brown, brook or rainbow) (52.7%) compared to the Au Sable River sample (30.5%) ( $X^2=32.513$ ,  $df=1$ ,  $p=.0001$ ). Of the anglers which selected a specific trout most Au Sable River anglers preferred brown trout (50.3%) while the statewide favorite was brook trout (56.0%) (Appendix N, Table 4).

Bass was most often preferred by trout anglers who did not prefer trout. This was true both Au Sable River trout anglers (25.5%) and Michigan trout anglers (22.4%). Walleye were preferred by 19.2% and 19.3%, respectively (Appendix N, Table 5). More of the Michigan trout angler sample

than the Au Sable River sample preferred salmon (21.8% vs. 11.7%) and steelhead (12.0% vs. 0.0%) while a higher number of Au Sable River anglers reported "no preference" (14.9% vs. 1.7%).

In addition, the Michigan trout angler sample was asked to pick (fixed choice question) their preferred stream trout species. "No preference" was picked by the greatest percent of anglers (39.7%) with brook trout the most often preferred specific trout species (30.0%) followed by rainbow trout (15.3%) and brown trout (14.4%). There was no significant difference on preferred trout species for the Michigan trout angler sample between the open- and closed- type of question (Appendix N, Table 6).

**Importance of Trout Fishing:** Stream trout fishing was a much more important recreational activity for the Au Sable River anglers than those anglers in the general statewide trout angler survey (Appendix N, Table 7). For the Au Sable River sample, 73.6% reported that stream trout fishing was the most important recreational activity or more important than most other recreational activities compared to only 27.8% for the statewide sample.

**Trout Fishing Experience:** Two measures of trout fishing experience were used: self rated experience and years of experience. Self-rated fishing experience was greater for the Au Sable River sample where 61.2% rated themselves as "experienced" or "expert" compared to only 33.9% for the statewide Michigan trout angler sample (Appendix N, Table 8). Also, the Au Sable River sample reported a significantly higher mean number of years of trout fishing experience (18.3 years) than the statewide sample of trout anglers (16.6 years) ( $F=5.7300$ ;  $df=1/1444$ ;  $p=.0168$ ), however, this difference is not great.

**Membership in Trout Fishing Organizations:** About half of the Au Sable River anglers ( $n=371$ , 50.6%) reported they were members of at least one fishing organization compared to only 10.4% ( $n=75$ ) of the Michigan trout angler sample ( $X^2=274.677$ ,  $df=1$ ,  $p<.0001$ ). Many ( $n=110$ , 29.6%) of these members were members of two or more organizations.

Most ( $n=307$ , 83.4%) of the Au Sable River anglers who were members were members of Trout

Unlimited (TU) and 23.1% (n=85) were members of the Fly Fishing Federation (FFF). Other organizations included: "a local anglers club" (n=51), Michigan FFF (23), MUCC (13), BASS (12), Steelheaders (10), and "other" (24). Only 19.7% (n=14) of the statewide sample of stream trout anglers who were members were members of TU and only 2.8% (2) were members of FFF. The highest percent belonged to BASS (22.5%) followed by Steelheaders (16.9%), "a local anglers club" (15.5%), MUCC (2.8%) and "other" (33.8%). Thus, 42.1% of all Au Sable River anglers belonged to TU (50.0% X 83.4%) compared to 2.0% (10.4% X 19.7%) for the statewide trout angler sample.

**Trout Releasing Behavior:** Anglers were asked if they released legal sized trout. A significantly higher percentage of Au Sable River anglers (29.4%) release all their trout than the statewide sample of trout anglers (4.0%) (Appendix N, Table 9).

**Fishing Intensity:** Au Sable River anglers reported similar total fishing days for the 1986 fishing season (43.4 days) to the Michigan trout angler sample (45.9 days) ( $F=1.3734$ ;  $df=1/1462$ ;  $p=.2414$ ). However, Au Sable River anglers reported significantly more days of trout fishing in 1986 (28.2 days) than the statewide trout angler sample (8.9 days) ( $F=188.4395$ ;  $df=1/1463$ ;  $p<.0001$ ). Thus, the percent of fishing days devoted to trout fishing is significantly greater for Au Sable River anglers (68.6%) than for the statewide sample of trout anglers (22.3%) ( $F=875.0615$ ;  $df=1/1443$ ;  $p<.0001$ ). In addition, Au Sable River anglers reported more fishing days in waters with designated catch-and-release regulations (5.6 days) than the statewide trout angler sample (0.9 days) ( $F=116.5549$ ;  $df=1/1461$ ;  $p<.0001$ ).

**Motivations for Trout Fishing:** Anglers rated the importance of six motivations as a reasons for trout fishing on a scale of 0 (NOT A REASON) to 9 (VERY IMPORTANT REASON). The Au Sable river anglers were different from the Michigan statewide trout angler sample on all six of the measured motivations for trout fishing (Appendix N, Table 10). However, the differences are not as great as this analysis suggests since for both groups the rank order of importance is the same for the first four highest valued reasons (Figure 4.1). "To enjoy nature", "to get away and relax" and "for fun

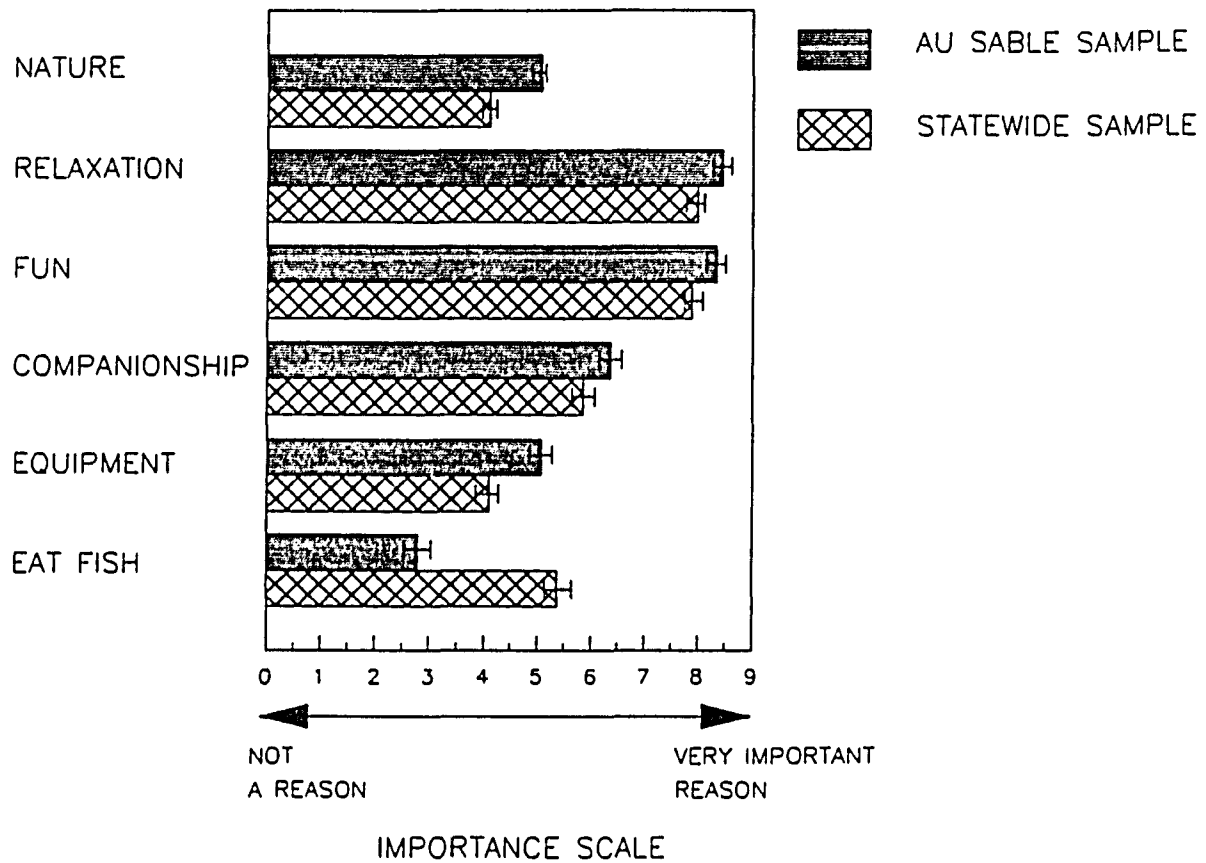


Figure 4.1. Relative importance of six motivations for trout fishing of AuSable River anglers and Michigan stream trout anglers (with 95% Confidence Intervals).

and excitement" were all ranked as the most important reasons for trout fishing followed by "companionship" for both the Au Sable River anglers and the Michigan statewide trout angler sample. The difference results from Au Sable River anglers ranking "enjoyment of fishing equipment" as fifth and "eating fish" as last while this was reversed by the statewide trout angler sample.

Importance of Catching Trout: Eight items were used to measure the importance of various aspects of catching trout. These items are compared singly here. Four items are success related, two are trophy related, one item is species oriented and one is technique oriented.

Results on three of the success related items were not significant, however, a higher percent of Au Sable River trout anglers would not go fishing if they thought they would not catch trout (47.8%) compared to 26.3% of the statewide Michigan trout angler sample (Appendix N, Table 11). Both of the trophy related items were significant although the differences were not great. A slightly higher percent of Au Sable River anglers felt that catching bigger trout or trophy trout was important compared to the statewide sample of trout anglers (Appendix N, Table 12). As expected, a higher percent of Au Sable River anglers than the statewide sample of trout anglers indicated that species of trout was important (Appendix N, Table 13). Also, trout fishing method was very important to Au Sable River anglers with 92.4% slightly agreeing (24.4%) or strongly agreeing (68.0%) that it was important compared to only 63.2% of the statewide sample slightly agreeing (35.3%) or strongly agreeing (27.9%) (Appendix N, Table 14).

Attitude Towards "Fly-Fishing Only" Regulations: As expected, Au Sable River anglers strongly supported regulations creating special "fly-fishing only" areas with 45.8% listing such areas as crucial and 28.8% as very important compared to only 3.7% and 6.2%, respectively, for the statewide Michigan trout angler sample (Appendix N, Table 15). Most (59.1%) of the statewide sample reported that special "fly-fishing only" areas were not important to them compared to only 7.7% of the Au Sable River sample.

**Attitude Towards Catch-and-Release Regulations:** Catch-and-release regulations were more strongly supported by Au Sable River anglers than the statewide sample, although catch-and-release was not nearly as important as "fly-fishing only" regulations. Nearly half (48.1%) of the Au Sable River anglers listed "no-kill" areas as crucial or very important compared to only 12.5% of the statewide sample of trout anglers (Appendix N, Table 16).

In addition, anglers were asked if they felt that the number of "no-kill" (catch-and-release) trout areas should be increased, decreased or stay the same. Most (56.0%) of the Au Sable River anglers wanted more "no-kill" areas compared to only 17.7% for the statewide sample (Appendix N, Table 17). A similar percentage of anglers from the two samples wanted the number of "no-kill" areas to decrease. Most (48.4%) of the statewide sample of trout anglers listed "NO OPINION" compared to only 14.3% of the Au Sable River anglers.

**Attitude Towards the Proposed Au Sable River No-Kill Regulation:** For this comparison, trout anglers in the statewide sample were omitted if they were not familiar with the proposed "no-kill" regulation for the Au Sable Mainstream Quality Fishing Section from Burtons Landing to Wakeley Bridge. Most (n=533, 73.9%) of the anglers in the statewide sample did not know of the Au Sable catch-and-release issue. Very few of the Au Sable River anglers were unfamiliar with the issue and those who were became familiar with the issue as a result of the interview. The greatest difference between the two groups was that a greater percent of Au Sable River anglers strongly supported the proposed "no-kill" regulation (37.1%) compared to 25.7% of the aware anglers in the statewide sample (Appendix N, Table 18). When the attitude positions are collapsed to simply approve, disapprove or undecided the two samples are similar.

## **SPECIAL CHARACTERISTICS OF AU SABLE RIVER ANGLERS**

**Anglers Contacted by Study Location:** The highest percent of anglers were contacted in the Mainstream Quality Section (34.9%) (Appendix O, Table 1). Most anglers had been fly-fishing when contacted (n=785, 92.8%) with 16 (1.9%) spincasting and 45 (5.3%) bait fishing. Most anglers had



been wading (n=727, 85.8%) when contacted, 88 (10.4%) were fishing from a boat, and 32 (3.8%) were fishing from shore.

**Primary Reasons for Selecting a Fishing Site:** Overall, "tradition" was listed as a primary reason most often (54.9% of the anglers) for selection of a fishing area (Appendix O, Table 2). "More fish", "easy access" and "larger fish" were the next three most popular choices being listed as a primary reason.

There are some important differences in reasons for selection when different locations are compared (Appendix O, Table 2). For example, "easy access" was not very important to anglers on the no-kill section of the South Branch, only 15.0% of the anglers picked it as a primary reason for fishing there while 47.9% reported "easy access" as a primary reason for fishing the Mainstream below Wakeley Bridge and 43.7% for the Mainstream Quality section. Many anglers apparently believe that the no-kill section on the South Branch is effective since 62.5% of the anglers in that section reported "expected larger fish" as a primary reason for fishing there and 51.7% of the anglers checked "expected more fish" as a primary reason for fishing there, which was much higher than for any of the other locations.

**Site Fishing Days:** Anglers were asked how many days they had fished the previous year (1985) within the study location in which they were contacted. About one-third (n=286, 33.9%) reported zero days, followed by 236 (28.0% reporting 1-5 days, 129 (15.3%) reporting 6-10 days, 113 (13.4%) reporting 11-20 days, 51 (6.0%) reporting 21-30 days and 28 (3.3%) reporting more than 30 days. Site fishing days ranged from a mean of 5.3 days for anglers fishing the South Branch no-kill section to 9.9 days for anglers fishing the North Branch although the difference was not significant ( $F=2.0982$ ;  $df=4/835$ ;  $p=.0792$ ).

**Night Fishing:** About two-thirds (n=480, 66.6%) of the Au Sable River anglers reported that they trout fish after dark in the study location in which they were contacted. A significantly greater

percent of the anglers in the two South Branch study locations fish after dark compared to the other three locations (Appendix O, Table 3).

**Party Size:** The most common party size was two ( $n=431$ , 51.1%) followed by single anglers (26.4%), three (14.9%), four (5.7%) and five or more (1.9%) in the party. Party size did not significantly vary among the five study locations ( $F=1.9550$ ;  $df=4/836$ ;  $p=.0995$ ).

**Au Sable River Areas Fished In:** Au Sable River anglers were asked which areas on the Au Sable River system they had fished or planned to fish during the 1986 fishing season. There were eight categories to choose from:

1. Mainstream above Burtons Landing
2. Mainstream below Wakeley Bridge
3. Mainstream Quality Section
4. North Branch Quality Section
5. South Branch No-kill Section
6. South Branch Quality Section excluding the no-kill section
7. East Branch
8. Other tributaries of the Au Sable River

Anglers fished a mean of 3.3 of the above Au Sable River areas. Only 17.5% of the anglers reported that they fished in only one of the above areas (Appendix O, Table 4), and 22.7% of the anglers reported that they fish in five or more of the above areas.

About three-fourths (74.3%) of the respondents reported that they fish the Mainstream Quality Section (Appendix O, Table 5). Over half (51.9%) reported that they fish the South Branch No-kill Section. Few anglers reported they fish the East Branch (10.7%), other tributaries (11.4%) and above the Mainstream Quality Section (21.5%). (Note: these three areas were not sampled while the other five areas included the interview locations.)

**Preferred Au Sable River Areas:** In the follow-up survey Au Sable River anglers were asked which area they most preferred. The Mainstream Quality Section was preferred by the greatest percent of anglers (30.4%) followed by 17.3% preferring the North Branch and 15.8% the South

Branch No-kill Section with 14.8% having no preferred Au Sable River fishing site (Appendix O, Table 6).

Money Invested in Specialized Trout Fishing Equipment: Amount of money which anglers have invested in specialized trout fishing equipment (including only specialized clothing, waders, vests, rods, reels, line, lures and flies, and fly tying and/or rod making equipment) varied widely among the Au Sable River anglers (Appendix O, Table 7). The values ranged from \$0 to \$25,000 with a mean of \$1,708.96 (SD=\$2576.29) a median of \$800.00 and a mode of \$1,000.00 (n=77, 10.8%).

Au Sable River Property Owners: In the follow-up survey of Au Sable River anglers almost one-fourth (n=142, 23.3%) of the anglers reported that they or their family owned property on or near the Au Sable River system. Half (n=71, 50.0%) reported that their property was on or close to the Mainstream, 32 (22.5%) the North Branch, 28 (19.7%) the South Branch and 11 (7.7%) "other" or blank. Sixty-two (44.0%) of this group of property owners reported that their property borders the river, 29 (20.6%) reported that their property was within one-fourth mile of the river and 50 (35.5%) had property more than one mile from the river. Most (n=74, 52.5%) used their property on vacations, holidays and/or weekends, 33 (23.4%) were year-long residents, 27 (19.1%) used their property seasonally (eg. summer) with 7 (5.0%) listing "other" uses.

Residence: Local residence is defined here as Crawford and Roscommon County residents. The Au Sable River sample consisted of 55 (6.7%) local residents, 621 (75.7%) non-local Michigan residents and 144 (17.6%) out-of-state anglers. Many of the non-local Michigan anglers were from Oakland and surrounding counties, and Kent, Bay, Saginaw and Midland Counties (Appendix P). Most (66, 45.8%) of the out-of-state anglers were from Ohio, 17 (11.8%) from Illinois, 14 (9.7%) from Indiana, 8 (5.6%) from Wisconsin and 39 (27.1%) from elsewhere, including 3 from Canada. The Au Sable River sample had a significantly higher percent of out-of-state anglers (n=144, 17.6%) than the statewide sample (n=57, 7.8%) ( $X^2=32.135$ , df=1,  $p<.0001$ ).

**1986 Harvest Characteristics:** The mean catch rate for all Au Sable River study locations in 1986 was 0.82 trout per hour of effort (SD=1.15) (includes all sizes). There were no significant differences among the five study locations ( $F=0.3047$ ;  $df=4,535$ ;  $p=.8748$ ). Anglers caught a mean of three trout although the greatest percentage of anglers ( $n=189$ , 34.9%) caught no trout (Appendix O, Table 8).

Of those anglers catching trout, most ( $n=283$ , 80.2%) did not keep any trout. However, this number also includes those anglers who did not catch any legal-sized trout. A mean of 0.43 trout were kept by anglers with 31 anglers (8.8%) keeping one trout, 17 (4.8%) keeping two trout, 13 (3.7%) keeping three trout and nine anglers (2.5%) keeping four or more trout.

Of those anglers catching trout over half ( $n=187$ , 53.1%) released legal-sized trout. Note that those not releasing legal-sized trout may not have caught any legal-sized trout. Anglers released a mean of 1.4 legal-sized trout.

The anglers who caught trout were asked to report their largest trout caught that day. Mean size was 9.7 inches (SD=3.35) and ranged from 3 inches to 26 inches with the most often reported size being 8 inches (Appendix O, Table 9).

**Satisfaction:** Most anglers ( $n=356$ , 67.2%) reported that they were extremely satisfied (19.6%) or satisfied (47.5%) with their fishing trip that day (Appendix O, Table 10). Satisfaction on a scale of 1 (EXTREMELY SATISFIED) to 6 (EXTREMELY DISSATISFIED) varied slightly by study location ranging from a mean of 2.2 for anglers on the North Branch to 2.7 for anglers on the South Branch excluding the no-kill section (Appendix O, Table 11).

Of interest is the relationship between satisfaction and trout catching success. Four variables were used to measure trout catching success: (1) total number of trout caught, (2) catch rate per hour, (3) size of largest trout caught, and (4) number of trout kept. Satisfaction was directly related to the total number of trout caught, the catch rate, the size of the largest trout caught, and the number of trout kept (Appendix O, Table 12).

## AU SABLE RIVER USERS AMONG THE STATEWIDE SAMPLE

Au Sable River Use: About two-thirds (n=507, 68.9%) of the statewide trout angler sample reported that they trout fished in streams during the 1986 fishing season, of which 22.1% (n=112) reported that they fished in the Au Sable River system. Sixty (53.6%) of this group reported that they fished in the special "Quality Fishing Areas" on the Au Sable River, of which, 45 reported to have fished in one or more of the four Quality fishing sections -- the other 15 anglers did not know exactly which section they had fished in. Twenty-six anglers reported fishing in the Mainstream Quality Section in 1986, 22 in the North Branch Quality Section, 20 in the South Branch Quality Section excluding the no-kill section, and 12 in the South Branch No-kill Section.

In addition, the statewide trout angler sample (n=736) were asked to list their favorite Michigan trout stream. The Au Sable River was mentioned by 56 anglers (7.6%), 358 (48.6%) listed a stream other than the Au Sable River, 311 (42.3%) listed "NONE" and 11 (1.5%) left the response blank.

Estimated Use: Calculations were made for total individual use of the Mainstream Quality Section and the South Branch No-kill Section based on 370,494 trout stamps sold for 1986 (Jamsen, DNR Fisheries Division, personal communication, 2-16-88); a sample size of 1492 which assumes that non-respondents did not fish in the Au Sable River Quality Sections; and the number who reported fishing in the Mainstream Quality Section and the South Branch No-kill Section.

### CALCULATIONS: MAINSTREAM QUALITY SECTION

$$26 / 1492 \times 370,494 = 6458$$

$$95\% \text{ C.I.} = P_r [p \pm 1.96 \sqrt{pq/n-1}]$$

$$p \ .00664$$

$$.01079; .02407$$

$$3318; 7401$$

Thus, the estimate for the number of individuals using the Mainstream Quality Section is 6,458 anglers with 95% confidence limits from 3,998 anglers to 8,918 anglers.

**CALCULATIONS: SOUTH BRANCH NO-KILL SECTION**

$$12 / 1492 \times 370,494 = 2980$$

$$95\% \text{ C.I.} = P_r [p \pm 1.96 \sqrt{pq/n-1}]$$

$$p = .00453388$$

$$.00350902; .01257676$$

$$1300; 4660$$

Thus, the estimate for the number of individuals using the South Branch No-kill is 2,980 anglers with 95% confidence limits from 1,300 anglers to 4,660 anglers.

### Part Three

#### ATTITUDE TOWARDS THE PROPOSED AU SABLE RIVER MAINSTREAM CATCH-AND-RELEASE (NO-KILL) REGULATION and RELATED VARIABLES

Demographics: Attitude towards the proposed Au Sable River no-kill regulation was not related to sex ( $F=.0828$ ;  $df=1,715$ ;  $p=.7736$ ). Attitude was related to residence with most (63.5%) local residents (Crawford and Roscommon Counties) disapproving of the proposed no-kill regulation while 55.5% of the Michigan non-local residents and 70.2% of the out-of-state residents approved of the proposed no-kill regulation (Table 4.8). Anglers who own (or their family owns) property on/or near the Au Sable River system were more opposed to the proposed Au Sable River no-kill regulations than non-owners (Table 4.9).

Those favorable to the proposed Au Sable River no-kill regulation had a higher income level and education level than those who disapproved of the proposed no-kill regulation (Appendix Q, Tables 1 and 2). Those opposed were slightly older than those favorable towards the proposed Au Sable River no-kill regulation (Appendix Q, Table 3).

Table 4.8. Attitude towards the proposed Au Sable River Mainstream catch-and-release regulation analyzed by residence.

ATTITUDE TOWARDS PROPOSED NO-KILL REGULATION	RESIDENCE		
	LOCAL <sup>*</sup> (N=52; 7.0%)	MICH. NON-LOCAL (N=557; 75.3%)	OUT-OF STATE (N=131; 17.7%)
APPROVE	25.0%	55.5%	70.2%
DISAPPROVE	63.5%	27.1%	16.0%
UNDECIDED	11.5%	17.4%	13.8%
TOTAL	100.0%	100.0%	100.0%

[ $\chi^2=45.883$ ,  $DF=4$ ,  $P<.0001$ ]

\*Local = Crawford and Roscommon Counties

Table 4.9. Attitude towards the proposed Au Sable River Mainstream catch-and-release regulation analyzed by owning property.

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<u>ATTITUDE SCALE</u>			
-3	STRONGLY DISAPPROVE		
-2	DISAPPROVE		
-1	SLIGHTLY DISAPPROVE		
0	UNDECIDED / NO OPINION		
1	SLIGHTLY APPROVE		
2	APPROVE		
3	STRONGLY APPROVE		

---

OWN PROPERTY ON/NEAR THE AU SABLE RIVER SYSTEM	ATTITUDE SCALE (MEAN)	STD DEV	NUMBER
YES	0.0	2.39	141
NO	1.1	2.12	<u>458</u>
TOTAL	0.9	2.19	599

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[F=25.7895; DF=1,597; P<.0001; ETA SQUARED=.0414]

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Other Attitudes Toward Special Regulations: The attitude towards the proposed Au Sable River Mainstream no-kill regulation was strongly related to the importance of catch-and-release (no-kill) regulations in general (Table 4.10). Part of this strong relationship may have been influenced by the controversy of the Au Sable River issue at the time of the survey. The questions about the importance of catch-and-release areas was asked before the anglers were asked to comment about their attitude towards the proposed Au Sable River no-kill regulations which may have caused some anglers to use the general question to voice their opinions about the specific issue. The correlation between the importance of no-kill areas in general and the proposed Au Sable River no-kill regulation was .8026 ( $n=712$ ,  $p=.000$ ) for the Au Sable River sample compared to only .6279 ( $n=183$ ,  $p=.000$ ) for the statewide Michigan trout angler sample which would not be as strongly influenced by the controversial issue because the general attitude was measured after the specific attitude towards the proposed Au Sable River no-kill regulation was measured.

The importance of "fly-fishing only" trout fishing areas was also related to the attitude towards the proposed Au Sable River no-kill regulation but was not nearly as strong as the importance of



catch-and-release trout fishing areas. A Pearson correlation between the attitude towards the proposed Au Sable River no-kill regulation and the importance of fly-fishing only areas to Au Sable River anglers was .3820 ( $n=711$ ,  $p=.000$ ) which was similar to the correlation of these same two variables in the statewide Michigan trout angler sample (Pearson corr. = .3295,  $n=183$ ,  $p=.000$ ). The importance of fly-fishing only areas and catch-and-release areas had a higher correlation (Pearson corr. = .5240,  $n=711$ ,  $p=.000$ ). Those favorable to the proposed Au Sable River no-kill regulation rated fly-fishing only areas as being more important than those opposed to the proposed Au Sable River no-kill regulation or undecided (Table 4.11).

Table 4.10. Importance of catch-and-release regulations in general analyzed by attitude towards the proposed Au Sable River Mainstream catch-and-release regulation.

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<u>IMPORTANCE OF CATCH-AND-RELEASE AREAS IN STATE</u>			
	1. CRUCIAL		
	2. VERY IMPORTANT		
	3. IMPORTANT		
	4. SOMEWHAT IMPORTANT		
	5. SLIGHTLY IMPORTANT		
	6. NOT IMPORTANT		
ATTITUDE TOWARDS	IMPORTANCE		
<u>AU SABLE NO-KILL REG.</u>	<u>SCALE (MEAN)</u>	<u>STD DEV</u>	<u>NUMBER</u>
STRONGLY DISAPPROVE	5.8	0.72	100
DISAPPROVE	4.9	1.48	61
SLIGHTLY DISAPPROVE	4.4	1.48	37
UNDECIDED / NO OPINION	3.8	1.70	114
SLIGHTLY APPROVE	3.0	1.15	29
APPROVE	2.8	1.28	104
STRONGLY APPROVE	1.4	0.72	<u>267</u>
TOTAL	3.1	1.15	712
[F=223.7109; DF=6,705; P<.0001; ETA SQUARED=.6556]			

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Table 4.11. Importance of fly-fishing only regulations in general analyzed by attitude towards the proposed Au Sable River Mainstream catch-and-release regulation.

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<u>IMPORTANCE OF FLY-FISHING ONLY AREAS IN STATE</u>			
	1. CRUCIAL		
	2. VERY IMPORTANT		
	3. IMPORTANT		
	4. SOMEWHAT IMPORTANT		
	5. SLIGHTLY IMPORTANT		
	6. NOT IMPORTANT		
ATTITUDE TOWARDS	IMPORTANCE		
AU SABLE NO-KILL REG.	SCALE (MEAN)	STD DEV	NUMBER
STRONGLY DISAPPROVE	2.8	1.81	101
DISAPPROVE	2.9	1.84	61
SLIGHTLY DISAPPROVE	2.2	1.43	37
UNDECIDED / NO OPINION	2.6	1.70	114
SLIGHTLY APPROVE	2.1	1.10	27
APPROVE	2.1	1.10	104
STRONGLY APPROVE	1.4	0.70	<u>267</u>
TOTAL	2.1	1.31	711
[ F=25.5522; DF=6,704; P<.0001; ETA SQUARED=.1788 ]			

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Importance of Trout Fishing: Trout fishing was more important to both those who strongly approved and those who strongly disapproved of the proposed Au Sable River no-kill regulation than it was for those with less strongly held opinions (Table 4.12). The correlation between the importance of trout fishing and strength of the attitude towards the proposed Au Sable River no-kill regulation was .2307 (n=706, p=.000) while the correlation between the importance of trout fishing with the attitude itself was only .0828 (n=706, p=.014).

Table 4.12. Importance of trout fishing analyzed by attitude towards the proposed Au Sable River Mainstream catch-and-release regulation.

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<u>IMPORTANCE OF TROUT FISHING SCALE</u>			
1.	MOST IMPORTANT RECREATIONAL ACTIVITY		
2.	MORE IMPORTANT THE MOST OTHER ACTIVITIES		
3.	IMPORTANT		
4.	SOMEWHAT IMPORTANT		
5.	SLIGHTLY IMPORTANT		
6.	NOT VERY IMPORTANT		

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ATTITUDE TOWARDS PROPOSED NO-KILL REG.	IMPORTANCE SCALE (MEAN)	STD DEV	NUMBER
STRONGLY DISAPPROVE	1.8	0.86	99
DISAPPROVE	2.2	0.92	61
SLIGHTLY DISAPPROVE	2.3	1.00	37
UNDECIDED / NO OPINION	2.4	1.15	114
SLIGHTLY APPROVE	2.1	0.82	27
APPROVE	2.2	0.98	104
STRONGLY APPROVE	1.8	0.78	<u>264</u>
TOTAL	2.0	0.92	706

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[F=7.9085; DF=6,699; P<.0001; ETA SQUARED=.0636]

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Trout Fishing Behaviors: Trout releasing behavior was very strongly related to the attitude towards the proposed Au Sable River no-kill regulation (Appendix Q, Table 4). Anglers who were more favorable towards the proposed no-kill regulation released a greater percent of their legal catch.

Anglers who disapproved of the proposed Au Sable River no-kill regulation had more years of trout fishing experience (Appendix Q, Table 5). There was no relationship between the attitude towards the proposed no-kill regulation and self-rated experience ( $F=0.3839$ ;  $df=3,703$ ;  $p=.7646$ ). Anglers were more favorable towards the no-kill regulation who were members of fishing organizations, who preferred trout over other species, or who tied flies (Appendix Q, Table 6). There was no significant relationship between attitude towards the proposed Au Sable River no-kill regulation and whether or not an angler trout fished after dark (Appendix Q, Table 6). Anglers with strongly held opinions (strongly approve or strongly disapprove) had the most money invested in

trout fishing equipment (strongly approve = \$2431, strongly disapprove = \$1956) (Appendix Q, Table 7).

**Motivations for Trout Fishing:** The motivation 'to eat fish', was strongly related to the attitude towards the proposed Au Sable River no-kill regulation (Table 4.13). The importance of eating fish decreased as approval of the proposed no-kill regulation increased.

The motivations, "for fun and excitement", "for companionship", "to get away and relax", and "to enjoy nature" were not significantly related to the attitude towards the proposed Au Sable River no-kill regulation (Appendix Q, Table 8). "To enjoy fishing equipment" was a slightly more important reason for trout fishing for those who favored the proposed no-kill regulation than for those who opposed the no-kill regulation (Appendix Q, Table 8).

**Table 4.13. The motivation for trout fishing, "to eat fish" analyzed by attitude towards the proposed Au Sable River Mainstream catch-and-release regulation.**

<u>IMPORTANCE OF EATING FISH SCALE</u>									
0	1	2	3	4	5	6	7	8	9
NOT A REASON								VERY IMPORTANT	
ATTITUDE TOWARDS PROPOSED NO-KILL REG.			IMPORTANCE OF FISH CONSUMPTION (MEAN)			STD DEV	NUMBER		
STRONGLY DISAPPROVE			5.2			3.27	100		
DISAPPROVE			4.4			3.00	60		
SLIGHTLY DISAPPROVE			3.8			2.77	37		
UNDECIDED / NO OPINION			3.8			2.86	114		
SLIGHTLY APPROVE			3.2			2.83	28		
APPROVE			2.4			2.64	104		
STRONGLY APPROVE			1.0			1.86	<u>263</u>		
TOTAL			2.8			2.57	706		
[F=44.2720; DF=6,699; P<.0001; ETA SQUARED=.2754]									
DISAPPROVE			4.7			3.14	197		
UNDECIDED / NO OPINION			3.8			2.86	114		
APPROVE			1.5			2.29	<u>395</u>		
TOTAL			2.8			2.65	706		
[F=104.9085; DF=2,703; P<.0001; ETA SQUARED=.2299]									

**Importance of Catching Trout:** Eight questions measured various aspects of the importance of catching trout to the anglers' satisfactions of which four were significantly related to attitude towards the proposed Au Sable River no-kill regulation (Appendix Q, Table 9). The largest relationship was for the statement, "How I catch a trout is as important to me as actually catching one." While most ( $n=557$ , 92.5%) Au Sable River anglers agreed (slightly or strongly) with this statement, the few who disagreed were significantly more opposed to the proposed no-kill regulation than those who agreed with the statement. Most (473, 78.6%) of the Au Sable River anglers agreed (slightly or strongly) that type of trout caught was not important. There was no relationship between importance of type of trout and attitude towards the proposed no-kill regulation.

Importance of catching trout items 1, 3 and 8 (see Appendix Q, Table 9 for description of items) were combined to form a "success" scale. The importance of "success" was indirectly correlated with attitude towards the proposed no-kill regulation, i.e., "success" was less important to those anglers who were favorable towards the proposed no-kill regulation (Pearson  $\text{corr} = -.149$ ,  $p < .001$ ,  $n=583$ ). The importance of catching trout items 2 and 4 were combined to form a "trophy" scale. The importance of "trophy" was directly correlated with attitude towards the proposed no-kill regulation, i.e., catching "big" trout was more important to those anglers who were favorable towards the proposed no-kill regulation (Pearson  $\text{corr} = .144$ ,  $p < .001$ ,  $n=585$ ).

**Primary Reasons Why Anglers Approve of the Proposed No-kill Regulation:** The primary reason selected by a majority (78.0%) of the Au Sable River anglers who approve of the proposed no-kill was "this area is a high quality area and deserves the most protective type of fishing regulations" (Table 4.14). Only 21.2% of the anglers who approve of the proposed no-kill believe it is an important means of reducing crowding (some even believe that it will eventually increase crowding once the fishing improves). Over half the anglers support the no-kill primarily because they believe that the size and numbers of trout caught will increase.

Table 4.14. Primary reasons why Au Sable River anglers approve of the proposed no-kill regulation for the Au Sable River Mainstream.

PRIMARY REASONS FOR WHY ANGLERS APPROVE OF THE NO-KILL REGULATION	% OF CASES (n=345)
THIS AREA IS A HIGH QUALITY AREA AND DESERVES THE MOST PROTECTIVE TYPE OF FISHING REGULATIONS.	78.0
IT WILL INCREASE THE SIZE OF THE FISH TO BE CAUGHT.	53.9
IT WILL INCREASE THE NUMBERS OF FISH TO BE CAUGHT.	51.6
TROUT ARE TOO VALUABLE TO BE KEPT.	46.7
IT WILL REDUCE CROWDING IN THE PROPOSED AREA.	21.2

Primary Reasons Why Anglers Disapprove of the Proposed No-kill Regulation: For the anglers who disapprove, loss of "personal choice" was their most frequent primary reason (72.1%) (Table 4.15). Few anglers (17.0%) were opposed to the proposed no-kill because of a belief that it would harm the local economy. About half (48.5%) of this group of anglers reported a belief that "no-kill will not improve fishing" as a primary reason for their opposition to the proposed no-kill regulation. Yet, only about 10% would change their position and accept the proposed no-kill if biological evidence from the South Branch study indicated that no-kill would produce satisfactory results in the Mainstream. As expected, of those who would change their position and accept the proposed no-kill regulation, most (47.1%, n=8) were only slightly opposed to the proposed no-kill regulation, 29.4% (5) were opposed and 23.5% (4) were strongly opposed. The relationship between attitude and whether they would change their attitude and accept the proposed no-kill regulation if evidence suggested that catch-and-release would be successful was significant ( $X^2=29.091$ ,  $df=16$ ,  $p=.0233$ ,  $\eta^2=.2523$ ).

Table 4.15. Primary reasons why Au Sable River anglers disapprove of the proposed no-kill regulation for the Au Sable River Mainstream.

<u>PRIMARY REASON FOR WHY ANGLERS DISAPPROVE OF THE PROPOSED NO-KILL</u>	<u>% OF CASES (n=165)</u>
RELEASING OR KEEPING FISH IS A PERSONAL CHOICE THAT EACH ANGLER SHOULD BE ABLE TO MAKE.	72.1
I WANT TO BE ABLE TO KEEP FISH TOO INJURED TO SURVIVE IF RELEASED.	52.1
NO-KILL REGULATIONS JUST SERVE SPECIAL INTEREST GROUPS.	49.7
NO-KILL WILL NOT IMPROVE FISHING.	48.5
I WANT TO KEEP SOME FISH TO EAT.	39.4
I WANT TO BE ABLE TO KEEP AN OUTSTANDING TROPHY FISH.	26.1
ANGLERS WILL SHIFT FROM THE "NO-KILL" AREA AND INCREASE FISHING PRESSURE IN OTHER AREAS IMPORTANT TO ME.	21.8
THE NO-KILL REGULATION WILL HARM THE LOCAL ECONOMY.	17.0

Beliefs Related to the Proposed No-kill Regulation Held by Au Sable River Anglers: All ten beliefs measured were significantly related to the anglers' attitude towards the proposed Au Sable River no-kill regulation (Table 4.16). Anglers who approved of the no-kill regulation felt that: (1) there was a shortage of no-kill areas in the State, (2) the proposed no-kill regulation would benefit the local economy, (3) the Mainstream Quality Section was over-fished, and (4) they had more trust in the Department of Natural Resources than those who disapproved of the proposed no-kill regulation. Anglers who disapproved of the no-kill regulation felt that: (1) enough of the trout caught are released to maintain quality fishing, (2) the no-kill regulation was unfair to landowners, (3) hooking mortality would be too high, (4) the Mainstream should be stocked to improve fishing, (5) the proposed no-kill regulation would not be enforced adequately, and (6) that the use of special fishing regulations should only be based on biological evidence.

A forward stepwise multiple regression (with 0.05 probability of F-to-enter) with attitude towards the proposed Au Sable River no-kill regulation as the dependent variable and these ten beliefs as independent variables gives an adjusted R-square of .7334 with seven variables in the equation (Table 4.17). The opinion that "there is a shortage of no-kill areas in the State" was the best predictor of attitude towards the proposed Au Sable River no-kill regulation with an adjusted R-square of .6018. The opinion that "anglers using the Mainstream Quality Section already release enough of the trout that are caught to maintain quality fishing" was the second variable to enter the equation raising the adjusted R-square to .6859.

Of the opposed (towards the proposed no-kill regulation) group of Au Sable River anglers, 45 (27.6%) agreed with the statement that "releasing trout is not effective because of hooking mortality" of which only 6 (13.3%) would change their attitude if evidence showed that catch-and-release was effective. Ninety (55.2%) anglers of the opposed group disagreed with this statement that "releasing trout is not effective because of hooking mortality" of which 9 (10.0%) would change their attitude if evidence showed that catch-and-release was effective. This evidence along with the fact that this belief did not enter the multiple regression equation (above) suggests that anglers opposed to the proposed Au Sable River catch-and-release regulation were not opposed because of a belief that the regulation would not be effective.



Table 4.16. Au Sable River angler opinions analyzed by attitude towards the proposed Au Sable Mainstream no-kill regulation.

-----			
OPINION SCORE			
1 = STRONGLY AGREE			
2 = AGREE			
3 = UNDECIDED			
4 = DISAGREE			
5 = STRONGLY DISAGREE			
-----			
ATTITUDE	OPINION SCORE	STD DEV	NUMBER
OPINION 1: There is a shortage of no-kill areas in the State.			
[F=312.193, DF=2, P<.0001, ETA SQUARED=.513]			
APPROVE	1.8	0.87	367
UNDECIDED	3.0	0.84	64
DISAPPROVE	<u>3.9</u>	<u>1.02</u>	<u>166</u>
Mean	2.5	1.31	597
-----			
OPINION 2: Anglers using the Mainstream Quality Section already release enough of the trout that are caught to maintain quality fishing.			
[F=238.525, DF=2, P<.0001, ETA SQUARED=.445]			
APPROVE	3.9	0.85	366
UNDECIDED	3.0	0.79	65
DISAPPROVE	<u>2.2</u>	<u>0.90</u>	<u>166</u>
Mean	3.3	1.15	597
-----			
OPINION 3: The no-kill regulation for the Mainstream is unfair to landowners.			
[F=159.116, DF=2, P<.0001, ETA SQUARED=.348]			
APPROVE	4.1	1.02	366
UNDECIDED	3.2	1.19	65
DISAPPROVE	<u>2.3</u>	<u>1.22</u>	<u>168</u>
Mean	3.5	1.36	599
-----			
OPINION 4: The proposed no-kill regulation will benefit the local economy.			
[F=150.169, DF=2, P<.0001, ETA SQUARED=.335]			
APPROVE	2.4	1.02	367
UNDECIDED	3.4	0.89	64
DISAPPROVE	<u>4.0</u>	<u>0.92</u>	<u>167</u>
Mean	3.0	1.20	598
-----			
OPINION 5: Releasing trout is not effective because most of the hooked trout die anyway.			
[F=73.188, DF=2, P<.0001, ETA SQUARED=.197]			
APPROVE	4.4	0.81	366
UNDECIDED	3.6	1.16	65
DISAPPROVE	<u>3.4</u>	<u>1.25</u>	<u>168</u>
Mean	4.0	1.11	599
-----			

Table 4.16. Continued.

ATTITUDE	OPINION SCORE	STD DEV	NUMBER
OPINION 6: The Mainstream Quality Section is overfished. [F=41.898, DF=2, P<.0001, ETA SQUARED=.123]			
APPROVE	2.4	1.03	367
UNDECIDED	2.6	0.92	65
DISAPPROVE	<u>3.3</u>	<u>1.17</u>	<u>167</u>
Mean	2.7	1.13	599
-----			
OPINION 7: The Mainstream should be stocked to improve fishing. [F=25.796, DF=2, P<.0001, ETA SQUARED=.078]			
APPROVE	3.6	1.39	365
UNDECIDED	2.7	1.20	66
DISAPPROVE	<u>2.7</u>	<u>1.41</u>	<u>169</u>
Mean	3.2	1.43	600
-----			
OPINION 8: The proposed no-kill regulation on the Mainstream will not be enforced adequately. [F=19.284, DF=2, P<.0001, ETA SQUARED=.061]			
APPROVE	2.8	1.03	367
UNDECIDED	2.6	0.95	65
DISAPPROVE	<u>2.2</u>	<u>1.07</u>	<u>168</u>
Mean	2.6	1.07	600
-----			
OPINION 9: I trust the Department of Natural Resources to manage the Au Sable River fishery in a fair and reasonable manner. [F=16.231, DF=2, P<.0001, ETA SQUARED=.052]			
APPROVE	2.5	1.00	366
UNDECIDED	2.3	0.94	65
DISAPPROVE	<u>3.0</u>	<u>1.34</u>	<u>169</u>
Mean	2.6	1.13	600
-----			
OPINION 10: The use of special fishing regulations should only be based on biological evidence. [F=7.934, DF=2, P=.0004, ETA SQUARED=.026]			
APPROVE	2.9	1.26	366
UNDECIDED	2.7	1.11	64
DISAPPROVE	<u>2.5</u>	<u>1.27</u>	<u>167</u>
Mean	2.8	1.26	597

Table 4.17. Stepwise multiple regression: Prediction of attitude towards the proposed Au Sable River no-kill regulation with beliefs held by the anglers (0.05 probability of F-to-enter criteria).<sup>1</sup>

STEP	VARIABLES <sup>2</sup>	BETA IN	F VALUE	SIGN. OF F
1	OPINION 1	-.7762	870.151	.000
2	OPINION 2	.3718	628.850	.000
3	OPINION 3	.1965	468.136	.000
4	OPINION 4	-.1533	375.462	.000
5	OPINION 9	-.0804	309.439	.000
6	OPINION 6	-.0685	262.759	.000
7	OPINION 7	.0466	226.987	.000
8-10	OPINIONS 8,10,5	--	158.549	.000

<sup>1</sup>Listwise deletion of missing data -- 575 cases were in the equation.

<sup>2</sup>Variables are described in Table 4.16.

Table 4.17. Continued.

STEP	R-SQUARE	R-SQUARE CHANGE	ADJUSTED R-SQUARE	F-CHANGE	SIGNIFICANCE OF F-CHANGE
1	.6025	.6025	.6018	870.151	.000
2	.6870	.0845	.6859	154.640	.000
3	.7106	.0236	.7091	46.605	.000
4	.7245	.0139	.7226	28.911	.000
5	.7308	.0062	.7284	13.216	.000
6	.7348	.0040	.7320	8.636	.003
7	.7367	.0019	.7334	4.012	.046
8-10	.7373	.0006	.7326	.437	.727

#### Intended Response if the Proposed Au Sable River No-kill Regulation Were To Be

Implemented: Almost half (46.9%, n=284) would fish the Au Sable Mainstream Quality Section "about the same" amount if the proposed no-kill were implemented, while 24.0% (145) would fish there more often, 15.7% (95) would fish there less often and 13.4% (81) would stop fishing there.

The intended response to the proposed no-kill regulation if implemented is strongly related to the attitude towards the proposed no-kill regulation (Table 4.18). Of particular importance is the intensity of the attitude. This is a highly polarized issue since many respondents selected extreme responses of either strongly approve (37.0%) or strongly disapprove (14.1%). The importance of

making a distinction on attitude intensity is illustrated by the difference of impact on fishing behavior within both the approve and disapprove groups. For example, 57.7% of those who "strongly approve" will fish more often if the no-kill regulation is implemented, however, only 13.3% who "approve" and 2.5% who "slightly approve" will fish more often. This trend is consistent since 51.2% of those who "strongly disapprove" would stop fishing there if the area became no-kill compared to 27.8% and 26.3% for those who "disapprove" and "slightly disapprove".

A linear regression of attitude towards the proposed no-kill regulation on intended response to the no-kill regulation if implemented gives an adjusted R-square of .549 ( $F=722.775$ ,  $df=1/592$ ,  $p<.0001$ ). The addition to the above equation of the general attitude towards catch-and-release regulations (importance of no-kill areas) gives a total adjusted r-square of .583 ( $F=414.644$ ,  $df=2/591$ ,  $p<.0001$ ).

Table 4.18. Relationship of attitude towards the proposed Au Sable River no-kill regulation and intended response in fishing behavior if the proposed no-kill regulation is implemented.\*

ATTITUDE	INTENDED FISHING RESPONSE TO NO-KILL				TOTAL (N=600)
	MORE (N=145)	SAME (N=281)	LESS (N=94)	STOP (N=80)	
STRONGLY APPROVE	57.7%	41.8%	0.5%	0%	100%
APPROVE	13.3%	80.0%	5.7%	1.0%	100%
SLIGHTLY APPROVE	2.5%	65.0%	22.5%	10.0%	100%
UNDECIDED	4.9%	57.4%	24.6%	13.1%	100%
SLIGHTLY DISAPPROVE	0%	39.5%	34.7%	26.3%	100%
DISAPPROVE	0%	22.2%	50.0%	27.8%	100%
STRONGLY DISAPPROVE	0%	20.7%	28.0%	51.2%	100%

\*CHI SQUARE=459.959, DF=18,  $P<.0001$ , ETA (WITH ATTITUDE DEPENDENT)=0.750

From the intended response and number of days fished the previous year at that site, I estimated about a 29% drop in fishing pressure for the first year of implementation of the catch-and-release regulation on the Au Sable River Mainstream Quality Section. This was based on the following assumptions:

1. The estimate of those who would "stop" fishing if a no-kill regulation were implemented is accurate.
2. The average decrease for those who reported they would "fish less" is 50% for the first year.
3. Those who reported that they would "fish more" do not increase their fishing the first year because the biological benefits of a no-kill regulation would not be very great the first year.

CALCULATIONS:

<u>INTENDED RESPONSE</u>	<u>SAMPLE SIZE</u>		<u>SITE DAYS</u>		<u>TOTAL DAYS</u>	<u>% DAYS</u>
FISH MORE	143	X	8.0	-	1144	22.0
FISH SAME	268	X	7.8	-	2090	40.2
FISH LESS	93	X	9.7	-	902	17.3
STOP FISHING	80	X	13.3	-	<u>1064</u>	<u>20.5</u>
					5200	100.0

THEREFORE: The estimated decrease in fishing pressure for the first year as a result of the catch-and-release regulations is:

$$\frac{1064 + 1/2(902)}{5200} = 29.1\%$$

Note that the estimated decrease in fishing pressure (29%) is greater than that based on just the number who would stop fishing ( $80/600 = 13.3\%$ ) (Table 4.18). This is because those who reported that they would stop fishing did the most fishing in that area (13.3 days).

Admittedly, this is a crude estimate of expected decrease in fishing pressure as a result of the catch-and-release regulation on the Au Sable River. An estimate with better confidence would require a more precise estimate of fishing pressure and behavioral intentions.

## Part Four

### SEGMENTATION BASES FOR STREAM TROUT ANGLERS

Three potential segmentation bases were proposed for Michigan stream trout anglers: (1) fly-fishing specialization, (2) non-consumptive orientation, and (3) trout fishing intensity. Fly-fishing specialization is based on frequency of fly fishing versus use of bait and/or lures. Non-consumptive orientation is based on the importance of "eating fish" as a reason why the angler trout fishes. Trout fishing intensity is based on the number of trout fishing days and the percent of fishing days spent fishing for trout. This section reports the results regarding these three segmentation bases for understanding and managing the State's trout angling public. These three segmentation bases are described on pages 45 - 46.

#### AU SABLE RIVER ANGLERS COMPARED WITH STATEWIDE TROUT ANGLERS

The Au Sable River sample had a much higher percent of highly specialized fly-anglers than the statewide sample of Michigan stream trout anglers largely because the Au Sable River sample heavily drew from the Quality Fishing Sections which have a "fly-only" regulation (Table 4.19). The comparison demonstrates that the fly-only regulation does indeed attract and concentrate the more specialized anglers. This suggests that the "fly-only" regulation is a product that an "identifiable" segment of Michigan stream trout anglers use and desire very much. The Au Sable River sample had a much higher percent of anglers in the higher levels of non-consumptive orientation than the statewide sample of Michigan trout anglers (Table 4.20). The Au Sable River sample had a much higher percent of anglers in the higher levels of trout fishing intensity than the statewide sample of trout anglers (Table 4.21).

Table 4.19. Levels of fly-fishing specialization in the Au Sable River sample compared to a statewide sample of Michigan stream trout anglers.

FLY-FISHING SPECIALIZATION	AU SABLE RIVER SAMPLE		STATEWIDE SAMPLE	
	NUMBER	PERCENT	NUMBER	PERCENT
LEVEL 1	27	3.7	374	51.8
LEVEL 2	63	8.7	266	36.8
LEVEL 3	36	5.0	22	3.0
LEVEL 4	202	28.1	35	4.8
LEVEL 5	<u>392</u>	<u>54.4</u>	<u>25</u>	<u>3.5</u>
TOTAL	720	100.0	722	99.9
CHI-SQUARE=869.576, DF=4, P<.0001				

Table 4.20. Levels of non-consumptive orientation in the Au Sable River sample compared to a statewide sample of Michigan stream trout anglers.

NON-CONSUMPTIVE ORIENTATION LEVEL	AU SABLE RIVER SAMPLE		STATEWIDE SAMPLE	
	NUMBER	PERCENT	NUMBER	PERCENT
1	64	9.1	172	23.8
2	44	6.2	105	14.5
3	145	20.5	250	34.6
4	185	26.2	139	19.2
5	<u>269</u>	<u>38.0</u>	<u>57</u>	<u>7.9</u>
TOTAL	707	100.0	723	100.0
CHI-SQUARE=246.556, DF=4, P<.0001				

Table 4.21. Levels of trout fishing intensity in the Au Sable River sample compared to a statewide sample of Michigan stream trout anglers.

TROUT FISHING INTENSITY LEVEL	AU SABLE RIVER SAMPLE		STATEWIDE SAMPLE	
	NUMBER	PERCENT	NUMBER	PERCENT
1	84	11.7	451	62.1
2	97	13.5	132	18.2
3	175	24.3	83	11.4
4	184	25.6	46	6.3
5	<u>179</u>	<u>24.9</u>	<u>14</u>	<u>1.9</u>
TOTAL	719	100.0	726	99.9
CHI-SQUARE=513.751, DF=4, P<.0001				

## RELATIONSHIP WITH OTHER VARIABLES -- AU SABLE RIVER SAMPLE

Attitude Towards Special Regulations: The anglers' attitudes towards the proposed catch-and-release regulation on the Au Sable River Mainstream Quality Section was significantly related to both fly-fishing specialization and non-consumptive orientation but not to trout fishing intensity (Table 4.22). With the attitude measured from -3 (STRONGLY DISAPPROVE) to 3 (STRONGLY APPROVE) the mean attitude score ranged from -1.2 for the most consumptive anglers (Level 1) to 2.0 for the most non-consumptive anglers (Level 5). Non-consumptive orientation was a better predictor of attitude towards the proposed catch-and-release regulation than fly-fishing specialization. In a multiple regression analysis predicting attitude towards the proposed catch-and-release regulation with fly-fishing specialization and non-consumptive orientation, fly-fishing specialization did not enter the equation at the 0.05 probability of F-to-enter criterion (Table 4.23).

The importance of having "no-kill" trout fishing areas in Michigan was also related to fly-fishing specialization and non-consumptive orientation but not to trout fishing intensity (Tables 4.24-4.26; Appendix R, Table 1). Non-consumptive orientation was the best predictor of importance of no-kill areas (Table 4.23). All three segmentation bases were significantly related to a desire to increase the number of no-kill areas (Tables 4.24-4.26; Appendix R, Table 2). A greater percentage of specialized anglers, non-consumptive anglers and high intensity anglers wanted an increase in the number of no-kill areas than did unspecialized anglers, consumptive anglers and low intensity anglers.

The importance of having "fly-only" trout fishing areas in Michigan was related to fly-fishing specialization, non-consumptive orientation and trout fishing intensity (Tables 4.24-4.26; Appendix R, Table 3). However, fly-fishing specialization was the best predictor of importance of fly-only areas (Table 4.23).



Table 4.22. Attitude towards the proposed catch-and-release regulation on the Au Sable River Mainstream Quality Section analyzed by fly-fishing specialization, non-consumptive orientation and trout fishing intensity.

<u>ATTITUDE SCALE</u>			
-3	STRONGLY DISAPPROVE		
-2	DISAPPROVE		
-1	SLIGHTLY DISAPPROVE		
0	UNDECIDED / NO OPINION		
1	SLIGHTLY APPROVE		
2	APPROVE		
3	STRONGLY APPROVE		
SEGMENTATION	MEAN ATTITUDE		
BASE	SCALE VALUE	STD DEV	NUMBER
FLY-FISHING SPECIALIZATION [F=10.8106, DF=4/714, P<.0001, ETA SQUARED=.057]			
LEVEL 1	-0.7	1.73	27
LEVEL 2	0.1	1.72	63
LEVEL 3	-0.3	2.26	36
LEVEL 4	0.6	2.29	201
LEVEL 5	1.2	2.20	392
TOTAL	0.8	2.18	719
NON-CONSUMPTIVE ORIENTATION [F=61.2537, DF=4/701, P<.0001, ETA SQUARED=.259]			
LEVEL 1	-1.2	2.12	64
LEVEL 2	-1.0	1.69	44
LEVEL 3	-0.3	2.02	144
LEVEL 4	1.1	2.03	185
LEVEL 5	2.0	1.79	269
TOTAL	0.8	1.93	706
TROUT FISHING INTENSITY [F=0.5759, DF=4/713, P=.6802]			
LEVEL 1	0.5	1.89	85
LEVEL 2	0.8	2.06	96
LEVEL 3	0.8	2.21	175
LEVEL 4	0.9	2.29	184
LEVEL 5	0.9	2.45	179
TOTAL	0.8	2.24	718

Table 4.23. Prediction of dependent variables with fly-fishing specialization, non-consumptive orientation and trout fishing intensity (0.05 probability of F-to-enter criteria).

VARIABLES	R-SQUARE	R-SQUARE CHANGE	F-CHANGE	SIGN OF F CHANGE
<u>TROUT RELEASING BEHAVIOR:</u>				
NON-CONSUMPTIVE ORIENTATION	.4789	.4789	638.731	.000
FLY-FISHING SPECIALIZATION	.5000	.0211	29.307	.000
TROUT FISHING INTENSITY	.5060	.0060	8.394	.004
<u>IMPORTANCE OF FLY-ONLY AREAS:</u>				
FLY-FISHING SPECIALIZATION	.2350	.2350	215.632	.000
NON-CONSUMPTIVE ORIENTATION	.2590	.0240	22.706	.000
<u>IMPORTANCE OF NO-KILL AREAS:</u>				
NON-CONSUMPTIVE ORIENTATION	.2487	.2487	232.662	.000
FLY-FISHING SPECIALIZATION	.2556	.0070	6.566	.011
<u>ATTITUDE TOWARDS PROPOSED AU SABLE RIVER NO-KILL REGULATION:</u>				
NON-CONSUMPTIVE ORIENTATION	.2476	.2476	231.378	.000
<u>IMPORTANCE OF TROUT FISHING:</u>				
TROUT FISHING INTENSITY	.1857	.1857	157.819	.000
FLY-FISHING SPECIALIZATION	.2462	.0605	56.226	.000
<u>SELF-RATED EXPERIENCE:</u>				
TROUT FISHING INTENSITY	.2125	.2125	189.456	.000
FLY-FISHING SPECIALIZATION	.2224	.0098	8.868	.003
<u>MONEY INVESTED IN TROUT FISHING EQUIPMENT:</u>				
TROUT FISHING INTENSITY	.0750	.0750	55.747	.000
FLY-FISHING SPECIALIZATION	.0973	.0223	16.986	.000
NON-CONSUMPTIVE ORIENTATION	.1075	.0102	7.868	.005
<u>INCOME LEVEL:</u>				
NON-CONSUMPTIVE ORIENTATION	.0842	.0842	59.873	.000
FLY-FISHING SPECIALIZATION	.0936	.0094	6.743	.010
<u>YEARS OF TROUT FISHING EXPERIENCE:</u>				
TROUT FISHING INTENSITY	.0945	.0945	73.197	.000
<u>EDUCATION LEVEL:</u>				
NON-CONSUMPTIVE ORIENTATION	.0610	.0610	45.443	.000
FLY-FISHING SPECIALIZATION	.0789	.0179	13.550	.000
<u>AGE:</u>				
FLY-FISHING SPECIALIZATION	.0349	.0349	25.313	.000
TROUT FISHING INTENSITY	.0548	.0198	14.626	.000

Table 4.24. List of variables from Au Sable River anglers related to fly-fishing specialization.  
Data found in Appendix R.

Variables	Statistic	D.F.	Sign.	Appendix R Table
IMPORTANCE OF NO-KILL AREAS	F=16.3661	4/708	<.0001	1
DESIRED NUMBER OF NO-KILL AREAS	X <sup>2</sup> =77.7762	12	<.0001	2
IMPORTANCE OF FLY-ONLY AREAS	F=62.2204	4/707	<.0001	3
YEARS OF TROUT FISHING EXPERIENCE	F=4.2044	4/701	.0023	4
SELF REPORTED EXPERIENCE	F=11.5948	4/702	<.0001	5
MONEY INVESTED IN TROUT FISHING EQUIPMENT	F=8.1585	4/688	<.0001	6
IMPORTANCE OF TROUT FISHING	F=29.3262	4/701	<.0001	7
TROUT RELEASING BEHAVIOR	F=35.0342	4/706	<.0001	8
MEMBERSHIP IN FISHING ORGANIZATIONS	X <sup>2</sup> =73.8751	4	<.0001	9
FLY TYING	X <sup>2</sup> =100.595	4	<.0001	10
PREFERRED FISH SPECIES	X <sup>2</sup> =117.611	4	<.0001	11
TROUT FISHING AFTER DARK	X <sup>2</sup> =55.9486	4	<.0001	12
REASONS FOR SELECTION AU SABLE RIVER SITES:				
EASY ACCESS TO THE RIVER	F=5.2450	4/713	.0004	13
CLOSE TO HOME, ETC.	F=3.5810	4/714	.0067	13
A FRIEND SUGGESTED IT	F=2.7201	4/712	.0287	13
TRADITIONAL FISHING AREA	F=9.7027	4/712	<.0001	13
AGE	F=8.5022	4/710	<.0001	16
EDUCATION LEVEL	F=12.5346	4/710	<.0001	17
INCOME LEVEL	F=9.5346	4/658	<.0001	18
RESIDENCE	X <sup>2</sup> =22.5309	8	.0040	19
NUMBER OF LEGAL-SIZED TROUT RELEASED	F=4.3641	4/289	.0019	22

Table 4.25. List of variables from Au Sable River anglers related to non-consumptive orientation. Data found in Appendix R.

Variables	Statistic	D.F.	Sign.	Appendix R Table
IMPORTANCE OF NO-KILL AREAS	F=59.0468	4/701	<.0001	1
DESIRED NUMBER OF NO-KILL AREAS	X <sup>2</sup> =184.932	12	<.0001	2
IMPORTANCE OF FLY-ONLY AREAS	F=22.2364	4/700	<.0001	3
MONEY INVESTED IN TROUT FISHING EQUIPMENT	F=8.4800	4/686	<.0001	6
IMPORTANCE OF TROUT FISHING	F=11.7456	4/699	<.0001	7
TROUT RELEASING BEHAVIOR	F=167.491	4/693	<.0001	8
MEMBERSHIP IN FISHING ORGANIZATIONS	X <sup>2</sup> =70.5609	4	<.0001	9
FLY TYING	X <sup>2</sup> =43.4601	4	<.0001	10
PREFERRED FISH SPECIES	X <sup>2</sup> =36.4075	4	<.0001	11
TROUT FISHING AFTER DARK	X <sup>2</sup> =16.2502	4	.0027	12
REASONS FOR SELECTION AU SABLE RIVER SITES:				
TRADITIONAL FISHING AREA	F=2.5392	4/699	.0388	14
EDUCATION LEVEL	F=12.7429	4/699	<.0001	17
INCOME LEVEL	F=16.4023	4/649	<.0001	18
RESIDENCE	X <sup>2</sup> =54.0414	8	<.0001	19
NUMBER OF TROUT KEPT	F=9.2637	4/285	<.0001	21
NUMBER OF LEGAL-SIZED TROUT RELEASED	F=4.2461	4/285	.0024	22

Table 4.26. List of variables from Au Sable River anglers related to trout fishing intensity.  
Data found in Appendix R.

Variables	Statistic	D.F.	Sign.	Appendix R Table
DESIRED NUMBER OF NO-KILL AREAS	$X^2=57.9639$	12	<.0001	2
IMPORTANCE OF FLY-ONLY AREAS	$F=4.8994$	4/706	.0007	3
YEARS OF TROUT FISHING EXPERIENCE	$F=19.7623$	4/700	<.0001	4
SELF REPORTED EXPERIENCE	$F=49.5129$	4/701	<.0001	5
MONEY INVESTED IN TROUT FISHING EQUIPMENT	$F=16.8423$	4/687	<.0001	6
IMPORTANCE OF TROUT FISHING	$F=40.3250$	4/700	<.0001	7
TROUT RELEASING BEHAVIOR	$F=10.4050$	4/705	<.0001	8
MEMBERSHIP IN FISHING ORGANIZATIONS	$X^2=39.6615$	4	<.0001	9
FLY TYING	$X^2=53.0443$	4	<.0001	10
PREFERRED FISH SPECIES	$X^2=169.969$	4	<.0001	11
TROUT FISHING AFTER DARK	$X^2=49.7134$	4	<.0001	12
REASONS FOR SELECTION AU SABLE RIVER SITES:				
EASY ACCESS TO THE RIVER	$F=2.5134$	4/712	.0405	15
A FRIEND SUGGESTED IT	$F=8.8639$	4/711	<.0001	15
TRADITIONAL FISHING AREA	$F=8.8633$	4/711	<.0001	15
AGE	$F=8.0278$	4/709	<.0001	16
EDUCATION LEVEL	$F=3.7191$	4/709	.0063	17
INCOME LEVEL	$F=3.0821$	4/657	.0157	18
RESIDENCE	$X^2=45.8223$	8	<.0001	19
CATCH RATE	$F=3.8815$	4/437	.0041	20
NUMBER OF LEGAL-SIZED TROUT RELEASED	$F=4.5892$	4/289	.0013	22

**Motivations For Trout Fishing:** Six motivations for trout fishing were analyzed by fly-fishing specialization, non-consumptive orientation and trout fishing intensity (excluding the motivation, "to eat fish" by non-consumptive orientation which was used to construct the non-consumptive orientation variable). Few motivations for trout fishing were related to these segmentation bases (Table 4.27). The importance of the motivation, "to eat fish", greatly decreased with increasing fly-fishing specialization and slightly decreased with increasing trout fishing intensity (Table 4.28).

**Miscellaneous Attitudes and Behaviors:** Specialized anglers had slightly more trout fishing experience than unspecialized anglers (Tables 4.24-4.26; Appendix R, Table 4). Years of trout fishing experience were not related to non-consumptive orientation ( $F=0.1482$ ,  $df=4/699$ ,  $p=.9638$ ). Highly intense trout anglers had many more years of trout fishing experience than less intense trout anglers.

Anglers who "fly fish often" (Levels 3 through 5) reported a higher level of experience (anglers rated themselves as a beginner, somewhat experienced, experienced, or expert trout angler) than less specialized anglers (Tables 4.24-4.26; Appendix R, Table 5). Self reported experience strongly increased with trout fishing intensity (Tables 4.23 and Appendix R, Table 5). Self reported experience was not related to non-consumptive orientation [ $F=1.9102$ ,  $df=4/700$ ,  $p=.1070$ ].

Money invested in trout fishing equipment (exclusive of boats) by Sable River anglers significantly increased with fly-fishing specialization, non-consumptive orientation and trout fishing intensity (Tables 4.24-4.26; Appendix R, Table 6). Money invested in trout fishing equipment was best predicted by trout fishing intensity (Table 4.23).

Specialized anglers, non-consumptive anglers and intense trout anglers rated trout fishing as significantly more important than did unspecialized anglers, consumptive anglers and low intensity trout anglers (Tables 4.24-4.26; Appendix R, Table 7). Importance of trout fishing was best predicted by trout fishing intensity (Table 4.23).

Voluntary trout releasing behavior increased with fly-fishing specialization, non-consumptive orientation and trout fishing intensity (Tables 4.24-4.26, Appendix R, Table 8). Non-consumptive orientation was the best predictor of trout releasing behavior (Table 4.23).

Table 4.27. F-value, degrees of freedom and significance for motivations for trout fishing analyzed by fly-fishing specialization, non-consumptive orientation and trout fishing intensity.

MOTIVATIONS FOR TROUT FISHING	F-VALUE	DF	SIGNIFICANCE
<u>FLY-FISHING SPECIALIZATION:</u>			
*- TO EAT FISH	32.9076	4/702	<.0001
-- FOR FUN AND EXCITEMENT	1.2479	4/702	.2892
-- FOR COMPANIONSHIP	1.2708	4/697	.2800
-- TO GET AWAY AND RELAX	0.2460	4/702	.9121
*- TO ENJOY NATURE	3.4466	4/703	.0084
-- TO ENJOY FISHING EQUIPMENT	1.4118	4/699	.2283
-----			
<u>NON-CONSUMPTIVE ORIENTATION:</u>			
-- TO EAT FISH	[EXCLUDED]		
-- FOR FUN AND EXCITEMENT	0.9852	4/701	.4148
-- FOR COMPANIONSHIP	0.6174	4/696	.6502
-- TO GET AWAY AND RELAX	1.6103	4/701	.1698
-- TO ENJOY NATURE	1.1375	4/701	.3376
-- TO ENJOY FISHING EQUIPMENT	2.0116	4/699	.0911
-----			
<u>TROUT FISHING INTENSITY:</u>			
*- TO EAT FISH	7.4074	4/701	<.0001
-- FOR FUN AND EXCITEMENT	0.3670	4/701	.8322
-- FOR COMPANIONSHIP	1.6071	4/696	.1707
-- TO GET AWAY AND RELAX	1.1353	4/701	.3387
-- TO ENJOY NATURE	1.5426	4/702	.1881
*- TO ENJOY FISHING EQUIPMENT	2.4581	4/698	.0443

\* Significant at the 0.05 significance level.

Table 4.28. Motivation, "to eat fish", as a reason for trout fishing analyzed by fly-fishing specialization and trout fishing intensity.

IMPORTANCE OF EATING FISH SCALE									
0	1	2	3	4	5	6	7	8	9
NOT A REASON					VERY IMPORTANT REASON				
SEGMENTATION		MEAN							
BASE		IMPORTANCE		STD DEV		NUMBER			
FLY-FISHING SPECIALIZATION [F=32.9076, DF=4/702, P<.0001, ETA SQUARED=.158]									
LEVEL 1		6.8		2.82		27			
LEVEL 2		4.5		3.11		63			
LEVEL 3		4.7		3.39		36			
LEVEL 4		3.0		2.89		202			
LEVEL 5		1.9		2.57		379			
TOTAL		2.8		2.77		707			
-----									
TROUT FISHING INTENSITY [F=7.4074, DF=4/701, P<.0001, ETA SQUARED=.041]									
LEVEL 1		3.7		3.31		83			
LEVEL 2		3.7		3.01		95			
LEVEL 3		2.8		2.88		172			
LEVEL 4		2.6		2.83		180			
LEVEL 5		2.1		2.95		176			
TOTAL		2.8		2.96		706			
-----									

Membership in fishing organizations increased with fly-fishing specialization (8.0% to 62.5%), non-consumptive orientation (16.1% to 66.5%) and trout fishing intensity (35.9% to 69.8%) (Tables 4.24-4.26; Appendix R, Table 9).

Tying flies increased significantly with fly-fishing specialization (3.7% to 73.6%), non-consumptive orientation (45.2% to 75.7%) and trout fishing intensity (43.7% to 80.1%) (Tables 4.24-4.26; Appendix R, Table 10).

Preference for trout significantly increased with fly-fishing specialization (44.4% to 94.6%), non-consumptive orientation (78.1% to 95.2%) and trout fishing intensity (48.8% to 98.3%) (Tables 4.24-4.26; Appendix R, Table 11).



The percent of Au Sable River anglers who trout fish after dark increased with fly-fishing specialization (although level 3 through 5 were similar) (23.1% to 74.3%), non-consumptive orientation (54.7% to 73.8%) and trout fishing intensity (46.3% to 81.4%) (Tables 4.24-4.26; Appendix R, Table 12).

Reasons For Selecting an Au Sable River Fishing Site: "Easy access" and "a friend suggested it" were more important to less specialized anglers (Tables 4.24-4.26; Appendix R, Table 13). Being "close to home/cabin" was most important to fly-fishing specialization level 3 anglers, and "tradition" was most important to the specialized anglers. "Fewer anglers", "larger fish", and "more fish" were not related to fly-fishing specialization. Of the seven reasons for selecting an Au Sable River fishing site only "tradition" was related to non-consumptive orientation (Tables 4.24-4.26; Appendix R, Table 14). However, this relationship was not strong and may simply reflect a Type I error.

"A friend suggested it" was least important to the high intensity trout anglers, while "tradition" was most important to the high intensity trout anglers (Tables 4.24-4.26; Appendix R, Table 15). "Easy access" was significantly related to trout fishing intensity but the differences were very small. "Close to home/cabin", "fewer anglers", "larger fish", and "more fish" were not related to trout fishing intensity.

Demographics: Sex was not related to fly-fishing specialization [ $X^2=1.7870$ ,  $df=4$ ,  $p=.7749$ ], non-consumptive orientation [ $X^2=2.4074$ ,  $df=4$ ,  $p=..6613$ ], or trout fishing intensity [ $X^2=2.8071$ ,  $df=4$ ,  $p=.5906$ ]. The most specialized and most intense trout anglers were oldest (Tables 4.24-4.26; Appendix R, Table 16). Age was not related to non-consumptive orientation [ $F=1.6815$ ,  $df=4/697$ ,  $p=.1524$ ].

Education level increased with fly-fishing specialization and non-consumptive orientation, while education level was highest for the medium trout fishing intensity level (Tables 4.24-4.26; Appendix R, Table 17). Income level was highest for the specialized trout anglers but lowest for level 3 anglers (use all three trout fishing methods often) (Tables 4.24-4.26; Appendix R, Table 18). Income level strongly increased with non-consumptive orientation but was only slightly related to trout fishing

intensity. Non-consumptive orientation was the best predictor of income level and education level (Table 4.23).

Local Au Sable River anglers (Crawford and Roscommon Counties) had a higher than expected percent of fly-fishing specialization level 3 (Tables 4.24-4.26; Appendix R, Table 19). Michigan non-local Au Sable River anglers had higher than expected percentages of less specialized anglers (levels 1 and 2), while out-of-state Au Sable River anglers had a greater percentage of specialized anglers (levels 4 and 5). Local Au Sable River anglers were more consumptive than expected and out-of-state anglers more non-consumptive than expected. Local Au Sable River anglers did more trout fishing than Michigan non-local and out-of-state anglers.

Catch Data: Catch rate (trout/hr.) was not related to fly-fishing specialization [ $F=1.3546$ ,  $df=4/437$ ,  $p=.2489$ ] or non-consumptive orientation [ $F=0.4270$ ,  $df=4/431$ ,  $p=.7891$ ]. Catch rate increased with trout fishing intensity (Tables 4.24-4.26; Appendix R, Table 20).

The number of trout kept was not related to fly-fishing specialization [ $F=1.0179$ ,  $df=4/289$ ,  $p=.3983$ ] or trout fishing intensity [ $F=0.2380$ ,  $df=4/289$ ,  $p=.9167$ ]. As expected, the number of trout kept significantly decreased with non-consumptive orientation (Tables 4.24-4.26; Appendix R, Table 21).

The number of "legal-sized" trout released increased with fly-fishing specialization and trout fishing intensity (Tables 4.24-4.26; Appendix R, Table 21). The number of "legal-sized" trout released was also related to non-consumptive orientation although the relationship was not linear, thus, even consumptive anglers release "legal-sized" trout.

Satisfaction: Satisfaction with the day's fishing trip was not significantly related to fly-fishing specialization, however, there was a trend towards an increase in satisfaction with increasing specialization (Table 4.29). Satisfaction was not related to non-consumptive orientation [ $F=2.2479$ ,  $df=4/426$ ,  $p=.0632$ ] or trout fishing intensity [ $F=1.4554$ ,  $df=4/426$ ,  $p=.2145$ ].

Table 4.29. Satisfaction with the day's fishing reported by Au Sable River anglers in 1986 analyzed by fly-fishing specialization.\*

<u>SATISFACTION SCORE</u>			
1.	EXTREMELY DISSATISFIED		
2.	DISSATISFIED		
3.	SLIGHTLY DISSATISFIED		
4.	SLIGHTLY SATISFIED		
5.	SATISFIED		
6.	EXTREMELY SATISFIED		
FLY-FISHING SPECIALIZATION	MEAN SATISFACTION	STD DEV	NUMBER
[F=2.3652, DF=4/426, P=.0523, ETA SQUARED=.022]			
LEVEL 1	4.0	1.28	12
LEVEL 2	4.4	1.04	39
LEVEL 3	4.6	1.42	18
LEVEL 4	4.7	1.11	129
LEVEL 5	4.8	1.07	<u>233</u>
TOTAL	4.7	1.10	431
*Pearson Corr = .1341, P=.003, N=434			

#### RELATIONSHIP WITH OTHER VARIABLES -- STATEWIDE SAMPLE OF MICHIGAN STREAM TROUT ANGLERS

Stream Trout Fishing Method: Preferred stream trout fishing method was strongly related to fly-fishing specialization (Tables 4.30-4.32, Appendix S, Table 1). Bait anglers were more consumptive than anglers who preferred lures or flies (Appendix S, Table 2). Trout fishing intensity was not related to preferred stream trout fishing method [ $X^2 = 13.3307$ ,  $df = 12$ ,  $p = .3455$ ].

A higher percent of specialized anglers began with flies than bait or lures (Tables 4.30-4.32, Appendix S, Table 3). Method first used for stream trout fishing was not related to non-consumptive orientation [ $X^2 = 7.5006$ ,  $df = 8$ ,  $p = .4837$ ] or trout fishing intensity [ $X^2 = 11.5859$ ,  $df = 8$ ,  $p = .1707$ ].

**Stream Trout Fishing in 1986:** Stream trout fishing in 1986 was related to fly-fishing specialization with "level 3" anglers the most likely to have fished in 1986 (95.5%, n=21) (Tables 4.30-4.32, Appendix S, Table 4). Stream trout fishing in 1986 increased with trout fishing intensity (53.3% to 100%), but was not related to non-consumptive orientation [ $X^2=2.1383$ , df=4, p=.7103].

Fishing the Au Sable River system in 1986 increased with fly-fishing specialization (Tables 4.30-4.32, Appendix S, Table 5), but was not related to non-consumptive orientation [ $X^2=6.7983$ , df=4, p=.1469] or trout fishing intensity [ $X^2=2.1741$ , df=4, p=.7038]. Fishing the "Quality Fishing Areas" of the Au Sable River increased with fly-fishing specialization and trout fishing intensity (Tables 4.30-4.32, Appendix S, Table 6), but was not related to non-consumptive orientation [ $X^2=2.5634$ , df=4, p=.6333]. Stream trout fishing outside of Michigan in 1986 increased with fly-fishing specialization and non-consumptive orientation but was only weakly related to trout fishing intensity (Tables 4.30-4.32, Appendix S, Table 7).

Table 4.30. List of variables from Michigan stream trout anglers related to fly-fishing specialization. Data found in Appendix S.

Variables	Statistic	D.F.	Sign.	Appendix S Table
PREFERRED STREAM TROUT FISHING METHOD	$X^2=395.850$	12	<.0001	1
METHOD OF STREAM TROUT FISHING FIRST USED	$X^2=176.855$	8	<.0001	3
STREAM TROUT FISHING IN 1986	$X^2=19.5514$	4	.0006	4
FISHING THE AU SABLE IN 1986	$X^2=28.0542$	4	<.0001	5
FISHING THE "QUALITY FISHING AREAS" ON THE AU SABLE RIVER IN 1986	$X^2=34.8853$	4	<.0001	6
STREAM TROUT FISHING OUTSIDE MICHIGAN IN 1986	$X^2=20.3243$	4	.0004	7
GREAT LAKES TROUT & SALMON FISHING	$X^2=12.2819$	4	.0154	8
STREAM TROUT ANGLERS WHO ALSO HUNT	$X^2=15.9484$	4	.0031	9
IMPORTANCE OF FISHING METHOD	F=6.8226	4/712	<.0001	13
PERCENT LEGAL TROUT RELEASED	F=12.7555	4/428	<.0001	14
RESIDENCY	$X^2=11.0391$	4	.0261	15

Table 4.31. List of variables from Michigan stream trout anglers related to non-consumptive orientation. Data found in Appendix S.

Variables	Statistic	D.F.	Sign.	Appendix S Table
PREFERRED STREAM TROUT FISHING METHOD	$\chi^2=31.3786$	12	.0017	2
STREAM TROUT FISHING OUTSIDE MICHIGAN IN 1986	$\chi^2=13.8631$	4	.0077	7
STREAM TROUT ANGLERS WHO ALSO HUNT	$\chi^2=28.7159$	4	<.0001	9
IMPORTANCE OF SUCCESS	$F=6.4351$	4/708	<.0001	12
IMPORTANCE OF FISHING METHOD	$F=3.7478$	4/713	.0050	13
PERCENT LEGAL TROUT RELEASED	$F=29.8787$	4/430	<.0001	14
RESIDENCY	$\chi^2=9.96309$	4	.0411	15

Table 4.32. List of variables from Michigan stream trout anglers related to trout fishing intensity. Data found in Appendix S.

Variables	Statistic	D.F.	Sign.	Appendix S Table
STREAM TROUT FISHING IN 1986	$\chi^2=138.996$	4	<.0001	4
FISHING THE "QUALITY FISHING AREAS" ON THE AU SABLE RIVER IN 1986	$\chi^2=8.6944$	4	.0692	6
STREAM TROUT FISHING OUTSIDE MICHIGAN IN 1986	$\chi^2=10.1531$	4	.0379	7
GREAT LAKES TROUT & SALMON FISHING	$\chi^2=20.3501$	4	.0004	8
FISHING IN FAVORITE TROUT FISHING AREA	$\chi^2=8.7405$	4	.0679	11
IMPORTANCE OF FISHING METHOD	$F=8.7500$	4/716	<.0001	13
PERCENT LEGAL TROUT RELEASED	$F=2.3389$	4/429	.0545	14

**Great Lakes Trout and Salmon Fishing:** The most specialized trout anglers (Level 5) were the least likely to fish for Great Lakes trout and salmon (64.0%, n=16) while "level 3" anglers were most likely to fish for Great Lakes trout and salmon (100%, n=22) (Tables 4.30-4.32, Appendix S, Table 8). Great Lakes trout and salmon fishing decreased with increasing trout fishing intensity. Non-consumptive orientation was not related to Great Lakes trout and salmon fishing [ $X^2=3.3475$ , df=4, p=.5014].

**Hunting:** The most specialized and most non-consumptive trout anglers (Level 5) were less likely to also hunt (Tables 4.30-4.32, Appendix S, Tables 9 and 10). Hunting was not related to trout fishing intensity [ $X^2=7.4263$ , df=4, p=.1150]. Preferred type of hunting (archery deer, gun deer, small game, upland birds, and waterfowl) was not related to fly-fishing specialization [ $X^2=13.6308$ , df=16, p=.6262], non-consumptive orientation [ $X^2=16.6261$ , df=16, p=.4102] or trout fishing intensity [ $X^2=22.7112$ , df=16, p=.1217].

**Most Preferred Trout Fishing Area:** About two-thirds (66.1%, n=472) of Michigan stream trout anglers do "most" of their trout fishing in their "most preferred" trout fishing area. This was not related to fly-fishing specialization [ $X^2=5.1122$ , df=4, p=.2760], non-consumptive orientation [ $X^2=7.6210$ , df=4, p=.1065] or trout fishing intensity although there was a trend towards an increase in the percent who do most of their trout fishing in their favorite trout fishing area with increasing trout fishing intensity (Tables 4.30-4.32, Appendix S, Table 11).

**Attributes For Selecting Most Preferred Trout Fishing Areas:** Only three of the 15 measured attributes which affects selection of most preferred trout fishing sites were significantly related to fly-fishing specialization (Table 4.33). "Because of the regulations there" and "type of water" increased in importance with increasing fly-fishing specialization and "close to home" decreased in importance with specialization.

Only three of the 15 measured attributes which affects selection of most preferred trout fishing sites were significantly related to non-consumptive orientation (Table 4.34). "Beauty of the area"

increased in importance with increasing non-consumptive orientation while "past success" and "usually get some action" decreased in importance with increasing non-consumptive orientation.

Seven of the 15 measured attributes which affects selection of most preferred trout fishing sites were significantly related to trout fishing intensity (Table 4.35). "Presence of wild trout", "type of water", and "type of fish in water" increased in importance with increasing trout fishing intensity. "Easy public fishing access", "available accommodations", and "because friends fish there" decreased in importance with increasing trout fishing intensity.

While most of the correlations between these three segmentation bases were small and any one segmentation base did not predict many attributes that anglers use to select their favorite trout fishing areas, 12 of the 15 attributes were significantly correlated with the three segmentation bases. Only one attribute, "type of water", was related to more than one segmentation base in which case fly-fishing specialization had a slightly higher correlation than trout fishing intensity. The three attributes not correlated with any of the three segmentation bases are: "few anglers", "chance to catch trophy trout", and "tradition, fished there often in the past".

Table 4.33. Attributes used in selecting most preferred trout fishing areas analyzed by fly-fishing specialization.

SITE ATTRIBUTE	PEARSON CORR.	NUMBER	SIGN.
*- close to home	.085	702	.012
*- because of the regulations	-.073	695	.026
*- type of water	-.081	704	.016
-- beauty of the area	-.032	703	.196
-- past success	-.001	702	.485
-- usually get some action	.028	703	.229
-- easy public fishing access	.023	699	.270
-- presence of "wild" trout	-.047	700	.109
-- presence of some large trout	-.026	704	.242
-- available accommodations	.001	703	.489
-- type of fish in water	-.031	705	.209
-- because friends fish there	-.020	705	.294
-- few anglers	-.030	705	.210
-- chance to catch trophy trout	-.046	704	.112
-- tradition, fished there often in the past	-.042	702	.131

\* Significant at 0.05 significance level.

Table 4.34. Attributes used in selecting most preferred trout fishing areas analyzed by non-consumptive orientation.

SITE ATTRIBUTE	PEARSON CORR.	NUMBER	SIGN.
-- close to home	-.007	703	.426
-- because of the regulations	.060	696	.056
-- type of water	-.036	705	.169
*- beauty of the area	-.176	704	.000
*- past success	.103	703	.003
*- usually get some action	.086	704	.012
-- easy public fishing access	.050	700	.093
-- presence of "wild" trout	.010	701	.395
-- presence of some large trout	-.012	705	.378
-- available accommodations	.026	704	.243
-- type of fish in water	-.009	706	.410
-- because friends fish there	-.024	706	.259
-- few anglers	-.040	706	.142
-- chance to catch trophy trout	-.057	705	.066
-- tradition, fished there often in the past	.001	703	.485

\* Significant at 0.05 significance level.

Table 4.35. Attributes used in selecting most preferred trout fishing areas analyzed by trout fishing intensity.

SITE ATTRIBUTE	PEARSON CORR.	NUMBER	SIGN.
-- close to home	.023	706	.269
-- because of the regulations	-.031	699	.207
*- type of water	-.073	708	.026
-- beauty of the area	.028	707	.228
-- past success	-.027	706	.234
-- usually get some action	-.027	707	.238
*- easy public fishing access	.107	703	.002
*- presence of "wild" trout	-.144	704	.000
*- presence of some large trout	-.095	708	.006
*- available accommodations	.066	707	.039
*- type of fish in water	-.112	709	.001
*- because friends fish there	.122	709	.001
-- few anglers	-.059	709	.058
-- chance to catch trophy trout	-.016	708	.334
-- tradition, fished there often in the past	.039	706	.149

\* Significant at 0.05 significance level.



**Importance of Catching Trout:** The importance of catching trout was measured along four dimensions: success, large or trophy-sized trout, method of fishing and type of trout. Four items were combined to form a success scale:

A fishing trip can be successful to me even if I don't catch trout.

When I go fishing, I am only satisfied when I catch some trout.

If I thought I would not catch trout, I would not go fishing.

The more trout I catch the happier I am.

This produced a scale ranging from 4 (success not important) to 16 (success very important). The statewide sample of Michigan stream trout anglers had a mean score of 8.1 (SD=2.85, N=717). The importance of "success" was not related to fly-fishing specialization [ $F=0.5258$ ,  $df=4/707$ ,  $p=.7168$ ] or trout fishing intensity [ $F=1.4030$ ,  $df=4/711$ ,  $p=.2313$ ]. The importance of success significantly decreased with increasing non-consumptive orientation (Tables 4.30-4.32; Appendix S, Table 12).

The importance of catching larger or trophy-sized trout to anglers' satisfaction was measured by two items: "The bigger the trout I catch, the better the fishing trip" and "Catching a trophy trout is the biggest reward for me". This produced a scale ranging from 2 (large trout not important) to 8 (larger trout very important). The statewide sample of Michigan stream trout anglers had a mean score of 4.9 (ST=1.73, N=720). The importance of catching larger trout was not related to fly-fishing specialization [ $F=0.2205$ ,  $df=4/710$ ,  $p=.9270$ ], non-consumptive orientation [ $F=0.2418$ ,  $df=4/711$ ,  $p=.9146$ ] or trout fishing intensity [ $F=2.2658$ ,  $df=4/714$ ,  $p=.0606$ ].

The importance of trout fishing method was measured with the following item: "How I catch a trout is as important to me as actually catching one." The importance of fishing method increased with fly-fishing specialization, non-consumptive orientation and trout fishing intensity (Tables 4.30-4.32; Appendix S, Table 13).

The importance of type of trout caught was measured with the following item: "It does not matter to me what type of trout I catch." The importance of type of trout was not related to fly-fishing specialization [ $F=1.6041$ ,  $df=4/710$ ,  $p=.1714$ ], non-consumptive orientation [ $F=1.3287$ ,  $df=4/711$ ,  $p=.2577$ ] or trout fishing intensity [ $F=1.7597$ ,  $df=4/714$ ,  $p=.1351$ ].

**Percent of Legal Trout Released:** The percent of legal trout voluntarily released in 1986 by Michigan stream trout anglers increased strongly with fly-fishing specialization and non-consumptive orientation and only slightly with trout fishing intensity (Tables 4.30-4.32; Appendix S, Table 14).

**Residence:** The most specialized stream trout anglers (Level 5) had a higher probability than expected of being out-of-state (Tables 4.30-4.32; Appendix S, Table 15). There was also an increase in out-of-state anglers with increasing non-consumptive orientation. Residency was not related to trout fishing intensity [ $X^2=2.9470$ ,  $df=4$ ,  $p=.5662$ ].

## OPINIONS RELATED TO FISHING REGULATIONS

Using a special sample drawn from both the Au Sable River sample and the Michigan statewide sample of trout anglers these three segmentation bases (fly-fishing specialization, non-consumptive orientation and trout fishing intensity) are examined to determine their usefulness in understanding attitudes related to fishing regulations.

**Fly-Fishing specialization:** More specialized trout anglers had greater disagreement with the statement, "Trout fishing regulations are overly protective and should be relaxed some," than less specialized trout anglers (Appendix T, Table 1). More specialized anglers were in greater agreement that regulations should be set on a stream or local area basis than less specialized anglers. More specialized trout anglers were in greater disagreement with the statement, "Fishing regulations detract from my trout fishing experience," than less specialized trout anglers. Competition with trout fishing companions was of least importance to the more specialized trout anglers.

More specialized trout anglers had greater agreement with the statement, "Trout fishing regulations are not enforced adequately," than less specialized anglers (Appendix T, Table 1). More specialized trout anglers had greater disagreement with the statement, "DNR Law Enforcement is too strict in its enforcement of trout fishing regulations" than less specialized anglers. Surprisingly,

more specialized trout anglers had less "trust" in the DNR Fisheries Division to manage the State's trout fisheries resource in a fair and reasonable manner than the less specialized trout anglers.

More specialized trout anglers had less agreement with the statement, "Most fishing regulations have a good biological basis," than less specialized trout anglers. More specialized trout anglers would be less upset to be checked by a Conservation Officer while trout fishing than less specialized trout anglers.

A higher percentage of more specialized trout anglers (41.4% of Level 4 and 54.6% of Level 5) felt that penalties for trout fishing violations should be increased compared to less specialized trout anglers (28.9% for Level 1, 27.2% for Level 2, and 21.1% for Level 3) (Appendix T, Table 2). Less specialized trout anglers were more willing to let the penalties "stay the same".

There was no relationship between fly-fishing specialization level and these three statements:

"Most trout fishing violations occur because anglers do not know the regulations, not because anglers deliberately break the laws." [MEAN=-0.4<sup>1</sup>, STD DEV=1.09, N=405] [F=1.5915, DF=4/400, P=.1757] [X<sup>2</sup>=5.4780, P=.2417]<sup>2</sup>

"The Department of Natural Resources (DNR) Fisheries Division has the competence and technical training to know how to properly manage the State's fisheries resource." [MEAN=0.4, STD DEV.=1.00, N=401] [F=0.7960, DF=4/396, P=.5283] [X<sup>2</sup>=3.7309, P=.4436]

"Conservation Officers are usually fair in their treatment of anglers." [MEAN=0.8, STD DEV.=0.80, N=405] [F=1.5423, DF=4/400, P=.1891] [X<sup>2</sup>=3.8556, P=.4259]

Non-Consumptive Orientation: Non-consumptive trout anglers had greater disagreement with the statement, "Trout fishing regulations are overly protective and should be relaxed some," than consumptive anglers (Appendix T, Table 3). Fishing regulations detract less from non-consumptive trout anglers than consumptive trout anglers. Competition with trout fishing companions was less important to non-consumptive trout anglers than consumptive trout anglers. Non-consumptive trout

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<sup>1</sup> 2=STRONGLY AGREE, 1=AGREE, 0=UNDECIDED, -1=DISAGREE, -2=STRONGLY DISAGREE

<sup>2</sup> Kruskal-Wallis one-way ANOVA, CHI-SQUARE corrected for ties

anglers had a stronger belief that trout fishing regulations are not enforced adequately and would be less upset to be checked by a Conservation Officer while trout fishing than consumptive trout anglers.

Non-consumptive trout anglers had greater disagreement that DNR Law Enforcement is too strict in its enforcement of trout fishing regulations and had greater agreement that Conservation Officers are usually fair in their treatment of anglers than consumptive trout anglers (Appendix T, Table 3). Non-consumptive trout anglers were in greater agreement that regulations should be set on a stream or local area basis than consumptive trout anglers. Non-consumptive trout anglers had a greater belief that violators deliberately break the fishing regulations than consumptive trout anglers.

A higher percentage of non-consumptive trout anglers (44.3% of Level 4 and 54.8% of Level 5) felt that penalties for trout fishing violations should be increased compared to consumptive trout anglers (22.8% for Level 1, 23.4% for Level 2, and 30.6% for Level 3) (Appendix T, Table 4). Consumptive trout anglers were more willing to let the penalties "stay the same".

There was no relationship between non-consumptive orientation level and these three statements:

"The Department of Natural Resources (DNR) Fisheries Division has the competence and technical training to know how to properly manage the State's fisheries resource. [MEAN=0.4<sup>3</sup>, STD DEV.=0.99, N=401] [F=1.6491, DF=4/396, P=.1611] [X<sup>2</sup>=4.9871, P=.2886]<sup>4</sup>

"I trust the DNR Fisheries Division to manage the State's trout fisheries resource in a fair and reasonable manner." [MEAN=0.6, STD DEV.=0.96, N=405] [F=1.8375, DF=4/400, P=.1208] [X<sup>2</sup>=8.6852, P=.0695]

"Most fishing regulations have a sound biological basis." [MEAN=0.6, STD DEV.=0.84, N=406] [F=0.5288, DF=4/401, P=.7146] [X<sup>2</sup>=1.0086, P=.9085]

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<sup>3</sup> 2=STRONGLY AGREE, 1=AGREE, 0=UNDECIDED, -1=DISAGREE, -2=STRONGLY DISAGREE

<sup>4</sup> Kruskal-Wallis one-way ANOVA, CHI-SQUARE corrected for ties

**Trout Fishing Intensity:** More intense trout anglers disagreed more that trout fishing regulations should be relaxed, than did less intense trout anglers (Appendix T, Table 5). Competition with trout fishing companions was less important to the more intense trout anglers than the less intense trout anglers. Fishing regulations detract less from the more intense trout anglers than the less intense trout anglers.

More intense trout anglers had a stronger belief that trout fishing regulations are not enforced adequately and that regulations should be set on a stream or local area basis than less intense trout anglers (Appendix T, Table 5). More intense trout anglers had greater disagreement that DNR Law Enforcement is too strict in its enforcement of trout fishing regulations and had greater agreement that Conservation Officers are usually fair in their treatment of anglers than less intense trout anglers. Also, more intense trout anglers would be less upset to be checked by a Conservation Officer while trout fishing than less intense trout anglers.

A higher percentage of more intense trout anglers (46.3% of Level 4 and 56.4% of Level 5) felt that penalties for trout fishing violations should be increased compared to less intense trout anglers (24.6% for Level 1, 40.6% for Level 2, and 37.3% for Level 3) (Appendix T, Table 6). Less intense trout anglers were more willing to let the penalties "stay the same".

There was no relationship between non-consumptive orientation level and these four statements:

"The Department of Natural Resources (DNR) Fisheries Division has the competence and technical training to know how to properly manage the State's fisheries resource." [MEAN=0.4<sup>5</sup>, STD DEV.=1.00, N=402] [F=0.4787, DF=4/397, P=.7512] [X<sup>2</sup>=1.8725, P=.7592]<sup>6</sup>

"I trust the DNR Fisheries Division to manage the State's trout fisheries resource in a fair and reasonable manner." [MEAN=0.6, STD DEV.=0.95, N=406] [F=2.6424, DF=4/401, P=.0334] [X<sup>2</sup>=7.4528, P=.1138]

"Most fishing regulations have a sound biological basis." [MEAN=0.6, STD DEV.=0.84, N=407] [F=1.8104, DF=4/402, P=.1259] [X<sup>2</sup>=5.2039, P=.2670]

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<sup>5</sup> 2=STRONGLY AGREE, 1=AGREE, 0=UNDECIDED, -1=DISAGREE, -2=STRONGLY DISAGREE

<sup>6</sup> Kruskal-Wallis one-way ANOVA, CHI-SQUARE corrected for ties

"Most trout fishing violations occur because anglers do not know the regulations, not because anglers deliberately break the laws." [MEAN=-0.4, STD DEV.= 1.09, N=406] [F=1.2244, DF=4/401, P=.2990] [ $X^2=4.7759$ , P=.3111]

Prediction of Opinions Related to Fishing Regulations: Fly-fishing specialization, non-consumptive orientation and trout fishing intensity were used as independent variables in a multiple regression analysis to determine which segmentation base best predicts each of these opinions related to fishing regulations. Non-consumptive orientation best predicted five opinions, fly-fishing specialization best predicted four opinions, and trout fishing intensity best predicted two opinions (Table 4.36). The statement, "The Department of Natural Resources Fisheries Division has the competence and technical training to know how to properly manage the State's fisheries resource," was not well predicted by any of these three segmentation bases.

#### SATISFACTIONS WITH TROUT FISHING REGULATIONS

Satisfaction with trout fishing regulations was measured on a scale of -3 (EXTREMELY DISSATISFIED) to 3 (EXTREMELY SATISFIED). Anglers from the special sample drawn from both the Au Sable River sample and the Michigan statewide sample of trout anglers had a mean satisfaction score of 0.7 (STD DEV.=1.54, N=410).

For fly-fishing specialization, level 5 had the lowest satisfaction score (0.2) (Table 4.37). For non-consumptive orientation, surprisingly, anglers with the lowest level (0.4) and highest level (0.3) were the least satisfied with trout fishing regulations. Trout fishing intensity was not related to satisfaction with trout fishing regulations ( $F=1.9764$ ,  $df=4/402$ ,  $p=.0973$ ).

Table 4.36. Prediction of opinions related to fishing regulations with fly-fishing specialization, non-consumptive orientation and trout fishing intensity (stepwise multiple regression: 0.05 probability of F-to-enter criteria).

VARIABLES:	R-SQUARE		SIGN. OF F	
OPINION:	R-SQUARE	CHANGE	F-CHANGE	CHANGE
<u>Trout fishing regulations are overly protective and should be relaxed some. (n=401 cases)</u>				
NON-CONSUMPTIVE ORIENTATION	.1535	.1535	72.361	.000
TROUT FISHING INTENSITY	.1673	.0138	6.594	.011
<u>Fishing regulations detract from my trout fishing experience. (403 cases)</u>				
NON-CONSUMPTIVE ORIENTATION	.1301	.1301	59.951	.000
TROUT FISHING INTENSITY	.1445	.0144	6.748	.010
<u>Competing with my trout fishing companions is an important part of my trout fishing experience. (404 cases)</u>				
FLY-FISHING SPECIALIZATION	.0552	.0552	23.482	.000
NON-CONSUMPTIVE ORIENTATION	.0656	.0150	6.469	.011
TROUT FISHING INTENSITY	.0740	.0107	4.667	.031
<u>Trout fishing regulations are not enforced adequately. (403 cases)</u>				
FLY-FISHING SPECIALIZATION	.0561	.0561	23.833	.000
NON-CONSUMPTIVE ORIENTATION	.0735	.0174	7.496	.006
<u>Each stream or local area should have its own set of trout fishing regulations which is best suited for that particular stream of area. (402 cases)</u>				
FLY-FISHING SPECIALIZATION	.0676	.0676	29.015	.000
<u>DNR Law Enforcement is too strict in its enforcement of trout fishing regulations. (404 cases)</u>				
NON-CONSUMPTIVE ORIENTATION	.0437	.0437	18.375	.000
TROUT FISHING INTENSITY	.0593	.0156	6.634	.010
<u>It would upset me to be checked by a Conservation Officer while I am trout fishing. (403 cases)</u>				
NON-CONSUMPTIVE ORIENTATION	.0466	.0466	19.585	.000
<u>Conservation Officers are usually fair in their treatment of anglers. (403 cases)</u>				
TROUT FISHING INTENSITY	.0239	.0239	9.798	.002

Table 4.36. Continued.

VARIABLES:	R-SQUARE		SIGN. OF F	
OPINION:	R-SQUARE	CHANGE	F-CHANGE	CHANGE
<u>I trust the DNR Fisheries Division to manage the State's trout fisheries resource in a fair and reasonable manner.</u>				
(404 cases)				
TROUT FISHING INTENSITY	.0234	.0234	9.609	.002
<u>Most trout fishing violations occur because anglers do not know the regulations, not because anglers deliberately break the laws.</u>				
(403 cases)				
NON-CONSUMPTIVE ORIENTATION	.0231	.0231	9.496	.002
<u>Most fishing regulations have a sound biological basis.</u>				
(404 cases)				
FLY-FISHING SPECIALIZATION	.0189	.0189	7.742	.006

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\*Listwise deletion of missing data.



Table 4.37. Satisfaction with the trout fishing regulations analyzed by fly-fishing specialization, non-consumptive orientation and trout fishing intensity.

<u>SATISFACTION SCORE</u>			
-3	EXTREMELY DISSATISFIED		
-2	DISSATISFIED		
-1	SLIGHTLY DISSATISFIED		
0	NEUTRAL OR NO OPINION		
1	SLIGHTLY SATISFIED		
2	SATISFIED		
3	EXTREMELY SATISFIED		
<u>MEAN SATISFACTION</u>			
<u>SEGMENTATION BASE</u>	<u>SCORE</u>	<u>STD DEV</u>	<u>NUMBER</u>
<u>FLY-FISHING SPECIALIZATION:</u>			
LEVEL 1	0.8	1.50	128
LEVEL 2	0.9	1.34	91
LEVEL 3	0.8	1.67	19
LEVEL 4	0.6	1.57	71
LEVEL 5	0.2	1.67	97
[F=3.0800, DF=4/401, P=.0162, ETA SQUARED=.030]			
<u>NON-CONSUMPTIVE ORIENTATION:</u>			
LEVEL 1	0.4	1.60	79
LEVEL 2	1.0	1.36	47
LEVEL 3	0.9	1.37	108
LEVEL 4	0.8	1.55	88
LEVEL 5	0.3	1.71	84
[F=2.9108, DF=4/401, P=.0214, ETA SQUARED=.028]			

## VALIDATION OF SEGMENTATION VARIABLES

The Au Sable River sample was used to identify potential segmentation variables since these data were collected first. An attempt was made to validate the findings using the statewide sample of stream trout anglers. A major problem encountered was that the extreme differences between these two samples resulted in very small sample sizes in the opposite ends of each scale which precluded valid statistical comparisons (Tables 4.19-4.21).

Membership in Fishing Organizations: Membership in fishing organizations was compared with fly-fishing specialization since the relationship was found to be strong in the Au Sable River sample (Appendix R, Table 9). Comparing the percent of members in each fly-fishing specialization level for Au Sable River anglers with the statewide sample of stream trout anglers showed that membership increased with fly-fishing specialization at a faster rate for the Au Sable River anglers (Table 4.38). Differences at fly-fishing specialization levels 1, 2 and 3 were not significant, however, this may be a Type II error since the sample sizes between the two groups were very uneven at each level.

This analysis indicates that Au Sable River anglers are unique beyond the difference in fly-fishing specialization. The Au Sable River may attract a higher percent of members of fishing organizations from among the specialized fly anglers. This is a very possible explanation since there are many areas along the Au Sable River that cater to organized clubs which could cause a higher than expected (based on that predicted by the segmentation variables) membership rate.

Other Variables: Overall, the correlations between the three segmentation bases and most other variables were stronger for the Au Sable River sample than the statewide sample. Thus, these segmentation variables work a little better for the Au Sable River sample than the statewide sample. This may be due to the further difference between these two sample on membership in fishing organizations.

Table 4.38. Percent membership in fishing organizations analyzed by fly-fishing specialization levels comparing Au Sable River anglers with Michigan stream trout anglers.

FLY-FISHING SPECIALIZATION	PERCENT MEMBERSHIP		CHI-SQUARE	DF	N	SIGN.
	AU SABLE	STATEWIDE				
LEVEL 1	8.0	7.3	0.071	1	29	.7904
LEVEL 2	16.1	9.6	1.599	1	35	.2061
LEVEL 3	33.3	19.1	0.726	1	16	.3940
LEVEL 4	50.3	17.7	11.183	1	107	.0008
LEVEL 5	62.5	36.0	5.863	1	254	.0155

Table 4.39. Pearson correlations between the three proposed segmentation bases and selected variables for Au Sable River anglers and statewide stream trout anglers.

SEGMENTATION BASE: VARIABLE	AU SABLE RIVER ANGLERS			STATEWIDE ANGLERS		
	PEARSON	CORR	N SIGN.	PEARSON	CORR	N SIGN.
<b>FLY-FISHING SPECIALIZATION:</b>						
FLY ONLY REGULATIONS	.4839	712	.000	.3487	714	.000
NO-KILL REGULATIONS	.2698	713	.000	.1441	713	.000
MEMBERSHIP	.3198	716	.000	.1739	711	.000
TIE FLIES	.3648	705	.000	.1970	339	.000
EXPERIENCE	.2122	707	.000	.2097	722	.000
IMPORTANCE OF TROUT FISHING	.3452	706	.000	.1468	721	.000
TROUT RELEASING BEHAVIOR	.4040	711	.000	.2725	719	.000
PREFERRED SPECIES	.3711	720	.000	.1031	712	.000
EDUCATION	.2142	715	.000	.2032	717	.000
INCOME	.2046	663	.000	.0881	676	.011
NON-CONSUMPTIVE ORIENTATION	.3860	707	.000	.1338	720	.000
TROUT FISHING INTENSITY	.2528	719	.000	.1577	721	.000

Table 4.39. Continued.

<u>SEGMENTATION BASE:</u>		<u>AU SABLE RIVER ANGLERS</u>			<u>STATEWIDE ANGLERS</u>		
<u>VARIABLE</u>		<u>PEARSON CORR</u>	<u>N</u>	<u>SIGN.</u>	<u>PEARSON CORR</u>	<u>N</u>	<u>SIGN.</u>
<u>NON-CONSUMPTIVE ORIENTATION:</u>							
FLY ONLY REGULATIONS	.3293	705	.000		.1108	715	.000
NO-KILL REGULATIONS	.4979	706	.000		.1908	714	.000
MEMBERSHIP	.3146	703	.000		.0956	712	.000
TIE FLIES	.2381	703	.000		.0290	340	.297
EXPERIENCE	.0719	705	.028		.0137	723	.357
IMPORTANCE OF TROUT FISHING	.2159	704	.000		.0158	722	.335
TROUT RELEASING BEHAVIOR	.6917	698	.000		.4926	721	.000
PREFERRED SPECIES	.1984	707	.000		.0132	713	.363
EDUCATION	.2476	702	.000		.1696	718	.000
INCOME	.2911	654	.000		.1713	677	.000
FLY-FISHING SPECIALIZATION	.3860	707	.000		.1338	720	.000
TROUT FISHING INTENSITY	.1853	706	.000		-.0041	722	.456
<u>TROUT FISHING INTENSITY:</u>							
FLY ONLY REGULATIONS	.1419	711	.000		.0598	718	.055
NO-KILL REGULATIONS	.0870	712	.010		.0115	717	.380
MEMBERSHIP	.2248	715	.000		.0147	715	.348
TIE FLIES	.2707	704	.000		.1264	342	.010
EXPERIENCE	.4625	706	.028		.2826	724	.000
IMPORTANCE OF TROUT FISHING	.4320	705	.000		.3405	723	.000
TROUT RELEASING BEHAVIOR	.2350	710	.000		.0805	721	.015
PREFERRED SPECIES	.4366	719	.000		.4663	716	.000
EDUCATION	.0637	714	.044		-.0904	721	.008
INCOME	.0437	662	.131		-.1643	680	.000
FLY-FISHING SPECIALIZATION	.2528	719	.000		.1577	721	.000
NON-CONSUMPTIVE ORIENTATION	.1853	706	.000		-.0041	722	.456

## Part Five

### DEVELOPMENTAL NATURE OF TROUT FISHING

Most trout anglers first started stream trout fishing with bait (76.3%, n=552) while 13.8% (100) started with lures and 9.8% (71) with flies (Table 4.40). Of anglers who started with a particular method, a majority still preferred that method (68% of bait anglers, 51% of lure anglers, 62% of fly anglers). Nine percent (65) of the trout anglers had no preference for stream trout fishing method. Overall, 65.1% (471) of the stream trout anglers preferred the trout fishing method they first started with. A similar relationship was found between fly-fishing specialization and the stream trout fishing method first used. Most (76.0%, n=19) of the highly specialized anglers (Level 5) started with fly fishing (Table 4.41).

### CHANGES IN ATTITUDES AND PRACTICES

Of 24 attitudes and practices related to trout fishing, anglers reported that "enjoyment of nature while fishing" had increased the most since they first started trout fishing (Table 4.42). This was followed by "desire to find solitude in fishing", "interest in learning about trout habitat, food, etc.", and "desire to fish new habitat and waters".

Table 4.40. Relationship between stream trout fishing method first used and preferred method.\*

METHOD FIRST USED	PREFERRED STREAM TROUT FISHING METHOD									
	NO PREF.		BAIT		LURES		FLIES		TOTAL	
	#	%	#	%	#	%	#	%	#	%
BAIT	41	7.4	376	68.1	87	15.8	48	8.7	552	100
LURES	21	21.0	18	18.0	51	51.0	10	10.0	100	100
FLIES	3	4.2	12	16.9	12	16.9	44	62.0	71	100
TOTAL (%)	65	(9.0%)	406	(56.2%)	150	(20.7%)	102	(14.1%)	723	100%

\*CHI SQUARE=257.994, DF=6, P<.0001, ETA (with method first used the dependent) = 0.467

Table 4.41. Relationship between fly-fishing specialization and stream trout fishing method first used.

FLY-FISHING SPECIALIZATION LEVEL	STREAM TROUT FISHING METHOD FIRST USED							
	BAIT		LURES		FLIES		TOTAL	
	#	%	#	%	#	%	#	%
1	309	82.6	59	15.8	6	1.6	374	100
2	202	76.2	33	12.5	30	11.3	265	100
3	16	72.7	1	4.5	5	22.7	22	100
4	20	57.1	4	11.0	11	31.4	35	100
5	<u>4</u>	16.0	<u>2</u>	8.0	<u>19</u>	76.0	<u>25</u>	100
TOTAL	551		99		71		721	

\*CHI SQUARE=176.854, DF=8, P<.0001, ETA (with method first used the dependent) =0.424

#### YEARS OF TROUT FISHING EXPERIENCE

##### Preferred Stream Trout Fishing Method, Method First Used and Fly-Fishing Specialization:

Anglers who had no preference or preferred lures had fewer years of trout fishing experience (13.6, 13.8 years) than anglers who preferred bait (17.4 years) or flies (19.1 years) (Table 4.43). Years of trout fishing experience was also related to fly-fishing specialization level although the main difference was between level 1 and the other four levels (Table 4.44). Anglers who first started stream trout fishing with bait or flies were also similar in years of experience (17.7, 16.8 years) while those anglers who first started stream trout fishing with lures had fewer years (9.6 years) of trout fishing experience (Table 4.45).

Miscellaneous Variables: Anglers who rated stream trout fishing as "most important" or "more important than most other recreational activities" had more years of trout fishing experience than anglers who rated stream trout fishing as less important (Table 4.46).

Members of trout fishing organizations (19.1 years) were not significantly different from non-members (16.1 years) in terms of years of trout fishing experience ( $F=3.5879$ ,  $df=1/700$ ,  $p=.0586$ ).

Trout anglers who also hunt had significantly more years of trout fishing experience (17.5 years) than trout anglers who did not hunt (13.6 years) ( $F=12.1775$ ,  $df=1/702$ ,  $p=.0005$ ,  $\eta^2=.017$ ).

Trout anglers who preferred trout had significantly more years of trout fishing experience (20.0 years) than trout anglers who preferred species other than trout (15.2 years) ( $F=19.8795$ ,  $df=1/703$ ,  $p<.0001$ ,  $\eta^2=.028$ ).

Table 4.42. Mean change in attitudes and practices (since they first started trout fishing) self reported by trout anglers.

VARIABLES	SCALE					NUMBER
	1 DECREASED	2	3 STAYED THE SAME	4	5 INCREASED	
OFF SEASON ACTIVITIES						343
INTEREST IN LIMITING OUT						463
INTEREST IN CATCH AND RELEASE						428
NUMBER OF DAYS YOU FISH EACH SEASON						485
FLY FISHING						351
INTEREST IN CATCHING TROUT TO EAT						482
USE OF VACATION TIME FOR TROUT FISHING						474
BAIT FISHING						440
INTEREST IN CATCHING TROPHY TROUT						480
TENDENCY TO SPECIALIZE FOR CERTAIN SPECIES						459
TROUT FISHING WITH A PARTNER						477
TROUT FISHING WITH FAMILY						458
SPINNER (LURE) FISHING						423
DISTANCE TRAVELED TO FISH TROUT						491
NUMBER OF FISHING AREAS USED						475
MONEY SPENT ON TROUT FISHING						487
CONFIDENCE IN CATCHING TROUT						490
HANDICAPPING (LIGHT LINE, ROD, ETC.)						428
IMPORTANCE OF FISHING METHOD						461
DESIRE TO TRY NEW EQUIPMENT, TECHNIQUES, AND METHODS						469
DESIRE TO FISH NEW HABITAT & WATERS						473
INTEREST IN LEARNING ABOUT TROUT HABITAT, FOOD, ETC.						468
DESIRE TO FIND SOLITUDE IN FISHING						477
ENJOYMENT OF NATURE WHILE FISHING						493

Years of trout fishing experience was not related to non-consumptive orientation level ( $F=0.9192$ ,  $df=4/706$ ,  $p=.4522$ ) nor it's related behavior, voluntary release of legal trout ( $F=1.3474$ ,  $df=3/707$ ,  $p=.2579$ ). This indicates that non-consumptive orientation changes at different rates among trout anglers. Years of trout fishing experience was directly related to trout fishing intensity level (Table 4.47).

Table 4.43. Years of trout fishing experience analyzed by preferred stream trout fishing method.

PREFERRED TROUT FISHING METHOD	MEAN YEARS OF TROUT FISHING EXPERIENCE	STD DEV	NUMBER
[ $F=5.2604$ , $DF=3/708$ , $P=.0014$ , $ETA\ SQUARED=.022$ ]			
NO PREFERENCE	13.6	13.34	63
BAIT	17.4	13.03	398
LURES	13.8	11.31	150
FLIES	19.1	14.19	<u>101</u>
TOTAL	16.5	12.89	712

Table 4.44. Years of trout fishing experience analyzed by fly-fishing specialization level.

FLY-FISHING SPECIALIZATION LEVEL	MEAN YEARS OF TROUT FISHING EXPERIENCE	STD DEV	NUMBER
[ $F=5.8528$ , $DF=4/705$ , $P=.0001$ , $ETA\ SQUARED=.032$ ]			
LEVEL 1	14.3	12.07	367
LEVEL 2	18.4	13.37	261
LEVEL 3	19.7	11.79	22
LEVEL 4	21.2	14.39	35
LEVEL 5	18.6	15.41	<u>25</u>
TOTAL	16.5	12.79	710



Table 4.45. Years of trout fishing experience analyzed by stream trout fishing method first used.

TROUT FISHING METHOD FIRST USED	MEAN YEARS OF TROUT FISHING EXPERIENCE	STD DEV	NUMBER
[F=17.1216, DF=2/710, P<.0001, ETA SQUARED=.046]			
BAIT	17.7	13.14	543
LURES	9.6	9.22	100
FLIES	16.8	13.63	<u>70</u>
TOTAL	16.5	12.72	713

Table 4.46. Years of trout fishing experience analyzed by importance of stream trout fishing.

IMPORTANCE OF STREAM TROUT FISHING	MEAN YEARS OF TROUT FISHING EXPERIENCE	STD DEV	NUMBER
[F=5.1955, DF=5/706, P=.0001, ETA SQUARED=.036]			
MOST IMPORTANT	20.9	15.80	45
MORE IMPORTANT THE MOST OTHER ACTIVITIES	19.8	12.90	153
IMPORTANT	15.9	12.19	262
SOMEWHAT IMPORTANT	14.0	12.36	131
SLIGHTLY IMPORTANT	15.7	12.98	52
NOT VERY IMPORTANT	13.4	13.00	<u>69</u>
TOTAL	16.5	12.76	712

Table 4.47. Years of trout fishing experience analyzed by trout fishing intensity level.

TROUT FISHING INTENSITY LEVEL	MEAN YEARS OF TROUT FISHING EXPERIENCE	STD DEV	NUMBER
[F=4.8161, DF=4/707, P=.0008, ETA SQUARED=.027]			
LEVEL 1	15.1	12.61	440
LEVEL 2	17.9	13.54	130
LEVEL 3	18.0	13.24	82
LEVEL 4	20.3	12.39	46
LEVEL 5	25.7	14.00	<u>14</u>
TOTAL	16.5	12.87	712

**Changes in Attitudes and Practices:** Using three criteria (F-test of means, chi-square analysis, and simple linear regression) to determine significance, only three of the 24 measured self-reported changes in attitudes and practices were related to years of trout fishing experience. Anglers with more years of trout fishing experience reported less "desire to try new equipment, techniques and methods", a decrease in the "number of days fished each season" and a decrease in "interest in limiting out" than anglers with less years of experience (Table 4.48). Failure to find a significant relationship between years of trout fishing experience and a given change in attitude and/or practice suggests that anglers change at varying rates for that variable. But, if the changes are sequential, development could still be occurring.

**Importance of Catching Trout:** The importance of "success" or catching a "trophy" trout to the angler's satisfaction was not related to years of trout fishing experience ( $F=0.3837$ ,  $df=4/698$ ,  $p=.8204$  and  $F=0.0196$ ,  $df=4/701$ ,  $p=.9993$ ). The importance of fishing method also was not related to years of trout fishing experience ( $F=2.0504$ ,  $df=3/704$ ,  $p=.1055$ ). However, anglers who reported that trout species was important had more years of trout fishing experience (Table 4.49).

#### CHANGES RELATED TO FLY-FISHING SPECIALIZATION, NON-CONSUMPTIVE ORIENTATION AND TROUT FISHING INTENSITY

**Fly-Fishing Specialization:** Eleven of 24 self-reported changes in attitudes and practices were not related to fly-fishing specialization (Appendix U, Table 1). This does not mean that the different levels of fly-fishing specialization are equivalent on these variables only that they are equivalent in the degree of change over time. For example, "use of vacation time for trout fishing" does not mean that anglers in all levels of fly-fishing specialization spend the same amount of their vacation time for trout fishing, only that the amount of change in vacation time has been similar over time across all five levels of fly-fishing specialization. In this case the amount of vacation time spent on trout fishing has not changed much on the average for the statewide sample of trout anglers.

Table 4.48. Changes in attitudes and practices (since they first started trout fishing) self reported by anglers analyzed by years of trout fishing experience.

SCALE				
1	2	3	4	5
DECREASED		STAYED THE SAME		INCREASED
YEARS OF TROUT FISHING EXPERIENCE				
	LEVEL 1	0 - 4 YEARS		
	LEVEL 2	5 - 9 YEARS		
	LEVEL 3	10 - 19 YEARS		
	LEVEL 4	20 - 29 YEARS		
	LEVEL 5	30 OR MORE YEARS		
VARIABLES	LEVEL OF TROUT FISHING EXPERIENCE	MEAN	STD DEV	NUMBER
<u>DESIRE TO TRY NEW EQUIPMENT, TECHNIQUES, AND METHODS:</u>				
	1	3.8	0.99	49
	2	4.0	0.87	65
	3	3.8	1.06	124
	4	3.3	1.15	102
	5	3.5	1.01	125
[F=4.9081, DF=4/460, P=.0007, ETA SQUARED=.041]				
[X <sup>2</sup> =26.865, DF=16, P=.0430; PEARSON'S R=-0.156, P=.0004]				
[R <sup>2</sup> =.019, 2-TAILED SIG.=.0039]				
<u>NUMBER OF DAYS FISHED EACH SEASON:</u>				
	1	3.3	1.04	46
	2	3.2	1.34	66
	3	2.9	1.35	135
	4	2.7	1.34	108
	5	2.6	1.43	126
[F=3.8631, DF=4/476, P=.0042, ETA SQUARED=.041]				
[X <sup>2</sup> =33.431, DF=16, P=.0055; PEARSON'S R=-0.174, P=.0001]				
[R <sup>2</sup> =.029, 2-TAILED SIG.=.0002]				
<u>INTEREST IN LIMITING OUT:</u>				
	1	3.1	1.06	45
	2	2.9	0.94	64
	3	2.8	1.01	125
	4	2.8	1.09	103
	5	2.5	1.12	123
[F=4.0127, DF=4/455, P=.0033, ETA SQUARED=.034]				
[X <sup>2</sup> =31.457, DF=16, P=.0118; PEARSON'S R=-0.168, P=.0002]				
[R <sup>2</sup> =.034, 2-TAILED SIG.=.0001]				

Table 4.49. Years of trout fishing experience analyzed by the importance of trout species.

IMPORTANCE OF TROUT SPECIES ITEM	MEAN YEARS OF TROUT FISHING EXPERIENCE	STD DEV	NUMBER
It does not matter to me what type of trout I catch.			
STRONGLY DISAGREE	24.1	13.40	31
SLIGHTLY DISAGREE	19.1	13.87	66
SLIGHTLY AGREE	16.2	12.45	256
STRONGLY AGREE	15.6	12.95	<u>353</u>
TOTAL	16.5	12.88	706
[F=5.0215, DF=3/702, P=.0019, ETA SQUARED=.021)			

Thirteen of the 24 self-reported changes in attitudes and practices were related (based on three criteria; F-test of means, Kruskal-Wallis one-way ANOVA, and simple linear regression) to fly-fishing specialization (Appendix U, Table 2). The amount of fly fishing increased while bait fishing and spinner fishing decreased over time for the higher levels of fly-fishing specialization. This indicates that at least for some of the anglers in the higher fly-fishing specialization levels there was a progression from bait and lure fishing to fly fishing. "Interest in limiting out" and "interest in catching trout to eat" decreased while "interest in catch-and-release" increased over time for the higher fly-fishing specialization levels. "Off season activities", "handicapping", "importance of fishing method", "interest in learning about trout habitat, food, etc.", "number of fishing areas used", and "confidence in catching trout" all had a greater increase over time for the higher levels of fly-fishing specialization. For "money spent on trout fishing" the largest increase over time was for level 3 for which, by definition, anglers use all three fishing methods (fly, lures, and bait) often.

Non-Consumptive Orientation: Five of 24 types of self-reported changes in attitudes and practices were related to non-consumptive orientation (Appendix U, Table 3). "Interest in catching trout to eat" had decreased over time for those in the higher levels of non-consumptive orientation (Appendix U, Table 4). While this does not show that the non-consumptive orientation is developmental it does at least show that not everyone in the higher levels of non-consumptive

orientation started out with a level of non-consumptive orientation. As expected, "interest in catch-and-release" increased while "interest in limiting out" decreased over time for those in the higher levels of non-consumptive orientation. "Bait fishing" decreased for those in the higher non-consumptive levels, however, change in "fly fishing" was similar over time for all levels of non-consumptive orientation. This suggests that the non-consumptive orientation develops mainly among fly anglers.

Trout Fishing Intensity: Fourteen of 24 types of self-reported changes in attitudes and practices were related to trout fishing intensity (Appendix U, Table 5). Anglers who do the most trout fishing had the greatest increase in "interest in learning about trout habitat, food, etc." (Appendix U, Table 6). "Number of days you trout fish each season" increased over time for the higher levels of trout fishing intensity. Thus, many trout anglers who fish a lot for trout did not always fish a lot for trout but over time had increased their trout fishing effort. "Fly fishing" was related to trout fishing intensity in that anglers who trout fish a lot increased their fly-fishing over time.

#### BRYAN'S SPECIALIZATION MODEL

Bryan's (1977) trout angler specialization model makes several predictions about specialized anglers. First, trout fishing intensity would be expected to increase with fly-fishing specialization. No relationship was found in the statewide sample between the preferred stream trout fishing method and trout fishing intensity (Table 4.50), i.e., there were both high intensity and low intensity anglers who preferred bait, lure or fly methods. However, more intense trout anglers did report that their fly fishing practice had increased over time (Appendix U, Tables 5 and 6). And for those not fly-fishing specialized (fly-fishing specialization levels 1 - 3), who were intense there was a self reported increase in bait fishing over time (Table 4.51). Also, for those anglers who preferred lures, reported use of spinner equipment increased with trout fishing intensity (Table 4.52). This shows that trout fishing intensity tends to increase over time for all types of anglers and thus is a potential measure of "development" in trout fishing since it is a measure of commitment to the sport unrelated to equipment use.

Second, Bryan's model proposed that specialized anglers are more skilled. Anglers who preferred flies tended to rate themselves as more skilled, however, experienced bait and lure anglers were also identified (Table 4.53). And third, Bryan predicts that the importance of fish consumption decreases with fly-fishing specialization. However, some anglers began trout fishing with a low interest in fish consumption (Table 4.54) and, conversely, there are specialized anglers for whom eating fish is important (Table 4.55).

Table 4.50. Preferred stream trout fishing method of statewide anglers analyzed by trout fishing intensity.

PREFERRED FISHING METHOD	TROUT FISHING INTENSITY											
	LEVEL 1		LEVEL 2		LEVEL 3		LEVEL 4		LEVEL 5		TOTAL	
	#	%	#	%	#	%	#	%	#	%	#	%
NO PREF.	43	66.2	11	16.9	6	9.2	3	4.6	2	3.1	65	100
BAIT	244	60.1	79	19.5	51	12.6	24	5.9	8	2.0	406	100
LURES	106	70.7	20	13.3	15	10.0	8	5.3	1	0.7	150	100
FLIES	56	54.9	22	21.6	10	9.8	11	10.8	3	2.9	102	100

[ $\chi^2=13.3307$ ,  $DF=12$ ,  $P=.3455$ ]

Table 4.51. Change in bait fishing for the statewide sample of low specialized anglers (fly-fishing specialization levels 1 - 3) analyzed by trout fishing intensity.

CHANGE SCALE				
1	2	3	4	5
DECREASED		STAYED THE SAME		INCREASED
TROUT FISHING INTENSITY LEVEL		MEAN CHANGE	STD DEV	NUMBER
CHANGE IN: BAIT FISHING [F=2.9869, DF=4/400, P=.0189, ETA SQUARED=.029]				
1		3.1	0.90	221
2		3.4	1.12	85
3		3.4	1.04	59
4		3.5	0.87	33
5		3.7	0.95	7
TOTAL		(3.2)	(0.87)	405

**Table 4.52. Change in spinner fishing for the statewide sample of anglers who prefer trout fishing with lures analyzed by trout fishing intensity.**

CHANGE SCALE			
1	2	3	5
DECREASED		STAYED THE SAME	INCREASED

TROUT FISHING INTENSITY LEVEL	MEAN CHANGE	STD DEV	NUMBER
CHANGE IN: SPINNER FISHING [F=2.3580, DF=4/89, P=.0595, ETA SQUARED=.096]			
1	3.8	0.97	59
2	4.4	0.78	18
3	4.4	0.70	10
4	4.3	1.03	6
5	5.0	0.00	<u>1</u>
TOTAL	(4.0)	(0.92)	94

**Table 4.53. Self-reported experience level of statewide stream trout anglers analyzed by preferred stream trout fishing method.**

SELF-REPORTED EXPERIENCE LEVEL	PREFERRED STREAM TROUT FISHING METHOD							
	NO PREF.		BAIT		LURES		FLIES	
	#	%	#	%	#	%	#	%
BEGINNER	23	34.8	81	20.0	36	24.0	16	15.7
SOMEWHAT EXPER.	28	42.4	184	45.3	72	48.0	41	40.2
EXPERIENCED	14	21.2	129	31.8	38	25.3	42	41.2
EXPERT	<u>1</u>	<u>1.5</u>	<u>12</u>	<u>3.0</u>	<u>4</u>	<u>2.7</u>	<u>3</u>	<u>2.9</u>
TOTAL	66	99.9	406	100.1	150	100.0	102	100.0

[X<sup>2</sup>=16.4335, DF=9, P=.0584]

Table 4.54. Statewide sample of anglers with low interest in eating fish (motivation value 0 - 3 on a scale of 0 - 9) analyzed by anglers' reported change in interest in catching trout to eat.

CHANGE IN INTEREST IN CATCHING TROUT TO EAT		<u>ANGLERS WITH LOW INTEREST IN EATING FISH (0 - 3)</u>	
		NUMBER	PERCENT
DECREASED	1	37	28.7
	2	23	17.8
SAME	3	63	48.8
	4	5	3.9
INCREASED	5	<u>1</u>	<u>0.8</u>
TOTAL		129	100.0

Table 4.55. Importance of eating fish for a sample of specialized Au Sable River anglers (fly-fishing specialization level 5).

IMPORTANCE OF EATING FISH		<u>FLY-FISHING SPECIALIZATION LEVEL 5 ANGLERS</u>	
		NUMBER	PERCENT
0 (NOT IMPORTANT)		191	50.4
1		31	8.2
2		35	9.2
3		30	7.9
4		25	6.6
5		30	7.9
6		5	1.3
7		12	3.2
8		4	1.1
9 (VERY IMPORTANT)		<u>16</u>	<u>4.2</u>
TOTAL		379	100.0



## Chapter 5

### DISCUSSION and RECOMMENDATIONS

This chapter begins with a discussion of some of the more important findings of the descriptive data for the Au Sable River anglers. Part two is a discussion of the Au Sable River no-kill controversy. Part three discusses the three proposed segmentation variables and implications for using a segmentation approach for the management of Michigan trout anglers. Part four is a discussion of the developmental nature of trout fishing. This chapter ends with a brief summary of recommended research and a summary of the major contributions of this research.

#### Part One

##### AU SABLE RIVER ANGLERS

This study provides an extensive data base on Au Sable River anglers and statewide stream trout anglers to aid fisheries managers in the difficult process of allocating limited trout stream resources in Michigan. Since the Au Sable River is an intensively managed fisheries with many experimental regulations (Clark et al. 1980, Clark 1983, Clark and Alexander 1985) and much management controversy (Clark et al. 1981) this data base will also permit future researchers to explore changes in user groups over time due to implementation of various management efforts as well as other trends.

The difference in support for the catch-and-release regulation on the Au Sable River suggests some anticipated changes in the sociological characteristics of those using the catch-and-release area. First, it is likely that the number of anglers who belong to fishing organizations will increase because a higher percent of members of fishing organizations supported the catch-and-release regulation than did non-members (Appendix Q, Table 6). Second, it is anticipated that there will be more high

income anglers and more high education level anglers using the catch-and-release area (Appendix Q, Tables 1 and 2). Third, there will probably be an increase in the proportion of non-local and out-of-state anglers using the catch-and-release area (Table 4.8). And fourth, the importance of trophy trout will increase among the users of the catch-and-release area since supporters of the catch-and-release regulation rated catching trophy trout more important to their satisfactions than opponents of the no-kill regulation (Appendix Q, Table 9).

Another valuable contribution of this study was the finding that Au Sable River anglers are a unique subset of Michigan stream trout anglers (Table 5.1). The special regulation areas in the Au Sable River system cater to anglers who mainly fly fish for stream trout and for whom trout fishing is an important recreational activity. Au Sable River anglers are also more committed to trout fishing than the average stream trout anglers as measured by a number of variables. These differences between Au Sable River anglers and the statewide sample suggest that the two groups will require different management goals and strategies. This becomes important in the allocation of high quality trout streams in the state. While in a minority, the highly specialized and unique anglers represented by Au Sable River anglers, actively lobby for special regulations on high quality waters. The regulations may increase the satisfaction of these anglers, but will also serve to restrict entry to the fishery and reduce competition. Many trout anglers in the state will be prevented from utilizing these highly regulated waters unless they adopt the practices and preferences of fly fishing specialists. The implications of ignoring the existing segmentation of trout anglers in Michigan are serious and affect the long term development of this recreation.

A specific case in point is the Au Sable River no-kill controversy. The unique grouping of anglers in the Au Sable River sample had much higher support for increasing no-kill areas in the state than did the statewide sample (Appendix N, Table 17). Thus, the Fisheries Division is faced with a philosophical decision on whom to allocate the Au Sable River resources to -- the current user constituency or statewide trout anglers.

The differences between Au Sable River anglers and statewide stream trout anglers justifies the allocation of some streams of the state (e.g., Au Sable River) to provide for special trout angling interests. However, as different management goals are established for the statewide trout stream

resources, user segments will question whether the allocation was fair with regard to size, distribution and needs of their own group. A market segmentation approach could be used to help in the allocation of Michigan's trout stream resources. This will require information about the number and proportion of the various identified segments in the state as well as an inventory of the various fisheries resources available.

Table 5.1. Summary of differences between Au Sable River anglers and a sample of Michigan stream trout anglers (see Chapter 4, Part 2).

VARIABLES	AU SABLE RIVER ANGLERS	MICHIGAN STREAM TROUT
Education Level	HIGHER	LOWER
Income Level	HIGHER	LOWER
Sex Ratio	FEWER FEMALES	MORE FEMALES
Tie Flies	HIGHER %	LOWER %
Preferred Fish Species	TROUT	OTHER SPECIES
Preferred Trout Species	BROWN TROUT	BROOK TROUT
Importance of Trout Fishing	MORE IMPORTANT	LESS IMPORTANT
Years of Fishing Experience	MORE	LESS
Self-reported Experience	MORE	LESS
Membership in Fishing Organization	HIGHER %	LOWER %
Trout Releasing Behavior	HIGHER	LOWER
Catching Trophy Trout	MORE IMPORTANT	LESS IMPORTANT
Species of Trout	MORE IMPORTANT	LESS IMPORTANT
Method of Trout Fishing	MORE IMPORTANT	LESS IMPORTANT
Importance of Fly-only Regs.	MORE IMPORTANT	LESS IMPORTANT
Importance of No-kill Regs.	MORE IMPORTANT	LESS IMPORTANT
Fly-Fishing Specialization	HIGHER	LOWER
Non-Consumptive Orientation	HIGHER	LOWER
Trout Fishing Intensity	HIGHER	LOWER

## SITE ATTRIBUTES

Fishing attributes ("more fish" and "larger fish") and "easy access" were listed by about one-third of the anglers as primary reasons for fishing the Au Sable River. The most important primary reason for selecting an Au Sable River fishing site was "traditional fishing area I'm familiar with" (Appendix O, Table 2). About two-thirds of the Au Sable River anglers reported they had fished the previous season (1985) in the section where contacted. This suggests that the Au Sable River provides attributes important enough to keep anglers returning year after year. It also suggests that a high percent of Au Sable River anglers may have a strong attachment to the Au Sable River and efforts must be made to include these anglers in the future management of the Au Sable River.

It is important to realize the effect of management on the acceptance and use of an area by anglers. For example, special "fly only" regulations are an important component of the fisheries management of the Au Sable River system. Large sections on the Mainstream, North Branch and South Branch have "fly only" regulations. Au Sable River anglers strongly support the "fly only" regulations (Appendix N, Table 15). These areas attract a significantly higher percent of out-of-state anglers (17.6%) compared to the statewide sample of stream trout anglers (7.8%). Therefore, the special regulations of these sections contribute to the unique recreational opportunities of the Au Sable River and it is important to consider how changes in these regulations will affect both current and future users.

The Au Sable River site attribute results were not comparable to the statewide sample because of the difference in formats used to measure the importance of site attributes. However, one gross difference between Au Sable River anglers and the statewide sample of stream trout anglers was evident. "Fewer anglers" was the least important of seven attributes for selection of an Au Sable River fishing site, while it was the most important of seven similar attributes for selection of most preferred trout fishing sites in the statewide sample of stream trout anglers (actually "fewer anglers" was the most important of all 15 measured attributes). It is possible that Au Sable River anglers expect to encounter a high density of anglers and accept this in compensation for other site attributes provided by the Au Sable River.

Probably most trout anglers would report that they don't like crowding but some may accept varying levels while others may simply avoid areas they perceive to be crowded. More research is needed to inventory characteristics of streams including crowding/use. It may be that for the non-fly angling segment, the "high" quality fly waters (open, easy access, but crowded) are not so high quality. If so, then there is not such an allocation problem.

## PREFERRED TROUT SPECIES

While over three-fourths of both the Au Sable River anglers and the statewide sample of anglers agreed that species of trout did not "matter" to them, there was a difference in preferred trout species between the two groups (Appendix N, Table 13). (Note that even though many anglers reported that species of trout did not "matter" some still reported a preferred trout species.) Of the anglers who reported a preferred trout species, Au Sable River anglers preferred brown trout (50%) while the statewide sample preferred brook trout (56%) (Appendix N, Table 4). While the Au Sable River has rainbow and brook trout, it is especially noted for large brown trout. Since night fishing is most productive for large brown trout, this may explain why a large proportion (67%) of the Au Sable River anglers fish after dark. The presence of these large trout may be the reason Au Sable River anglers rated catching "trophy trout" more important than did stream trout anglers in the statewide sample. During the most productive period for catching trophy trout (night time in early June) Au Sable River anglers endure large crowds to fish the hex (*Hexagenia* spp.) hatch for a chance to catch a trophy brown trout.

A number of hypotheses may be advanced to explain the differences in species preferences among the trout angler segments. One possible hypothesis would be that species preference is related to early experiences or recreational opportunities. Another hypothesis would be that anglers seek specific sporting qualities in choosing a preferred species. For example, specific fish attributes may include eating qualities, fighting abilities, size, or habitat requirements. It may be that some anglers who report that they prefer brown trout do so because brown trout reach larger sizes than do brook trout. In another case, some anglers may prefer brook trout because they are found in certain types of streams where they prefer to fish, such as undeveloped and uncrowded areas.

This hypothesis may be expanded to represent a developmental sequence in fishing. For example, starting with "any fish species" (no preference), moving to pan fish because they are easy to catch, then choosing trout because they can be caught with fly fishing gear and finally brown trout because they reach a large size and are difficult to catch, outlines a developmental model based on changing motivations from simply fishing, to catching lots of fish, to specialized equipment use, to trophy fish. This example hypothesizes how an angler's fish preference could change developmentally. However, more than one species of fish could be used to fulfill the various hypothesized stages in this example.

Species diversity represents another aspect of species preference. Catching a diversity of trout species may be more enjoyable for those anglers (75%) who reported that species of trout did not matter. Managers must be cautious in applying any management effort, such as catch-and-release, which could alter the species composition by changing mortality factors until the importance of species diversity to the angler can be determined. For example, a diversity of trout species (brown, brook and rainbow) exist in the Au Sable River which may or may not be important to the anglers, but plans to introduce the Arctic grayling (Thymallus arcticus) could alter this diversity, either increasing total diversity or decreasing diversity due to loss of some species through competition or management removal. Wood and Kennedy (1983) suggested that catching a diversity of fish provides greater satisfaction to trout anglers than catching the same number of a single species. Research to refine our understanding of the qualities and processes involved in establishing preferences for species among all types of anglers would enhance our ability to manage fisheries resources.

## Part Two

## THE AU SABLE RIVER NO-KILL CONTROVERSY

Most (56%) of the Au Sable River anglers interviewed approved of the proposed catch-and-release regulation for the Au Sable River Quality Fishing Section while 28 percent disapproved and 16 percent were undecided. Thus, of the anglers with an opinion, the catch-and-release regulation was favored by two to one. Groups were strongly polarized on the no-kill issue at the time of the survey. This is a very difficult situation for management to work from. Both groups had formed strong attitude positions with well developed supporting belief structures that were hard to change. The Fisheries Division may have lost credibility regardless of which side they supported. The most promising role for the Michigan Department of Natural Resources (MDNR) would have been that of facilitator rather than advocate. A facilitator role for the Fisheries Division would have enabled them to manage the situation without taking sides. Their job would be to get the participants to negotiate a settlement. By focusing on solving a resource allocation problem, rather than a catch-and-release solution, both sides could have been encouraged to listen to each other and perhaps some of the conflict in supporting belief structures concerning catch-and-release regulations could have been avoided.

Sociological data will become increasingly important to fisheries managers who take a market segmentation approach, especially in the setting of regulations. "How much", "which types", and "where they are implemented" are questions that fisheries managers will need to answer which will require more and new types of sociological data than is currently collected. For example, the controversy that developed over the proposed no-kill issue would have been predicted from this study since strongly committed anglers were identified on both sides of the issue.

The consumptive motivation, "to eat fish" was an important difference in angling preference and behavior between those opposed and those favorable to the proposed no-kill regulation (Table 4.13). However, on a number of variables those strongly opposed and those strongly favorable were quite similar (Table 4.12, Appendix Q Tables). Had data been available early in the controversy, emphasizing the similarities between the two groups may have had the effect of reducing the animosity between them, thus enabling channels of communication to be opened.

Preference for large or "trophy" trout was another reason for support of the proposed no-kill regulation. Thus, some measure of success of catch-and-release regulations to produce "trophy" trout may be necessary to assure continued support by some anglers. It will be useful to determine what expectations (e.g., trophy trout) are held by those who advocate special regulations. Since the fulfillment of these expectancies plays an undefined role in determining continued support for special regulations, further research would help clarify the importance of this aspect.

One practical use of this information by fisheries managers could be to modify demands for more catch-and-release regulations when such demands are for waters which would not meet the biological expectations of the anglers. Langenau and Peyton (1982) suggested that in some situations modification of beliefs alone can change behavior. For example, if expectations of more trophy fish are greater among catch-and-release advocates than can be achieved in the Au Sable River system, education programs may be necessary to encourage more realistic expectancies that are consistent with the biological limitations of the river system. Demand for more catch-and-release regulations may be reduced if fisheries managers can demonstrate that the biological realities of some streams can not meet the expectations of some anglers.

However, in addition to producing trophy fish, it appears that for many anglers, catch-and-release regulations are a matter of "ethics". Some anglers want this type of regulation because it shows a high degree of concern and respect for the resource. Fisheries managers will need to recognize this value and anticipate that some anglers may want catch-and-release regulations on streams which will not result in large biological benefits.

A primary reason given by the anglers opposed to the proposed no-kill regulations was that, "releasing or keeping fish is a personal choice that each angler should be able to make" (Table 4.15). Thus, the proposed no-kill regulation seems to intrude on an important value in American culture, that of "free choice" or freedom. Especially in such outdoor activities as fishing, the escape from everyday restrictions is probably an important benefit. Those anglers for whom "eating or keeping" fish is no longer important are less affected by the no-kill regulation because their "free choice" is academic since they already made the decision to release fish. Sportsmen seem willing to support regulations for which they understand and accept the goals underlying the regulations (Beattie 1981),



but the need for a catch-and-release regulation on the Au Sable River Mainstream is not accepted by everyone (Table 4.16). Therefore, some are not willing to give up their freedom of choice, whether or not they want to eat or keep trout.

A greater percentage of Au Sable River anglers favorable to the proposed no-kill regulation were members of fishing organizations (64%) compared to those opposed (36%). This may have been an important factor in pushing the issue into the disruptive stage. Au Sable River anglers opposed to the regulation were less represented as members of organizations which were involved in lobbying for the new regulation. As a result, the opposed anglers may have felt alienated from the decision making process and thus chose litigation as the only action available to get their position represented.

In terms of public involvement the high percent of membership in fishing organizations in the Au Sable River group offers both opportunities and potential problems. Fishing organizations provide an organized segment of anglers that are interested in the management of the area. Many anglers can be easily reached by a single contact with a representative of the organization, thus saving time and money. However, a potential problem was illustrated by the Au Sable no-kill issue where members may hold different values and opinions than non-members. Thus organizations are not necessarily representative of the entire user population. Public involvement methods must be implemented to ensure that the public input into the fisheries management of the area is representative of all user groups.

The ultimate impact of a regulation is its impact on behavior. Almost half the Au Sable River anglers did not expect to change their fishing behavior if the proposed no-kill regulation was implemented. About 24% would fish there more often, 16% would fish there less often and 13% would stop fishing there. Not everyone opposed to the regulation would decrease their use of the area if the proposed catch-and-release regulation was implemented, nor would everyone in favor increase their use of the area if the regulation was passed (Table 4.18). This suggests that the impact of the regulation on behavior or use of the area may not be as great as expected from an analysis of the attitudes alone.

A big unknown at this time is whether, as supporters of the no-kill regulation have suggested, this regulation will attract many new anglers to the area. These special regulations will appeal to the highly specialized, non-consumptive fly anglers, yet these are a minority in the State, and it appears that most of this segment already use this section. If a large number of new-comers are to utilize this section many will have to be recruited from other angler segments.

### Part Three

#### SEGMENTATION

Kikuchi (1986) concluded that, "Michigan's sport fishing market is a heterogeneous mixture of angler subgroups". This study shows that the same is true of Michigan's stream trout anglers. This study identifies three segmentation variables useful for management and study of the diversity found among stream trout anglers.

#### OVERALL EVALUATION OF THESE THREE SEGMENTATION BASES

The catch-and-release controversy on the Au Sable River clearly demonstrated that there were important differences among Michigan trout anglers. If these differences could be conveniently summarized by a few variables thereby permitting management efforts to be targeted towards more homogeneous groups, opportunities for management should be improved according to market segmentation theory. Three segmentation variables were developed from an *a priori* approach: fly-fishing specialization, non-consumptive orientation and trout fishing intensity. Five criteria were used to evaluate these three segmentation bases:

1. form a measurable continuum,
2. predict catch-and-release attitudes,
3. be related to attitudes, intentions and behaviors towards fishing regulations,
4. predict various angler preferences, and
5. be easily measured.

Most other potential segmentation variables were not further considered once they failed to meet the second criterion -- that of explaining the no-kill issue.

Most research tends to use these three variables in the definition of specialization (Bryan 1977, Chipman and Helfrich 1988). For example, Chipman and Helfrich (1988) defined specialization on the basis of 18 variables which included aspects of the three proposed segmentation variables in this research. Using this "specialization" index would make it difficult to describe anglers with a mid-range value, e.g., it would not be possible to determine whether anglers with a medium "specialization index" score were high on intensity, low on specialization or non-consumptive orientation or vice versa or a number of other possible combinations. This research is able to identify the variables related to fly-fishing specialization, non-consumptive orientation and trout fishing intensity.

Fly-Fishing Specialization: Bryan (1977) suggested that the degree of specialization can be used to determine an angler's orientation to and behavior in the sport. Indeed, to classify someone simply as an angler or non-angler is of little management use. According to Bryan, the type of involvement in the sport must be ascertained to be of any management use. The concept of recreational specialization is based fundamentally on sociological theory, makes logical sense, and has been explored by a number of researchers (Chipman and Helfrich 1988). For these reasons, fly-fishing specialization was considered as a potential segmentation base.

Bryan (1977) divided the population of trout anglers into four segments based on preference for fly fishing equipment, water preference, and degree of fishing. For example, the technique specialists and the technique-setting specialists are differentiated from the occasional fishermen and the generalists based on equipment preference. The difference between the occasional fishermen and the generalists is based on degree of fishing while the technique specialists and the technique-setting specialists are differentiated by water preference. The segmentation of fly-fishing specialists developed in this study more closely approximates a continuum than distinct, mutually exclusive groups. This has the advantages of allowing more sophisticated analysis of the data (correlation and regression analysis) and permits an identification of the variables that are strictly correlated with varying degrees of fly fishing.

The fly-fishing specialization variable was related to a number of other variables (see Chapter 4,

Part 4) including importance of fly-only areas, trout releasing behavior, non-consumptive orientation, importance of trout fishing, importance of no-kill areas, trout fishing intensity, education level, self-rated experience level, investment in trout fishing equipment, income level, and age. Preferred species, fly tying, membership in fishing organizations, trout fishing after dark, residence, preferred fishing method, method first used, fishing the Au Sable River and Quality Fishing Sections, stream trout fishing in 1986, stream trout fishing out-of-state and hunting were also related to fly-fishing specialization.

One strong relationship with fly-fishing specialization was membership in fishing organizations (Appendix R, Table 9). Membership in fishing organizations increased with fly-fishing specialization. It would be useful to know what causal relationships exist, if any, between membership in fly fishing organizations and practice in fly fishing behaviors. If fishing organizations are responsible for influencing angler attitudes and behaviors, Fisheries Division may be able to work closely with organizations by helping to increase membership of organizations that promote good conservation practices or by promoting certain kinds of management options through organizations.

Of importance was the large difference in fly-fishing specialization and support for fly-only regulations between the Au Sable River sample and the statewide sample of stream trout anglers (Appendix N, Table 15 and Table 4.19) which suggests that the "fly-only" regulations do establish unique subgroups of more specialized anglers. This role of special regulations is further supported by findings that anglers who otherwise prefer lures or bait do not adopt fly fishing in order to fish this section of the Au Sable River with its special physical and biological characteristics.

This does not mean that the establishment of fly-only regulations are necessary to attract fly anglers to a specific section of stream. The fly-only sections of the Au Sable River attracted fly anglers before the establishment of such regulations because the characteristics of these waters were well suited to fly fishing. Wadable, gravely bottomed rivers which produce large hatches of insects (and of course, trout) and are wide enough to permit fly-casting are waters that will attract fly anglers. Site descriptions alone should indicate to a fisheries manager which areas would attract fly anglers.

If only certain areas are suited to fly fishing and fly anglers already use these areas, then why are fly-only regulations needed? Presumably, these regulations increase the satisfactions of the fly anglers using these areas, perhaps through the reduction of competition. Also, from my personal experience of interviewing fly anglers I found many fly anglers who simply want to be separate from other types of anglers regardless of whether there is any direct competition.

In their specialization segmentation of Virginia river anglers, Chipman and Helfrich (1988) also reported that highly specialized anglers were more interested in trophy fish, emphasized skill versus luck in catching fish, and favored restrictive harvest regulations, such as, catch-and-release. Less specialized anglers cited escape and family-oriented recreation as motivations for fishing, placed greater emphasis on luck to catch fish, were satisfied with catching smaller fish, and favored liberal harvest regulations. However, Chipman and Helfrich used certain aspects of angler behavior such as frequency of fishing, investment, and consumptive habits to define specialization. This research proposes that it may be better to measure anglers on these three or more dimensions separately. While non-consumptive orientation and trout fishing intensity increases with fly-fishing specialization, important segments of anglers are identified which do not follow these relationships, such as specialized anglers who are interested in keeping fish and bait anglers who are intense.

The fly-fishing specialization variable did not differentiate between bait and lure anglers since these two groups are coded equally, and therefore differences in needs and desires of these two groups could not be established. Developmental stage theories predict that lure fishing is an intermediate stage between bait fishing and fly fishing and therefore needs should be different. Research is needed to determine what differences exist between bait anglers and lure anglers, their developmental relationship, and if necessary, what segmentation is most useful in incorporating the differences between bait and lure anglers.

In summary, the fly-fishing specialization variable forms a continuum of increasing use of fly fishing equipment and is easy to measure. Fly-fishing specialization was related to attitudes towards no-kill but not as strongly as the non-consumptive orientation variable. Fly-fishing specialization was related to a number of attitudes and intentions towards fishing regulations. However, prediction of

important-site attributes was poor with only three of 15 measured site attributes significantly related (Table 4.33). This means that fisheries managers will need to supplement the fly-fishing specialization variable when considering any management plans which affect various site attributes of trout streams.

Non-consumptive Orientation: In this study non-consumptive orientation was correlated with preferences for regulations which restrict harvest. Thus, a non-consumptive orientation may be an important basis for segmenting anglers when determining the best mix of restrictive regulations to apply to an area.

Bryan's (1977) proposal that more specialized trout anglers (increased use of fly fishing equipment) place less emphasis on keeping trout was generally supported in the Au Sable River data. However, it is important to note that not all highly specialized anglers were in the high level of non-consumptive orientation. The existence of specialized but consumptive oriented anglers in the Au Sable group contributed to the controversy over proposed catch-and-release (no-kill) regulations on the Au Sable River. This demonstrates the importance of further segmenting specialized anglers on the consumptive-nonconsumptive dimension.

In summary, the non-consumptive orientation variable forms a continuum of decreasing importance of eating fish as a reason for trout fishing and is easy to measure. The non-consumptive variable was crucial in explaining some important aspects in the Au Sable River no-kill controversy by identifying an important but small segment of highly specialized but consumptively oriented fly anglers. The non-consumptive orientation variable predicted attitudes and intentions towards trout fishing regulations. However, as with fly-fishing specialization, non-consumptive orientation predicted only three of 15 measured site attributes (Table 4.34).

Trout Fishing Intensity: Romsa and Girling (1976) determined that, "a small percentage of the participants (in outdoor activities) accounted for the majority of annual trips." They suggest that participation frequency may be a useful basis for segmenting many outdoor user groups, such as anglers. Fisheries managers must understand preferences and behaviors of both low intensity and

high intensity users to be sure that both groups are well served. For these reasons, trout fishing intensity was proposed as a segmentation base.

The trout fishing intensity variable can be applied to any level specialization or angling type (bait, lure, and flies). The very small correlation between trout fishing intensity and fly-fishing specialization indicates that bait and lure anglers also have high intensity users. Considering that 51.8 percent of the statewide sample of stream trout anglers never fly fish, fisheries managers must be careful not to overestimate the statewide demand for fly-only regulations relative to the demand for bait and lure fishing.

Trout fishing intensity potentially could serve as a predictor of angler involvement in issues (e.g., regulations) that pertain to their fishing site. The importance of trout fishing to an angler was highly correlated with the trout fishing intensity variable and further supports that the trout fishing intensity reflects the degree of commitment to trout fishing. Previous research (Gigliotti and Peyton 1985) suggests that degree of commitment is directly related to involvement in related issues. Also, the trout fishing intensity variable was related to 7 of 15 site attribute variables (Table 4.35).

Trout fishing intensity did not indicate either attitude preference in the Au Sable controversy or non-consumptive orientation. This indicates that intense anglers can be either consumptive or nonconsumptive and suggests the utility of using the trout fishing intensity variable to further segment consumptive and nonconsumptive anglers.

Also, the trout fishing intensity variable can be used to identify various levels of commitment to trout fishing, i.e., a type of trout fishing specialization that is not based on equipment use. For example, high trout fishing intensity describes anglers who not only trout fish a lot but do so at the expense of other types of fishing (and probably other types of recreation). Thus, this variable may be used to identify anglers with a strong dependence on the trout resource and also measures a type of "development" in the sport. The trout fishing intensity variable is used in this research to identify intense bait and lure anglers to show that development within trout fishing does not always mean a shift in equipment use.

In summary, the trout fishing intensity variable reflects an increasing participation in trout fishing and is easy to measure. The trout fishing intensity variable helps in understanding the Au

Sable River no-kill controversy by predicting that the more intense anglers will more likely become involved. The trout fishing intensity variable did not predict attitudes and intentions towards trout fishing regulations very well. However, trout fishing intensity did much better than the other two segmentation bases in predicting important site attributes of trout anglers (Table 4.35).

#### FURTHER DISCUSSION OF THE THREE SEGMENTATION VARIABLES

Site Selection Attributes: Attributes which statewide anglers consider important in selecting their preferred trout fishing sites are not well predicted by any of the individual proposed segmentation bases. However, overall, 12 of the 15 measured attributes were significantly correlated with these three segmentation bases (Tables 4.33 - 4.35). This suggests the importance of measuring all three segmentation bases to get an adequate summary of angler types.

While the correlations between site attributes and these three segmentation bases are significant, they are low. It may be that preferred site attributes are nearly similar for all stream trout anglers or that the site attribute items lacked the precision to adequately measure the important differences among types of anglers. For example, the 4-point attribute scale may have been inadequate to measure the differences among anglers. Alternatively, anglers may not be aware of how they select a fishing site and therefore are unsure of how to accurately respond to the question item. Research will be needed to more precisely determine whether a relationship exists between site attributes and these three proposed segmentation bases.

Not surprisingly, crowding and fish-related attributes were not related to the three segmentation bases among the Au Sable River sample. Anglers do not fish the Au Sable River because of perceived low densities of anglers. Also, the importance of fish-related attributes (more and larger fish) are similar for all types of anglers. However, four attributes were predicted by the segmentation bases: (1) easy access, (2) close to home/cabin or campground, (3) suggested by a friend, and (4) traditional fishing area. Thus, these three segmentation variables will aid in the identification of some of the site attributes used by Au Sable River anglers.

Harris et al. (1984) reported that an angler's choice of an actual trout fishing site can only be modestly predicted from his/her preferences for trout fishing site attributes. This difficulty in



predicting actual site selection from preferred trout fishing site attributes may be due to some anglers in the study not fishing in their "most preferred" trout fishing area. This study found that about two-thirds of Michigan stream trout anglers do "most" of their trout fishing in their "most preferred" trout fishing area. Thus, anglers use sites other than their most preferred sites and therefore their preferred site attributes may not necessarily apply in these cases. Future research on site attributes should consider the distinction between preferred sites and actual sites used.

Fly-fishing specialization and non-consumptive orientation were not related to an angler fishing most often in his/her preferred site. However, there was a trend for the more intense trout anglers to fish in their preferred trout fishing area more often (Appendix S, Table 11). Either the more intense trout angler makes a greater effort to fish in their more preferred sites or they are more intense because their more preferred areas may be more available, accessible, etc. than other sites.

Motivations For Trout Fishing: Some motivations were important for all anglers, while importance of other motivations varied greatly (Appendix V). The motivations, "for fun and excitement", "to get away and relax", and "to enjoy nature" were relatively similar among trout anglers, while the motivations, "for companionship", "to enjoy fishing equipment", and "to catch trophy sized fish" varied greatly among trout anglers but were simply not related to any of the three segmentation bases proposed here. Since these variables that varied greatly among the trout anglers but were unrelated to fly-fishing specialization, non-consumptive orientation, and trout fishing intensity, it suggests that these may be additional potential segmentation variables for stream trout anglers. For example, Adams' (1979) research suggested important differences on preferred site attributes among segments who preferred different party compositions (alone vs. with family members vs. with unrelated friends). Companionship may be useful as a distinct segmentation base when the management need requires it, such as anticipating impact on angler satisfaction when the free spouse's fishing license was eliminated.

"Enjoyment of fishing equipment" is not confined to fly anglers. Bait and lure anglers also have their equipment enthusiasts. Both groups have anglers for whom enjoyment of equipment is not an important motivation.

A proportion of all types of anglers are motivated to go trout fishing by an opportunity for "catching trophy trout". Managing for any of the proposed levels (segments) of specialization, non-consumptive orientation, or trout fishing intensity will require some provision of "trophy fish".

Compliance With Regulations: Non-consumptive orientation and fly-fishing specialization were good predictors of attitudes and opinions about fishing regulations (Appendix T, Tables 1 - 6 and Table 4.36). Those higher on the non-consumptive orientation scale were more likely to favor more restrictive regulations. Actual self-reported violations were too low in number to make valid statistical comparisons. While there was no good evidence that favorable attitudes and intentions not to violate regulations were related to actual behavior, attitude theory would predict a positive relationship (Fishbein and Ajzen 1975).

Satisfaction with statewide trout fishing regulations was not related to trout fishing intensity. However, the most specialized anglers, and the most and least consumptive anglers had significantly lower satisfaction with trout fishing regulations. Although the reasons for angler response were not measured, it may be speculated that the most specialized anglers were dissatisfied due to an inadequate number of specialized regulation areas or a perception that regulations were poorly enforced. The most consumptive anglers were probably dissatisfied because the regulations restricted their preferred recreation behavior. The least consumptive anglers were probably dissatisfied because the regulations were not restrictive enough. Thus, this segmentation approach to fisheries management may provide opportunities to improve satisfaction by managing areas for different levels of restrictive regulations. However, simply managing an area, such as the Au Sable River, with different levels of restrictive regulations will not produce increased satisfactions for all anglers. Some will gain and some will lose, with the overall goal being a net gain in satisfactions. Education and public involvement are two management tools that may help reduce the disruptive nature of establishing restrictive regulations. Those dissatisfied with the management action should at least understand the reasons for the regulation and have had an opportunity to participate in the process.

**Importance of Catching Trout:** The items used in this research to measure "importance of catching trout" were similar to the scale developed by Fedler and Ditton (1986) which they referred to as a "consumptive orientation scale". They reported that, "fishermen placing less importance on catching fish also place less importance on keeping fish, the number of fish caught, and trophy/challenge aspect of fishing." This research did show that the importance of success (catching numbers of trout) decreased slightly with increasing non-consumptive orientation (Appendix S, Table 12). However, the importance of catching trophy trout was not related to non-consumptive orientation. Thus, this research does not seem to support Fedler and Ditton's (1986) findings.

Fedler and Ditton (1986) stated that catch orientation provides a useful means for segmenting an angling population into managerially relevant groups. They may be correct for salt-water boat anglers where most fish caught are kept. However, for some trout anglers, catch-and-release is routinely practiced. Thus, catching and keeping fish are separate components of fishing behavior. Therefore, Fedler and Ditton's "catch orientation scale", would not distinguish between these two types of Michigan stream trout anglers.

Catching a trout was less important to those anglers who were favorable towards the no-kill regulation proposed for the Au Sable River, just as Fedler and Ditton would have predicted. However, the relationship was not nearly as strong as the relationship with the non-consumptive orientation variable and therefore, the non-consumptive variable does a much better job of meeting the criterion of explaining the Au Sable River no-kill controversy than the importance of catching trout.

Findings also showed that the importance of catching "trophy" trout was more important to those anglers who favored the proposed no-kill regulation. Since the importance of catching trout was less important to the supporters of the proposed no-kill regulation this means that the strongest supporters for the proposed no-kill regulation wanted to improve the probability of catching trophy fish rather than simply increase the number of trout caught.

## IMPLICATIONS FOR MANAGEMENT USE OF THESE THREE SEGMENTATION BASES

One way for fisheries managers to use these three segmentation bases is to consider an analogy between these variables and biological indices. For example, the morpho-edaphic index is a measure of lake productivity and is a function of total dissolved solids and mean depth. It permits easy comparisons of productivity among lakes and makes certain predictions about other aspects of the lake such as expected type of biotic community. These three segmentation variables can be thought of as indices of various aspects of the human factor in fisheries management. Knowing the mix of user groups could allow fisheries managers to make general predictions about the preferences of the various groups using specific sites. This utility will be more fully realized once standardized scales are available and validation studies have been made.

The measurements of fly-fishing specialization, non-consumptive orientation and trout fishing intensity are relatively simple and can be easily added to regular creel surveys or other regularly conducted angler mail surveys. The measurement of these variables would add about two to three minutes to an interview or a page to a mail survey (Appendix A, Questions 18, 19 and 21 or Appendix I, Questions 1, 4 and 10). By collecting this information on trout angler populations using specific stream systems around the state, a fisheries manager can compare these subpopulations with the statewide population averages as well as other subpopulations. From this a manager could derive a profile of angler groups associated with specific sites or statewide and determine the best mix of management products to supply.

Also, these variables can be used to measure trends in user groups. For example, fly-fishing specialization, non-consumptive orientation and trout fishing intensity may be becoming more or less common among Michigan stream trout anglers. Long-term studies can document such changes. Knowledge of trends may enable more effective long term planning for fisheries management.

Trout angler subpopulations can be measured on their non-consumptive orientation and compared with other specific areas to determine where the best support for restrictive harvest regulations are as well as the amount of expected opposition to restrictive harvest regulations. However, the Au Sable River catch-and-release controversy demonstrates that even when the appropriate locations for restrictive regulations are determined, fisheries managers can not disregard

public involvement in development of regulations. Had it been conducted earlier, this survey would have predicted that a significant controversy would emerge over the Au Sable River catch-and-release issue since a significant proportion of anglers (about one-third) would have been found to be opposed to the regulation and to be intense anglers. Even a small amount of opposition should be regarded as important and an effort should be made to work with all groups affected.

These segmentation bases could also be used to evaluate public involvement. A difficult problem in public involvement is to gain representative input. By knowing the proportion of the various segments in a population a fisheries manager can measure public input to determine if it is representative and if not, know which groups to seek additional input from. Also, research to determine whether different segments prefer different types of public involvement may be useful in defining public involvement programs.

One final distinction should be made in the use of these proposed segmentation bases. When summarizing angler characteristics the 5-level scales should be used. This will help to make minor distinctions between various groups of trout anglers possible. However, in segmenting anglers, these scales should be used to manage for the desires and needs of anglers at the opposite ends of each scale. In other words, fisheries managers should work to satisfy fly anglers on one end of the specialization scale and bait and lure anglers at the other end. Similarly, the preferences of both consumptive anglers and non-consumptive anglers as well as both intense and occasional trout anglers must be considered. This is because in many cases the differences between anglers in levels 1 and 2 and between anglers in levels 4 and 5 were generally too small to segment anglers.

#### **SOME SUGGESTED POINTS FOR APPLICATION OF A SEGMENTATION APPROACH**

The first step in application of a segmentation approach is developing a plan. Simply providing a diversity of management products or responding to the desires of a few specialized groups, such as in the Au Sable River system, does not fully constitute a segmentation approach. The plan should answer such questions as: How will the angler population be segmented? How will information on angler segments be collected? How will such information be updated? How will the various segments be managed?

Once a plan has been generated, probably the most important next step is gaining acceptance of the concept of a segmentation approach by the anglers. Many anglers may be opposed to special management efforts, including regulations, that appear to benefit a small, select group of anglers. Because the Fisheries Division manages under the philosophy of "the greatest good for the greatest number", many anglers may equate this with managing for the majority of the anglers. A good education program will be needed to illustrate the benefits of multiple management strategies based on market segmentation and to demonstrate how the approach satisfies "the greatest good for the greatest number" philosophy.

Over half (53.4%) of the anglers in the compliance survey sample felt that fishing regulations should be generic statewide and special regulations should not be assigned to specific streams or local areas. This is especially noteworthy since this sample was biased towards the more specialized angler. Presumably, a similar percent of these anglers would also be opposed to special regulations based on social reasons, i.e., to benefit specific segments of the angling public. About two-thirds (65.1%) of this same sample believed that most fishing regulations have a sound biological basis. Almost half (49.1%) of the Au Sable River sample believed that "the use of special fishing regulations should only be based on biological evidence". An education program is thus needed that points out the social aspects and benefits of some fishing regulations. It would also benefit anglers and managers if the managers sought and implemented means to encourage communication among segments to expand awareness and appreciation of the need to allocate resources statewide among the various user groups.

In general, anglers must understand the concept of a segmentation approach to fisheries management as a means of equitably allocating scarce resources. When a potentially controversial management effort or regulation is needed, an education program must clarify the specifics of the segmentation basis in that instance. For example, in the Au Sable River "no-kill" issue the anglers needed to know the true level of support for the catch-and-release regulation, which groups were benefited, and whether the allocation (in terms of resource available) was fair in proportion to group size and benefits received. In this instance, many anglers that were interviewed did not seem to know why the catch-and-release regulation was proposed. Some assumed that the fisheries was

threatened. Others concluded that there was no valid reason for the regulation and that it was just "dirty politics". This reaction is detrimental to image and credibility of the agency and damages future actions (even on unrelated issues) by the agency.

While an education program is a form of public involvement, it does not allow an opportunity for active participation (Arnstein 1969). Involvement strategies which truly permit and use input from the public will likely be needed for implementation of a segmentation approach. There are several possible procedures for soliciting public participation and some guidelines for when and how to use them (Heberlein 1976, Hendee et al. 1976, Rosener 1978 and Creighton 1981). Some public involvement strategies should be used from the early development of the plan through the implementation stage of the segmentation approach to the final evaluation.

The demand for public involvement does not occur with regard to all matters that affect the public (Heberlein 1976). In fact, there is usually very little such demand and the agency faces the dilemma of either no interest or excessive, emotional interest. According to Reidel (in Heberlein 1976), "...concern for participation arises almost entirely in the context of real or imagined failure of government to respond appropriately to the more competitive needs and demands of citizens, some of whom feel that the response would have been more satisfactory had their values been given and assured their hearing." As long as individuals trust the decision maker to act in their best interest, they have no need to participate. However, as trust erodes, the demand for public participation tends to increase (Heberlein 1976). In the Au Sable River, for example, a segment of the public felt excluded from the decision process within the agency and sought involvement in the issue through the court system. A good public involvement program, implemented early in the issue, may avoid such a disruptive issue stage .

#### Part Four

### DEVELOPMENTAL NATURE OF TROUT FISHING

Jackson et al. (1979) proposed that almost all hunters proceed through five developmental stages of hunting. For example, the first step in this developmental sequence is termed the shooter stage. During this stage the hunter needs to fire the gun to obtain satisfaction. The hunter does not progress to the next stage, the limiting-out stage, until the first need is satisfied. Thus, growth from one stage to the other depends upon the passage of time and the need for fulfilling experiences as prerequisites to that movement (Jackson et al 1979).

The important question here is whether anglers also go through a similar developmental sequence. Research confirms that trout fishing satisfies different personal needs for different anglers (Knopf et al. 1973). Therefore, it is logical to expect changes in an individual's trout fishing attitudes and behaviors over time as participation and experience in the sport increases. For example, anglers with a strong need to master and display new skills would be expected to progress from bait fishing to lure fishing to fly fishing. On the other hand, anglers motivated by the desire for fish consumption would not necessarily progress through more specialized fishing methods and gear. A possible explanation of why anglers move through the developmental stages is that as initial motivations become satiated (fulfilled), the angler adopts new motivations, seeks different benefits from fishing and develops new angling behaviors.

Kohlberg (1971) stated that to effectively raise an individual to a higher stage of moral reasoning, the person must become involved with an individual (or group) already at that higher level of development. Anglers who join organizations adopt the ethics and ethical reasoning of fly-fishing specialization and non-consumptive orientation that is exhibited by the other members in the organization. Anglers may quickly adopt these behaviors to become a part of the group, but over time the new values and behaviors become internalized, perhaps due to cognitive dissonance. However, it is also possible that fishing organizations attract members who already have values and beliefs consistent with that of the organization.

Studies to identify possible reasons for dropping out of fishing may gain new insight by taking a



developmental approach. When early motivations for trout fishing become satiated, the necessary link to the next stage of fishing with its new motivations may not occur and the angler may stop fishing altogether. For example, the angler may become successful and then satiated by bait fishing for trout but for unknown reasons not experience new motivations.

Of the change in 24 attitudes and practices measured, anglers reported that "enjoyment of nature while fishing" had increased the most since they first started trout fishing (Table 4.42). This increased "enjoyment of nature while fishing" was unrelated to membership in fishing organizations, years of trout fishing experience, fly-fishing specialization and non-consumptive orientation. Also, "nature enjoyment" was the most important motivation reported by all trout anglers. Thus, nature enjoyment is a major component of trout fishing and increases over time at a relatively constant rate regardless of membership in a fishing organization, their degree of fly fishing use or their non-consumptive orientation. There was a very slight increase in "enjoyment of nature while fishing" with trout fishing intensity indicating that a higher rate of trout fishing may either be caused by a greater need of nature enjoyment or that the higher rate of trout fishing may cause an accelerated rate of increase in nature enjoyment. These findings stress the importance of nature enjoyment as a benefit to trout anglers of all types which appears to increase (develop) over time for all types of anglers rather than being important at one stage of development.

According to Jackson et al's (1979) theory, nature enjoyment was most important to the hunters in the sportsman or last stage of development. This research does not necessarily contradict this theory. Rather trout angling itself (of all types) may represent a special segment of angling recreation for which nature enjoyment is very important. Also, development among these trout anglers may not necessarily mean an increase in importance of nature enjoyment from a low level in earlier stages to a high level in later stages, rather development may be reflected in a decrease in importance in other motivations, such as, harvest and success, thereby, the increase in nature enjoyment is only relative to other motivations.

While it is clear that nature enjoyment is an important component of trout fishing, a more precise definition of what nature enjoyment means to the angler is needed. An angler's enjoyment of nature could mean many things to many different trout anglers. More research directed at

discovering the important components of nature enjoyment may be helpful in developing management policies. Without an understanding of this important but vague benefit fisheries managers could unintentionally reduce satisfactions or fail to see new ways to increase satisfactions from this benefit. For example, one angler may appreciate well maintained parking lots and trails while another angler may feel that parking lots and trails detract from the natural experience.

#### **A MODIFIED MODEL OF DEVELOPMENT AND SPECIALIZATION AMONG TROUT ANGLERS**

A developmental approach to understanding trout anglers is clearly a complex problem. This study illustrates the inadequacy of current specialization models to characterize anglers and predict their behaviors. First a distinction must be made between specialization and development. Specialization refers to the selection and concentration on a specific aspect of fishing, for example, trout specialization or equipment specialization. This definition is different than that used by Williams (1984) which states that specialization indicates an evolution of preference and style of participation in an activity. However, this definition is too similar to development and the definition used in this study is more in line with the dictionary definition of specialization. Specialization is different from development since an angler can specialize on a specific aspect of fishing from the beginning and not change over a period of time. Development refers to a change or evolution along some continuum. According to Flavell (1972) the items in a developmental sequence may refer to a structure, skill, concept, belief, attitude, bit of knowledge, etc. Thus, depending on what is measured, development can reflect many things, but in terms of understanding recreational behavior a motivational developmental sequence may be most useful since this would define the reasons for participation in the activity. Therefore, specialization involving a sequential change in equipment may result from a developmental change in motivations, but specialization can also occur without this developmental change and development can occur without specialization on a particular aspect of fishing.

An improved model that incorporates multiple pathways of development and multiple entry points into Bryan's trout fishing specialization model is proposed (Figure 5.2). This model shows

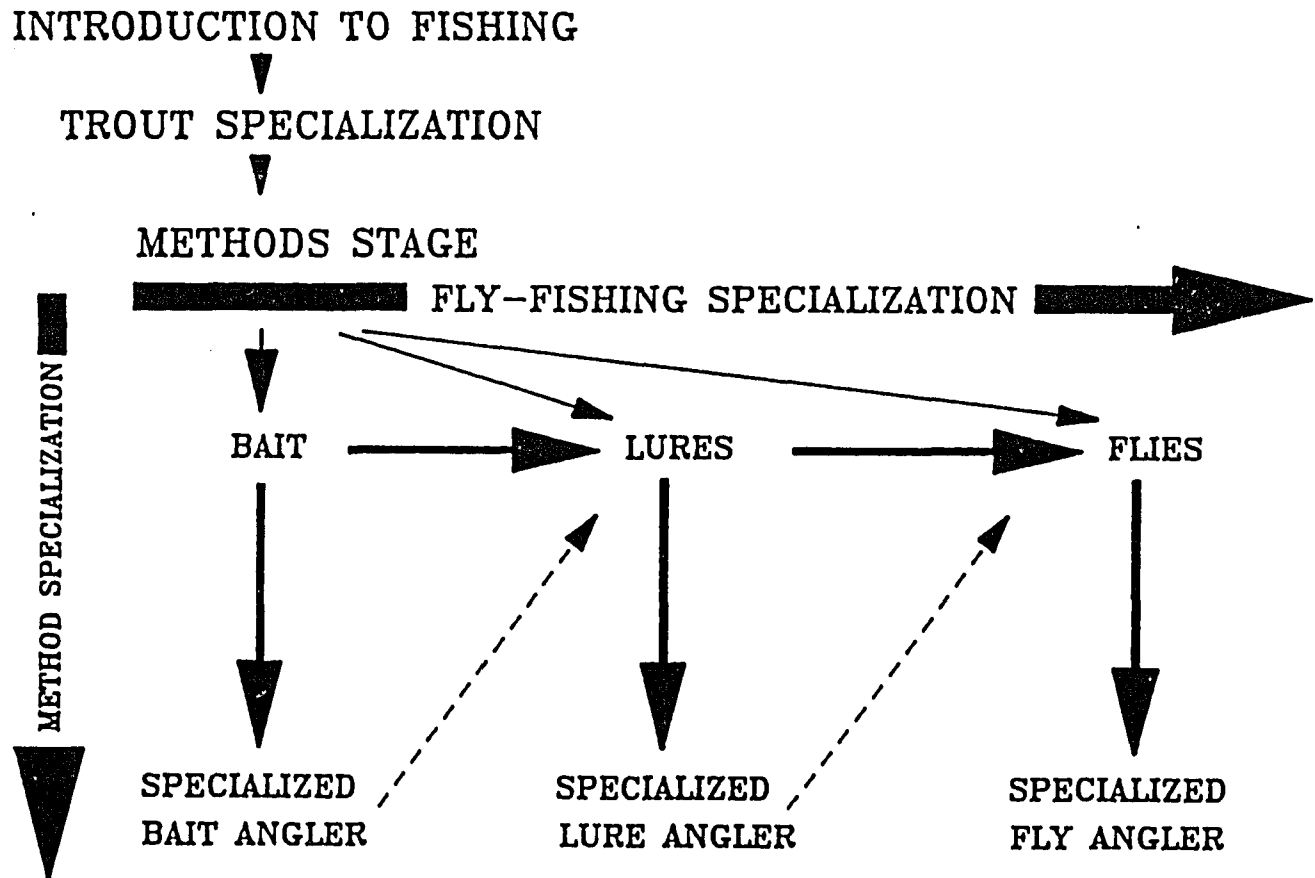


Figure 5.1. Proposed developmental model for trout anglers.

that trout anglers, after introduction to fishing (either trout or other species), specialize on trout at some point. At the method stage, some anglers follow the traditional developmental pathway of fly-fishing specialization -- starting with bait, moving to lures and then flies. But this model also says that trout anglers can start with any method. Thus, bait anglers can specialize on bait, becoming very skilled and over time develop through potential stages as reflected by changing motivations for fishing all without a change in equipment. Or, anglers may begin with flies, specialize on the method and also pass through a developmental pathway without the traditional equipment change.

This model predicts that development does occur but for a number of reasons not all anglers will take the same developmental sequence due to different histories, different initial preferences, different needs, different personalities, and other possible differences. Further research is necessary to identify the potential developmental pathways and predictors of which pathways the various types of anglers will follow. Such a model may allow effective use of market segmentation in fisheries management. Predicting which anglers will change over time and why they change may help fisheries managers predict future demand. Understanding the developmental nature of trout fishing also may clarify other topics of interest to fisheries managers, such as, drop-out rate for trout anglers or compliance with fishing regulations. Jackson et al. (1979) predicted that for hunters many unethical and illegal behaviors occur during the early stages of development. If true for anglers, a developmental approach would identify certain segments to concentrate their efforts on and would predict possible reasons for the behaviors, i.e., the unethical and illegal behaviors are associated with the various needs with each stage. From such a model fisheries managers would be able to suggest methods to improve or correct these unethical and illegal behaviors.

## YEARS OF EXPERIENCE

Only three of 24 changes in attitudes and behaviors were related to years of trout fishing experience (Table 4.48). All anglers reported that the "desire to try new equipment, techniques, and methods" had increased since they first started trout fishing, but more experienced anglers reported less of an increase in desire to try new equipment, techniques, and methods. "Number of days fished

each season" and "interest in limiting out" decreased with years of experience. These findings would be predicted by the hunter stage model of Jackson et al. (1979).

The sportsman stage (Jackson et al. 1979) is characterized by a decreased emphasis on bagging game. Thus, in anglers this would be indicated by a decrease in "interest in limiting out". Jackson et al. also characterized the sportsman stage as finding satisfaction in the total hunting experience. The emphasis possibly shifts to quality hunting rather than quantity hunting and perhaps accounts for a decrease in "number of days fished each season" by the anglers with more years of experience. Jackson et al. proposed that the sportsman stage may actually be a mellowing stage which may be signified by a decrease in the importance of advancing further in the sport. Perhaps in anglers this is being expressed by a reduced "desire to try new equipment, techniques, and methods" found in the more experienced anglers. If it is hypothesized that "desire to try new equipment, techniques, and methods" is curvilinear with years of experience, then less experienced anglers would report the greatest change while more experienced anglers, although they increased since first starting to fish, would have less of an overall desire to try new equipment, techniques, and methods, reflecting this reduced desire in the later stages of trout fishing.

The cognitive development theory of recreational development suggests that the time element is very important (Flavell 1972, Williams 1984). There are several possible explanations why only three of the 24 measured changes in attitudes and practices were related to years of experience. One explanation is that years of experience is too vaguely defined to adequately measure experience level. For example, a beginning angler may have reported a single day of trout fishing within a year as a year of trout fishing experience while another angler may have fished extensively for trout within the same year. Although their actual experience varies greatly, both anglers would be measured as the same level of experience. Thus, the unit to measure experience level must be more precisely defined in future research on the developmental nature of trout fishing.

Another explanation for the low number of correlations between years of experience and changes in attitudes and practices may be that anglers can pass through the stages at different speeds. For example, anglers may move through the stages more quickly if they join organizations in which the majority of members are at higher levels, as would be suggested by Kohlberg's (1971)

theories. Other factors that may effect the rate of development include: reading fishing literature, the skill level of the person who introduced them to the sport, age when introduced to the sport, and the relative value to the individual of a supplemental food source versus recreation. Each of these variables may influence the time spent within levels as well as the time spent progressing through levels.

A third explanation may be that anglers develop through different pathways. The cognitive developmental theory suggests that anglers can develop or become specialized within methods rather than progressing through increasing use of fly fishing equipment. Thus, specialized bait and lure anglers might also be identified by analysis of different developmental pathways. Therefore, time spent may be a valid measure of experience within a stage or level, but a poor indicator of progression through stages when all of the developmental pathways are analyzed together.

#### NON-CONSUMPTIVE ORIENTATION

Fewer ( $n=5$ ) of the 24 changes in attitudes and practices were related to non-consumptive orientation than to fly-fishing specialization ( $n=13$ ) (Appendix U, Tables 3 and 4). Interest in catching trout to eat decreased over time for the more non-consumptive anglers suggesting that non-consumptive orientation is developmental. Bait fishing decreased over time for the more non-consumptive anglers while the change in fly fishing was similar over time for all levels of non-consumptive orientation. This suggests that non-consumptive orientation develops mainly among fly anglers. Also, interest in catching larger trout increased slightly more for those in the higher non-consumptive levels. This relates to their interest in catch-and-release regulations since a main purpose for these regulations is to produce larger fish.

#### TROUT FISHING INTENSITY

Many trout anglers who currently fish often for trout have increased their amount of time devoted to trout fishing since they began trout fishing. This is apparently a characteristics which develops over time. Trout fishing intensity would be expected to increase over time as trout fishing became more important to the angler. Thus, trout fishing intensity may be an indicator of

development within trout fishing since it is a measure of commitment to or specialization on trout (as opposed to fishing for other species).

One interesting finding from this study was that fly fishing increased with trout fishing intensity (Appendix U, Table 6) and for those in fly-fishing specialization levels 1-3 who were intense, there was an increase in bait fishing over time (Table 4.51). And for those anglers who preferred lures, use of spinner equipment increased with trout fishing intensity (Table 4.52). In other words, some anglers do develop by moving through several methods culminating in specialized use of fly fishing equipment as predicted by Bryan. However, others develop within a method, such as bait or lure fishing. This supports the hypothesis of multiple pathways (Figure 5.1).

#### FLY-FISHING SPECIALIZATION

If fly-fishing specialization is developmental, then we would expect anglers in different levels to report differing degrees of change in certain attitudes and practices since they first began trout fishing. Eleven of the 24 changes in attitudes and practices were not related to fly-fishing specialization (Appendix U, Tables 1 and 2). Some of these were unexpected, such as the lack of relationships with changes in: the number of days fished each season, use of vacation time for trout fishing, interest in catching larger (trophy) trout, and desire to try new equipment, techniques and methods. This doesn't mean that these variables are similar for the different levels of fly-fishing specialization; only that their change over time is similar for all fly-fishing specialization levels.

Use of vacation time for trout fishing would be expected to be greater for the more specialized angler (Bryan 1977). Perhaps increasing use of vacation time for trout fishing is the cause rather than effect of specialization. If so, anglers who devote more vacation time to trout fishing may be the anglers who become more specialized over time. Because this research only measured the degree of change in attitudes and practices, not the current level, additional research is needed to test this hypothesis.

Bryan's (1977) specialization model implies that trout anglers progress from bait fishing to lure fishing to fly fishing, reflecting changes in equipment and skill used in the sport. The statewide sample of stream trout anglers showed that reported time spent fly fishing increased while the

reported time spent bait fishing and spinner fishing decreased as the degree of fly-fishing specialization increased (Figure 5.2). This indicates that at least some of the specialized anglers in the statewide sample progressed as predicted by Bryan's model from bait and lure fishing to fly fishing. However, 62% of the anglers who preferred fly fishing began trout fishing with flies and 76% of the most specialized anglers started with fly fishing. Also, nearly one-third (31.6%,  $n=25$ ) of the statewide anglers who preferred flies have maintained the same level of fly fishing. This does not mean that fly fishing is not developmental, only that the linear model of bait to lure to fly fishing does not apply to all stream trout anglers. These data support the conclusion that time spent fishing is not an accurate predictor of progression through specialization levels and suggest that the models which consider multiple pathways of development are more appropriate for analyzing characteristics of anglers.

Bryan's model predicts that specialized anglers are more intense anglers (fish more often). However, the cognitive developmental theory suggests that anglers can develop in ways unrelated to equipment changes, i.e., bait, lure and fly anglers can develop or specialize without moving through a progression of methods. The trout fishing intensity variable, which was proposed as a segmentation variable, is a measure of commitment to trout fishing. My analysis identified intense bait and lure anglers as well as intense fly anglers (Table 4.50). These data support the hypothesis that development and specialization proceeds through multiple pathways (Figure 5.1).

Another measure of development according to the cognitive developmental theory is skill level (Williams 1984). Experienced or expert levels were claimed by 23% of the anglers with no preference, 35% of the anglers who preferred bait, 28% of the anglers who preferred lures and 44% of the anglers who preferred flies. Thus skilled bait and lure anglers as well as skilled fly anglers were identified; again supporting the hypothesis of multiple pathways (Figure 5.1).

Bryan predicts that the importance of fish consumption decreases with specialization and the data strongly confirm this relationship (Table 4.28). About 45% of the anglers with a low interest in eating fish reported that this motive was more important during their early experience in trout fishing (Table 4.54). Thus, for some of the anglers attainment of this attitude appears to be the result of progressive development. There are, however, important exceptions to this model. First,



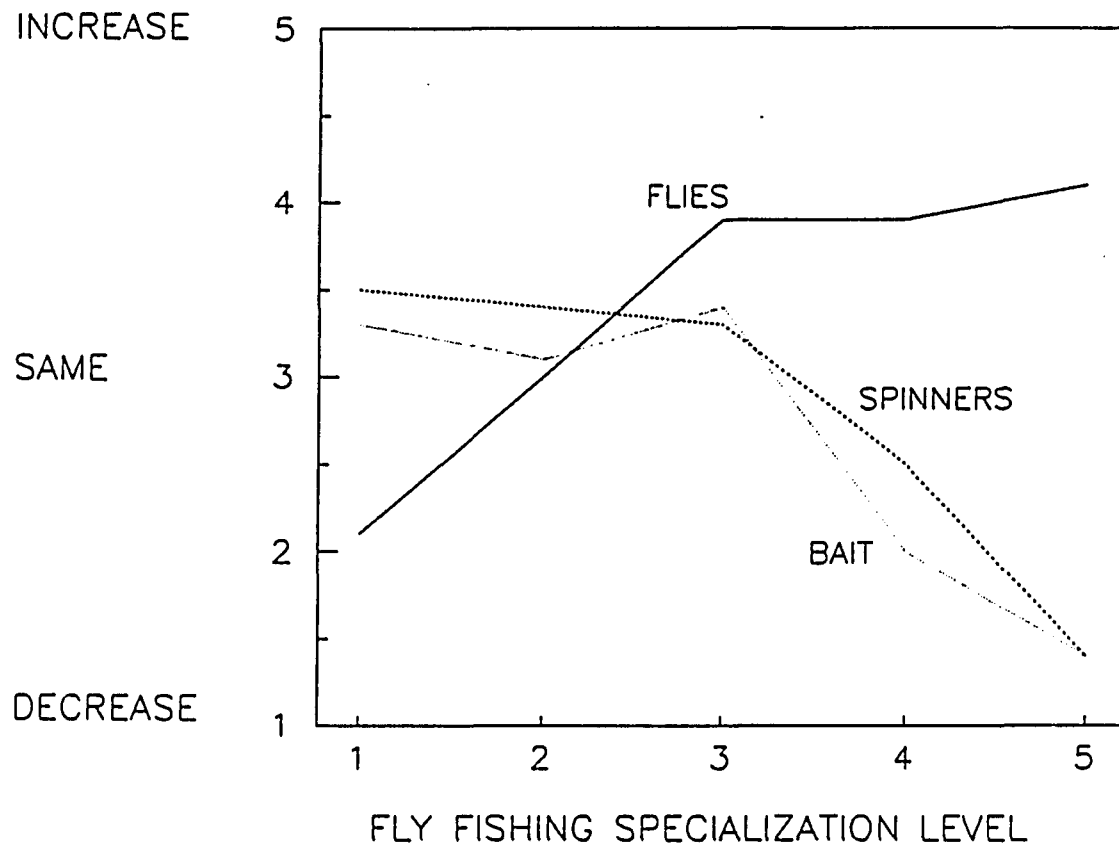


Figure 5.2. Change in time spent fly fishing, lure fishing and bait fishing reported by statewide stream trout anglers as a function of fly-fishing specialization.

there are specialized anglers for whom eating fish is very important (Table 4.55). This was a major factor in the Au Sable River no-kill controversy. Second, some anglers (48.8%) began trout fishing with a low interest in fish consumption (Table 4.54). A multiple pathways model might incorporate these exceptions to Bryan's model. For some pathways, non-consumptive orientation would increase with specialization while for other pathways it would not.

#### SOME FURTHER QUESTIONS TO CONSIDER

This research explored only the development of trout anglers within the sport of trout fishing. However, it is possible that trout fishing itself is a developmental stage of angling in general. For example, anglers may start with pan fish and progress to trout species. Thus, at least two pathways of development are possible; people who initially begin fishing for trout and people who begin fishing for other species and progress to trout fishing. Anglers who initially begin fishing for other species probably will master certain basic fishing skills before they start trout fishing. Thus, they will likely develop differently (probably faster) in the sport than anglers who begin with trout fishing.

Jackson et al. (1979) proposed that the second stage of hunting is a limiting out stage where success is very important. However, as applied to angling, important questions remain to be answered. For example, does the importance of success decrease at the time that the angler moves to the next higher stage (method stage) or does the decrease in importance occur later? Do anglers go through a limiting out stage only once or do they repeat this stage each time they progress to a new species, new method or higher stage? Can individuals be at different developmental stages at the same time for different types of fishing? For example, can they be a highly specialized trout angler interested only in technique at the same time that they are beginning as bass anglers interested in catching a limit regardless of method used?

Another important stage identified by Jackson et al. is the trophy stage. It is possible that species specialization is a type of trophy in that the angler has limited his/her choice of available game. However, in fishing, trophy usually refers to large size. Jackson et al.'s. model proposed that the method stage follows the trophy stage. As applied to fishing this may not be valid. At least three potential pathways of development exist: (1) anglers first go through a stage where catching

larger trout is the main emphasis regardless of method used followed by increased interest in method (TROPHY ---> METHOD), (2) method stage occurs first and once a method is mastered the challenge then becomes to catch a large (trophy) trout by the method (METHOD ---> TROPHY), or (3) a development of these two stages occurs simultaneously.

Jackson et al. also implied that many unethical and illegal behaviors were common among hunters in the early stages. This research found that intention to violate decreased with fly-fishing specialization and non-consumptive orientation but was unrelated with trout fishing intensity. One explanation for the decrease in intention to violate with fly-fishing specialization may be that the importance of using fly fishing equipment is more important than violating regulations to improve success. The decrease in intention to violate with non-consumptive orientation suggests that since keeping fish is not important there is no little need to violate regulations. Since intention to violate was not related to trout fishing intensity this suggests that anglers can develop (become intense trout anglers) based on different needs, supporting the multiple pathways of development hypothesis. If so, this suggests that violation behavior is related to motivations for fishing and will thus be more prevalent in those stages where catching and keeping fish is most important.

Another interesting question is, what effect do regulations have on the development of trout anglers? For example, different bag limits may cause anglers to develop through the limiting out stage at different speeds. Small bag limits may permit anglers to limit out more often causing them to progress more quickly. Gear restrictions, such as fly-only areas, may encourage some anglers to try new fishing methods. Answers to these questions may show how fisheries managers can help reduce illegal and unethical behaviors among trout anglers.

## SUMMARY OF RECOMMENDED RESEARCH

This research effort produced a large data base on trout anglers but also generated many questions. A number of research topics and suggestions have been mentioned throughout this discussion and for convenience are summarized here.

### • IMPACT OF CATCH-AND-RELEASE REGULATION ON THE AU SABLE RIVER

Future studies should monitor the impact on user groups after implementation of catch-and-release regulations on the Au Sable River Mainstream Quality Fishing Section. A suggested schedule would be the first year, fifth year and tenth year to document long term effects. A more extensive study would be to monitor yearly use along with the biological response. This would look at the relationship of angler response to fish populations. For example, if the catch-and-release regulations results in increased numbers of larger trout, how will the angling public respond to this and how much of an increase in fish stocks will be necessary for an angler response? The overall question being, how do anglers respond to various characteristics of fish populations? Also, further research is needed to measure the degree of success that supporters expect or would be satisfied with.

### • FURTHER AU SABLE RIVER RESEARCH

Site Attributes: Future research should compare the importance of site attributes at a number of different river systems around the state. The importance of the Au Sable River site attributes can only be fully understood by comparing them with other trout fishing streams throughout the state. This may help identify future areas where anglers may demand catch-and-release regulations. Also, this information will be needed to allocate Michigan's trout resources.

Preferred Trout Species: Further research should be conducted on the importance of catching a mixed bag to Au Sable River anglers (as well as statewide trout anglers). This may be particularly important since the Au Sable River provides three species of trout and special regulations, such as, catch-and-release, may affect species composition.

- **MEMBERSHIP IN FISHING ORGANIZATIONS**

Does fly-fishing specialization and non-consumptive orientation increase due to membership in fishing organizations or do only certain already established angler types join certain organizations?

- **REFINEMENT OF INSTRUMENT**

Segmentation Bases: Similar studies should be conducted on other unique waters around the state to determine reliability and validity of these segmentation bases. A classification of the state's trout resources and the type of users (segments) will be necessary for the statewide allocation of trout resources.

Developmental Nature of Trout Fishing: Simply measuring years of trout fishing experience may be an inadequate measure of trout fishing experience. It was suggested that a new measure of experience should include a measure of the "quality", which includes such aspects as the amount of time spent fishing each year, as well as the number of years fished.

Also, it was recommended to measure the present level of attitudes and behaviors in addition to studying the change in attitudes and behaviors over time when researching the developmental nature of fishing. For example, the change in the "use of vacation time for trout fishing" was similar for all levels of fly-fishing specialization. However, different predictions would be made if anglers in the different specialization levels had similar amounts of vacation time spent for trout fishing compared to different amounts of vacation time spent for trout fishing.

- **CONTRIBUTION TO UNDERSTANDING TROUT ANGLERS**

Motivations For Trout Fishing: Some of the motivations for trout fishing were identified as universal, i.e., equally important to all trout anglers, such as nature enjoyment, relaxation, and excitement. Yet, these dimensions, especially, nature enjoyment, may be defined differently by different anglers. Therefore, research was recommended to further establish the meaning of these dimensions to the various types or segments of anglers. Important differences between angler types could have both theoretical and management implications.

**Specialization:** The fly-fishing specialization variable neglects the difference between bait and lure anglers. Therefore, research was suggested which more closely examines the difference between bait fishing and lure fishing for trout.

**Public Involvement:** Research should identify the public involvement strategies most acceptable to angler segments so that disruption may be minimized and benefits to anglers maximized.

**Regulations:** Also, research should explore angler attitudes towards regulations and their subsequent behavior. While this research suggests that attitude was the most important predictor of behavioral intention, other mediating factors may improve the predictive ability of attitudes. Also, what are the reasons for satisfaction and dissatisfaction with trout fishing regulations?

#### • DEVELOPMENTAL THEORY

**Drop-Out and Recruitment:** A developmental approach to the study of the drop-out rate and recruitment rate for trout anglers was suggested. For example, anglers may become satiated at one stage but fail to adopt or link new motivations with fishing and thus drop out. This represents a new approach to understanding drop-out and recruitment.

**Different Pathways of Recruitment:** Future research on the developmental nature of trout fishing should consider the model proposed in this study which proposes that development and specialization can follow multiple pathways. Once the different pathways are identified the developmental sequences can be described for each pathway. For example, research was suggested to look at the developmental difference between anglers who start with trout fishing compared to anglers who start with other species and then begin to fish for trout. Also, research should consider whether trout fishing is a developmental stage of fishing.

**Importance of Success:** Research is needed to explore the importance of success (numbers of fish) and where and how the importance of trophy fish fit into a developmental model.

**Effects of Regulations:** Research is also needed to explore the effect that regulations have on the development of trout anglers. For example, do more restrictive regulations cause anglers to become less consumptively oriented?

## SUMMARY OF MAJOR CONTRIBUTIONS OF THIS RESEARCH

1. One contribution of this research was the collection of a large sociological data base on Au Sable River anglers and Michigan stream trout anglers. Since the Au Sable River is an intensively managed fisheries with many experimental regulations this data base will permit future researchers to explore changes in user groups over time due to implementation of various management efforts as well as other trends.

A major finding was that Au Sable River anglers are more specialized, less consumptive and more intense trout anglers than the average statewide stream trout angler. One implication of this finding is that data from stream trout anglers in general do not describe Au Sable River anglers. For example, support for fly-only regulations is very high among Au Sable River anglers but not among trout anglers in general. However, this also means that these special regulations may be excluding many potential anglers from these sections of the Au Sable River. A next step would be to determine whether the benefits received by the specialized fly anglers are greater than the loss to the non-fly anglers excluded from these sections.

2. A second contribution of this research was the identification of the major factors that contributed to the Au Sable River no-kill controversy. Many of the findings will be applicable to future catch-and-release regulations that are likely to occur in Michigan. Past research has given the impression that specialized anglers support catch-and-release, however, one valuable finding of this research was the identification of specialized, consumptive-oriented anglers. This research also suggests that catch-and-release regulations may impinge upon other important values of anglers, namely, freedom of choice. What this means for the fisheries manager is that, in most cases, implementation of catch-and-release regulations will likely be controversial and good public involvement procedures will be necessary.

3. A third major contribution was the identification and descriptive analysis of three potential segmentation variables for stream trout anglers -- fly-fishing specialization, non-consumptive orientation, and trout fishing intensity. This does not mean to imply that there are only three segmentation bases useful for stream trout anglers, as the literature has shown many possible variables which could be used to segment anglers. However, based on the criteria used here to evaluate potential segmentation bases these three variables seem best suited for segmentation of Michigan stream trout anglers. One important criterion was the ability to predict attitudes towards trout fishing regulations since regulations are a major tool of fisheries managers which have a potential to impact on angler satisfactions.

One valuable use of these segmentation variables by fisheries managers would be for quick summaries of user groups at various sites. These three variables summarize the sociological characteristics as well as the wants and needs of stream trout anglers. Of course, a second use of these variables would be to apply a market segmentation approach to the management of stream trout anglers.

4. A final contribution of this research was the exploration of developmental processes in trout anglers and the formation of an alternative theory to the Bryan model of specialization. This research can not support (or reject) the notion that all anglers pass through developmental stages, however, some reasons are suggested as to why it may be difficult to identify developmental stages in anglers. One reason may be that anglers pass through different stages at different rates. This was suggested by the fact that anglers reported that many attitudes and practices had changed over time but few of these were related to years of trout fishing experience. Another reason may be that anglers develop through different pathways. A major contribution of this study was the identification of "specialized" bait and lure anglers (measured by trout fishing intensity which is a measure of trout fishing specialization as opposed to concentration on other species of fish). The importance of the proposed modified model of development and specialization among trout anglers was the distinction between specialization and development. Specialization was defined as the fixation on an aspect of fishing and development was defined as a process of change in fishing. The model shows that



specialization can result from developmental changes but it is not necessary for that to occur, for example anglers can start with fly fishing and specialize on that method. Development can be a number of sequential changes but probably the most useful theoretically and on a practical level are changes in motivation for fishing.

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## APPENDIX A

Complete field interview for Au Sable River anglers

SURVEY OF ANGLERS IN THE AU SABLE RIVER MAINSTREAM  
QUALITY FISHING ZONE (BURTONS LANDING ON WAKELY BRIDGE)

TODAY'S DATE \_\_\_\_\_ ACCESS POINT \_\_\_\_\_  
(mo. - day - yr.)  
LOC. 1 INT. \_\_\_\_\_ TIME: \_\_\_\_\_

Please complete this survey according to today's fishing trip in the Mainstream Quality Section (Burtons Landing to Wakely Bridge).

YOUR RESPONSES TO THIS SURVEY WILL BE TREATED AS CONFIDENTIAL

- 
1. How many hours have you fished so far today in this section (the Mainstream "Quality Fishing" section)?  
 \_\_\_\_\_ HOURS \_\_\_\_\_ HAVE NOT YET STARTED ---> GO TO QUESTION 4
  2. How many trout did you catch in this section today? \_\_\_\_\_  
 How many trout did you keep? \_\_\_\_\_  
 How many "legal-sized" fish (8-12 or > 16 inches) did you release? \_\_\_\_\_  
 About how large was the largest trout you caught? \_\_\_\_\_ inches?
  3. Considering all factors, how satisfied are you with your fishing trip today? (check one)
 

_____	1. EXTREMELY SATISFIED
_____	2. SATISFIED
_____	3. SLIGHTLY SATISFIED
_____	4. SLIGHTLY DISSATISFIED
_____	5. DISSATISFIED
_____	6. EXTREMELY DISSATISFIED
- 
4. Fishing method (check 2)? \_\_\_\_\_ SHORE \_\_\_\_\_ WADING \_\_\_\_\_ BOAT  
 \_\_\_\_\_ FLY FISHING \_\_\_\_\_ SPINCASTING \_\_\_\_\_ BAIT
  5. Number in fishing party: \_\_\_\_\_
  6. Not counting this season, about how many days, if any, have you spent fishing this section of the Au Sable River last year? \_\_\_\_\_ DAYS
  7. Would a "no-kill" regulation prevent you from fishing here in the future?  
 \_\_\_\_\_ YES \_\_\_\_\_ NO ----> WHY: \_\_\_\_\_

8. There are several other types of regulations in the Au Sable River System. How important were each of the following reasons for your selection of this particular section of the river for your trip today? Please respond by checking whether each item is a primary reason, somewhat important reason, or not a reason for your selection of this particular section of the river for today's trip.

	PRIMARY REASON	SOMEWHAT IMPORTANT	NOT A REASON
1. EASY TO ACCESS THE RIVER	_____	_____	_____
2. CLOSE TO HOME/CABIN OR CAMPGROUND	_____	_____	_____
3. A FRIEND SUGGESTED IT	_____	_____	_____
4. THOUGHT THERE WOULD BE FEWER ANGLERS	_____	_____	_____
5. EXPECTED TO CATCH LARGER FISH	_____	_____	_____
6. EXPECTED TO CATCH MORE FISH	_____	_____	_____
7. TRADITIONAL FISHING AREA I'M FAMILIAR WITH	_____	_____	_____

Were there any other primary reasons for coming here? \_\_\_\_\_

9. How important is it to you to have a special "fly-fishing only" area in Michigan to trout fish in?

- \_\_\_\_\_ 1. CRUCIAL  
 \_\_\_\_\_ 2. VERY IMPORTANT  
 \_\_\_\_\_ 3. IMPORTANT  
 \_\_\_\_\_ 4. SOMEWHAT IMPORTANT  
 \_\_\_\_\_ 5. SLIGHTLY IMPORTANT  
 \_\_\_\_\_ 6. NOT IMPORTANT

10. How important is it to you to have a special "no-kill" area in Michigan to trout fish in?
- ☐ 1. CRUCIAL
  - ☐ 2. VERY IMPORTANT
  - ☐ 3. IMPORTANT
  - ☐ 4. SOMEWHAT IMPORTANT
  - ☐ 5. SLIGHTLY IMPORTANT
  - ☐ 6. NOT IMPORTANT
11. In your opinion, what are the purposes or benefits that a "no-kill" regulation is supposed to provide?
- 
12. Do you feel that the number of "no-kill" (catch-and-release) trout areas in the state should be:
- ☐ 1. INCREASED
  - ☐ 2. DECREASED
  - ☐ 3. STAY THE SAME
  - ☐ 4. NO OPINION
13. How do you feel about the proposed new "no-kill" regulation for this section of the AuSable River (Burtons Landing to Wakely Bridge)?
- ☐ 1. STRONGLY APPROVE
  - ☐ 2. APPROVE
  - ☐ 3. SLIGHTLY APPROVE
  - ☐ 4. UNDECIDED
  - ☐ 5. SLIGHTLY DISAPPROVE
  - ☐ 6. DISAPPROVE
  - ☐ 7. STRONGLY DISAPPROVE
- Why do you feel that way? \_\_\_\_\_
- 
14. In your opinion, if this area (Burtons Landing to Wakely Bridge) were designated "no-kill" what percent of the anglers would ignore the regulation and keep trout? Include those fishing from canoes, at night, landowners along the river and other anglers.
- ☐ % OF THE ANGLERS KEEPING TROUT
  - ☐ NO OPINION
15. What influence do you think these violations would have on your chances of catching large trout?
- ☐ 1. GREATLY REDUCE MY CHANCES
  - ☐ 2. SOMEWHAT REDUCE MY CHANCES
  - ☐ 3. SLIGHTLY REDUCE MY CHANCES
  - ☐ 4. WILL HAVE NO EFFECT ON MY CHANCES
  - ☐ 5. NO OPINION

16. In your opinion, what percent of the anglers who illegally keep trout on this stretch would be caught by law enforcement officers? \_\_\_\_\_ NO OPINION

17. How often do you think you would keep trout you catch here if this were a "no-kill" section?

- \_\_\_\_\_ 1. NEVER  
 \_\_\_\_\_ 2. A FEW  
 \_\_\_\_\_ 3. SOMETIMES  
 \_\_\_\_\_ 4. OFTEN  
 \_\_\_\_\_ 5. VERY OFTEN

18. About how many days did you fish during the 1985 season (last year), for all types of fishing?..... \_\_\_\_\_ DAYS  
 About how many of those days were spent fishing for trout?..... \_\_\_\_\_ DAYS  
 About how many of those days were spent fishing in any designated "no-kill" areas?.... \_\_\_\_\_ DAYS

19. What fishing methods do you use for trout?

	OFTEN	SOMETIMES	NEVER
1. FLY FISHING	_____	_____	_____
2. LURES/SPINCASTING	_____	_____	_____
3. BAIT FISHING	_____	_____	_____

20. Of all fish species, what species do you most prefer to fish for? \_\_\_\_\_

21. Anglers tend to fish for a number of reasons. Below are six general reasons anglers give for fishing that I will read to you. I would like you to rate from zero (0) to nine (9) the importance of each reason for why you trout fish. A zero means that it is not a reason for why you trout fish and at the other end a 9 indicates that it is a very important reason for why you trout fish.

REASONS FOR WHY YOU TROUT FISH - RATED FROM 0 - 9

1. TO CATCH FISH TO EAT..... \_\_\_\_\_  
 2. TO CATCH FISH FOR FUN AND EXCITEMENT..... \_\_\_\_\_  
 3. FOR COMPANIONSHIP (FRIENDS &/OR FAMILY)..... \_\_\_\_\_  
 4. TO GET AWAY AND RELAX..... \_\_\_\_\_  
 5. TO ENJOY NATURE..... \_\_\_\_\_  
 6. TO USE MY FISHING EQUIPMENT..... \_\_\_\_\_

22. What areas on the AuSable River system have you fished this season or plan to fish this season?
- ☐ 1. AU SABLE RIVER MAINSTREAM ABOVE BURTONS LANDING
  - ☐ 2. AU SABLE RIVER MAINSTREAM BELOW WAKELY BRIDGE
  - ☐ 3. EAST BRANCH AU SABLE RIVER
  - ☐ 4. NORTH BRANCH AU SABLE RIVER
  - ☐ 5. "NO-KILL" SECTION ON THE SOUTH BRANCH AU SABLE RIVER
  - ☐ 6. SOUTH BRANCH AU SABLE EXCLUDING THE "NO-KILL" SECTION
  - ☐ 7. OTHER TRIBUTARIES OF THE AU SABLE RIVER
  - ☐ 8. AU SABLE RIVER MAINSTREAM "QUALITY FISHING" SECTION (BURTONS LANDING TO WAKELY BRIDGE).
23. When you fish for trout in areas where it is legal to keep fish, do you:
- ☐ 1. RELEASE ALL TROUT CAUGHT
  - ☐ 2. RELEASE MOST LEGAL TROUT CAUGHT
  - ☐ 3. KEEP MOST LEGAL TROUT CAUGHT
  - ☐ 4. KEEP ALL LEGAL TROUT CAUGHT (UP TO THE LEGAL LIMIT)
24. Do you belong to any fishing organizations? ☐ YES ☐ NO
- If yes, please list: \_\_\_\_\_
25. Do you tie your own flies? ☐ YES ☐ NO
26. How many years have you been trout fishing? \_\_\_\_\_ YEARS
27. How do you rate yourself as a trout angler? ☐ BEGINNER
- ☐ SOMEWHAT EXPERIENCED ☐ EXPERIENCED ☐ EXPERT
28. How important is trout fishing to you in relation to all your other types of recreation, including other types of fishing?
- ☐ 1. MOST IMPORTANT RECREATIONAL ACTIVITY
  - ☐ 2. MORE IMPORTANT THAN MOST OTHER RECREATIONAL ACTIVITIES
  - ☐ 3. IMPORTANT, BUT SEVERAL OTHER RECREATIONAL ACTIVITIES ARE MORE IMPORTANT
  - ☐ 4. SOMEWHAT IMPORTANT, BUT RANKED RELATIVELY LOW COMPARED TO CERTAIN OTHER RECREATIONAL ACTIVITIES
  - ☐ 5. SLIGHTLY IMPORTANT
  - ☐ 6. NOT VERY IMPORTANT
29. About how much money do you have invested in specialized trout fishing equipment including only specialized clothing, waders, vests, rods, reels, line, lures and flies, fly tying or rod making equipment. \$ \_\_\_\_\_

30. Do you fish for trout after dark in this section? ☐ YES  
☐ NO

Do you plan to fish here after dark tonight? ☐ YES ☐ NO

#### INFORMATION ABOUT YOURSELF

1. What is your sex? ☐ MALE ☐ FEMALE

2. What is your age? ☐ YEARS OF AGE

3. What is the highest level you completed in school?

- ☐ 1. GRADE SCHOOL
- ☐ 2. SOME HIGH SCHOOL
- ☐ 3. HIGH SCHOOL DIPLOMA
- ☐ 4. SOME COLLEGE
- ☐ 5. ASSOCIATE DEGREE (2-YR)
- ☐ 6. COLLEGE DEGREE (B.S. OR B.A.)
- ☐ 7. SOME GRADUATE, MEDICAL OR LAW SCHOOL
- ☐ 8. ADVANCED DEGREE (M.S., Ph.D., M.D.,  
D.O., D.D.S., D.V.M., J.D.)

4. What is your present primary occupation? \_\_\_\_\_

5. What is your total family income before taxes (include all wage earners in your household)?

- |  |  |
|--|--|
| <input type="checkbox"/> 1. UNDER \$10,000       | <input type="checkbox"/> 2. \$10,000 to \$14,999 |
| <input type="checkbox"/> 3. \$15,000 to \$19,999 | <input type="checkbox"/> 4. \$20,000 to \$24,999 |
| <input type="checkbox"/> 5. \$25,000 to \$29,999 | <input type="checkbox"/> 6. \$30,000 to \$34,999 |
| <input type="checkbox"/> 7. \$35,000 to \$39,999 | <input type="checkbox"/> 8. \$40,000 to \$44,999 |
| <input type="checkbox"/> 9. \$45,000 to \$49,999 | <input type="checkbox"/> 10. \$50,000 OR OVER    |

6. In what county do you live? \_\_\_\_\_  
 (and include state if you are not a Michigan resident)

We will be studying the use of this area for the next several years. We would like to possibly send you a mail survey sometime in the future as part of this on-going study. Would you give us your name and mailing address so we can contact you and determine your future fishing behaviors and opinions?

---

---

---

---

THANK YOU VERY MUCH FOR YOUR VALUABLE TIME  
IN COMPLETING THIS SURVEY



## APPENDIX B

Short field interview for Au Sable River anglers

**SURVEY OF ANGLERS IN THE AU SABLE RIVER MAINSTREAM  
QUALITY FISHING ZONE (BURTONS LANDING ON WAKELY BRIDGE)**

TODAY'S DATE \_\_\_\_\_ ACCESS POINT \_\_\_\_\_  
 (mo. - day - yr.)  
 LOC. 1 INT. \_\_\_\_\_ TIME: \_\_\_\_\_

Please complete this survey according to today's fishing trip in the Mainstream Quality Section (Burtons Landing to Wakely Bridge).

**YOUR RESPONSES TO THIS SURVEY WILL BE TREATED AS CONFIDENTIAL**

- 
1. How many hours have you fished so far today in this section (the Mainstream "Quality Fishing" section)?  
       \_\_\_\_\_ HOURS      \_\_\_\_\_ HAVE NOT YET STARTED ---> GO TO QUESTION 4
  2. How many trout did you catch in this section today? \_\_\_\_\_  
       How many trout did you keep? \_\_\_\_\_  
       How many "legal-sized" fish (8-12 or > 16 inches) did you release? \_\_\_\_\_  
       About how large was the largest trout you caught? \_\_\_\_\_ inches?
  3. Considering all factors, how satisfied are you with your fishing trip today? (check one)
 

_____	1. EXTREMELY SATISFIED
_____	2. SATISFIED
_____	3. SLIGHTLY SATISFIED
_____	4. SLIGHTLY DISSATISFIED
_____	5. DISSATISFIED
_____	6. EXTREMELY DISSATISFIED
- 

4. Fishing method (check 2)? \_\_\_\_\_ SHORE \_\_\_\_\_ WADING \_\_\_\_\_ BOAT  
       \_\_\_\_\_ FLY FISHING \_\_\_\_\_ SPINCASTING \_\_\_\_\_ BAIT
5. Number in fishing party: \_\_\_\_\_
6. Not counting this season, about how many days, if any, have you spent fishing this section of the Au Sable River last year? \_\_\_\_\_ DAYS
7. Would a "no-kill" regulation prevent you from fishing here in the future?  
       \_\_\_\_\_ YES      \_\_\_\_\_ NO ----> WHY: \_\_\_\_\_

OVER

8. There are several other types of regulations in the Au Sable River System. How important were each of the following reasons for your selection of this particular section of the river for your trip today? Please respond by checking whether each item is a primary reason, somewhat important reason, or not a reason for your selection of this particular section of the river for today's trip.

	PRIMARY REASON	SOMEWHAT IMPORTANT	NOT A REASON
1. EASY TO ACCESS THE RIVER	_____	_____	_____
2. CLOSE TO HOME/CABIN OR CAMPGROUND	_____	_____	_____
3. A FRIEND SUGGESTED IT	_____	_____	_____
4. THOUGHT THERE WOULD BE FEWER ANGLERS	_____	_____	_____
5. EXPECTED TO CATCH LARGER FISH	_____	_____	_____
6. EXPECTED TO CATCH MORE FISH	_____	_____	_____
7. TRADITIONAL FISHING AREA I'M FAMILIAR WITH	_____	_____	_____

Were there any other primary reasons for coming here? \_\_\_\_\_

-----

This survey is part of a larger survey which deals with some aspects of your trout fishing behavior and attitudes about "no-kill" trout fishing areas. We would like to include you in this survey. Would you please give us your name and mailing address?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

THANK YOU VERY MUCH FOR YOUR VALUABLE TIME  
IN COMPLETING THIS SURVEY

#### APPENDIX C

Cover letter left on cars with the short field  
interview for the Au Sable River anglers

## MICHIGAN STATE UNIVERSITY

DEPARTMENT OF FISHERIES AND WILDLIFE  
NATURAL RESOURCES BUILDING  
(517) 355-4477

EAST LANSING • MICHIGAN • 48824-1222

Summer, 1986

Anglers  
AuSable River Survey  
Field Interview

Dear Anglers:

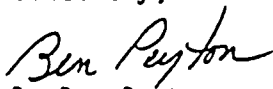
Michigan State University is conducting an extensive survey of anglers on the AuSable River system. This survey is largely a field interview, however, time and manpower does not permit us to personally contact all anglers. If you were fishing today we would like to include you in this survey. We would like the driver plus up to two fishing companions (if any) to each fill out a survey form and return them together in the addressed, stamped envelope.

If you were not fishing, please write "NOT FISHING" on one of the surveys and return it.

For any angler who has already been contacted by a Michigan State University agent and filled out a similar survey, please indicate so by writing a "2" at the top of the survey before completing this survey.

THANK-YOU.

Sincerely,



R. Ben Peyton  
Associate Professor

RBP:cb

#### APPENDIX D

Remainder of the field survey sent to all Au Sable River  
anglers interviewed with the short field survey

## SURVEY OF ANGLERS IN THE AU SABLE RIVER SYSTEM

Dear Angler,

You were recently contacted by a Michigan State University survey agent in the AuSable River system and asked to answer a few questions in the field (Questions 1-8). This questionnaire is the follow-up to that short survey (Questions 1-8). This survey deals with some aspects of your trout fishing behavior and attitudes about "no-kill" trout fishing areas. This information is crucial to our understanding of the issue and it is important that we receive your responses.

THANK-YOU.

Sincerely,  
*Larry M. Gigliotti*  
Larry M. Gigliotti  
Research Assistant

- 
9. How important is it to you to have a special "fly-fishing only" area in Michigan to trout fish in?
- ☐ 1. CRUCIAL
  - ☐ 2. VERY IMPORTANT
  - ☐ 3. IMPORTANT
  - ☐ 4. SOMEWHAT IMPORTANT
  - ☐ 5. SLIGHTLY IMPORTANT
  - ☐ 6. NOT IMPORTANT
10. How important is it to you to have a special "no-kill" area in Michigan to trout fish in?
- ☐ 1. CRUCIAL
  - ☐ 2. VERY IMPORTANT
  - ☐ 3. IMPORTANT
  - ☐ 4. SOMEWHAT IMPORTANT
  - ☐ 5. SLIGHTLY IMPORTANT
  - ☐ 6. NOT IMPORTANT
11. In your opinion, what are the purposes or benefits that a "no-kill" regulation is supposed to provide? \_\_\_\_\_
- 
12. Do you feel that the number of "no-kill" (catch-and-release) trout areas in the state should be:
- ☐ 1. INCREASED
  - ☐ 2. DECREASED
  - ☐ 3. STAY THE SAME
  - ☐ 4. NO OPINION

-----  
 Questions 13-17 pertain to the proposed "no-kill" regulation on the AuSable Mainstream (Burtons Landing to Wakely Bridge).  
 -----

13. How do you feel about the proposed "no-kill" regulation for this section of the AuSable River (Burtons Landing to Wakely Bridge)?

- ☐ 1. STRONGLY APPROVE  
☐ 2. APPROVE  
☐ 3. SLIGHTLY APPROVE  
☐ 4. UNDECIDED  
☐ 5. SLIGHTLY DISAPPROVE  
☐ 6. DISAPPROVE  
☐ 7. STRONGLY DISAPPROVE

Why do you feel that way? \_\_\_\_\_

14. In your opinion, if this area (Burtons Landing to Wakely Bridge) were designated "no-kill" what percent of the anglers would ignore the regulation and keep trout? Include those fishing from canoes, at night, landowners along the river and other anglers.

☐ % OF THE ANGLERS KEEPING TROUT  
☐ NO OPINION

15. What influence do you think these violations would have on your chances of catching large trout in that stretch of river?

- ☐ 1. GREATLY REDUCE MY CHANCES  
☐ 2. SOMEWHAT REDUCE MY CHANCES  
☐ 3. SLIGHTLY REDUCE MY CHANCES  
☐ 4. WILL HAVE NO EFFECT ON MY CHANCES  
☐ 5. NO OPINION

16. In your opinion, what percent of the anglers who illegally keep trout on this stretch would be caught by law enforcement officers? \_\_\_\_\_% \_\_\_\_\_ NO OPINION

17. How often do you think you would keep trout you catch here if this were a "no-kill" section?

- ☐ 1. NEVER  
☐ 2. A FEW  
☐ 3. SOMETIMES  
☐ 4. OFTEN  
☐ 5. VERY OFTEN



- |                      | OFTEN | SOMETIMES | NEVER |
|----------------------|-------|-----------|-------|
| 1. FLY FISHING       | _____ | _____     | _____ |
| 2. LURES/SPINCASTING | _____ | _____     | _____ |
| 3. BAIT FISHING      | _____ | _____     | _____ |

- Not a Reason ----- Very Important

- 3

22. What areas on the AuSable River system have you fished this season or plan to fish this season?
- ☐ 1. AU SABLE RIVER MAINSTREAM ABOVE BURTONS LANDING
  - ☐ 2. AU SABLE RIVER MAINSTREAM BELOW WAKELY BRIDGE
  - ☐ 3. EAST BRANCH AU SABLE RIVER
  - ☐ 4. NORTH BRANCH AU SABLE RIVER
  - ☐ 5. "NO-KILL" SECTION ON THE SOUTH BRANCH AU SABLE RIVER
  - ☐ 6. SOUTH BRANCH AU SABLE EXCLUDING THE "NO-KILL" SECTION
  - ☐ 7. OTHER TRIBUTARIES OF THE AU SABLE RIVER
  - ☐ 8. AU SABLE RIVER MAINSTREAM "QUALITY FISHING" SECTION (BURTONS LANDING TO WAKELY BRIDGE).
23. When you fish for trout in areas where it is legal to keep fish, do you:
- ☐ 1. RELEASE ALL TROUT CAUGHT
  - ☐ 2. RELEASE MOST LEGAL TROUT CAUGHT
  - ☐ 3. KEEP MOST LEGAL TROUT CAUGHT
  - ☐ 4. KEEP ALL LEGAL TROUT CAUGHT (UP TO THE LEGAL LIMIT)
24. Do you belong to any fishing organizations? ☐ YES ☐ NO  
If yes, please list: \_\_\_\_\_
- 
25. Do you tie your own flies? ☐ YES ☐ NO
26. How many years have you been trout fishing? \_\_\_\_\_ YEARS
27. How do you rate yourself as a trout angler? ☐ BEGINNER  
☐ SOMEWHAT EXPERIENCED ☐ EXPERIENCED ☐ EXPERT
28. How important is trout fishing to you in relation to all your other types of recreation, including other types of fishing?
- ☐ 1. MOST IMPORTANT RECREATIONAL ACTIVITY
  - ☐ 2. MORE IMPORTANT THAN MOST OTHER RECREATIONAL ACTIVITIES
  - ☐ 3. IMPORTANT, BUT SEVERAL OTHER RECREATIONAL ACTIVITIES ARE MORE IMPORTANT
  - ☐ 4. SOMEWHAT IMPORTANT, BUT RANKED RELATIVELY LOW COMPARED TO CERTAIN OTHER RECREATIONAL ACTIVITIES
  - ☐ 5. SLIGHTLY IMPORTANT
  - ☐ 6. NOT VERY IMPORTANT
29. About how much money do you have invested in specialized trout fishing equipment including only specialized clothing, waders, vests, rods, reels, line, lures and flies, fly tying or rod making equipment. \$ \_\_\_\_\_

30. Do you fish for trout after dark in the AuSable River system? ☐ YES  
☐ NO
31. Answer this question if you are familiar with the "No-Kill" section on the South Branch AuSable River. In your opinion, how effective has the "No-Kill" regulation been at providing larger fish in this area?
- ☐ 1. VERY EFFECTIVE
  - ☐ 2. EFFECTIVE
  - ☐ 3. SOMEWHAT EFFECTIVE
  - ☐ 4. SLIGHTLY EFFECTIVE
  - ☐ 5. NOT EFFECTIVE
  - ☐ 6. NO OPINION

#### INFORMATION ABOUT YOURSELF

1. What is your sex? ☐ MALE ☐ FEMALE
2. What is your age? ☐ YEARS OF AGE
3. What is the highest level you completed in school?
- ☐ 1. GRADE SCHOOL
  - ☐ 2. SOME HIGH SCHOOL
  - ☐ 3. HIGH SCHOOL DIPLOMA
  - ☐ 4. SOME COLLEGE
  - ☐ 5. ASSOCIATE DEGREE (2-YR)
  - ☐ 6. COLLEGE DEGREE (B.S. OR B.A.)
  - ☐ 7. SOME GRADUATE, MEDICAL OR LAW SCHOOL
  - ☐ 8. ADVANCED DEGREE (M.S., Ph.D., M.D., D.O., D.D.S., D.V.M., J.D.)
4. What is your present primary occupation? \_\_\_\_\_
5. What is your total family income before taxes (include all wage earners in your household)?
- |  |  |
|--|--|
| <input type="checkbox"/> 1. UNDER \$10,000       | <input type="checkbox"/> 2. \$10,000 to \$14,999 |
| <input type="checkbox"/> 3. \$15,000 to \$19,999 | <input type="checkbox"/> 4. \$20,000 to \$24,999 |
| <input type="checkbox"/> 5. \$25,000 to \$29,999 | <input type="checkbox"/> 6. \$30,000 to \$34,999 |
| <input type="checkbox"/> 7. \$35,000 to \$39,999 | <input type="checkbox"/> 8. \$40,000 to \$44,999 |
| <input type="checkbox"/> 9. \$45,000 to \$49,999 | <input type="checkbox"/> 10. \$50,000 OR OVER    |
6. In what county do you live? \_\_\_\_\_  
 (and include state if you are not a Michigan resident)

**COMMENTS:**

**THANK YOU VERY MUCH FOR YOUR VALUABLE TIME  
IN COMPLETING THIS SURVEY**

**Ben Peyton  
Associate Professor**

**Larry M. Gigliotti  
Research Assistant**

**Michigan State University  
Department of Fisheries and Wildlife  
Natural Resources Building  
East Lansing, Michigan 48824-1222**

**Phone: (517) 355-4477**

#### APPENDIX E

Cover letter included with the second mailing  
of the remainder of the field survey sent to  
non-respondents to the first mailing

## MICHIGAN STATE UNIVERSITY

DEPARTMENT OF FISHERIES AND WILDLIFE  
NATURAL RESOURCES BUILDING  
(517) 353-4477

EAST LANSING • MICHIGAN • 48824-1222

Dear Angler:

About two months ago we sent you a survey to follow-up a short interview on the AuSable River with one of our Michigan State University interviewers. As of today we have not received your completed questionnaire in the mail.

We are encouraged by the number of questionnaires already returned, but we need your response to be able to accurately describe the opinions of AuSable River anglers. This is because our past experiences suggest that those of you who have not yet sent in your questionnaires may hold quite different opinions from those that have already responded.

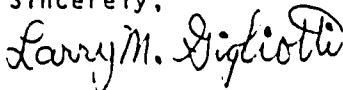
We are interested in hearing from you even if you do not have strong opinions concerning this issue. However, your response is strictly voluntary and you may refuse to answer any or all of the questions. Your answers will all be treated confidentially. None of the forms will be released to the Michigan Department of Natural Resources or any other person or agency. Only the overall analysis of our results will be made public.

The information is strictly for the purpose of providing a better understanding to the DNR of the sociological impacts which future DNR regulations may have. Your input is essential if the DNR is to make fair evaluations of the costs and benefits of management programs to all citizens.

Your return of this filled out questionnaire constitutes your consent to participate in this study. In the event that your questionnaire has been misplaced, a replacement is enclosed. This will be your last chance to participate since the results will soon be tabulated and analyzed.

Thank you.

Sincerely,



Larry M. Gigliotti  
Research Assistant



R. Ben Peyton, Associate Professor  
Project Director

cb

## APPENDIX F

Sampling schedule for the Au Sable River study, 1986

## Sampling Schedule for the AuSable River Attitude Study, 1986

-----  
 Location 4 = Locations 4 & 5  
 Early = 8 am - 6 pm (E)  
 Late = 2 pm - Midnight (L)  
 -----

<u>MONTH</u>	<u>DATE</u>	<u>LOCATION</u>	<u>TIME</u>	<u>MONTH</u>	<u>DATE</u>	<u>LOCATION</u>	<u>TIME</u>
APR	26	1	-	JULY	16	3	L
	27	1	-		17	2-3	E-E
MAY	3	1	-		18	4-1	L-E
	4	1	-		19	4	E
	10	1/2	-		20	4-2	E-L
	11	1	-		21	2-3	E-E
	17	1/3	-		24	3-1	L-L
	18	1	-		25	2-1	L-L
	24	1	-		26	4-3	E-E
	25	3	-		27	4-2	E-E
	26	1/2	-		28	1-3	L-L
	31	1/2	-		29	4	E
JUNE	1	1/4	-		30	2	L
	7	4	E		31	4-3	L-L
	8	3	E	AUGUST	1	1	E
	13	4	L		2	2-3	L-E
	14	2	L		3	4-4	E-E
	15	1	L		6	2	L
	16	1	E		7	4-3	E-E
	19	1	L		8	3-1	L-L
	20	3	L		9	4-1	L-E
	21	3	L		10	1	E
	22	1-4	E-L		11	2	E
	23	3	L		13	1-2	L-E
	24	4	L		14	4-4	E-L
	25	2-4	E-E		15	3-1	E-L
	26	4-3	L-E		16	1-3	L-L
	27	3	L		17	3-1	L-L
	28	4-1	L-E		18	2	L
	29	1-2	E-L		19	4	L
	30	1-2	L-E		20	3	L
JULY	1	1	L		22	4	L
	2	1	L		23	2	E
	3	3-4	E-L		24	1	E
	4	1-4	E-L		25	1	E
	5	2-1	L-L		26	4-1	E-E
	6	4	L		27	4-1	L-L
	7	1	E		28	4	L
	10	4	L		29	1/4-1	L/E-E
	11	1-3	L-E		30	4/3-2	L/E-E
	12	4-1	L-L		31	1/1-3	E/L-E
	13	2-1	L-E				
	14	4-3	E-E				



page 2

<u>MONTH</u>	<u>DATE</u>	<u>LOCATION</u>	<u>TIME</u>
SEPT	1	3-1	E-E
	13	1/2/3	-
	14	1/2	-
	15	3/2	-
	16	1/4	-
	17	1/3/4	-
	18	1/4	-
	19	1/4	-
	20	1/2/4	-
	21	1/3/4	-
	27	1	-
	28	1/2	-
OCT	4	1/2/3	-
	5	3/4	-

## APPENDIX G

Follow-up survey sent to participants  
in the Au Sable River study

SURVEY OF ANGLERS IN THE AUSABLE RIVER SYSTEM  
Follow-Up Survey

SURVEY # \_\_\_\_\_

1. Please indicate the area on the AuSable River system where your MOST PREFERRED AuSable River fishing site is located. Please check only one.

- ☐ 1. AU SABLE RIVER MAINSTREAM ABOVE BURTONS LANDING
- ☐ 2. AU SABLE RIVER MAINSTREAM BELOW WAKELY BRIDGE
- ☐ 3. AU SABLE RIVER MAINSTREAM "QUALITY FISHING" SECTION (BURTONS LANDING TO WAKELY BRIDGE)
- ☐ 4. EAST BRANCH AU SABLE RIVER
- ☐ 5. NORTH BRANCH AU SABLE RIVER
- ☐ 6. "NO-KILL" SECTION ON THE SOUTH BRANCH AU SABLE RIVER
- ☐ 7. SOUTH BRANCH AU SABLE RIVER "QUALITY FISHING" EXCLUDING THE "NO-KILL" SECTION
- ☐ 8. OTHER TRIBUTARIES OF THE AU SABLE RIVER
- ☐ 9. I DO NOT HAVE A PREFERRED AU SABLE RIVER FISHING SITE

2. If a mandatory catch-and-release regulation were to be placed on the part of the AuSable where I usually fish, I would....

- ☐ 1. FISH THERE MORE OFTEN
- ☐ 2. FISH THERE ABOUT THE SAME
- ☐ 3. FISH THERE LESS OFTEN
- ☐ 4. STOP FISHING THERE AND MOVE TO A DIFFERENT AREA

3. Do you or your family own property on/or near the AuSable River System?

- ☐ YES, please continue
- ☐ NO, please go to question # 7.

4. On what branch of the AuSable River is the property closest to?

\_\_\_\_\_

5. How close is the property to the river?

- ☐ 1. BORDERS THE RIVER
- ☐ 2. SEPARATED FROM THE RIVER BUT WITHIN 1/4 MILE OF THE RIVER
- ☐ 3. MORE THAN 1/4 MILE FROM THE RIVER

6. Which best describes your use of this property?

- ☐ 1. YEAR LONG RESIDENT  
☐ 2. SEASONALLY (eg. summer)  
☐ 3. VACATIONS, HOLIDAYS AND/OR WEEKENDS  
☐ 4. OTHER

7. Here are some statements which deal with your feelings about catching trout. Please indicate the extent to which you agree or disagree with each of the following statements. Please circle one number for each item.

	STRONGLY DISAGREE	SLIGHTLY DISAGREE	SLIGHTLY AGREE	STRONGLY AGREE
a) A fishing trip can be successful to me even if I don't catch trout.	1	2	3	4
b) The bigger the trout I catch, the better the fishing trip.	1	2	3	4
c) When I go fishing, I am only satisfied when I catch some trout.	1	2	3	4
d) Catching a "trophy" trout is the biggest reward for me.	1	2	3	4
e) It does not matter to me what type of trout I catch.	1	2	3	4
f) How I catch a trout is as important to me as actually catching one.	1	2	3	4
g) If I thought I would not catch trout, I would not go fishing.	1	2	3	4
h) The more trout I catch the happier I am.	1	2	3	4

8. How do you feel about the proposed "no-kill" regulation for the Mainstream AuSable River from Burtons Landing to Wakely Bridge?

- ☐ 1. STRONGLY APPROVE } ----->Go to question 9  
☐ 2. APPROVE }  
☐ 3. SLIGHTLY APPROVE }  
☐ 4. UNDECIDED ----->Go to question 25  
☐ 5. SLIGHTLY DISAPPROVE } ----->Go to question 15  
☐ 6. DISAPPROVE }  
☐ 7. STRONGLY DISAPPROVE }

- 9-14. Below are some possible reasons for why you may approve of the proposed "no-kill" regulation. Please indicate how important each of these is as a reason for why you approve of the proposed regulation by checking one response for each reason. While you may agree that most of these are true statements, please answer according to whether it is a reason why you hold the position that you do.

	PRIMARY REASON	SOMEWHAT IMPORTANT	NOT A REASON
9. It will increase the size of the fish to be caught.	_____	_____	_____
10. It will increase the numbers of fish to be caught.	_____	_____	_____
11. It will reduce crowding in the proposed area.	_____	_____	_____
12. Trout are too valuable to kill.	_____	_____	_____
13. This area is a high quality fishing area and deserves the most protective type of fishing regulations.	_____	_____	_____
14. Are there any other primary reasons for your position on the no-kill regulation? _____			

-----  
GO ON TO QUESTION #25 ON PAGE 5

-----  
 15-24. Below are some possible reasons for why you may disapprove of the proposed "no-kill" regulation. Please indicate how important each of these is as a reason for why you disapprove of the proposed regulation by checking one response for each reason. While you may agree that most of these are true statements, please answer according to whether it is a reason why you hold the position that you do.

	PRIMARY REASON	SOMEWHAT IMPORTANT	NOT A REASON
15. I want to keep some fish to eat.	_____	_____	_____
16. I want to be able to keep an outstanding trophy fish.	_____	_____	_____
17. I want to be able to keep fish too injured to survive if released.	_____	_____	_____
18. Anglers will shift from the "no-kill" area and increase fishing pressure in other areas important to me.	_____	_____	_____
19. Releasing or keeping fish is a personal choice that each angler should be able to make.	_____	_____	_____
20. No-kill will not improve fishing.	_____	_____	_____
21. The no-kill regulation will harm the local economy.	_____	_____	_____
22. No-kill regulations just serve special interest groups.	_____	_____	_____
23. Are there any other primary reasons for your position on the no-kill regulation? _____			
-----			
24. If the results of the study on the catch-and-release section of the South Branch are satisfactory, I would support catch-and-release on the Mainstream. Please circle your response.			

STRONGLY  
AGREE

AGREE

UNDECIDED

DISAGREE

STRONGLY  
DISAGREE

-----  
 GO ON TO QUESTION #25 ON PAGE 5

Please circle the response at the right of each statement which indicates how strongly you agree or disagree.

SA = STRONGLY AGREE  
A = AGREE  
U = UNDECIDED

D = DISAGREE  
SD = STRONGLY DISAGREE

- |   |    |   |   |   |    |
|---|----|---|---|---|----|
| 25. There is a shortage of no-kill areas in the State.  | SA | A | U | D | SD |
| 26. The no-kill regulation for the Mainstream is unfair to land-owners.   | SA | A | U | D | SD |
| 27. The proposed no-kill regulation on the Mainstream will not be enforced adequately.  | SA | A | U | D | SD |
| 28. The Mainstream Quality Section is overfished.   | SA | A | U | D | SD |
| 29. Releasing trout is not effective because most of the hooked trout die anyway.   | SA | A | U | D | SD |
| 30. The use of special fishing regulations should only be based on biological evidence.   | SA | A | U | D | SD |
| 31. Anglers using the Mainstream Quality Section already release enough of the trout that are caught to maintain quality fishing. | SA | A | U | D | SD |
| 32. The Mainstream should be stocked to improve fishing.  | SA | A | U | D | SD |
| 33. The proposed no-kill regulation will benefit the local economy.   | SA | A | U | D | SD |
| 34. I trust the Department of Natural Resources to manage the AuSable River fishery in a fair and reasonable manner.              | SA | A | U | D | SD |
-

35. We will be conducting an additional survey of Michigan trout anglers next year to investigate anglers' compliance with various types of fishing regulations. This topic is extremely important in fisheries management but very difficult to study because some sensitive questions must be asked. Because of the sensitive nature of this study and the fact that you have already completed an extensive survey for us we are providing an opportunity for you to exclude yourself from our study by checking NO below. Checking YES does not obligate you to answer our survey, it only means that you will receive our survey in the mail at which time you can decide whether you wish to complete it.

\_\_\_\_\_ YES -- YOU MAY SEND ME A QUESTIONNAIRE ABOUT  
COMPLIANCE WITH FISHING REGULATIONS  
\_\_\_\_\_ NO -- PLEASE DO NOT INCLUDE ME IN YOUR SURVEY

THANK YOU VERY MUCH FOR YOUR VALUABLE TIME IN COMPLETING THIS SURVEY. You have been generous with your time and for that we are grateful. Many anglers have requested a copy of our results. If our budget permits we will prepare a summary of some of the more important findings in our study and send them out to all interested participants in our study. Please check this box [ ] if you would like to receive a summary copy of our results. This summary will probably not be ready until spring, 1987.

WE WELCOME ANY FURTHER COMMENTS YOU MAY WISH TO WRITE BELOW.

Ben Peyton  
Associate Professor

Larry M. Gigliotti  
Research Assistant

Michigan State University  
Department of Fisheries and Wildlife  
Natural Resources Building  
East Lansing, Michigan 48824-1222

Phone: (517) 355-4477



## APPENDIX H

Cover letters sent with the follow-up survey  
sent to Au Sable River anglers

## MICHIGAN STATE UNIVERSITY

DEPARTMENT OF FISHERIES AND WILDLIFE  
NATURAL RESOURCES BUILDING  
(517) 355-4477

EAST LANSING • MICHIGAN • 48824-1222

December 1, 1986

Dear Angler:

You recently participated in a Michigan State University study of anglers in the AuSable River system. To refresh your memory, you were contacted by a Michigan State University survey agent in the AuSable River this past fishing season and asked to answer either a long survey or a short survey plus a mail follow-up survey.

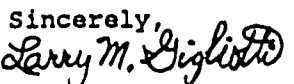
We want to thank-you for your participation in this study. This information is providing a better understanding to the DNR of the sociological impacts which future DNR regulations may have.

The study has identified a need for additional information. We would like you to respond to some additional statements concerning the proposed "no-kill" regulation on the AuSable River Mainstream from Burtons Landing to Wakeley Bridge. This information will greatly improve the value of the first survey which you completed and we urge you to answer this short follow-up survey.

Your response is strictly voluntary and you may refuse to answer any or all of the questions. Your answers will be treated confidentially. None of the forms will be released to the Michigan Department of Natural Resources or any other person or agency. Only the overall analysis of our results will be made public. The questionnaire has an identification number so that it can be matched with your previous survey which is necessary for the analysis.

Your return of this filled out questionnaire constitutes your consent to participate in this study.

Thank you.

Sincerely,  
  
Larry M. Gigliotti  
Research Assistant

  
R. Ben Peyton, Associate Professor  
Project Director

## MICHIGAN STATE UNIVERSITY

DEPARTMENT OF FISHERIES AND WILDLIFE  
NATURAL RESOURCES BUILDING  
(517) 353-4477

EAST LANSING • MICHIGAN • 48824-1222

January 12, 1987

Dear Angler:

About one month ago we sent you an additional survey to supplement the information we collected from AuSable River anglers this past year. As of today we have not received your completed questionnaire in the mail.

We are encouraged by the good response rate of AuSable River anglers. However, our past experiences suggest that those of you who have not yet sent in your questionnaires may hold quite different opinions from those that have already responded. We need your response to give the most accurate description of AuSable River anglers.

We are interested in hearing from you even if you do not have strong opinions concerning this issue. This information will greatly improve the value of the first survey which you completed and we urge you to answer this short additional survey. However, your response is strictly voluntary and you may refuse to answer any or all of the questions. Your answers will all be treated confidentially. None of the forms will be released to the Michigan Department of Natural Resources or any other person or agency. Only the overall analysis of our results will be made public.

The information is strictly for the purpose of providing a better understanding to the DNR of the sociological impacts which future DNR regulations may have. Your input is essential if the DNR is to make fair evaluations of the costs and benefits of management programs to all citizens.

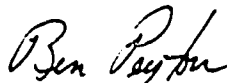
Your return of this filled out questionnaire constitutes your consent to participate in this study. In the event that your questionnaire has been misplaced or you did not receive the first questionnaire, a replacement is enclosed. This will be your last chance to participate since the results will soon be tabulated and analyzed.

Thank you.

Sincerely,



Larry M. Gigliotti  
Research Assistant



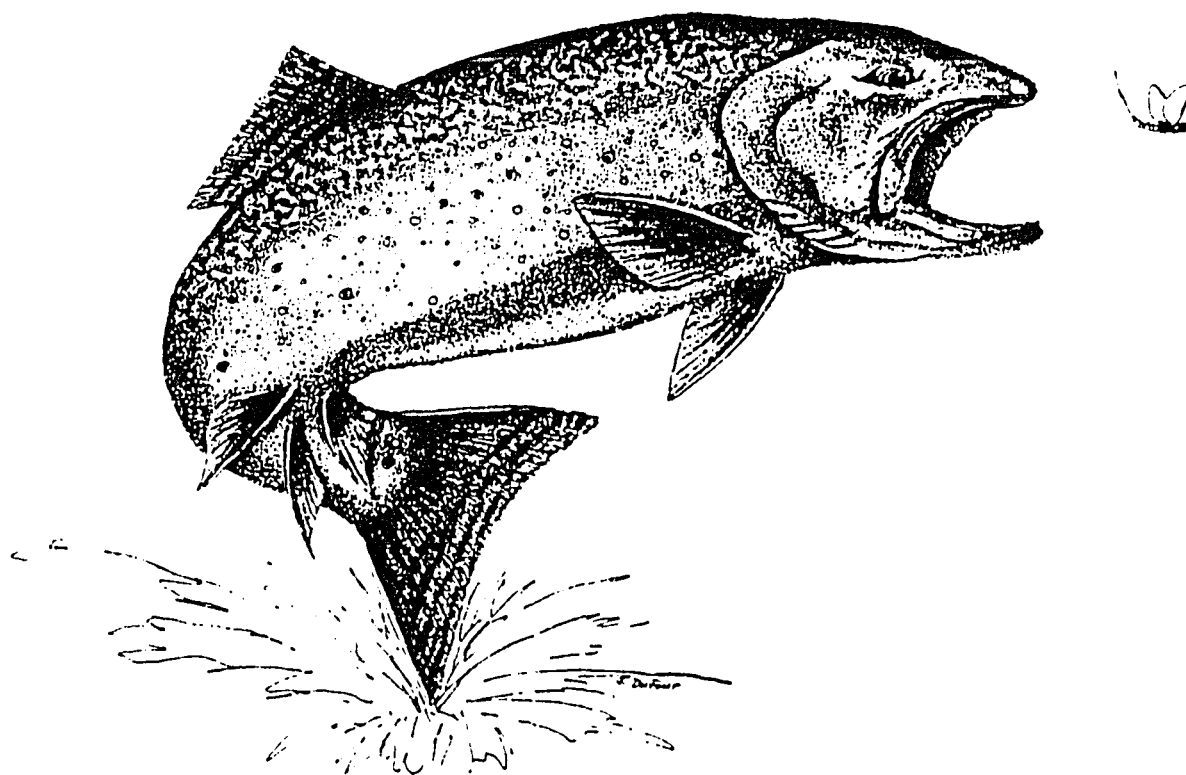
R. Ben Peyton, Associate Professor  
Project Director

LMG/RBP:cb

APPENDIX I

Michigan Trout Angler Survey

# MICHIGAN TROUT ANGLER SURVEY



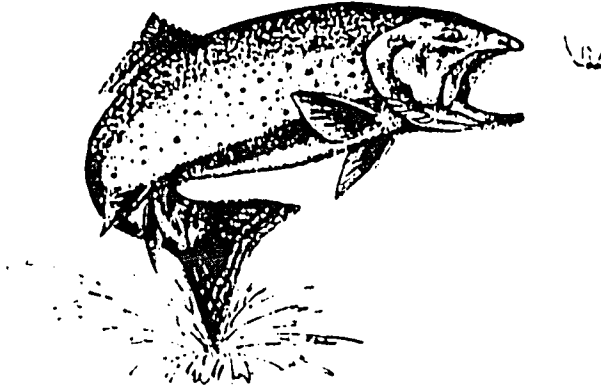
A PROJECT OF:

Michigan State University  
Department of Fisheries and Wildlife  
Natural Resources Building  
East Lansing, Michigan 48824

#### DIRECTIONS FOR FILLING OUT THE QUESTIONNAIRE

- Please try to answer what you believe to be true for you. The best answer is the one which most closely reflects your own feelings and beliefs, or what you actually did.
- It is important that the person to whom this questionnaire is addressed fills it out. This will ensure representativeness.
- We are interested in hearing from everyone who receives this survey, not just those who fish a lot. Please answer this survey even if you do not fish very much or trout fishing is not very important to you.
- Do not write your name on the questionnaire.
- Your answers will be treated confidentially. The questionnaire has an identification number so that your name can be checked off our list when you return your survey and to identify those who agreed to participate in a future study.
- Return the questionnaire using the addressed, pre-paid return envelope provided.

THANK YOU FOR YOUR COOPERATION!



# TROUT FISHING SURVEY

1. Number of fishing days in 1986 season from April 1, 1986 - March 31, 1987 (include fishing from everywhere, not just in Michigan):

a) About how many days did you fish during the 1986 season, for all species of fish)?.....DAYS

About how many of those days (if any) were spent fishing for:

b) Great Lakes trout or salmon?.....DAYS

c) fishing for trout in streams (not including salmon and steelhead fishing)?.....DAYS

d) fishing for trout in any designated "no-kill" (catch-and-release) areas?.....DAYS

Which best describes your above answers: ☐ ACCURATE  
☐ CLOSE APPROXIMATION  
☐ JUST A GUESS

2. Of all fish species, what one species do you most prefer to fish for?

---

3. Have you ever fished for trout in streams (do not include salmon and steelhead fishing)?

[ ] YES, please continue with # 4  
[ ] NO, please skip to question # 38

STREAM TROUT FISHING

-----

4. What fishing methods do you use for trout fishing in streams?  
Please check your responses below:

	OFTEN	SOMETIMES	NEVER
A) FLY FISHING	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
B) LURES / SPINCASTING	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C) BAIT FISHING	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

5. Please check your preferred method for stream trout fishing  
(check only one).

- ☐ BAIT (LIVE OR DEAD)  
☐ SPINNING LURES  
☐ FLIES  
☐ NO PREFERENCE

6. Please check your preferred stream trout species (check only  
one).

- ☐ NO PREFERENCE, LIKE TROUT IN GENERAL  
☐ BROWN TROUT  
☐ BROOK TROUT  
☐ RAINBOW TROUT  
☐ OTHER TROUT SPECIES, please list \_\_\_\_\_

7. How many years have you been stream trout fishing? \_\_\_\_\_ YEARS

8. How do you rate yourself as a trout angler?     ☐ BEGINNER  
☐ SOMEWHAT EXPERIENCED     ☐ EXPERIENCED     ☐ EXPERT

9. What method of stream trout fishing did you begin to use  
first? Please check one.

- ☐ BAIT FISHING  
☐ LURES / SPINCASTING  
☐ FLY FISHING



- 
10. Anglers tend to fish for a number of reasons. Below are seven general reasons anglers give for fishing. Please rate from zero (0) to nine (9) the importance of each reason for why you fish for stream trout. Please circle one number for each reason.

	NOT A												VERY
	REASON	-----											IMPORTANT
a).	TO CATCH FISH TO EAT.....	0	1	2	3	4	5	6	7	8	9		
b).	TO CATCH FISH FOR FUN AND EXCITEMENT.....	0	1	2	3	4	5	6	7	8	9		
c).	FOR COMPANIONSHIP (FRIENDS &/OR FAMILY).....	0	1	2	3	4	5	6	7	8	9		
d).	TO GET AWAY AND RELAX.....	0	1	2	3	4	5	6	7	8	9		
e).	TO ENJOY NATURE.....	0	1	2	3	4	5	6	7	8	9		
f).	TO ENJOY MY FISHING EQUIPMENT.....	0	1	2	3	4	5	6	7	8	9		
g).	TO CATCH TROPHY SIZED FISH.	0	1	2	3	4	5	6	7	8	9		

-----

11. How important is stream trout fishing to you in relation to all your other types of recreation, including other types of fishing? Please check one.

- [ ] 1. MOST IMPORTANT RECREATIONAL ACTIVITY
- [ ] 2. MORE IMPORTANT THAN MOST OTHER RECREATIONAL ACTIVITIES
- [ ] 3. IMPORTANT, BUT SEVERAL OTHER RECREATIONAL ACTIVITIES ARE MORE IMPORTANT
- [ ] 4. SOMEWHAT IMPORTANT, BUT RANKED RELATIVELY LOW COMPARED TO CERTAIN OTHER RECREATIONAL ACTIVITIES
- [ ] 5. SLIGHTLY IMPORTANT
- [ ] 6. NOT VERY IMPORTANT

12. When you fish for trout in areas where it is legal to keep fish, do you:

- [ ] 1. RELEASE ALL TROUT CAUGHT
- [ ] 2. RELEASE MOST LEGAL TROUT CAUGHT
- [ ] 3. KEEP MOST LEGAL TROUT CAUGHT
- [ ] 4. KEEP ALL LEGAL TROUT CAUGHT (UP TO THE LEGAL LIMIT)

-----  
 13. Here are some statements which deal with your feelings about catching trout. Please indicate the extent to which you agree or disagree with each of the following statements. Please circle one number for each item.

	STRONGLY DISAGREE	SLIGHTLY DISAGREE	SLIGHTLY AGREE	STRONGLY AGREE
a) A fishing trip can be successful to me even if I don't catch trout.	1	2	3	4
b) The bigger the trout I catch, the better the fishing trip.	1	2	3	4
c) When I go fishing, I am only satisfied when I catch some trout.	1	2	3	4
d) Catching a "trophy" trout is the biggest reward for me.	1	2	3	4
e) It does not matter to me what type of trout I catch.	1	2	3	4
f) How I catch a trout is as important to me as actually catching one.	1	2	3	4
g) If I thought I would not catch trout, I would not go fishing.	1	2	3	4
h) The more trout I catch the happier I am.	1	2	3	4

-----

14. What is your favorite Michigan trout stream? If you do not have one write 'NONE'.

Name of stream: \_\_\_\_\_

County in which stream is located: \_\_\_\_\_

Approximate number of miles (one-way) from home that this stream is located: \_\_\_\_\_ MILES

15. Now think about your favorite trout stream areas. We would like to know what factors enter into your selection of a place to fish. For each item please indicate whether or not it affects your decision when selecting your most preferred fishing sites.

(Circle one number for each item)

	GREATLY AFFECTS DECISION	SOMEWHAT AFFECTS DECISION	SLIGHTLY AFFECTS DECISION	DOES NOT AFFECT DECISION
few anglers.....	1	2	3	4
beauty of the area.....	1	2	3	4
easy public fishing access	1	2	3	4
chance to catch trophy trout.....	1	2	3	4
tradition, fished there often in the past.....	1	2	3	4
past success.....	1	2	3	4
usually get some action...	1	2	3	4
because of the regulations there.....	1	2	3	4
presence of 'wild' trout..	1	2	3	4
presence of some large trout.....	1	2	3	4
type of water.....	1	2	3	4
available accommodations...	1	2	3	4
close to home.....	1	2	3	4
type of fish in water.....	1	2	3	4
because friends fish there	1	2	3	4

16. Is your most preferred trout fishing area also where you do most of your trout fishing? ☐ YES ☐ NO

17. Did you fish for trout in streams in the 1986 fishing season (does not include salmon and steelhead fishing)?

☐ YES, please continue with # 18

☐ NO, please skip to question # 25

18. About how many legal-sized stream trout (does not include salmon or steelhead) did you catch in 1986 from everywhere, not just in Michigan (include both those you kept and the legal-sized fish you released)? Please give your best guess.

\_\_\_\_\_ NUMBER OF LEGAL SIZED TROUT YOU CAUGHT

19. About what percent of your 1986 catch which you could have legally kept did you voluntarily release?

\_\_\_\_\_ % LEGAL CATCH RELEASED

20. Were you checked by a warden (conservation officer) while trout fishing in 1986? ☐ YES ☐ NO

21. Did you fish the AuSable River system in 1986?

☐ YES, please continue with # 22

☐ NO, please skip to question # 24

22. Did you fish any of the special "Quality Fishing Areas" on the AuSable River?

☐ YES, please continue with # 23

☐ NO, please skip to question # 24

23. Which "Quality Fishing Areas" on the AuSable River did you fish in 1986? Check all that apply.

☐ 1. MAINSTREAM QUALITY FISHING SECTION

☐ 2. NORTH BRANCH QUALITY FISHING SECTION

☐ 3. SOUTH BRANCH QUALITY FISHING SECTION

EXCLUDING THE "NO-KILL" SECTION

☐ 4. SOUTH BRANCH "NO-KILL" SECTION

☐ 5. DON'T KNOW EXACTLY WHICH SECTION

24. Did you fish for trout during 1986 in streams outside of Michigan?

☐ YES ----->ABOUT HOW MANY DAYS \_\_\_\_\_

☐ NO

25. Are you familiar with the proposed "no-kill" regulation for the AuSable Mainstream Quality Fishing Section from Burtons Landing to Wakely Bridge?

☐ YES, please continue with # 26

☐ NO, please skip to question # 27

26. How do you feel about the proposed "no-kill" regulation for this section of the AuSable River (Burtons Landing to Wakely Bridge)?
- ☐ 1. STRONGLY APPROVE
  - ☐ 2. APPROVE
  - ☐ 3. SLIGHTLY APPROVE
  - ☐ 4. UNDECIDED
  - ☐ 5. SLIGHTLY DISAPPROVE
  - ☐ 6. DISAPPROVE
  - ☐ 7. STRONGLY DISAPPROVE
27. Do you fly fish? ☐ YES, please continue with # 28  
☐ NO, please skip to question # 31
28. Do you tie your own flies? ☐ YES ☐ NO
29. How many years have you been fly fishing? \_\_\_\_\_ YEARS
30. About how many days (if any) did you fly fish for stream trout in the 1986 season?  
\_\_\_\_\_ DAYS
31. How important is it to you to have a special "fly-fishing only" area in Michigan to trout fish in?
- ☐ 1. CRUCIAL
  - ☐ 2. VERY IMPORTANT
  - ☐ 3. IMPORTANT
  - ☐ 4. SOMEWHAT IMPORTANT
  - ☐ 5. SLIGHTLY IMPORTANT
  - ☐ 6. NOT IMPORTANT
32. How important is it to you to have a special "no-kill" area in Michigan to trout fish in?
- ☐ 1. CRUCIAL
  - ☐ 2. VERY IMPORTANT
  - ☐ 3. IMPORTANT
  - ☐ 4. SOMEWHAT IMPORTANT
  - ☐ 5. SLIGHTLY IMPORTANT
  - ☐ 6. NOT IMPORTANT
33. Do you feel that the number of "no-kill" (catch-and-release) trout areas in the state should be:
- ☐ 1. INCREASED
  - ☐ 2. DECREASED
  - ☐ 3. STAY THE SAME
  - ☐ 4. NO OPINION

34. Below are some possible violations. Please tell us how frequently you think they occur in the areas you most prefer to fish for trout.

(Circle one number for each item)				
	DOES NOT OCCUR	OCCURS SOMETIMES	OCCURS OFTEN	NO OPINION
keeping illegal sized trout..	1	2	3	4
keeping more than limit.....	1	2	3	4
use of illegal fishing gear or methods.....	1	2	3	4
fishing out of season.....	1	2	3	4
fishing without a license....	1	2	3	4

35. Do you feel that enforcement of regulations in the areas that you most prefer to fish for trout should be:

☐ GREATLY INCREASED  
☐ INCREASED  
☐ STAY THE SAME  
☐ DECREASED  
☐ GREATLY DECREASED

36. What would you do if your favorite stream trout fishing area were changed to a catch-and-release (no-kill) zone? Please check the most appropriate response.

- ☐ 1. MY PREFERRED TROUT FISHING AREA IS ALREADY A CATCH-AND-RELEASE AREA  
☐ 2. FISH THERE MORE OFTEN  
☐ 3. FISH THERE ABOUT THE SAME  
☐ 4. FISH THERE LESS OFTEN  
☐ 5. STOP FISHING THERE COMPLETELY

→ What would be your response to the regulation?

- ☐ 1. WOULD RELEASE ALL TROUT CAUGHT  
☐ 2. WOULD KEEP A FEW TROPHY TROUT  
☐ 3. WOULD KEEP A FEW INJURED TROUT  
☐ 4. WOULD KEEP SOME TROUT CAUGHT  
☐ 4. WOULD KEEP MOST TROUT CAUGHT  
☐ 5. WOULD KEEP ALL TROUT CAUGHT

Beginning trout anglers can skip this next section (# 37) and go on to question # 38.

37. TROUT FISHING PHASES: Rate how your attitudes and practices have changed since you started trout fishing. If an item is not applicable to you, leave it blank.

	STAYED DECREASED THE SAME INCREASED				
Number of days you fish each season	1	2	3	4	5
Confidence in catching trout.....	1	2	3	4	5
Interest in catching larger (trophy) trout.....	1	2	3	4	5
Off season activities (tying flies, constructing rods, etc.).....	1	2	3	4	5
Interest in catching trout to eat..	1	2	3	4	5
Interest in catch and release.....	1	2	3	4	5
Importance of fishing method.....	1	2	3	4	5
Interest in limiting out.....	1	2	3	4	5
Desire to find solitude in fishing.	1	2	3	4	5
Trout fishing with a partner.....	1	2	3	4	5
Trout fishing with family.....	1	2	3	4	5
Enjoyment of nature while fishing..	1	2	3	4	5
Interest in learning about trout habitat, food, etc.....	1	2	3	4	5
Desire to fish new habitat & waters	1	2	3	4	5
Desire to try new equipment, techni- ques, and methods.....	1	2	3	4	5
Number of fishing areas used.....	1	2	3	4	5
Use of vacation time for trout fishing.....	1	2	3	4	5
Handicapping (light line, rod, etc.)	1	2	3	4	5
Money spent on trout fishing.....	1	2	3	4	5

(Continued from page 9)

(Continued from page 9)		STAYED				
		DECREASED	THE SAME	INCREASED		
Distance traveled to fish trout....	1	2	3	4	5	
Tendency to specialize for certain species.....	1	2	3	4	5	
<u>Fishing method:</u> bait fishing.....	1	2	3	4	5	
spinner (lure) fishing.....	1	2	3	4	5	
fly fishing.....	1	2	3	4	5	

38. Do you fish for Great Lakes trout or salmon? This includes both open water fishing in the Great Lakes and fishing in streams and river mouths during spawning runs?

☐ YES, please continue with # 39

☐ NO, please skip to question # 41

#### GREAT LAKES TROUT & SALMON FISHING

39. Anglers tend to fish for a number of reasons. Below are seven general reasons anglers give for fishing. Please rate from zero (0) to nine (9) the importance of each reason for why you fish for Great Lakes trout and salmon. Please circle one number for each reason.

	NOT A		-----															VERY	
	REASON																	IMPORTANT	
1. TO CATCH FISH TO EAT.....	0	1	2	3	4	5	6	7	8	9									
2. TO CATCH FISH FOR FUN AND EXCITEMENT.....	0	1	2	3	4	5	6	7	8	9									
3. FOR COMPANIONSHIP (FRIENDS &/OR FAMILY).....	0	1	2	3	4	5	6	7	8	9									
4. TO GET AWAY AND RELAX.....	0	1	2	3	4	5	6	7	8	9									
5. TO ENJOY NATURE.....	0	1	2	3	4	5	6	7	8	9									
6. TO ENJOY MY FISHING EQUIPMENT.....	0	1	2	3	4	5	6	7	8	9									
7. TO CATCH TROPHY SIZED FISH.	0	1	2	3	4	5	6	7	8	9									



40. GREAT LAKES FISHING PHASES: Rate how your attitudes and practices have changed since you started Great Lakes fishing. If an item is not applicable to you, leave it blank.

	STAYED DECREASED THE SAME INCREASED				
Number of days you fish each season	1	2	3	4	5
Interest in catching larger (trophy) salmon .....	1	2	3	4	5
Interest in catching fish to eat...	1	2	3	4	5
Interest in limiting out.....	1	2	3	4	5
Desire to try new equipment, techniques, and methods.....	1	2	3	4	5
Handicapping (light line, rod, etc.)	1	2	3	4	5

41. Do you belong to any fishing organizations?

☐ YES ☐ NO

If yes, please list: \_\_\_\_\_

42. Do you hunt? ☐ YES ☐ NO

If so, check the ONE type of hunting that you most prefer:

<input type="checkbox"/> ARCHERY DEER	<input type="checkbox"/> SMALL GAME (RABBIT, SQUIRREL, ETC.)
<input type="checkbox"/> GUN DEER	<input type="checkbox"/> UPLAND BIRD (GROUSE, PHEASANT, ETC.)
<input type="checkbox"/> ARCHERY BEAR	<input type="checkbox"/> WATERFOWL
<input type="checkbox"/> GUN BEAR	<input type="checkbox"/> OTHER, _____
<input type="checkbox"/> PREDATOR	
<input type="checkbox"/> TURKEY	

INFORMATION ABOUT YOURSELF--This information is strictly for descriptive purposes of comparing various groups or types of anglers.

43. What is your sex? ☐ MALE ☐ FEMALE

44. What is your age? \_\_\_\_\_ YEARS OF AGE

45. What is the highest level you completed in school? Please check the one that best applies.

☐ 1. GRADE SCHOOL  
☐ 2. SOME HIGH SCHOOL  
☐ 3. HIGH SCHOOL DIPLOMA  
☐ 4. SOME COLLEGE  
☐ 5. ASSOCIATE DEGREE (2-YR)  
☐ 6. COLLEGE DEGREE (B.S. OR B.A.)  
☐ 7. SOME GRADUATE, MEDICAL OR LAW SCHOOL  
☐ 8. ADVANCED DEGREE (M.S., Ph.D., M.D.,  
D.O., D.D.S., D.V.M., J.D.)

46. What is your total family income before taxes (include all wage earners in your household)?

<input type="checkbox"/> 1. UNDER \$10,000	<input type="checkbox"/> 6. \$30,000 to \$34,999
<input type="checkbox"/> 2. \$10,000 to \$14,999	<input type="checkbox"/> 7. \$35,000 to \$39,999
<input type="checkbox"/> 3. \$15,000 to \$19,999	<input type="checkbox"/> 8. \$40,000 to \$44,999
<input type="checkbox"/> 4. \$20,000 to \$24,999	<input type="checkbox"/> 9. \$45,000 to \$49,999
<input type="checkbox"/> 5. \$25,000 to \$29,999	<input type="checkbox"/> 10. \$50,000 OR OVER

47. Michigan residents: In what county do you live? \_\_\_\_\_

Non-residents: In what state do you live? \_\_\_\_\_

48. We will be conducting an additional survey of Michigan trout anglers next year to investigate anglers' compliance with various types of fishing regulations. This topic is extremely important in fisheries management but very difficult to study because some sensitive questions must be asked. Because of the sensitive nature of this study and the fact that you have already completed an extensive survey for us we are providing an opportunity for you to exclude yourself from our study by checking "NO" below. Checking "YES" does not obligate you to answer our survey, it only means that you will receive our survey in the mail at which time you can decide whether you wish to complete it.

☐ YES -- YOU MAY SEND ME A QUESTIONNAIRE ABOUT  
COMPLIANCE WITH FISHING REGULATIONS  
☐ NO -- PLEASE DO NOT INCLUDE ME IN YOUR SURVEY

THANK YOU VERY MUCH FOR YOUR VALUABLE TIME IN COMPLETING THIS SURVEY. You have been generous with your time and for that we are grateful. We plan to publish some of our findings in a popular fishing or outdoor magazine. We will send all participants a postcard informing you of the particular issue.

WE WELCOME ANY FURTHER COMMENTS YOU MAY WISH TO WRITE BELOW.

Ben Peyton  
Associate Professor

Larry M. Gigliotti  
Research Assistant

Michigan State University  
Department of Fisheries and Wildlife  
Natural Resources Building  
East Lansing, Michigan 48824-1222

Phone: (517) 355-4477

## APPENDIX J

Cover letters sent with the  
Michigan Trout Angler Survey mailings

## MICHIGAN STATE UNIVERSITY

DEPARTMENT OF FISHERIES AND WILDLIFE  
NATURAL RESOURCES BUILDING  
(517) 487-4477

EAST LANSING • MICHIGAN • 48824-1222

March 9, 1987

Dear Angler:

You have been selected as part of a small sample of anglers purchasing 1986 Michigan trout stamps who are being asked to participate in a Michigan State University study. This questionnaire deals with some aspects of your fishing activities and a number of your attitudes related to trout fishing. This information is needed to improve the ability of the Fisheries Division to manage streams for trout anglers around the state.

Because this is a scientific sample designed to represent all trout stamp purchasers it is important that EVERYONE in our sample respond, even if you do not trout fish very much or do not have strong opinions concerning this issue. Your input is essential if the DNR is to make fair evaluations of the costs and benefits of management programs to all citizens.

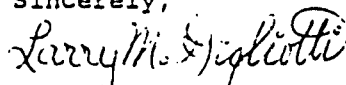
As an incentive and as a token of our appreciation for the time and effort involved, we have arranged for a fishing tackle manufacturer to donate a prize (retail value of approximately \$50). Everyone who returns a completed survey will have their survey identification number entered into a random drawing for this equipment. The winner will be contacted by mail by June, 1987.

Your response is strictly voluntary and you may refuse to answer any or all of the questions. Your answers will be treated confidentially. None of the forms will be released to the Michigan Department of Natural Resources or any other person or agency. Only the overall analysis of our results will be made public.

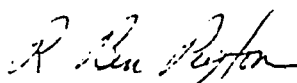
Your return of this filled out questionnaire constitutes your consent to participate in this study.

Thank you.

Sincerely,



Larry M. Gigliotti  
Research Assistant



R. Ben Peyton, Associate Professor  
Project Director

## MICHIGAN STATE UNIVERSITY

DEPARTMENT OF FISHERIES AND WILDLIFE  
NATURAL RESOURCES BUILDING  
(517) 355-4477

EAST LANSING • MICHIGAN • 48824-1222

April 27, 1987

Dear Angler:

About one month ago we sent you a survey from Michigan State University asking about your trout fishing activities. As of today we have not received your completed questionnaire in the mail.

We are encouraged by the good response rate so far. However, our past experiences suggest that those of you who have not yet sent in your questionnaires may hold quite different opinions from those that have already responded. Because this is a scientific sample designed to represent all trout stamp purchasers it is important that everyone in our sample respond, even if you do not trout fish very much.

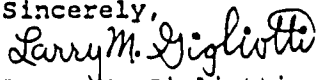
The Fisheries Division relies on surveys such as this as a means of considering public opinion when they make management plans. Even though it takes considerable time and effort on your part, we hope you will agree to participate in this and other such surveys. Only then can the method be used as an inexpensive and effective means to obtain information needed to manage our fisheries for public use.

Remember, as an incentive and as a token of our appreciation for the time and effort involved, everyone who returns a completed survey will have their survey identification number entered into a random drawing for a donated prize (retail value approximately \$50). The winner will be contacted by mail in June, 1987.

Your response is strictly voluntary and you may refuse to answer any or all of the questions. Your answers will be treated confidentially. None of the forms will be released to the Michigan Department of Natural Resources or any other person or agency. Only the overall analysis of our results will be made public.

Your return of this filled out questionnaire constitutes your consent to participate in this study.

Thank you.

Sincerely,  
  
Larry M. Gigliotti  
Research Assistant

  
R. Ben Peyton, Associate Professor  
Project Director

## MICHIGAN STATE UNIVERSITY

DEPARTMENT OF FISHERIES AND WILDLIFE  
NATURAL RESOURCES BUILDING  
(517) 355-4477

EAST LANSING • MICHIGAN • 48824-1222

June 1, 1987

Dear Angler:

About one month ago we sent you a survey from Michigan State University asking about your trout fishing activities. As of today we have not received your completed questionnaire in the mail. We are including another survey with this mailing in case you discarded or did not receive the first one.

Because this is a scientific sample designed to represent all trout stamp purchasers it is important that everyone in our sample respond. This survey deals mostly with stream trout fishing and your response is important to our study and the management of Michigan's trout resource. If you are not a stream trout angler then only a few questions actually apply to you and it should only take a few minutes to complete this survey, but please do so because YOUR RESPONSE IS STILL IMPORTANT TO OUR STUDY.

If we receive your survey in the mail by July 1, 1987 your survey identification number will be entered into a random drawing for a donated prize (retail value approximately \$50).

Your answers will be treated confidentially. Your return of this filled out questionnaire constitutes your consent to participate in this study.

Thank you.

Sincerely,

*Larry M. Gigliotti*  
Larry M. Gigliotti  
Research Assistant

*R. Ben Peyton*  
R. Ben Peyton, Associate Professor  
Project Director

If you do not intend to participate in our study, please write your survey number (lower right hand corner on front cover) here: \_\_\_\_\_ and we will remove your name from our mailing list. Also, please check all of the following that apply to you and return letter this in the prepaid envelope provided.

- \_\_\_\_\_ 1. Fishing is not important to me.
- \_\_\_\_\_ 2. Trout fishing is not important to me.
- \_\_\_\_\_ 3. I do not have the time to fill out a survey.
- \_\_\_\_\_ 4. I do not like filling out surveys.
- \_\_\_\_\_ 5. I really don't trust this survey or its use.
- \_\_\_\_\_ 6. Other \_\_\_\_\_

## MICHIGAN STATE UNIVERSITY

DEPARTMENT OF FISHERIES AND WILDLIFE  
NATURAL RESOURCES BUILDING  
(517) 353-4477

EAST LANSING • MICHIGAN • 48824-1222

July 6, 1987

Dear Angler:

We have been sending you surveys from Michigan State University asking about your trout fishing activities. As of today we have not received your reply.

We do realize that completing this survey requires a considerable amount of your valuable time. However, it is important to our study that EVERYONE in our sample respond. We are including another survey with this mailing in case you discarded or did not receive the first.

-----  
If you do not wish to participate in our study please write the survey number (lower right hand corner of the front cover) in the space below and we will remove your name from our mailing list:

0                                        

Also, please check all of the following reasons that may apply and return this letter in the prepaid envelope provided.

- ☐ 1. Fishing is not important to me.
  - ☐ 2. Trout fishing is not important to me.
  - ☐ 3. I do not have the time to fill out a survey.
  - ☐ 4. I do not like filling out surveys.
  - ☐ 5. I really don't trust this survey or its use.
  - ☐ 6. Other: \_\_\_\_\_
- 

Thank you.

Sincerely,

*Larry M. Gigliotti*

Larry M. Gigliotti  
Research Assistant

*Ben Peyton*

R. Ben Peyton, Associate Professor  
Project Director



## APPENDIX K

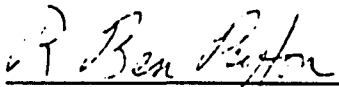
Postcards used with the  
Michigan Trout Angler Survey

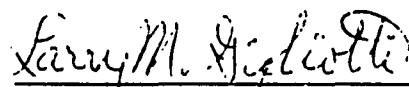
March 2, 1987

You have been selected as part of a small sample of anglers purchasing 1986 Michigan trout stamps who are being asked to participate in a Michigan State University study. This information is needed to improve the ability of the Fisheries Division to manage streams for trout anglers around the state.

You will be receiving a survey in the mail in a few days. Because this is a scientific sample designed to represent all trout stamp purchasers it is important that EVERYONE in our sample respond, even if you do not trout fish very much.

As an extra incentive, every participant who returns their completed survey will be entered into a random drawing for a prize worth about \$50 which has been donated by a major tackle manufacturer.

  
R. Ben Peyton  
Project Director

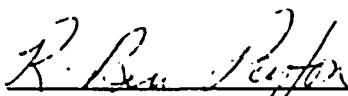
  
Larry M. Gigliotti  
Research Assistant

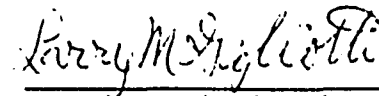
March 16, 1987

Last week a questionnaire seeking your fishing activities and attitudes about trout fishing was mailed to you.

If you have already completed and returned it to us, please accept our sincere thanks. If not, please do so today. The survey has been sent to only a small, but representative, sample of anglers. Thus, it is extremely important that YOUR VIEWS are also included in this study if the results are to accurately represent the opinions of anglers fishing in Michigan.

Remember that all participants who return their completed survey will be entered into a random drawing for a prize worth about \$50 which has been donated by a major tackle manufacturer. If you have any questions you may call (517-355-4477) or write us. Thank-you.

  
R. Ben Peyton  
Project Director

  
Larry M. Gigliotti  
Research Assistant

## APPENDIX L

### Michigan Trout Fishing Regulations Survey

# YOUR OPINIONS ABOUT MICHIGAN TROUT FISHING REGULATIONS



A PROJECT OF:

Michigan State University  
Department of Fisheries and Wildlife  
Natural Resources Building  
East Lansing, Michigan 48824

SURVEY ID \_\_\_\_\_

## DIRECTIONS FOR FILLING OUT THE QUESTIONNAIRE

- Please try to answer what you believe to be true for you. The best answer is the one which most closely reflects your own feelings and beliefs, or what you actually did.
- It is important that the person to whom this questionnaire is addressed fills it out. This survey complements another survey which you already completed and we plan to combine the two surveys.
- We are interested in hearing from everyone who receives this survey even if you do not have strong opinions about this topic.
- Do not write your name on the questionnaire.
- Your answers will be treated confidentially. Your name will never be matched with your survey. The questionnaire has an identification number so that it can be matched with the earlier survey which you completed for us.
- Return the questionnaire using the addressed, pre-paid return envelope provided.

THANK YOU FOR YOUR COOPERATION!

**YOUR OPINIONS ABOUT  
MICHIGAN TROUT FISHING REGULATIONS**

1. How well do you usually know the trout regulations where you fish (eg., do you know the legal size limits, daily possession limits and legal fishing gear)?

- ☐ 1. I DO NOT KNOW THE REGULATIONS  
☐ 2. I KNOW A FEW OF THE REGULATIONS  
☐ 3. I KNOW MOST OF THE REGULATIONS  
☐ 4. I HAVE A VERY GOOD KNOWLEDGE OF THE REGULATIONS

→ If you checked 1 or 2 above is it because you (please check all that may apply to you):

- ☐ 1. DEPEND ON YOUR FISHING COMPANIONS TO KNOW THE REGULATIONS  
☐ 2. DEPEND ON THE AREAS TO BE POSTED WITH THE REGULATIONS YOU NEED TO KNOW  
☐ 3. DON'T PLAN ON KEEPING ANY TROUT  
☐ 4. DON'T WORRY ABOUT WHAT THE REGULATIONS ARE  
☐ 5. OTHER: \_\_\_\_\_

2. How easy is it to understand the fishing regulations for trout/salmon as stated in the Michigan Fishing Guide (brochure obtained with your fishing license)?

- ☐ 1. EASILY UNDERSTOOD  
☐ 2. SLIGHTLY CONFUSING  
☐ 3. SOMEWHAT DIFFICULT  
☐ 4. VERY DIFFICULT  
☐ 5. DON'T READ THEM

3. What statewide daily possession limit on trout would you prefer (excluding special regulation areas)?

- ☐ 1. DECREASED TO \_\_\_\_\_  
☐ 2. REMAIN AT 5 TROUT  
☐ 3. INCREASED TO \_\_\_\_\_  
☐ 4. NO LIMIT (KEEP AS MANY AS YOU WANT)  
☐ 5. NO OPINION

4. Currently, the state-wide minimum size for trout is 7 inches for Upper Peninsula (UP) streams and 8 inches for Lower Peninsula (LP) streams (except for special regulation areas). What minimum size limit would you prefer?

UP streams: \_\_\_\_\_ inches  
☐ STAY THE SAME  
☐ NO MINIMUM SIZE (ALL SIZES LEGAL)  
☐ NO OPINION

LP streams: \_\_\_\_\_ inches  
☐ STAY THE SAME  
☐ NO MINIMUM SIZE (ALL SIZES LEGAL)  
☐ NO OPINION

5. In general how satisfied are you with the overall fishing regulations for trout/salmon as they are now?

☐ 1. EXTREMELY DISSATISFIED  
☐ 2. DISSATISFIED  
☐ 3. SLIGHTLY DISSATISFIED  
☐ 4. NEUTRAL  
☐ 5. SLIGHTLY SATISFIED  
☐ 6. SATISFIED  
☐ 7. EXTREMELY SATISFIED  
☐ 8. NO OPINION

COMMENTS: \_\_\_\_\_

-----  
 What is YOUR position on the following statements about trout fishing regulations? Please circle the one response at the right of each statement which indicates how strongly you agree or disagree.

SA = STRONGLY AGREE  
 A = AGREE  
 U = UNDECIDED

D = DISAGREE  
 SD = STRONGLY DISAGREE

- |  |    |   |   |   |    |
|--|----|---|---|---|----|
| 6. Each stream or local area should have its own set of trout fishing regulations which is best suited for that particular stream or area. | SA | A | U | D | SD |
| 7. Fishing regulations detract from my trout fishing experience.   | SA | A | U | D | SD |
| 8. Trout fishing regulations are not enforced adequately.  | SA | A | U | D | SD |
| 9. It would upset me to be checked by a Conservation Officer while I am trout fishing.   | SA | A | U | D | SD |

10. Competing with my trout fishing companions is an important part of my trout fishing experience. SA A U D SD
11. Trout fishing regulations are overly protective and should be relaxed some. SA A U D SD
12. The Department of Natural Resources (DNR) Fisheries Division has the competence and technical training to know how to properly manage the State's fisheries resource. SA A U D SD
13. DNR Law Enforcement is too strict in its enforcement of trout fishing regulations. SA A U D SD
14. I trust the DNR Fisheries Division to manage the State's trout fisheries resource in a fair and reasonable manner. SA A U D SD
15. Conservation Officers are usually fair in their treatment of anglers. SA A U D SD
16. Most fishing regulations have a sound biological basis. SA A U D SD
17. Most trout fishing violations occur because anglers do not know the regulations, not because anglers deliberately break the laws. SA A U D SD
18. Do you think that the penalties for trout fishing violations should be:
- [ ] 1. INCREASED  
[ ] 2. STAY THE SAME  
[ ] 3. DECREASED  
[ ] 4. NO OPINION

-----  
If you are a begining trout angler and have fished less than 3 years you may skip this section and go on to question # 26.

Rate how your attitudes and practices have changed since you started trout fishing.

			STAYED		
	<u>DECREASED</u>		<u>THE SAME</u>	<u>INCREASED</u>	
19. Understanding of reasons for <u>trout</u> fishing regulations...	1	2	3	4	5
20. Knowledge of <u>trout</u> regulations.	1	2	3	4	5
21. Satisfaction with the <u>trout</u> fishing regulations.....	1	2	3	4	5
22. Compliance with <u>trout</u> fishing regulations.....	1	2	3	4	5



		STAYED				
		DECREASED	THE SAME	INCREASED		
23.	Desire to catch <u>trout</u> .....	1	2	3	4	5
24.	Desire to keep <u>trout</u> .....	1	2	3	4	5
25.	Interest in catching trophy (large) <u>trout</u> .....	1	2	3	4	5

26. Were you checked by a conservation officer while fishing during the 1987 fishing season? ☐1. YES ☐2. NO

IF YES, what kind of fishing were you doing for each contact?

First Time:\_\_\_\_\_ Second Time:\_\_\_\_\_

Third Time:\_\_\_\_\_ Fourth Time:\_\_\_\_\_

27. Were you ever checked by a conservation officer while fishing during the past 10 years? ☐1. YES ☐2. NO

IF YES, for your most recent contact, how would you describe your treatment by the conservation officer? Circle one number for each pair of adjectives.

1. FAIR	1	2	3	4	5	UNFAIR
2. ROUGH	1	2	3	4	5	KIND
3. PROFESSIONAL	1	2	3	4	5	UNPROFESSIONAL
4. GOOD	1	2	3	4	5	BAD
5. UNFRIENDLY	1	2	3	4	5	FRIENDLY

28. Were you ever ticketed for a fishing violation during the past 10 years? ☐1. YES ☐2. NO

IF YES, how many times: \_\_\_\_\_

and for what reasons: \_\_\_\_\_

For your most recent ticket, would you describe it as (please circle one number as your response):

JUSTIFIED	1	2	3	4	5	UNJUSTIFIED
-----------	---	---	---	---	---	-------------

Hypothetically, please rate what you think your likelihood of violating a regulation would be given the 3 scenarios listed below. Please circle only one number for each scenario.

29. A regulation is passed which affects your favorite trout fishing area and is much more restrictive than you like. In fact, you are strongly opposed to the regulation and really do not believe it was necessary. How likely is it that you might violate this regulation?

1	2	3	4	5	6	7	8	9
NEVER								VERY LIKELY

30. How likely is it that you might violate a regulation if it would greatly improve your chances of catching a trophy trout?

1	2	3	4	5	6	7	8	9
NEVER								VERY LIKELY

31. You catch a trout which is in a size length category which must be released (for example, a regulation which says that 12-16 inch trout must be released), however, it is mortally wounded and obviously will not survive. How likely might you be to keep this trout?

1	2	3	4	5	6	7	8	9
NEVER								VERY LIKELY

-----

Please indicate your likelihood of violating each trout regulation under the following conditions by circling the most appropriate number.

32. You are fishing a stream where large trout are very abundant. Would you:

	OFTEN	SOMETIMES	RARELY	NEVER
use illegal gear?	1	2	3	4
keep illegal sized fish?	1	2	3	4
keep more than the limit?	1	2	3	4

33. You are fishing with one or more good friends in an excellent trout stream. Would you:
- |                           | OFTEN | SOMETIMES | RARELY | NEVER |
|---------------------------|-------|-----------|--------|-------|
| use illegal gear?         | 1     | 2         | 3      | 4     |
| keep illegal sized fish?  | 1     | 2         | 3      | 4     |
| keep more than the limit? | 1     | 2         | 3      | 4     |
34. You are fishing with family members in an excellent trout stream. Would you:
- |                           | OFTEN | SOMETIMES | RARELY | NEVER |
|---------------------------|-------|-----------|--------|-------|
| use illegal gear?         | 1     | 2         | 3      | 4     |
| keep illegal sized fish?  | 1     | 2         | 3      | 4     |
| keep more than the limit? | 1     | 2         | 3      | 4     |
35. You are fishing in an excellent trout stream in front of your own property shore line. Would you:
- |                           | OFTEN | SOMETIMES | RARELY | NEVER |
|---------------------------|-------|-----------|--------|-------|
| use illegal gear?         | 1     | 2         | 3      | 4     |
| keep illegal sized fish?  | 1     | 2         | 3      | 4     |
| keep more than the limit? | 1     | 2         | 3      | 4     |
36. You are fishing an excellent trout stream with absolute assurance that you will not get caught if you violate a regulation. Would you:
- |                           | OFTEN | SOMETIMES | RARELY | NEVER |
|---------------------------|-------|-----------|--------|-------|
| use illegal gear?         | 1     | 2         | 3      | 4     |
| keep illegal sized fish?  | 1     | 2         | 3      | 4     |
| keep more than the limit? | 1     | 2         | 3      | 4     |
37. You are fishing an excellent trout stream and observe many other anglers not obeying regulations for the stream. Would you:
- |                           | OFTEN | SOMETIMES | RARELY | NEVER |
|---------------------------|-------|-----------|--------|-------|
| use illegal gear?         | 1     | 2         | 3      | 4     |
| keep illegal sized fish?  | 1     | 2         | 3      | 4     |
| keep more than the limit? | 1     | 2         | 3      | 4     |

Now we need to ask some sensitive questions about your fishing behaviors. Remember, all answers are confidential, i.e., your name will not be associated with your survey and the identification codes will never be released to anyone.

38. About how many days did you fish for trout (not including salmon and steelhead fishing) during the 1987 season?

☐ 1. LESS THAN 10 DAYS  
☐ 2. 10 TO 19 DAYS  
☐ 3. 20 TO 29 DAYS  
☐ 4. 30 TO 39 DAYS  
☐ 5. 40 DAYS OR MORE

39. About how many legal sized trout did you catch during the 1987 fishing season (include the number kept plus the number of legal-sized trout you released)?

TOTAL LEGAL-SIZED TROUT CAUGHT IN 1987

☐ 1. 0 TO 5                      ☐ 4. 21 TO 50  
☐ 2. 6 TO 10                    ☐ 5. 51 TO 100  
☐ 3. 11 TO 20                   ☐ 6. 101 OR MORE

40. About how many legal sized trout did you KEEP.

TOTAL LEGAL-SIZED TROUT KEPT IN 1987

☐ 1. 0 TO 5                      ☐ 4. 21 TO 50  
☐ 2. 6 TO 10                    ☐ 5. 51 TO 100  
☐ 3. 11 TO 20                   ☐ 6. 101 OR MORE

41. During the 1987 season did you ever keep illegal-sized trout?

☐ 1. YES                      ☐ 2. NO

IF YES, about how many illegal-sized trout did you keep?

\_\_\_\_\_ ILLEGAL-SIZED TROUT KEPT

42. During the 1987 season did you ever fish for trout in areas where the season was closed to trout fishing?

☐ 1. YES                      ☐ 2. NO

IF YES, on about how many occasions? \_\_\_\_\_ DAYS

43. During the 1987 season, did you ever use illegal fishing gear (such as bait in a "flies only" area)?

☐ 1. YES ☐ 2. NO

IF YES, on about how many occasions? \_\_\_\_\_ DAYS

44. During the 1987 season, did you ever keep more than the legal limit of trout?

☐ 1. YES ☐ 2. NO

IF YES, on about how many occasions? \_\_\_\_\_ DAYS

45. In about how many separate fishing seasons during the past 10 years did you trout fish at least once without first purchasing a fishing license?

\_\_\_\_\_ SEASONS

46. In general, how satisfied are you with the fishing regulations for species other than trout/salmon as they are now?

☐ 1. EXTREMELY DISSATISFIED  
☐ 2. DISSATISFIED  
☐ 3. SLIGHTLY DISSATISFIED  
☐ 4. NEUTRAL  
☐ 5. SLIGHTLY SATISFIED  
☐ 6. SATISFIED  
☐ 7. EXTREMELY SATISFIED  
☐ 8. NO OPINION

47. To your knowledge during your 1987 fishing season did you ever violate the fishing regulations for species other than trout/salmon?

☐ 1. NEVER  
☐ 2. 1-2 OCCASIONS  
☐ 3. 3-5 OCCASIONS  
☐ 4. 6-10 OCCASIONS  
☐ 5. MORE THAN 10 OCCASIONS

THANK YOU VERY MUCH FOR YOUR VALUABLE TIME IN COMPLETING THIS SURVEY. You have been generous with your time and for that we are grateful. The information you provided us will be used to help guide future fisheries management decisions.

WE WELCOME ANY FURTHER COMMENTS YOU MAY WISH TO WRITE BELOW.

Ben Peyton  
Associate Professor

Larry M. Gigliotti  
Research Assistant

Michigan State University  
Department of Fisheries and Wildlife  
Natural Resources Building  
East Lansing, Michigan 48824-1222

Phone: (517) 355-4477

## APPENDIX M

Mailings used with the  
Michigan Trout Fishing Regulations Survey

## MICHIGAN STATE UNIVERSITY

DEPARTMENT OF FISHERIES AND WILDLIFE  
NATURAL RESOURCES BUILDING  
(517) 355-4477

EAST LANSING • MICHIGAN • 48824-1222

January 18, 1988

Dear Angler,

Sometime during either 1986 or 1987 you completed a survey on your trout fishing behaviors and attitudes for Michigan State University. You also indicated a willingness to receive this survey on your behaviors and attitudes towards Michigan Fishing Regulations. We hope you are still interested in participating in this study since we have reduced our sample of anglers to cut costs. To be statistically valid we need to hear from everyone.

Our analysis of anglers who do not respond to our surveys show that it is because they feel that their answers won't be of much help to us. This just is not so! EVERY response is important to a scientific survey such as this one, even if you don't fish very much or you don't have strong opinions on the topic. Most of the questions ask about your attitudes and even if you don't have an opinion it is important for us to document the number of anglers who do not have an opinion.

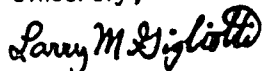
Your answers will be treated confidentially. Your questionnaire has an identification number so that it can be matched with the earlier survey which you completed for us. This enables us to reduce the number of questions we need to ask thereby reducing our costs and your time spent filling out the survey.

Your response is strictly voluntary and you may refuse to answer any or all of the questions. None of the forms will be released to the Michigan Department of Natural Resources or any other person or agency. Only the overall analysis of our results will be made public.

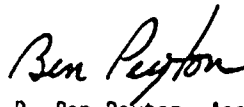
Your return of this filled out questionnaire constitutes your consent to participate in this study.

Thank you.

Sincerely,



Larry M. Gigliotti  
Research Assistant



R. Ben Peyton, Associate Professor  
Project Director



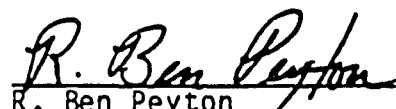
January 25, 1988

Last week a questionnaire seeking your opinions about trout fishing regulations was mailed to you.

If you have already completed and returned it to us, please accept our sincere thanks. If not, please do so today. The survey has been sent to only a small, but representative sample of trout anglers. Thus, it is extremely important that YOUR VIEWS are also included in this study if the results are to accurately represent the opinions of Michigan trout anglers. This is true even if you do not have strong opinions.

If by some chance you did not receive the questionnaire or if it got misplaced, please mail back this postcard and we will send another one to you in the mail.

  
Larry M. Gigliotti  
Research Assistant

  
R. Ben Peyton  
Project Director

## MICHIGAN STATE UNIVERSITY

DEPARTMENT OF FISHERIES AND WILDLIFE  
NATURAL RESOURCES BUILDING  
(517) 355-4477

EAST LANSING • MICHIGAN • 48824-1222

March 1, 1988

Dear Angler:

About one month ago we sent you a survey from Michigan State University asking about your behaviors and attitudes towards Michigan trout fishing regulations. As of today we have not received your completed questionnaire in the mail.

Our past experience suggests that those of you who have not yet sent in your questionnaires may hold quite different opinions from those that have already responded. Because this is a scientific sample designed to represent all trout stamp purchasers it is important that EVERYONE in our small sample respond.

The management of the State's trout resource relies heavily on the use of regulations. Fisheries Division needs to know what Michigan trout anglers think about the regulations and how they respond to them so that regulations are applied most effectively. This survey represents an inexpensive and effective means to obtain the necessary information to manage our fisheries for public use. Even though it takes considerable time and effort on your part, we hope you will agree to participate in this study.

Your questionnaire has an identification number so that it can be matched with the earlier survey which you completed for us. This enables us to reduce the number of questions we need to ask thereby reducing our costs and your time spent filling out the survey.

Your answers will be treated confidentially. None of the forms will be released to the Michigan Department of Natural Resources or any other person or agency. Only the overall analysis of our results will be made public.

Your return of this filled out survey constitutes your consent to participate in this study.

Thank you.

Sincerely,  
*Larry M. Gigliotti*  
Larry M. Gigliotti  
Rese

*R. Ben Peyton*  
R. Ben Peyton, Associate Professor  
Project Director

## NON-RESPONSE CARD

SURVEY NUMBER: \_\_\_\_\_

If you do not wish to participate on our study please return this card in the prepaid envelope provided. Also, please check all of the following reasons that may apply to you.

- ☐ 1. Fishing is not important to me.
- ☐ 2. Trout fishing is not important to me.
- ☐ 3. I am not interested in this particular topic.
- ☐ 4. I do not have the time to fill out this survey.
- ☐ 5. I do not like filling out surveys.
- ☐ 6. I really don't trust this survey or its use.
- ☐ 7. Other: \_\_\_\_\_

## MICHIGAN STATE UNIVERSITY

DEPARTMENT OF FISHERIES AND WILDLIFE  
NATURAL RESOURCES BUILDING  
(517) 355-4477

EAST LANSING • MICHIGAN • 48824-1222

April 15, 1988

Dear Angler:

About one month ago we sent you a survey from Michigan State University asking about your behaviors and attitudes towards Michigan trout fishing regulations. As of today we have not received your completed questionnaire in the mail.

We do realize that completing this survey requires a considerable amount of your valuable time. However, it is important to our study that EVERYONE in our sample respond. We are including another survey with this mailing in case you discarded or did not receive the first one.

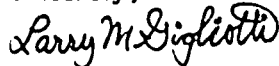
IF YOU DO NOT WISH TO PARTICIPATE IN OUR STUDY PLEASE FILL OUT THE ENCLOSED NON-RESPONSE CARD AND RETURN IT IN THE PREPAID ENVELOPE PROVIDED. We will remove your name from our mailing list.

If you participate, your answers will be treated confidentially. None of the forms will be released to the Michigan Department of Natural Resources or any other person or agency. Only the overall analysis of our results will be made public. Your return of this filled out survey constitutes your consent to participate in this study.

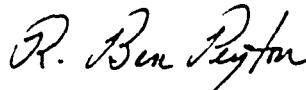
Your questionnaire has an identification number so that it can be matched with the earlier survey which you completed for us. This enables us to reduce the number of questions we need to ask thereby reducing our costs and your time spent filling out the survey.

Thank you.

Sincerely,



Larry M. Gigliotti  
Research Assistant



R. Ben Peyton, Associate Professor  
Project Director

#### APPENDIX N (TABLES)

Description of Au Sable River anglers:  
Comparison of Au Sable River anglers with a sample  
of Michigan stream trout anglers

Table 1. Education levels of Au Sable River trout anglers compared to a sample of Michigan trout anglers.\*

EDUCATION LEVEL	AU SABLE ANGLERS		MICHIGAN TROUT ANGLERS	
	#	%	#	%
HIGH SCHOOL OR LESS	128	17.4	288	39.4
SOME COLLEGE OR ASSOCIATE DEGREE	190	25.9	273	37.4
COLLEGE DEGREE	235	32.0	109	14.9
ADVANCED DEGREE	182	24.8	61	8.3
TOTAL	735	100.1	731	100.0

\*CHI-SQUARE=182.810, DF=3, P<.0001

Table 2. Family income levels of Au Sable River trout anglers compared to a sample of Michigan trout anglers.\*

INCOME LEVEL	AU SABLE ANGLERS		MICHIGAN TROUT ANGLERS	
	#	%	#	%
UNDER \$10,000	35	5.2	36	5.2
\$10,000 - \$19,999	51	7.5	93	13.5
\$20,000 - \$29,999	100	14.7	133	19.3
\$30,000 - \$39,999	118	17.4	156	22.6
\$40,000 - \$49,999	110	16.2	118	17.3
\$50,000 OR OVER	266	39.1	153	22.2
TOTAL	680	100.1	689	100.1

\*CHI-SQUARE=52.907, DF=5, P,.0001

Table 3. Fishing methods used by Au Sable River anglers for stream trout compared to a sample of Michigan trout anglers.

FISHING METHOD FREQUENCY	AU SABLE ANGLERS		MICHIGAN TROUT ANGLERS	
	#	%	#	%
FLY FISHING:				
OFTEN	643	86.9	83	11.4
SOMETIMES	67	9.1	269	36.9
NEVER	30	4.1	378	51.8
TOTAL	740	100.1	730	100.1
(X <sup>2</sup> =850.191, DF=2, P<.0001)				
LURES:				
OFTEN	63	8.5	215	29.4
SOMETIMES	223	30.1	361	49.3
NEVER	454	61.4	156	21.3
TOTAL	740	100.0	732	100.0
(X <sup>2</sup> =261.262, DF=2, P<.0001)				
BAIT:				
OFTEN	73	9.9	388	53.2
SOMETIMES	180	24.4	242	33.2
NEVER	484	65.7	100	13.7
TOTAL	737	100.0	730	100.1
(X <sup>2</sup> =476.818, DF=2, P<.0001)				

Table 4. Preferred specific trout species of Au Sable River trout anglers compared to a statewide sample of trout anglers.\*

PREFERRED SPECIFIC TROUT SPECIES	AU SABLE ANGLERS		STATEWIDE SAMPLE	
	#	%	#	%
BROWN TROUT	99	50.3	27	24.8
BROOK TROUT	63	32.0	61	56.0
RAINBOW TROUT	35	17.8	21	19.3
TOTAL	197	100.1	109	100.1

\*CHI-SQUARE=21.114, DF=2, P,.0001

Table 5. Preferred species of anglers who do not prefer trout for Au Sable River trout anglers compared to a sample of Michigan trout anglers.\*

PREFERRED OTHER SPECIES**	AU SABLE ANGLERS		MICHIGAN TROUT ANGLERS	
	#	%	#	%
BASS	24	25.5	116	22.4
WALLEYE	18	19.2	100	19.3
SALMON	11	11.7	113	21.8
PIKE-MUSKY	9	9.6	37	7.1
PAN FISH	6	6.4	36	6.9
PERCH	5	5.3	25	4.8
LAKE TROUT	1	1.1	12	2.3
STEELHEAD	0	0.0	62	12.0
OTHER	6	6.4	9	1.7
NO PREFERENCE	<u>14</u>	<u>14.9</u>	<u>9</u>	<u>1.7</u>
TOTAL	94	99.9	519	99.9

\*CHI-SQUARE=60.629, DF=9, P<.0001

\*\*Only 12.7% of the Au Sable River anglers preferred a species other than trout while 71.5% of the statewide trout angler sample preferred a species other than trout.

Table 6. Preferred stream trout species of Michigan trout anglers: comparisons of closed- vs. open- ended questions.\*

PREFERRED TROUT SPECIES	CLOSED QUESTION		OPEN QUESTION	
	#	%	#	%
TROUT -- NO PREFERENCE	291	39.7	98	47.3
BROWN TROUT	106	14.4	27	13.0
BROOK TROUT	220	30.0	61	29.5
RAINBOW TROUT	112	15.3	21	10.1
OTHER TROUT SPECIES	<u>5</u>	<u>0.7</u>	<u>0</u>	<u>0.0</u>
TOTAL	734	100.1	207	99.9

\*CHI-SQUARE=6.949, DF=4, P=.1386



Table 7. Importance of stream trout fishing as a recreational activity for Au Sable River anglers compared to a statewide sample of Michigan trout anglers.\*

IMPORTANCE OF STREAM TROUT FISHING	AU SABLE ANGLERS		MICHIGAN ANGLERS	
	#	%	#	%
MOST IMPORTANT	230	31.7	47	6.4
MORE IMPORTANT THAN MOST IMPORTANT	304	41.9	157	21.4
SOMEWHAT IMPORTANT	145	20.0	267	36.4
SLIGHTLY IMPORTANT	31	4.3	131	17.9
NOT VERY IMPORTANT	11	1.5	54	7.4
	4	0.6	77	10.5
TOTAL	725	100.0	733	100.0

\*CHI-SQUARE=359.831, DF=5, P<.0001)

Table 8. Self-rated trout fishing experience of Au Sable River anglers compared to a sample of Michigan trout anglers.\*

SELF-RATED TROUT FISHING EXPERIENCE	AU SABLE ANGLERS		MICHIGAN TROUT ANGLERS	
	#	%	#	%
BEGINNER	78	10.7	156	21.3
SOMEWHAT EXPERIENCED	204	28.1	329	44.8
EXPERIENCED	352	48.5	229	31.2
EXPERT	92	12.7	20	2.7
TOTAL	726	100.0	734	100.0

\*CHI-SQUARE=127.600, DF=3, P<.0001

Table 9. Trout releasing behavior of Au Sable River trout anglers compared to a sample of Michigan trout anglers.\*

TROUT RELEASING BEHAVIOR	AU SABLE ANGLERS		MICHIGAN TROUT ANGLERS	
	#	%	#	%
RELEASE ALL	214	29.4	29	4.0
RELEASE MOST	302	41.4	109	14.9
KEEP MOST	129	17.7	275	37.6
KEEP ALL	84	11.5	318	43.5
TOTAL	729	100.0	731	100.0

\*CHI-SQUARE=420.443, DF=3, P<.0001

Table 10. Motivations for trout fishing for Au Sable river anglers compared to a sample of Michigan trout anglers.

<u>IMPORTANCE SCALE</u>									
0	1	2	3	4	5	6	7	8	9
NOT A REASON						VERY IMPORTANT REASON			
MOTIVATION	SAMPLE		MEAN		SD	NUMBER			
TO EAT FISH	(F=278.6178; DF=1/1456; P<.0001)								
	AU SABLE RIVER ANGLERS		2.8		3.0	726			
	MICHIGAN TROUT ANGLERS		5.3		2.9	732			
TO ENJOY MY FISHING EQUIPMENT	(F=40.5792; DF=1/1450; P<.0001)								
	AU SABLE RIVER ANGLERS		5.1		2.9	723			
	MICHIGAN TROUT ANGLERS		4.1		2.8	729			
TO ENJOY NATURE	(F=39.9424; DF=1/1458; P<.0001)								
	AU SABLE RIVER ANGLERS		8.5		1.1	728			
	MICHIGAN TROUT ANGLERS		8.0		1.6	737			
TO GET AWAY & RELAX	(F=34.7225; DF=1/1456; P<.0001)								
	AU SABLE RIVER ANGLERS		8.4		1.2	726			
	MICHIGAN TROUT ANGLERS		7.9		1.7	732			
FOR FUN & EXCITEMENT	(F=28.8278; DF=1/1455, P<.0001)								
	AU SABLE RIVER ANGLERS		8.3		1.4	727			
	MICHIGAN TROUT ANGLERS		7.9		1.7	730			
FOR COMPANIONSHIP	(F=11.4162; DF=1/1447; P=.0007)								
	AU SABLE RIVER ANGLERS		6.3		2.6	722			
	MICHIGAN TROUT ANGLERS		5.9		2.8	727			

Table 11. Importance of "success" to Au Sable River anglers compared to a sample of Michigan trout anglers.

ITEM RESPONSE	AU SABLE ANGLERS		MICHIGAN TROUT ANGLERS	
	#	%	#	%
"A fishing trip can be successful to me even if I don't catch trout." ( $\chi^2=5.574$ , $df=3$ , $p=.1343$ )				
STRONGLY DISAGREE	32	5.3	42	5.8
SLIGHTLY DISAGREE	50	8.3	83	11.4
SLIGHTLY AGREE	220	36.3	231	31.6
STRONGLY AGREE	<u>304</u>	<u>50.2</u>	<u>374</u>	<u>51.2</u>
TOTAL	606	100.1	730	100.0
"When I go fishing, I am only satisfied when I catch some trout." ( $\chi^2=0.937$ , $df=3$ , $p=.8164$ )				
STRONGLY DISAGREE	246	40.5	305	41.8
SLIGHTLY DISAGREE	196	32.3	234	32.1
SLIGHTLY AGREE	118	19.4	143	19.6
STRONGLY AGREE	<u>47</u>	<u>7.7</u>	<u>47</u>	<u>6.5</u>
TOTAL	607	99.9	729	100.0
"The more trout I catch the happier I am." ( $\chi^2=4.637$ , $df=3$ , $p=.2004$ )				
STRONGLY DISAGREE	116	19.1	138	18.9
SLIGHTLY DISAGREE	112	18.5	150	20.6
SLIGHTLY AGREE	255	42.1	269	36.9
STRONGLY AGREE	<u>123</u>	<u>20.3</u>	<u>172</u>	<u>23.6</u>
TOTAL	606	100.0	729	100.0
"If I thought I would not catch trout, I would not go fishing." ( $\chi^2=73.797$ , $df=3$ , $p<.0001$ )				
STRONGLY DISAGREE	211	34.8	400	54.7
SLIGHTLY DISAGREE	106	17.5	139	19.0
SLIGHTLY AGREE	140	23.1	105	14.4
STRONGLY AGREE	<u>150</u>	<u>24.7</u>	<u>87</u>	<u>11.9</u>
TOTAL	607	100.1	731	100.0

Table 12. Importance of "bigger or trophy trout" to Au Sable River anglers compared to a sample of Michigan trout anglers.

ITEM RESPONSE	AU SABLE ANGLERS		MICHIGAN TROUT ANGLERS	
	#	%	#	%
"The bigger the trout I catch, the better the fishing trip." ( $X^2=10.804$ , $df=3$ , $p=.0128$ )				
STRONGLY DISAGREE	84	13.8	100	13.7
SLIGHTLY DISAGREE	94	15.5	148	20.3
SLIGHTLY AGREE	274	45.1	343	47.0
STRONGLY AGREE	<u>155</u>	<u>25.5</u>	<u>139</u>	<u>19.0</u>
TOTAL	606	100.1	730	100.0

"Catching a "trophy" trout is the biggest reward for me." ( $X^2=15.248$ , $df=3$ , $p=.0016$ )				
STRONGLY DISAGREE	188	31.0	279	38.2
SLIGHTLY DISAGREE	143	23.6	186	25.5
SLIGHTLY AGREE	174	28.7	148	20.3
STRONGLY AGREE	<u>101</u>	<u>16.7</u>	<u>117</u>	<u>16.0</u>
TOTAL	606	99.9	730	100.0

Table 13. Importance of "trout species" to Au Sable River anglers compared to a sample of Michigan trout anglers.

ITEM RESPONSE	AU SABLE ANGLERS		MICHIGAN TROUT ANGLERS	
	#	%	#	%
"It does not matter to me what type of trout I catch." ( $X^2=23.325$ , $df=3$ , $p<.0001$ )				
STRONGLY DISAGREE	22	3.6	33	4.5
SLIGHTLY DISAGREE	109	18.0	70	9.6
SLIGHTLY AGREE	225	37.1	262	35.9
STRONGLY AGREE	<u>251</u>	<u>41.4</u>	<u>364</u>	<u>49.9</u>
TOTAL	607	100.1	729	99.9

Table 14. Importance of "trout fishing method" to Au Sable River anglers compared to a sample of Michigan trout anglers.

ITEM RESPONSE	AU SABLE ANGLERS		MICHIGAN TROUT ANGLERS	
	#	%	#	%
"How I catch a trout is as important to me as actually catching one." ( $\chi^2=249.243$ , $df=3$ , $p<.0001$ )				
STRONGLY DISAGREE	16	2.6	104	14.2
SLIGHTLY DISAGREE	30	4.9	165	22.6
SLIGHTLY AGREE	148	24.4	258	35.3
STRONGLY AGREE	413	68.0	204	27.9
TOTAL	607	99.9	731	100.0

Table 15. Importance of "fly-fishing only" areas to Au Sable River trout anglers compared to a sample of Michigan trout anglers.\*

IMPORTANCE RATING	AU SABLE ANGLERS		MICHIGAN TROUT ANGLERS	
	#	%	#	%
1. CRUCIAL	335	45.8	27	3.7
2. VERY IMPORTANT	211	28.8	45	6.2
3. IMPORTANT	80	10.9	86	11.8
4. SOMEWHAT IMPORTANT	40	5.5	96	13.2
5. SLIGHTLY IMPORTANT	10	1.4	44	6.0
6. NOT IMPORTANT	56	7.7	430	59.1
TOTAL	732	100.1	728	100.0

\*CHI-SQUARE=702.184, DF=5,  $P<.0001$

Table 16. Importance of "no-kill" areas to Au Sable River trout anglers compared to a sample of Michigan trout anglers.\*

IMPORTANCE RATING	AU SABLE ANGLERS		MICHIGAN TROUT ANGLERS	
	#	%	#	%
1. CRUCIAL	207	28.2	37	5.1
2. VERY IMPORTANT	146	19.9	54	7.4
3. IMPORTANT	103	14.1	114	15.7
4. SOMEWHAT IMPORTANT	60	8.2	117	16.1
5. SLIGHTLY IMPORTANT	36	4.9	72	9.9
6. NOT IMPORTANT	181	24.7	333	45.8
TOTAL	733	100.1	727	100.0

\*CHI-SQUARE=236.605, DF=5,  $P<.0001$

Table 17. Attitude towards the number of "no-kill" areas in Michigan by Au Sable River trout anglers compared to a sample of Michigan trout anglers.\*

NUMBER OF "NO-KILL" AREAS	AU SABLE ANGLERS		MICHIGAN TROUT ANGLERS	
	#	%	#	%
INCREASED	414	56.0	129	17.7
DECREASED	82	11.1	71	9.7
STAY THE SAME	137	18.5	176	24.1
NO OPINION	<u>106</u>	<u>14.3</u>	<u>353</u>	<u>48.4</u>
TOTAL	739	99.9	729	99.9

\*CHI-SQUARE=288.098, DF=3, P<.0001

Table 18. Attitude towards the proposed Au Sable River no-kill regulation of Au Sable River trout anglers compared to a sample of Michigan trout anglers\*.

ATTITUDE TOWARDS PROPOSED NO-KILL REGULATION	AU SABLE ANGLERS		MICHIGAN TROUT*	
	#	%	#	%
(CHI-SQUARE=16.132, DF=6, P=.0131)				
STRONGLY APPROVE	274	37.1	48	25.7
APPROVE	110	14.9	34	18.2
SLIGHTLY APPROVE	29	3.9	15	8.0
UNDECIDED	120	16.3	36	19.3
SLIGHTLY DISAPPROVE	39	5.3	14	7.5
DISAPPROVE	62	8.4	20	10.7
STRONGLY DISAPPROVE	<u>104</u>	<u>14.1</u>	<u>20</u>	<u>10.7</u>
TOTAL	738	100.0	187	100.1

(CHI-SQUARE=1.309, DF=2, P=.5198)

APPROVE	413	56.0	97	51.9
UNDECIDED	120	16.3	36	19.3
DISAPPROVE	<u>205</u>	<u>27.8</u>	<u>54</u>	<u>28.9</u>
TOTAL	738	100.1	187	100.1

\*Includes only 26.1% of the Michigan sample who were aware of the proposed "no-kill" regulation for the Au Sable River Mainstream.

APPENDIX O (TABLES)

Special characteristics of Au Sable River anglers

Table 1. Total number of Au Sable River anglers  
contacted at each study location.

LOCATION	#	%
1. MAINSTREAM QUALITY SECTION	295	34.9
2. BELOW MAINSTREAM QUALITY SECTION	129	15.3
3. NORTH BRANCH QUALITY SECTION	157	18.6
4. SOUTH BRANCH NO-KILL SECTION	133	15.7
5. SOUTH BRANCH QUALITY SECTION EXCLUDING NO-KILL	<u>131</u>	<u>15.5</u>
TOTAL	845	100.0



Table 2. Primary reasons listed by Au Sable River anglers for fishing at each of the five study locations in 1986.

Loc. 1 = Mainstream Quality Section Loc. 2 = Mainstream below Wakely Bridge to McMasters Bridge Loc. 3 = North Branch Quality Section Loc. 4 = South Branch No-kill Section Loc. 5 = South Branch Quality Section excluding the no-kill section						
PRIMARY REASONS	LOC 1 # %*	LOC 2 # %	LOC 3 # %	LOC 4 # %	LOC 5 # %	TOTAL # %
TRADITION	170 63.4	63 53.8	80 54.1	52 43.3	62 49.6	427 54.9
MORE FISH	89 33.2	44 37.6	52 35.1	62 51.7	43 34.4	290 37.3
EASY ACCESS	117 43.7	56 47.9	58 39.2	18 15.0	31 24.8	280 36.0
LARGER FISH	53 19.8	55 47.0	34 23.0	75 62.5	56 44.8	273 35.1
SUGGESTED BY FRIEND	56 20.9	29 24.8	50 33.8	31 25.8	43 34.4	209 26.9
CLOSE TO HOME/CAMP	69 25.7	38 32.5	40 27.0	15 12.5	25 20.0	187 24.0
FEWER ANGLERS	21 7.8	20 17.1	46 31.1	28 23.3	25 20.0	148 18.0
TOTAL #	268	117	148	120	125	778

\*COLUMN PERCENTS BASED ON TOTAL RESPONDENT NUMBER IN COLUMN  
(TOTAL NUMBER OF VALID CASES = 778)

Table 3. Au Sable River anglers who trout fish after dark by study location.\*

LOCATION	FISH AFTER DARK	
	#	%
1. MAINSTREAM QUALITY SECTION	161	63.1
2. BELOW MAINSTREAM QUALITY SECTION	70	61.4
3. NORTH BRANCH QUALITY SECTION	81	57.4
4. SOUTH BRANCH NO-KILL SECTION	86	78.2
5. SOUTH BRANCH QUALITY SECTION EXCLUDING THE NO-KILL	82	81.2
TOTAL (MEAN %)	480	(66.6)

\*CHI-SQUARE=24.3554, DF=4, P=.0001

Table 4. Number of Au Sable River areas fished in 1986 by the sample of Au Sable River anglers.

NUMBER OF AREAS	NUMBER OF ANGLERS	PERCENT
1	129	17.5
2	134	18.2
3	157	21.3
4	151	20.5
5	95	12.9
6	39	5.3
7	24	3.3
8	9	1.2
TOTAL	738	100.2

Table 5. Au Sable River areas that Au Sable River anglers fished or planned to fish in the 1986 fishing season.

AREA	NUMBER	PERCENT OF RESPONSES	PERCENT OF CASES*
MAINSTREAM QUALITY SECTION	548	22.7	74.3
NORTH BRANCH	473	19.6	64.1
S. BRANCH NO-KILL SECTION	383	15.9	51.9
S. BRANCH EXCLUDING NO-KILL	376	15.6	50.9
MAINSTREAM BELOW WAKELY BRIDGE	312	12.9	42.3
MAINSTREAM ABOVE BRUTONS LANDING	159	6.6	21.5
OTHER TRIBUTARIES OF AU SABLE	84	3.5	11.4
EAST BRANCH	79	3.3	10.7
TOTAL RESPONSES	2414	100.0	

\*VALID CASES=738

Table 6. Most preferred Au Sable River fishing site of Au Sable River anglers.

MOST PREFERRED Au Sable RIVER SITE*	#	%
MAINSTREAM QUALITY SECTION	179	30.4
NORTH BRANCH QUALITY SECTION	102	17.3
SOUTH BRANCH NO-KILL SECTION	93	15.8
SOUTH BRANCH QUALITY SECTION EXCLUDING NO-KILL SECTION	73	12.4
MAINSTREAM BELOW WAKELY BRIDGE	40	6.8
MAINSTREAM ABOVE BURTONS LANDING	8	1.4
EAST BRANCH	5	0.8
OTHER	2	0.3
NO PREFERENCE	87	14.8
TOTAL	589	100.0

\*Note that only the first five locations above were study location sites.

Table 7. Money invested in specialized trout fishing equipment by Au Sable River anglers.

RANGE	NUMBER OF ANGLERS	PERCENT
\$0	6	0.8
\$1 - \$50	23	3.2
\$51 - \$100	26	3.7
\$101 - \$300	132	18.6
\$301 - \$600	128	18.0
\$601 - \$900	52	7.3
\$901 - \$1,100	78	11.0
\$1,101 - \$2,000	115	16.2
\$2,001 - \$5,000	111	15.6
\$5,001 - \$10,000	35	4.9
GREATER THAN \$10,000	5	0.7
TOTAL	711	100.0

Table 8. Frequency of the number of trout caught in 1986 reported by Au Sable River anglers.\*

NUMBER OF TROUT	FREQUENCY	PERCENT
0	189	34.9
1	91	16.8
2	58	10.7
3	44	8.1
4	42	7.8
5	30	5.5
6	22	4.1
7	12	2.2
8	13	2.4
9	5	0.9
10	6	1.1
11 - 15	16	3.0
16 - 20	7	1.3
> 20	<u>6</u>	<u>1.1</u>
TOTAL	541	99.9

\*MEAN=3.0, SD=4.97

Table 9. Frequency of the size of the largest trout caught reported by Au Sable River anglers in 1986.\*

SIZE OF LARGEST TROUT (INCHES)	FREQUENCY	PERCENT
< 6	14	4.0
6	43	12.4
7	37	10.6
8	50	14.4
9	45	12.9
10	40	11.5
11	28	8.0
12	34	9.8
13	14	4.0
14	13	3.7
15	12	3.4
16	7	2.0
17	1	0.3
18	3	0.9
19	2	0.6
20	1	0.3
> 20	<u>4</u>	<u>1.1</u>
TOTAL	348	99.9

\*MEAN=9.7, SD=3.35

Table 10. Reported satisfaction with the days fishing trip of Au Sable River anglers in 1986.

SATISFACTION LEVEL	NUMBER	PERCENT
EXTREMELY SATISFIED	104	19.6
SATISFIED	252	47.5
SLIGHTLY SATISFIED	95	17.9
SLIGHTLY DISSATISFIED	48	9.1
DISSATISFIED	23	4.3
EXTREMELY DISSATISFIED	8	1.5
TOTAL	530	99.9

Table 11. Mean satisfaction score analyzed by study locations of Au Sable River anglers in 1986.\*

SATISFACTION SCORE			
EXTREMELY SATISFIED	.....	1	
SATISFIED	.....	2	
SLIGHTLY SATISFIED	.....	3	
SLIGHTLY DISSATISFIED	.....	4	
DISSATISFIED	.....	5	
EXTREMELY DISSATISFIED	.....	6	

STUDY LOCATIONS	SATISFACTION SCORE		
	MEAN	STD DEV	NUMBER
MAINSTREAM QUALITY SECTION	2.3	1.09	198
BELOW MAINSTREAM QUALITY SECTION	2.5	1.29	61
NORTH BRANCH QUALITY SECTION	2.2	1.00	77
SOUTH BRANCH NO-KILL SECTION	2.2	1.11	108
SOUTH BRANCH QUALITY SECTION EXCLUDING NO-KILL SECTION	2.7	1.11	85
MEAN (TOTAL)	2.4	1.12	(529)

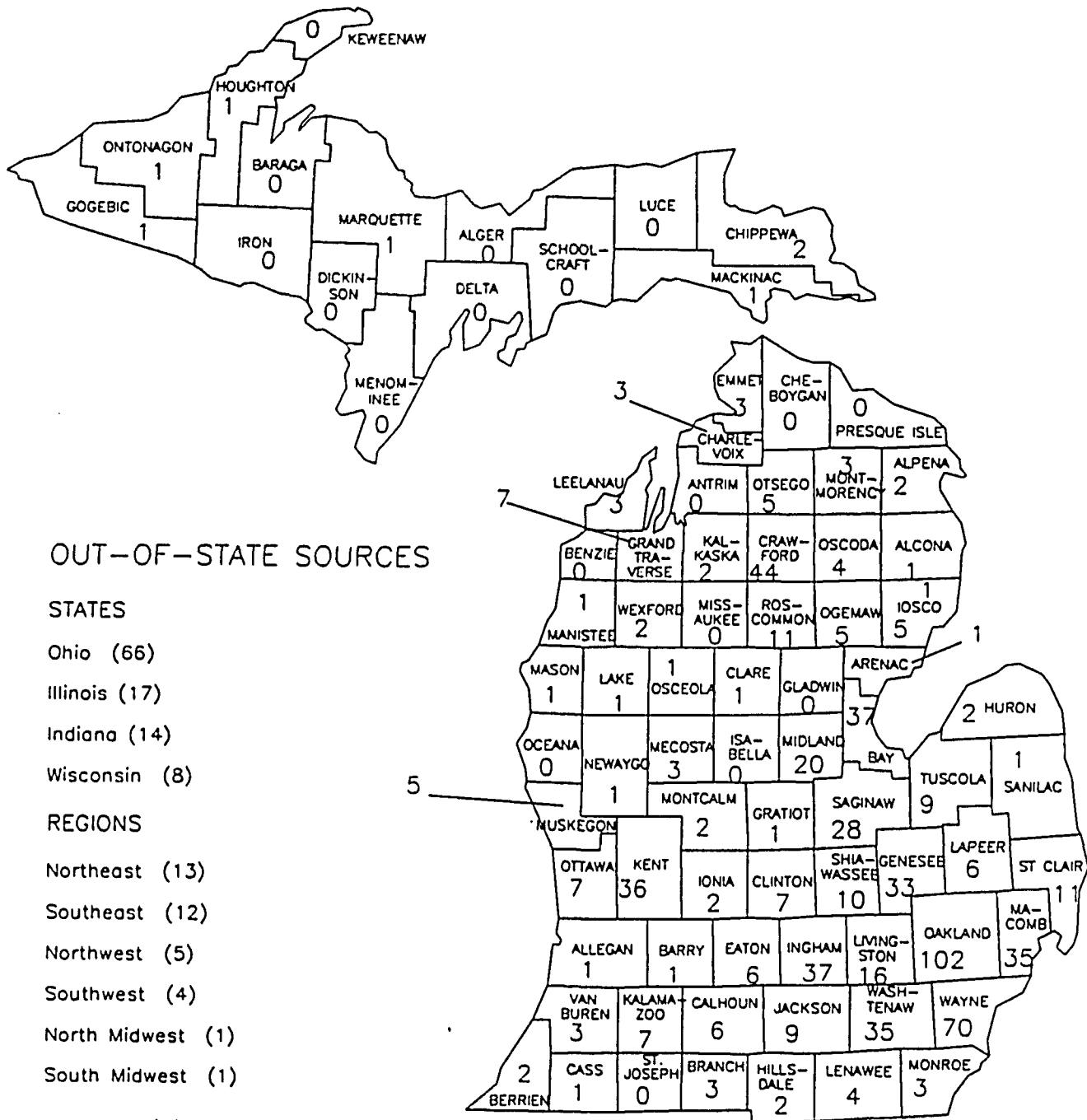
\*F=3.9303; DF=4/524; P=.0130

Table 12. Satisfaction with the day's fishing trip on the Au Sable River analyzed by trout catching "success" variables.

SUCCESS VARIABLES	PEARSON CORR.	NUMBER	SIGN.
SIZE OF LARGEST TROUT CAUGHT	.2206	287	<.001
CATCH RATE PER HOUR	.1831	431	<.001
TOTAL TROUT CAUGHT	.1472	431	.001
NUMBER TROUT KEPT	.1396	289	.009

## APPENDIX P

Map of residence of Au Sable River anglers



(Total Michigan Residents = 676)

Residence of Au Sable River Angler Sample (N = 820)

#### APPENDIX Q (TABLES)

Variables related to attitude towards the  
Au Sable River catch-and-release regulation



Table 1. Income level of Au Sable River anglers analyzed by attitude towards the proposed Au Sable River Mainstream catch-and-release regulation.

<u>INCOME LEVEL SCALE</u>			
1. UNDER \$10,000	6. \$30,000 to \$34,999		
2. \$10,000 to \$14,999	7. \$35,000 to \$39,999		
3. \$15,000 to \$19,999	8. \$40,000 to \$44,999		
4. \$20,000 to \$24,999	9. \$45,000 to \$49,999		
5. \$25,000 to \$29,999	10. \$50,000 OR OVER		
ATTITUDE TOWARDS PROPOSED NO-KILL REG.	INCOME LEVEL SCALE (MEAN)	STD DEV	NUMBER
DISAPPROVE	6.8	2.83	181
UNDECIDED / NO OPINION	6.6	3.00	103
APPROVE	8.0	2.49	<u>378</u>
TOTAL	7.5	2.67	662

[F=17.9340; DF=2,659; P<.0001; ETA SQUARED=.0516]

Table 2. Education level of Au Sable River anglers analyzed by attitude towards the proposed Au Sable River Mainstream catch-and-release regulation.

<u>EDUCATION LEVEL SCALE</u>			
1. GRADE SCHOOL			
2. SOME HIGH SCHOOL			
3. HIGH SCHOOL DIPLOMA			
4. SOME COLLEGE			
5. ASSOCIATE DEGREE (2-YR)			
6. COLLEGE DEGREE (B.S. or B.A.)			
7. SOME GRADUATE, MEDICAL or LAW SCHOOL			
8. ADVANCED DEGREE			
ATTITUDE TOWARDS PROPOSED NO-KILL REG.	EDUCATION LEVEL SCALE (MEAN)	STD DEV	NUMBER
DISAPPROVE	5.1	1.93	196
UNDECIDED / NO OPINION	5.4	1.82	114
APPROVE	6.0	1.79	<u>404</u>
TOTAL	5.6	1.83	714

[F=18.5449; DF=2,711; P<.0001; ETA SQUARED=.0496]

Table 3. Mean age (years) of Au Sable River anglers analyzed by attitude towards the proposed Au Sable River Mainstream catch-and-release regulation.

ATTITUDE TOWARDS PROPOSED NO-KILL REG.	MEAN AGE (YEARS)	STD DEV	NUMBER
DISAPPROVE	43.6	15.36	196
UNDECIDED / NO OPINION	37.5	13.15	114
APPROVE	40.8	13.03	<u>404</u>
TOTAL	41.1	13.73	714

[F=7.3655; DF=2,711; P=.0007; ETA SQUARED=.0203]

Table 4. Trout releasing behavior analyzed by attitude towards the proposed Au Sable River Mainstream catch-and-release regulation.

<u>TROUT RELEASING BEHAVIOR SCALE</u>			
1. RELEASE ALL TROUT CAUGHT			
2. RELEASE MOST LEGAL TROUT CAUGHT			
3. KEEP MOST LEGAL TROUT CAUGHT			
4. KEEP ALL LEGAL TROUT CAUGHT (UP TO THE LIMIT)			
ATTITUDE TOWARDS PROPOSED NO-KILL REG.	TROUT RELEASING SCALE (MEAN)	STD DEV	NUMBER
STRONGLY DISAPPROVE	2.8	0.80	100
DISAPPROVE	2.7	0.93	61
SLIGHTLY DISAPPROVE	2.6	0.86	37
UNDECIDED / NO OPINION	2.5	0.87	113
SLIGHTLY APPROVE	2.3	0.94	28
APPROVE	2.0	0.92	104
STRONGLY APPROVE	1.5	0.62	<u>268</u>
TOTAL	2.1	0.78	711

[F=54.2561; DF=6,704; P<.0001; ETA SQUARED=.3162]

Table 5. Years of trout fishing experience analyzed by attitude towards the proposed Au Sable River Mainstream catch-and-release regulation.

ATTITUDE TOWARDS PROPOSED NO-KILL REG.	YEARS OF TROUT FISHING EXPERIENCE	STD DEV	NUMBER
STRONGLY DISAPPROVE	26.8	14.89	100
DISAPPROVE	20.9	16.04	60
SLIGHTLY DISAPPROVE	15.6	11.85	37
UNDECIDED / NO OPINION	14.9	13.28	114
SLIGHTLY APPROVE	14.8	12.67	27
APPROVE	15.6	13.87	104
STRONGLY APPROVE	18.0	12.96	<u>264</u>
TOTAL	18.3	13.65	706

[F=8.5979; DF=6,699; P<.0001; ETA SQUARED=.0687]

Table 6. Attitude towards the proposed Au Sable River Mainstream catch-and-release regulation analyzed by membership in fishing organizations, preferred fish species, tying flies and trout fishing after dark.

ATTITUDE SCALE			
-3	STRONGLY DISAPPROVE		
-2	DISAPPROVE		
-1	SLIGHTLY DISAPPROVE		
0	UNDECIDED / NO OPINION		
1	SLIGHTLY APPROVE		
2	APPROVE		
3	STRONGLY APPROVE		

VARIABLES	ATTITUDE SCALE (MEAN)	STD DEV	NUMBER
MEMBERSHIP IN FISHING ORGANIZATIONS:			
MEMBERS	1.5	2.07	370
NON-MEMBERS	0.1	2.20	<u>346</u>
TOTAL	0.8	2.13	716
[F=74.8617; DF=1,714; P<.0001; ETA SQUARED=.0949]			
PREFERRED FISH SPECIES:			
TROUT	0.9	2.28	629
OTHER SPECIES	0.3	1.87	<u>90</u>
TOTAL	0.8	2.23	719
[F=4.7146; DF=1,717; P=.0302; ETA SQUARED=.0065]			
FLY TYING:			
YES	1.1	2.23	449
NO	0.3	2.17	<u>256</u>
TOTAL	0.8	2.21	705
[F=21.1518; DF=1,703; P<.0001; ETA SQUARED=.0292]			
TROUT FISH AFTER DARK:			
YES	0.7	2.36	470
NO	0.9	1.98	<u>232</u>
TOTAL	0.8	2.24	702
[F=1.0984; DF=1,700; P=.2950]			

Table 7. Money invested in trout fishing equipment analyzed by attitude towards the proposed Au Sable River Mainstream catch-and-release regulation.

ATTITUDE TOWARDS PROPOSED NO-KILL REG.	MONEY IN TROUT FISHING EQUIPMENT	STD DEV	NUMBER
STRONGLY DISAPPROVE	\$1956	3142.1	97
DISAPPROVE	\$ 931	1300.1	60
SLIGHTLY DISAPPROVE	\$1814	2863.2	37
UNDECIDED / NO OPINION	\$ 924	1497.3	109
SLIGHTLY APPROVE	\$ 755	824.0	27
APPROVE	\$1370	1809.8	101
STRONGLY APPROVE	\$2431	3072.8	<u>262</u>
TOTAL	\$1745	2531.0	693
[F=7.3262; DF=6,686; P<.0001; ETA SQUARED=.0602]			

		<u>IMPORTANCE SCALE</u>									
		0	1	2	3	4	5	6	7	8	9
NOT A REASON		VERY IMPORTANT									
<u>ATTITUDE TOWARDS PROPOSED NO-KILL REG.</u>		<u>IMPORTANCE SCALE (MEAN)</u>						<u>STD DEV</u>		<u>NUMBER</u>	
<u>MOTIVATION: FOR FUN AND EXCITEMENT:</u>											
DISAPPROVE		8.2						1.50		196	
UNDECIDED / NO OPINION		8.4						1.36		114	
APPROVE		8.4						1.31		396	
TOTAL		8.3						1.37		706	
[F=0.9850; DF=2,703; P=.3740]											
<u>MOTIVATION: FOR COMPANIONSHIP:</u>											
DISAPPROVE		6.4						2.73		194	
UNDECIDED / NO OPINION		5.9						2.82		114	
APPROVE		6.5						2.40		393	
TOTAL		6.3						2.57		701	
[F=2.3936; DF=2,698; P=.0921]											
<u>MOTIVATION: TO GET AWAY AND RELAX:</u>											
DISAPPROVE		8.3						1.43		196	
UNDECIDED / NO OPINION		8.3						1.29		114	
APPROVE		8.4						1.07		396	
TOTAL		8.4						1.22		706	
[F=0.7265; DF=2,703; P=.4840]											
<u>MOTIVATION: TO ENJOY NATURE:</u>											
DISAPPROVE		8.4						1.27		197	
UNDECIDED / NO OPINION		8.4						1.19		114	
APPROVE		8.5						0.97		396	
TOTAL		8.4						1.10		707	
[F=1.8290; DF=2,704; P=.1613]											
<u>MOTIVATION: TO ENJOY FISHING EQUIPMENT:</u>											
DISAPPROVE		4.6						3.23		195	
UNDECIDED / NO OPINION		5.1						2.85		114	
APPROVE		5.3						2.72		394	
TOTAL		5.1						2.89		703	
[F=3.7859; DF=2,700; P=.0232; ETA SQUARED=.0107]											

Table 9. Attitude towards the proposed Au Sable River no-kill regulation analyzed by the importance of catching trout.

ATTITUDE SCALE			
-3	STRONGLY DISAPPROVE		
-2	DISAPPROVE		
-1	SLIGHTLY DISAPPROVE		
0	UNDECIDED / NO OPINION		
1	SLIGHTLY APPROVE		
2	APPROVE		
3	STRONGLY APPROVE		
IMPORTANCE OF CATCHING TROUT	ATTITUDE SCALE (MEAN)	STD DEV	NUMBER
1. A fishing trip can be successful to me even if I don't catch trout.			
STRONGLY DISAGREE	-0.72	2.44	32
SLIGHTLY DISAGREE	0.55	2.28	49
SLIGHTLY AGREE	0.76	2.20	217
STRONGLY AGREE	1.17	2.14	<u>303</u>
TOTAL	0.87	2.19	601
[F=8.0064, DF=3/597, P<.0001, ETA SQUARED=.039]			
2. The bigger the trout I catch, the better the fishing trip.			
STRONGLY DISAGREE	0.43	2.46	84
SLIGHTLY DISAGREE	0.52	2.19	93
SLIGHTLY AGREE	0.94	2.16	220
STRONGLY AGREE	1.19	2.19	<u>155</u>
TOTAL	0.87	2.22	602
[F=3.1050, DF=3/598, P=.0261, ETA SQUARED=.015]			
3. When I go fishing, I am only satisfied when I catch some trout.			
STRONGLY DISAGREE	1.20	2.12	243
SLIGHTLY DISAGREE	0.78	2.20	196
SLIGHTLY AGREE	0.72	2.15	117
STRONGLY AGREE	-0.09	2.72	<u>49</u>
TOTAL	0.87	2.21	602
[F=4.9647, DF=3/598, P=.0021, ETA SQUARED=.024]			

Table 9. Continued.

IMPORTANCE OF CATCHING TROUT	ATTITUDE SCALE (MEAN)	STD DEV	NUMBER
4. Catching a "trophy" trout is the biggest reward for me.			
STRONGLY DISAGREE	0.55	2.33	187
SLIGHTLY DISAGREE	0.80	2.13	142
SLIGHTLY AGREE	1.09	2.18	174
STRONGLY AGREE	1.18	2.18	<u>98</u>
TOTAL	0.87	2.22	601
[F=2.5456, DF=3/597, P=.0552, ETA SQUARED=.013]			
5. It does not matter to me what type of trout I catch.			
STRONGLY DISAGREE	0.62	2.13	21
SLIGHTLY DISAGREE	0.96	2.18	108
SLIGHTLY AGREE	0.95	2.19	224
STRONGLY AGREE	0.77	2.29	<u>249</u>
TOTAL	0.87	2.23	602
[F=0.4241, DF=3/598, P=.7358, ETA SQUARED=.002]			
6. How I catch a trout is as important to me as actually catching one.			
STRONGLY DISAGREE	-1.38	1.86	16
SLIGHTLY DISAGREE	-0.48	2.05	29
SLIGHTLY AGREE	0.44	2.06	145
STRONGLY AGREE	1.21	2.20	<u>412</u>
TOTAL	0.87	2.15	602
[F=14.7976, DF=3/598, P<.0001, ETA SQUARED=.069]			
7. If I thought I would not catch trout, I would not go fishing.			
STRONGLY DISAGREE	1.00	2.24	210
SLIGHTLY DISAGREE	0.86	2.10	106
SLIGHTLY AGREE	0.98	2.12	138
STRONGLY AGREE	0.58	2.38	<u>140</u>
TOTAL	0.87	2.23	602
[F=1.1794, DF=3/598, P=.3168, ETA SQUARED=.006]			



Table 9. Continued.

IMPORTANCE OF CATCHING TROUT	ATTITUDE SCALE (MEAN)	STD DEV	NUMBER
8. The more trout I catch the happier I am.			
STRONGLY DISAGREE	0.97	2.23	116
SLIGHTLY DISAGREE	0.76	2.18	111
SLIGHTLY AGREE	0.78	2.23	255
STRONGLY AGREE	1.04	2.28	<u>119</u>
TOTAL	0.87	2.23	601
[F=0.5408, DF=3/597, P=.6545, ETA SQUARED=.003]			

#### APPENDIX R (TABLES)

Variables related to segmentation bases for  
stream trout anglers -- Au Sable River Data

Table 1. Importance of "no-kill" trout fishing areas in Michigan to Au Sable River anglers analyzed by fly-fishing specialization, non-consumptive orientation and trout fishing intensity.

<u>IMPORTANCE OF "NO-KILL" AREAS SCALE</u>			
	1. CRUCIAL		
	2. VERY IMPORTANT		
	3. IMPORTANT		
	4. SOMEWHAT IMPORTANT		
	5. SLIGHTLY IMPORTANT		
	6. NOT IMPORTANT		

SEGMENTATION	MEAN IMPORTANCE		
BASE	SCALE VALUE	STD DEV	NUMBER
FLY-FISHING SPECIALIZATION [F=16.3661, DF=4/708, P<.0001, ETA SQUARED=.085]			
LEVEL 1	5.0	1.36	27
LEVEL 2	3.7	1.70	62
LEVEL 3	4.4	1.90	36
LEVEL 4	3.2	1.84	202
LEVEL 5	2.8	1.94	386
TOTAL	3.1	1.87	713

NON-CONSUMPTIVE ORIENTATION [F=59.0468, DF=4/701, P<.0001, ETA SQUARED=.252]			
LEVEL 1	5.1	1.43	64
LEVEL 2	4.4	1.69	44
LEVEL 3	4.0	1.77	145
LEVEL 4	2.9	1.83	185
LEVEL 5	2.2	1.61	268
TOTAL	3.1	1.69	706

TROUT FISHING INTENSITY [F=1.6881, DF=4/704, P=.1509]			
LEVEL 1	3.4	1.86	83
LEVEL 2	3.4	1.77	96
LEVEL 3	3.2	1.91	174
LEVEL 4	2.9	1.98	181
LEVEL 5	3.0	2.07	178
TOTAL	3.1	1.95	712

Table 2. Desired number of catch-and-release trout fishing areas in Michigan analyzed by fly-fishing specialization, non-consumptive orientation and trout fishing intensity.

	<u>LEVEL 1</u>		<u>LEVEL 2</u>		<u>LEVEL 3</u>		<u>LEVEL 4</u>		<u>LEVEL 5</u>	
ATTITUDE	#	%	#	%	#	%	#	%	#	%
FLY-FISHING SPECIALIZATION [ $X^2=77.7762$ , $DF=12$ , $P<.0001$ , $ETA=.2938$ ]										
INCREASE	4	14.8	17	27.0	15	41.7	119	58.9	252	64.5
DECREASE	4	14.8	5	7.9	6	16.9	33	16.3	30	7.7
STAY SAME	10	37.0	22	34.9	10	27.8	33	16.3	61	15.6
NO OPINION	<u>9</u>	<u>33.3</u>	<u>19</u>	<u>30.2</u>	<u>5</u>	<u>13.9</u>	<u>17</u>	<u>8.4</u>	<u>48</u>	<u>12.3</u>
TOTAL	27	99.9	63	100.0	36	100.1	202	99.9	391	100.1
NON-CONSUMPTIVE ORIENTATION [ $X^2=184.9324$ , $DF=12$ , $P<.0001$ , $ETA=.4100$ ]										
INCREASE	11	17.2	7	15.9	48	33.1	116	63.0	214	79.6
DECREASE	22	34.4	7	15.9	26	17.9	9	4.9	14	5.2
STAY SAME	18	28.1	16	36.4	43	29.7	37	21.1	21	7.8
NO OPINION	<u>13</u>	<u>20.3</u>	<u>14</u>	<u>31.8</u>	<u>28</u>	<u>19.3</u>	<u>22</u>	<u>12.0</u>	<u>20</u>	<u>7.4</u>
TOTAL	64	100.0	44	100.0	145	100.0	184	100.0	269	100.0
TROUT FISHING INTENSITY [ $X^2=57.9639$ , $DF=12$ , $P<.0001$ , $ETA=.2098$ ]										
INCREASE	36	42.9	51	52.6	90	51.4	119	65.0	110	61.5
DECREASE	6	7.1	13	13.4	11	6.3	26	14.2	22	12.3
STAY SAME	15	17.9	18	18.6	50	28.6	19	10.4	34	19.0
NO OPINION	<u>27</u>	<u>32.1</u>	<u>15</u>	<u>15.5</u>	<u>24</u>	<u>13.7</u>	<u>19</u>	<u>10.4</u>	<u>13</u>	<u>7.3</u>
TOTAL	84	100.0	97	100.1	175	100.0	183	100.0	179	100.1

Table 3. Importance of "fly-only" trout fishing areas in Michigan to Au Sable River anglers analyzed by fly-fishing specialization, non-consumptive orientation and trout fishing intensity.

<u>IMPORTANCE OF "FLY-ONLY" AREAS SCALE</u>			
	1. CRUCIAL		
	2. VERY IMPORTANT		
	3. IMPORTANT		
	4. SOMEWHAT IMPORTANT		
	5. SLIGHTLY IMPORTANT		
	6. NOT IMPORTANT		

SEGMENTATION	MEAN IMPORTANCE		
BASE	SCALE VALUE	STD DEV	NUMBER
FLY-FISHING SPECIALIZATION [F=62.2204, DF=4/707, P<.0001, ETA SQUARED=.260]			
LEVEL 1	4.8	1.72	27
LEVEL 2	3.3	1.65	63
LEVEL 3	3.0	1.81	36
LEVEL 4	1.9	1.11	202
LEVEL 5	1.7	1.12	384
TOTAL	2.1	1.24	712

NON-CONSUMPTIVE ORIENTATION [F=22.2364, DF=4/700, P<.0001, ETA SQUARED=.113]			
LEVEL 1	3.3	1.96	64
LEVEL 2	2.5	1.80	44
LEVEL 3	2.4	1.52	144
LEVEL 4	2.0	1.28	184
LEVEL 5	1.7	1.04	269
TOTAL	2.1	1.37	705

TROUT FISHING INTENSITY [F=4.8994, DF=4/706, P=.0007, ETA SQUARED=.027]			
LEVEL 1	2.7	1.67	83
LEVEL 2	2.2	1.36	96
LEVEL 3	2.1	1.46	173
LEVEL 4	1.9	1.30	181
LEVEL 5	2.0	1.43	178
TOTAL	2.1	1.43	711

Table 4. Years of trout fishing experience analyzed by fly-fishing specialization and trout fishing intensity.

SEGMENTATION BASE	MEAN YEARS OF EXPERIENCE	STD DEV	NUMBER
FLY-FISHING SPECIALIZATION [F=4.2044, DF=4/701, P=.0023, ETA SQUARED=.023]			
LEVEL 1	13.3	14.69	27
LEVEL 2	13.0	13.49	62
LEVEL 3	18.3	12.97	35
LEVEL 4	17.8	12.10	201
LEVEL 5	19.8	14.95	381
TOTAL	18.3	13.96	706
-----			
TROUT FISHING INTENSITY [F=19.7623, DF=4/700, P<.0001, ETA SQUARED=.102]			
LEVEL 1	10.4	11.24	82
LEVEL 2	15.7	13.72	94
LEVEL 3	16.2	13.34	171
LEVEL 4	18.9	11.83	180
LEVEL 5	24.9	15.51	178
TOTAL	18.3	13.40	705
=====			

Table 5. Self reported experience of Au Sable River anglers analyzed by fly-fishing specialization, non-consumptive orientation and trout fishing intensity.

<u>EXPERIENCE SCALE</u>			
	1.	BEGINNER	
	2.	SOMEWHAT EXPERIENCE	
	3.	EXPERIENCED	
	4.	EXPERT	

SEGMENTATION	MEAN EXPERIENCE		
BASE	LEVEL	STD DEV	NUMBER
FLY-FISHING SPECIALIZATION [F=11.5948, DF=4/702, P<.0001, ETA SQUARED=.062]			
LEVEL 1	2.1	0.86	27
LEVEL 2	2.1	0.87	62
LEVEL 3	2.8	0.74	36
LEVEL 4	2.7	0.75	201
LEVEL 5	2.7	0.81	<u>381</u>
TOTAL	2.7	0.80	707

TROUT FISHING INTENSITY [F=49.5129, DF=4/701, P<.0001, ETA SQUARED=.220]			
LEVEL 1	1.8	0.81	82
LEVEL 2	2.4	0.72	94
LEVEL 3	2.6	0.74	172
LEVEL 4	2.8	0.74	180
LEVEL 5	3.1	0.66	<u>178</u>
TOTAL	2.7	0.73	706

Table 6. Money invested in trout fishing equipment (exclusive of boats) analyzed by fly-fishing specialization, non-consumptive orientation and trout fishing intensity.

SEGMENTATION BASE	MONEY INVESTED IN EQUIPMENT (\$)	STD DEV	NUMBER
FLY-FISHING SPECIALIZATION [F=8.1585, DF=4/688, P<.0001, ETA SQUARED=.045]			
LEVEL 1	381	594.5	25
LEVEL 2	479	696.5	59
LEVEL 3	1115	1559.7	36
LEVEL 4	1676	2182.2	196
LEVEL 5	2129	3013.2	377
TOTAL	1745	2547.3	693
-----			
NON-CONSUMPTIVE ORIENTATION [F=8.4800, DF=4/686, P<.0001, ETA SQUARED=.047]			
LEVEL 1	1153	3402.9	61
LEVEL 2	955	1194.8	43
LEVEL 3	1028	1394.7	142
LEVEL 4	1792	3033.6	180
LEVEL 5	2355	2593.9	265
TOTAL	1742	2547.7	691
-----			
TROUT FISHING INTENSITY [F=16.8423, DF=4/687, P<.0001, ETA SQUARED=.089]			
LEVEL 1	892	1927.4	81
LEVEL 2	1035	1701.4	90
LEVEL 3	1163	1507.5	170
LEVEL 4	1877	2529.4	176
LEVEL 5	2946	3553.9	175
TOTAL	1747	2489.0	692
-----			



Table 7. Importance of trout fishing as a recreational activity analyzed by fly-fishing specialization, non-consumptive orientation and trout fishing intensity.

IMPORTANCE OF TROUT FISHING SCALE			
1. MOST IMPORTANT ACTIVITY			
2. MORE IMPORTANT THAN MOST OTHER ACTIVITIES			
3. IMPORTANT			
4. SOMEWHAT IMPORTANT			
5. SLIGHTLY IMPORTANT			
6. NOT VERY IMPORTANT			
SEGMENTATION	MEAN IMPORTANCE		
BASE	SCALE VALUE	STD DEV	NUMBER
FLY-FISHING SPECIALIZATION [F=29.3262, DF=4/701, P<.0001, ETA SQUARED=.143]			
LEVEL 1	2.8	1.34	26
LEVEL 2	3.0	1.14	62
LEVEL 3	2.0	0.79	36
LEVEL 4	2.0	0.80	201
LEVEL 5	1.8	0.88	381
TOTAL	2.0	0.88	706
NON-CONSUMPTIVE ORIENTATION [F=11.7456, DF=4/699, P<.0001, ETA SQUARED=.063]			
LEVEL 1	2.3	1.09	62
LEVEL 2	2.2	0.95	44
LEVEL 3	2.3	0.88	144
LEVEL 4	2.1	1.01	185
LEVEL 5	1.7	0.81	269
TOTAL	2.0	0.92	704
TROUT FISHING INTENSITY [F=40.3250, DF=4/700, P<.0001, ETA SQUARED=.187]			
LEVEL 1	2.8	1.25	82
LEVEL 2	2.5	0.85	93
LEVEL 3	2.2	0.87	172
LEVEL 4	1.8	0.79	180
LEVEL 5	1.5	0.64	178
TOTAL	2.0	0.85	705

Table 8. Voluntary trout releasing behavior analyzed by fly-fishing specialization, non-consumptive orientation and trout fishing intensity.

<u>TROUT RELEASING SCALE</u>			
1. RELEASE ALL TROUT CAUGHT			
2. RELEASE MOST LEGAL TROUT CAUGHT			
3. KEEP MOST LEGAL TROUT CAUGHT			
4. KEEP ALL LEGAL TROUT CAUGHT (UP TO THE LEGAL LIMIT)			
SEGMENTATION	MEAN TROUT		
BASE	RELEASING SCALE	STD DEV	NUMBER
FLY-FISHING SPECIALIZATION [F=35.0342, DF=4/706, P<.0001, ETA SQUARED=.166]			
LEVEL 1	3.3	0.79	25
LEVEL 2	2.8	0.98	62
LEVEL 3	2.7	0.92	36
LEVEL 4	2.1	0.85	197
LEVEL 5	1.8	0.87	391
TOTAL	2.1	0.87	711
NON-CONSUMPTIVE ORIENTATION [F=167.4912, DF=4/693, P<.0001, ETA SQUARED=.491]			
LEVEL 1	3.4	0.70	62
LEVEL 2	3.1	0.77	44
LEVEL 3	2.6	0.74	142
LEVEL 4	2.1	0.73	183
LEVEL 5	1.4	0.59	267
TOTAL	2.1	0.68	698
TROUT FISHING INTENSITY [F=10.4050, DF=4/705, P<.0001, ETA SQUARED=.056]			
LEVEL 1	2.5	1.11	82
LEVEL 2	2.3	0.96	95
LEVEL 3	2.1	0.99	172
LEVEL 4	2.0	0.83	182
LEVEL 5	1.8	0.84	179
TOTAL	2.1	0.93	710

Table 9. Membership in fishing organizations analyzed by fly-fishing specialization, non-consumptive orientation and trout fishing intensity.

	<u>LEVEL 1</u>		<u>LEVEL 2</u>		<u>LEVEL 3</u>		<u>LEVEL 4</u>		<u>LEVEL 5</u>	
<u>MEMBERSHIP</u>	<u>#</u>	<u>%</u>	<u>#</u>	<u>%</u>	<u>#</u>	<u>%</u>	<u>#</u>	<u>%</u>	<u>#</u>	<u>%</u>
FLY-FISHING SPECIALIZATION [ $\chi^2=73.8751$ , $DF=4$ , $P<.0001$ , ETA=.3212]										
YES	2	8.0	10	16.1	12	33.3	101	50.2	245	62.5
NO	<u>23</u>	<u>92.0</u>	<u>52</u>	<u>83.9</u>	<u>24</u>	<u>66.7</u>	<u>100</u>	<u>49.8</u>	<u>147</u>	<u>37.5</u>
TOTAL	25	100.0	62	100.0	36	100.0	201	100.0	392	100.0
NON-CONSUMPTIVE ORIENTATION [ $\chi^2=70.5609$ , $DF=4$ , $P<.0001$ , ETA=.3168]										
YES	10	16.1	11	25.0	64	44.8	98	53.0	179	66.5
NO	<u>52</u>	<u>83.9</u>	<u>33</u>	<u>75.0</u>	<u>79</u>	<u>55.2</u>	<u>87</u>	<u>47.0</u>	<u>90</u>	<u>33.5</u>
TOTAL	62	100.0	44	100.0	143	100.0	185	100.0	269	100.0
TROUT FISHING INTENSITY [ $\chi^2=39.6615$ , $DF=4$ , $P<.0001$ , ETA=.2355]										
YES	29	35.4	38	39.6	82	46.9	96	52.5	125	69.8
NO	<u>53</u>	<u>64.6</u>	<u>58</u>	<u>60.4</u>	<u>93</u>	<u>53.1</u>	<u>87</u>	<u>47.5</u>	<u>54</u>	<u>30.2</u>
TOTAL	82	100.0	96	100.0	175	100.0	183	100.0	179	100.0

Table 10. Fly tying by Au Sable River anglers analyzed by fly-fishing specialization, non-consumptive orientation and trout fishing intensity.

	<u>LEVEL 1</u>		<u>LEVEL 2</u>		<u>LEVEL 3</u>		<u>LEVEL 4</u>		<u>LEVEL 5</u>	
<u>FLY TYING</u>	<u>#</u>	<u>%</u>	<u>#</u>	<u>%</u>	<u>#</u>	<u>%</u>	<u>#</u>	<u>%</u>	<u>#</u>	<u>%</u>
FLY-FISHING SPECIALIZATION [ $\chi^2=100.5952$ , $DF=4$ , $P<.0001$ , ETA=.3777]										
YES	1	3.7	16	25.8	18	50.0	135	67.2	279	73.6
NO	<u>26</u>	<u>96.3</u>	<u>46</u>	<u>74.2</u>	<u>18</u>	<u>50.0</u>	<u>66</u>	<u>32.8</u>	<u>100</u>	<u>26.4</u>
TOTAL	27	100.0	62	100.0	36	100.0	201	100.0	379	100.0
NON-CONSUMPTIVE ORIENTATION [ $\chi^2=43.4601$ , $DF=4$ , $P<.0001$ , ETA=.2486]										
YES	28	45.2	20	45.5	73	50.7	123	66.5	203	75.7
NO	<u>34</u>	<u>54.8</u>	<u>24</u>	<u>54.5</u>	<u>71</u>	<u>49.3</u>	<u>62</u>	<u>33.5</u>	<u>65</u>	<u>24.3</u>
TOTAL	62	100.0	44	100.0	144	100.0	185	100.0	268	100.0
TROUT FISHING INTENSITY [ $\chi^2=53.0443$ , $DF=4$ , $P<.0001$ , ETA=.2745]										
YES	36	43.9	44	46.8	99	57.6	128	71.1	141	80.1
NO	<u>46</u>	<u>56.1</u>	<u>50</u>	<u>53.2</u>	<u>73</u>	<u>42.4</u>	<u>52</u>	<u>28.9</u>	<u>35</u>	<u>19.5</u>
TOTAL	82	100.0	94	100.0	172	100.0	180	100.0	176	100.0

Table 11. Preferred fish species of Au Sable River anglers analyzed by fly-fishing specialization, non-consumptive orientation and trout fishing intensity.

PREFERRED SPECIES	<u>LEVEL 1</u>		<u>LEVEL 2</u>		<u>LEVEL 3</u>		<u>LEVEL 4</u>		<u>LEVEL 5</u>	
	#	%	#	%	#	%	#	%	#	%
FLY-FISHING SPECIALIZATION [ $X^2=117.6112$ , $DF=4$ , $P<.0001$ , $ETA=.4042$ ]										
TROUT	12	44.4	36	57.1	34	94.4	176	87.1	371	94.6
OTHER	<u>15</u>	<u>55.6</u>	<u>27</u>	<u>42.9</u>	<u>2</u>	<u>5.6</u>	<u>26</u>	<u>12.9</u>	<u>21</u>	<u>5.4</u>
TOTAL	27	100.0	63	100.0	36	100.0	202	100.0	392	100.0
NON-CONSUMPTIVE ORIENTATION [ $X^2=36.4075$ , $DF=4$ , $P<.0001$ , $ETA=.2269$ ]										
TROUT	50	78.1	36	81.8	111	76.6	164	88.6	256	95.2
OTHER	<u>14</u>	<u>21.9</u>	<u>8</u>	<u>18.2</u>	<u>34</u>	<u>23.4</u>	<u>21</u>	<u>11.4</u>	<u>13</u>	<u>4.8</u>
TOTAL	64	100.0	44	100.0	145	100.0	185	100.0	269	100.0
TROUT FISHING INTENSITY [ $X^2=169.9688$ , $DF=4$ , $P<.0001$ , $ETA=.4862$ ]										
TROUT	41	48.8	72	74.2	160	91.4	180	97.5	176	98.3
OTHER	<u>43</u>	<u>51.2</u>	<u>25</u>	<u>25.8</u>	<u>15</u>	<u>8.6</u>	<u>4</u>	<u>2.2</u>	<u>3</u>	<u>1.7</u>
TOTAL	84	100.0	97	100.0	175	100.0	184	100.0	179	100.0

Table 12. Au Sable River trout fishing after dark analyzed by fly-fishing specialization, non-consumptive orientation and trout fishing intensity.

TROUT FISH	LEVEL 1		LEVEL 2		LEVEL 3		LEVEL 4		LEVEL 5	
AFTER DARK	#	%	#	%	#	%	#	%	#	%
FLY-FISHING SPECIALIZATION [ $\chi^2=55.9486$ , $DF=4$ , $P<.0001$ , ETA=.2821]										
YES	6	23.1	22	36.1	26	74.3	146	72.3	271	71.5
NO	<u>20</u>	<u>76.9</u>	<u>39</u>	<u>63.9</u>	<u>9</u>	<u>25.7</u>	<u>56</u>	<u>27.7</u>	<u>108</u>	<u>28.5</u>
TOTAL	26	100.0	61	100.0	35	100.0	202	100.0	379	100.0
NON-CONSUMPTIVE ORIENTATION [ $\chi^2=16.2502$ , $DF=4$ , $P=.0027$ , ETA=.1523]										
YES	35	54.7	24	54.5	86	60.6	128	69.6	197	73.8
NO	<u>29</u>	<u>45.3</u>	<u>20</u>	<u>45.5</u>	<u>56</u>	<u>39.4</u>	<u>56</u>	<u>30.4</u>	<u>70</u>	<u>26.2</u>
TOTAL	64	100.0	44	100.0	142	100.0	184	100.0	267	100.0
TROUT FISHING INTENSITY [ $\chi^2=49.7134$ , $DF=4$ , $P<.0001$ , ETA=.2661]										
YES	38	46.3	45	47.9	116	68.2	128	71.5	144	81.4
NO	<u>44</u>	<u>53.7</u>	<u>49</u>	<u>52.1</u>	<u>54</u>	<u>31.8</u>	<u>51</u>	<u>28.5</u>	<u>33</u>	<u>18.6</u>
TOTAL	82	100.0	94	100.0	170	100.0	179	100.0	177	100.0

Table 13. Reasons for selecting an Au Sable River fishing site analyzed by fly-fishing specialization.

REASON FOR SELECTING A SITE SCALE			
1. PRIMARY REASON			
2. SOMEWHAT IMPORTANT			
3. NOT A REASON			
FLY-FISHING SPECIALIZATION	MEAN REASON SCALE	STD DEV	NUMBER
—EASY ACCESS TO THE RIVER: [F=5.2450, DF=4/713, P=.0004, ETA SQUARED=.029] [X <sup>2</sup> =20.9494, P=.0003]*			
LEVEL 1	1.6	0.90	26
LEVEL 2	1.8	0.85	63
LEVEL 3	1.8	0.84	36
LEVEL 4	1.9	0.78	202
LEVEL 5	2.1	0.79	<u>391</u>
TOTAL	2.0	0.80	718
—CLOSE TO HOME/CABIN OR CAMPGROUND: [F=3.5810, DF=4/714, P=.0067, ETA SQUARED=.020] [X <sup>2</sup> =11.5773, P=.0208]			
LEVEL 1	2.1	0.99	26
LEVEL 2	2.3	0.90	63
LEVEL 3	1.9	0.91	36
LEVEL 4	2.3	0.82	202
LEVEL 5	2.4	0.78	<u>392</u>
TOTAL	2.3	0.82	719
—A FRIEND SUGGESTED IT: [F=2.7201, DF=4/712, P=.0287, ETA SQUARED=.015] [X <sup>2</sup> =9.9812, P=.0407]			
LEVEL 1	2.2	0.95	26
LEVEL 2	2.2	0.94	63
LEVEL 3	2.5	0.81	36
LEVEL 4	2.4	0.84	202
LEVEL 5	2.5	0.80	<u>390</u>
TOTAL	2.4	0.83	717
**THOUGHT THERE WOULD BE FEWER ANGLERS: [F=1.0029, DF=4/713, P=.4052] [X <sup>2</sup> =4.3557, P=.3600]			
TOTAL	2.4	0.76	718

Table 13. Continued

FLY-FISHING SPECIALIZATION	MEAN REASON SCALE	STD DEV	NUMBER
**EXPECTED TO CATCH LARGER FISH: [F=0.8736, DF=4/714, P=.4793] [X <sup>2</sup> =3.7976, P=.4341]			
TOTAL	2.1	0.87	719
**EXPECTED TO CATCH MORE FISH: [F=0.5369, DF=4/714, P=.7086] [X <sup>2</sup> =2.2108, P=.6971]			
TOTAL	2.0	0.85	719
—TRADITIONAL FISHING AREAS I'M FAMILIAR WITH: [F=9.7027, DF=4/712, P<.0001, ETA SQUARED=.052] [X <sup>2</sup> =35.5561, P<.0001]			
LEVEL 1	2.3	0.93	26
LEVEL 2	2.3	0.90	63
LEVEL 3	1.7	0.95	35
LEVEL 4	1.9	0.93	202
LEVEL 5	1.7	0.87	<u>391</u>
TOTAL	1.8	0.90	717

\*Kruskal-Wallis one-way ANOVA, X<sup>2</sup> corrected for ties.

\*\*Not significant at 0.05 significance level.



Table 14. Reasons for selecting an Au Sable River fishing site analyzed by non-consumptive orientation.

REASON FOR SELECTING A SITE SCALE			
1. PRIMARY REASON			
2. SOMEWHAT IMPORTANT			
3. NOT A REASON			
NON-CONSUMPTIVE ORIENTATION	MEAN REASON SCALE	STD DEV	NUMBER
**EASY ACCESS TO THE RIVER: [F=1.9514, DF=4/700, P=.1002] [X <sup>2</sup> =7.9780, P=.0924]*			
TOTAL	2.0	0.81	705
**CLOSE TO HOME/CABIN OR CAMPGROUND: [F=1.3715, DF=4/701, P=.2422] [X <sup>2</sup> =3.5514, P=.4701]			
TOTAL	2.3	0.82	706
**A FRIEND SUGGESTED IT: [F=1.9331, DF=4/699, P=.1032] [X <sup>2</sup> =5.9293, P=.2045]			
TOTAL	2.4	0.84	704
**THOUGHT THERE WOULD BE FEWER ANGLERS: [F=1.6516, DF=4/700, P=.1595] [X <sup>2</sup> =7.3447, P=.1188]			
TOTAL	2.4	0.77	705
**EXPECTED TO CATCH LARGER FISH: [F=1.7989, DF=4/701, P=.1272] [X <sup>2</sup> =6.6826, P=.1536]			
TOTAL	2.1	0.87	706
**EXPECTED TO CATCH MORE FISH: [F=0.3580, DF=4/701, P=.8385] [X <sup>2</sup> =1.3957, P=.8449]			
TOTAL	2.0	0.85	706
---TRADITIONAL FISHING AREAS I'M FAMILIAR WITH: [F=2.5392, DF=4/699, P=.0388, ETA SQUARED=.014] [X <sup>2</sup> =10.0866, P=.0390]			
LEVEL 1	2.0	0.99	63
LEVEL 2	1.6	0.90	44
LEVEL 3	2.0	0.94	145
LEVEL 4	1.8	0.90	183
LEVEL 5	1.8	0.90	269
TOTAL	1.8	0.92	704

\*Kruskal-Wallis one-way ANOVA, X<sup>2</sup> corrected for ties.

\*\*Not significant at 0.05 significance level.

Table 15. Reasons for selecting an Au Sable River fishing site analyzed by trout fishing intensity.

REASON FOR SELECTING A SITE SCALE			
1. PRIMARY REASON			
2. SOMEWHAT IMPORTANT			
3. NOT A REASON			
TROUT FISHING INTENSITY	MEAN REASON SCALE	STD DEV	NUMBER
--EASY ACCESS TO THE RIVER: [F=2.5134, DF=4/712, P=.0405, ETA SQUARED=.014] [X <sup>2</sup> =9.8419, P=.0432]*			
LEVEL 1	2.0	0.81	84
LEVEL 2	1.9	0.83	96
LEVEL 3	1.9	0.78	174
LEVEL 4	2.0	0.78	184
LEVEL 5	2.1	0.83	179
TOTAL	2.0	0.81	717
**CLOSE TO HOME/CABIN OR CAMPGROUND: [F=0.7364, DF=4/713, P=.5673] [X <sup>2</sup> =3.1484, P=.5333]			
TOTAL	2.3	0.82	718
--A FRIEND SUGGESTED IT: [F=8.8639, DF=4/711, P<.0001, ETA SQUARED=.048] [X <sup>2</sup> =30.4147, P<.0001]			
LEVEL 1	2.1	0.94	84
LEVEL 2	2.2	0.95	96
LEVEL 3	2.4	0.84	173
LEVEL 4	2.5	0.74	184
LEVEL 5	2.6	0.74	179
TOTAL	2.4	0.82	716
**THOUGHT THERE WOULD BE FEWER ANGLERS: [F=0.5480, DF=4/712, P=.7006] [X <sup>2</sup> =2.0523, P=.7261]			
TOTAL	2.4	0.76	717
**EXPECTED TO CATCH LARGER FISH: [F=1.2938, DF=4/713, P=.2709] [X <sup>2</sup> =4.9612, P=.2913]			
TOTAL	2.1	0.87	718
**EXPECTED TO CATCH MORE FISH: [F=2.0334, DF=4/713, P=.2790] [X <sup>2</sup> =5.2111, P=.2663]			
TOTAL	2.0	0.85	718

Table 15. Continued.

TROUT FISHING INTENSITY	MEAN REASON SCALE	STD DEV	NUMBER
—TRADITIONAL FISHING AREAS I'M FAMILIAR WITH: [F=8.8633, DF=4/711, P<.0001, ETA SQUARED=.048] [X <sup>2</sup> =32.7929, P<.0001]			
LEVEL 1	2.3	0.91	84
LEVEL 2	2.0	0.96	96
LEVEL 3	1.7	0.89	174
LEVEL 4	1.7	0.88	183
LEVEL 5	1.7	0.90	<u>179</u>
TOTAL	1.8	0.90	716

\*Kruskal-Wallis one-way ANOVA, X<sup>2</sup> corrected for ties.

\*\*Not significant at 0.05 significance level.

Table 16. Age of Au Sable River anglers analyzed by fly-fishing specialization, non-consumptive orientation and trout fishing intensity.

SEGMENTATION BASE	MEAN AGE (YEARS)	STD DEV	NUMBER
FLY-FISHING SPECIALIZATION [F=8.5022, DF=4/710, P<.0001, ETA SQUARED=.046]			
LEVEL 1	39.3	17.72	26
LEVEL 2	34.3	12.40	62
LEVEL 3	38.5	15.39	35
LEVEL 4	39.1	12.28	201
LEVEL 5	43.6	13.95	<u>391</u>
TOTAL	41.1	13.60	715
TROUT FISHING INTENSITY [F=8.0278, DF=4/709, P<.0001, ETA SQUARED=.043]			
LEVEL 1	35.5	12.72	84
LEVEL 2	40.3	14.62	96
LEVEL 3	40.9	14.10	172
LEVEL 4	40.2	12.41	183
LEVEL 5	45.2	14.18	<u>179</u>
TOTAL	41.1	13.62	714

Table 17. Education level of Au Sable River anglers analyzed by fly-fishing specialization, non-consumptive orientation and trout fishing intensity.

EDUCATION LEVEL			
1.	GRADE SCHOOL		
2.	SOME HIGH SCHOOL		
3.	HIGH SCHOOL DIPLOMA		
4.	SOME COLLEGE		
5.	ASSOCIATE DEGREE (2-YR)		
6.	COLLEGE DEGREE (B.S. or B.A.)		
7.	SOME GRADUATE, MEDICAL OR LAW SCHOOL		
8.	ADVANCED DEGREE (M.S., Ph.D., M.D. D.O., D.D.S., D.V.M., J.D.)		
SEGMENTATION	MEAN EDUCATION		
BASE	LEVEL	STD DEV	NUMBER
FLY-FISHING SPECIALIZATION [F=12.5346, DF=4/710, P<.0001, ETA SQUARED=.066]			
LEVEL 1	4.5	2.08	26
LEVEL 2	4.5	1.72	62
LEVEL 3	4.7	1.96	35
LEVEL 4	6.0	1.76	202
LEVEL 5	5.8	1.83	<u>390</u>
TOTAL	5.6	1.82	715
NON-CONSUMPTIVE ORIENTATION [F=12.7429, DF=4/699, P<.0001, ETA SQUARED=.068]			
LEVEL 1	4.3	1.91	63
LEVEL 2	5.1	1.91	44
LEVEL 3	5.5	1.74	143
LEVEL 4	5.9	1.78	185
LEVEL 5	6.0	1.84	<u>267</u>
TOTAL	5.6	1.81	702
TROUT FISHING INTENSITY [F=3.7191, DF=4/709, P=.0063, ETA SQUARED=.021]			
LEVEL 1	5.0	1.85	84
LEVEL 2	5.5	1.79	96
LEVEL 3	5.9	1.82	173
LEVEL 4	5.8	1.92	183
LEVEL 5	5.6	1.89	<u>178</u>
TOTAL	5.6	1.86	714

Table 18. Income level of Au Sable River anglers analyzed by fly-fishing specialization, non-consumptive orientation and trout fishing intensity.

<u>INCOME LEVEL</u>			
1. UNDER \$10,000	6. \$30,000 to \$34,999		
2. \$10,000 to \$14,999	7. \$35,000 to \$39,999		
3. \$15,000 to \$19,999	8. \$40,000 to \$44,999		
4. \$20,000 to \$24,999	9. \$45,000 to \$49,999		
5. \$25,000 to \$29,999	10. \$50,000 OR OVER		

SEGMENTATION	MEAN INCOME		
<u>BASE</u>	<u>LEVEL</u>	<u>STD DEV</u>	<u>NUMBER</u>
FLY-FISHING SPECIALIZATION [F=9.5359, DF=4/658, P<.0001, ETA SQUARED=.055]			
LEVEL 1	6.5	2.94	21
LEVEL 2	6.2	2.87	56
LEVEL 3	5.7	2.89	35
LEVEL 4	7.5	2.62	194
LEVEL 5	7.8	2.62	<u>357</u>
TOTAL	7.4	2.67	663
NON-CONSUMPTIVE ORIENTATION [F=16.4023, DF=4/649, P<.0001, ETA SQUARED=.092]			
LEVEL 1	5.3	3.17	60
LEVEL 2	6.9	2.62	39
LEVEL 3	6.8	2.87	132
LEVEL 4	7.7	2.56	172
LEVEL 5	8.1	2.38	<u>251</u>
TOTAL	7.4	2.63	654
TROUT FISHING INTENSITY [F=3.0821, DF=4/657, P=.0157, ETA SQUARED=.018]			
LEVEL 1	6.8	2.97	79
LEVEL 2	7.4	2.89	89
LEVEL 3	7.5	2.76	164
LEVEL 4	8.0	2.46	163
LEVEL 5	7.2	2.69	<u>167</u>
TOTAL	7.5	2.71	662

Table 19. Residence of Au Sable River anglers analyzed by fly-fishing specialization, non-consumptive orientation and trout fishing intensity.

	LEVEL 1		LEVEL 2		LEVEL 3		LEVEL 4		LEVEL 5	
RESIDENCE	#	%	#	%	#	%	#	%	#	%
FLY-FISHING SPECIALIZATION [ $\chi^2=22.5309$ , $DF=8$ , $P=.0040$ , $ETA=.1276$ ]										
LOCAL*	1	3.7	2	3.2	4	11.1	16	7.9	25	6.4
MI NONLOCAL	25	92.6	57	90.5	30	83.3	151	74.8	279	71.2
OUT-OF-STATE	<u>1</u>	<u>3.7</u>	<u>4</u>	<u>6.3</u>	<u>2</u>	<u>5.6</u>	<u>35</u>	<u>17.3</u>	<u>88</u>	<u>22.4</u>
TOTAL	27	100.0	63	100.0	36	100.0	202	100.0	392	100.0
NON-CONSUMPTIVE ORIENTATION [ $\chi^2=54.0414$ , $DF=8$ , $P<.0001$ , $ETA=.2090$ ]										
LOCAL*	12	18.8	1	2.3	9	6.2	9	4.9	16	5.9
MI NONLOCAL	45	70.3	40	90.9	121	83.4	150	81.0	174	64.7
OUT-OF-STATE	<u>7</u>	<u>10.9</u>	<u>3</u>	<u>6.8</u>	<u>15</u>	<u>10.4</u>	<u>26</u>	<u>14.1</u>	<u>79</u>	<u>29.4</u>
TOTAL	64	100.0	44	100.0	145	100.0	185	100.0	269	100.0
TROUT FISHING INTENSITY [ $\chi^2=45.8223$ , $DF=8$ , $P<.0001$ , $ETA=.1289$ ]										
LOCAL*	2	2.4	2	2.1	2	1.1	12	6.5	30	16.8
MI NONLOCAL	69	82.1	77	79.4	138	78.9	142	77.2	115	64.2
OUT-OF-STATE	<u>13</u>	<u>15.5</u>	<u>18</u>	<u>18.6</u>	<u>35</u>	<u>20.0</u>	<u>30</u>	<u>16.3</u>	<u>34</u>	<u>19.0</u>
TOTAL	84	100.0	97	100.0	175	100.0	184	100.0	179	100.0

\*Crawford and Roscommon Counties

Table 20. Catch rate (trout/hour) of Au Sable River anglers in 1986 analyzed by trout fishing intensity.

TROUT FISHING INTENSITY	MEAN CATCH RATE (TROUT/HR)	STD DEV	NUMBER
[ $F=3.8815$ , $DF=4/437$ , $P=.0041$ , $ETA SQUARED=.034$ ]			
LEVEL 1	0.5	0.62	51
LEVEL 2	0.7	0.88	61
LEVEL 3	0.8	1.28	102
LEVEL 4	0.9	1.06	113
LEVEL 5	1.1	1.32	<u>115</u>
TOTAL	0.8	1.13	442

Table 21. Number of trout kept by the Au Sable River sample in 1986 analyzed by non-consumptive orientation.

NON-CONSUMPTIVE ORIENTATION	MEAN NUMBER TROUT KEPT	STD DEV	NUMBER
[F=9.2637, DF=4/285, P<.0001, ETA SQUARED=.115]			
LEVEL 1	1.2	1.37	21
LEVEL 2	1.3	1.38	14
LEVEL 3	0.7	1.65	53
LEVEL 4	0.3	0.94	74
LEVEL 5	0.1	0.67	<u>128</u>
TOTAL	0.4	1.07	290

Table 22. Number of legal-sized trout released by the Au Sable River sample in 1986 analyzed by fly-fishing specialization, non-consumptive orientation and trout fishing intensity.

SEGMENTATION BASE	MEAN NUMBER TROUT RELEASED	STD DEV	NUMBER
FLY-FISHING SPECIALIZATION [F=4.3641, DF=4/289, P=.0019, ETA SQUARED=.057]			
LEVEL 1	0.3	0.67	10
LEVEL 2	0.3	0.67	19
LEVEL 3	0.3	0.65	12
LEVEL 4	1.3	1.86	82
LEVEL 5	1.8	2.46	<u>171</u>
TOTAL	1.5	2.14	294
-----			
NON-CONSUMPTIVE ORIENTATION [F=4.2461, DF=4/285, P=.0024, ETA SQUARED=.056]			
LEVEL 1	1.9	3.88	21
LEVEL 2	0.5	1.02	14
LEVEL 3	0.9	1.28	53
LEVEL 4	1.0	1.21	74
LEVEL 5	2.0	2.53	<u>128</u>
TOTAL	1.5	2.15	290
-----			
TROUT FISHING INTENSITY [F=4.5892, DF=4/289, P=.0013, ETA SQUARED=.060]			
LEVEL 1	0.4	0.69	28
LEVEL 2	0.9	1.61	38
LEVEL 3	1.3	1.74	65
LEVEL 4	1.5	2.28	84
LEVEL 5	2.2	2.74	<u>79</u>
TOTAL	1.5	2.14	294
-----			



#### APPENDIX S (TABLES)

Variables related to segmentation bases for  
stream trout anglers — Michigan statewide sample

Table 1. Preferred stream trout fishing method analyzed by fly-fishing specialization.

PREFERRED METHOD	FLY-FISHING SPECIALIZATION									
	LEVEL 1		LEVEL 2		LEVEL 3		LEVEL 4		LEVEL 5	
	#	%	#	%	#	%	#	%	#	%
NO PREF.	26	7.0	34	12.8	2	9.1	3	8.6	1	4.0
BAIT	260	69.5	136	51.1	10	45.5	0	—	0	—
LURES	86	23.0	61	22.9	2	9.1	0	—	0	—
FLIES	2	0.5	35	13.2	8	36.3	32	91.4	24	96.0

TOTAL 374 100.0 266 100.0 22 100.0 35 100.0 25 100.0

[ $\chi^2=395.8497$ , DF=12, P<.0001, ETA=.5260]

Table 2. Preferred stream trout fishing method analyzed by non-consumptive orientation.

PREFERRED METHOD	NON-CONSUMPTIVE ORIENTATION									
	LEVEL 1		LEVEL 2		LEVEL 3		LEVEL 4		LEVEL 5	
	#	%	#	%	#	%	#	%	#	%
NO PREF.	18	10.5	14	13.4	18	7.2	11	7.9	4	7.0
BAIT	113	65.7	55	52.9	148	59.2	70	50.4	20	35.1
LURES	27	15.7	22	21.2	51	20.4	31	22.3	19	33.3
FLIES	14	8.1	13	12.5	33	13.2	27	19.4	14	24.6

TOTAL 172 100.0 104 100.0 250 100.0 139 100.0 57 100.0

[ $\chi^2=31.3786$ , DF=12, P=.0017, ETA=.1782]

Table 3. Method of stream trout fishing first used analyzed by fly-fishing specialization.

METHOD FIRST USED	FLY-FISHING SPECIALIZATION									
	LEVEL 1		LEVEL 2		LEVEL 3		LEVEL 4		LEVEL 5	
	#	%	#	%	#	%	#	%	#	%
BAIT	309	82.6	202	76.2	16	72.8	20	57.2	4	16.0
LURES	59	15.8	33	12.5	1	4.5	4	11.4	2	8.0
FLIES	6	1.6	30	11.3	5	22.7	11	31.4	19	76.0

TOTAL 374 100.0 265 100.0 22 100.0 35 100.0 25 100.0

[ $\chi^2=176.8545$ , DF=8, P<.0001, ETA=.4240]

1896 TROUT	LEVEL 1		LEVEL 2		LEVEL 3		LEVEL 4		LEVEL 5	
FISHING	#	%	#	%	#	%	#	%	#	%
FLY-FISHING SPECIALIZATION: [ $\chi^2=19.5514$ , $DF=4$ , $P=.0006$ , $ETA=.1647$ ]										
YES	235	63.0	195	73.3	21	95.5	29	82.9	19	76.0
NO	138	37.0	71	26.7	1	4.5	6	17.1	6	24.0
TOTAL	373	100.0	266	100.0	22	100.0	35	100.0	25	100.0
TROUT FISHING INTENSITY: [ $\chi^2=138.9964$ , $DF=4$ , $P<.0001$ , $ETA=.4379$ ]										
YES	240	53.3	126	95.5	76	91.6	45	97.8	14	100.0
NO	210	46.7	6	4.5	7	8.4	1	2.2	0	—
TOTAL	450	100.0	132	100.0	83	100.0	46	100.0	14	100.0

AU SABLE RIVER FISHING	FLY-FISHING SPECIALIZATION									
	LEVEL 1		LEVEL 2		LEVEL 3		LEVEL 4		LEVEL 5	
	#	%	#	%	#	%	#	%	#	%
YES	37	15.9	43	22.4	7	33.3	14	48.3	10	52.6
NO	195	84.1	149	77.6	14	66.7	15	51.7	9	47.1
TOTAL	232	100.0	192	100.0	21	100.0	29	100.0	19	100.0

[X<sup>2</sup>=28.0542, DF=4, P<.0001, ETA=.2386]

Table 6. Fishing the "Quality Fishing Areas" on the Au Sable River in 1986 analyzed by fly-fishing specialization and trout fishing intensity.

QUALITY AREAS	LEVEL 1		LEVEL 2		LEVEL 3		LEVEL 4		LEVEL 5	
	#	%	#	%	#	%	#	%	#	%
FLY-FISHING SPECIALIZATION: [ $\chi^2=34.8853$ , DF=4, $P<.0001$ , ETA=.4115]										
YES	14	16.1	19	24.1	5	50.0	11	68.7	10	71.4
NO	73	83.9	60	75.9	5	50.0	5	31.3	4	28.6
TOTAL	87	100.0	79	100.0	10	100.0	16	100.0	14	100.0
TROUT FISHING INTENSITY: [ $\chi^2=8.6944$ , DF=4, $P=.0692$ , ETA=.2049]										
YES	23	23.5	14	26.9	13	43.3	7	30.4	3	75.0
NO	75	76.5	38	73.1	17	56.7	16	69.6	1	25.0
TOTAL	98	100.0	52	100.0	30	100.0	23	100.0	4	100.0

Table 7. Stream trout fishing outside of Michigan in 1986 analyzed by fly-fishing specialization, non-consumptive orientation and trout fishing intensity.

FISHING OUT-STATE	LEVEL 1		LEVEL 2		LEVEL 3		LEVEL 4		LEVEL 5	
	#	%	#	%	#	%	#	%	#	%
FLY-FISHING SPECIALIZATION: [ $\chi^2=20.3243$ , DF=4, $P=.0004$ , ETA=.2045]										
YES	20	8.7	33	17.6	2	9.5	5	17.2	8	42.1
NO	209	91.3	155	82.4	19	90.5	24	82.8	11	57.9
TOTAL	229	100.0	188	100.0	21	100.0	29	100.0	19	100.0
NON-CONSUMPTIVE ORIENTATION: [ $\chi^2=13.8631$ , DF=4, $P=.0077$ , ETA=.1684]										
YES	7	5.9	8	10.8	28	17.4	14	14.9	11	26.2
NO	111	94.1	66	89.2	133	82.6	80	85.1	31	73.8
TOTAL	118	100.0	74	100.0	161	100.0	94	100.0	42	100.0
TROUT FISHING INTENSITY: [ $\chi^2=10.1531$ , DF=4, $P=.0379$ , ETA=.1442]										
YES	27	11.7	26	21.1	5	6.7	8	17.8	2	14.3
NO	204	88.3	97	78.9	70	93.3	37	82.2	12	85.7
TOTAL	231	100.0	123	100.0	75	100.0	45	100.0	14	100.0

Table 8. Great Lakes trout and salmon fishing analyzed by fly-fishing specialization and trout fishing intensity.

GREAT LAKES FISHING	LEVEL 1		LEVEL 2		LEVEL 3		LEVEL 4		LEVEL 5	
	#	%	#	%	#	%	#	%	#	%
FLY-FISHING SPECIALIZATION: [ $\chi^2=12.2819$ , $DF=4$ , $P=.0154$ , ETA=.1307]										
YES	294	79.0	222	83.5	22	100.0	29	85.3	16	64.0
NO	78	21.0	44	16.5	0	—	5	14.7	9	36.0
TOTAL	372	100.0	266	100.0	22	100.0	34	100.0	25	100.0
TROUT FISHING INTENSITY: [ $\chi^2=20.3501$ , $DF=4$ , $P=.0004$ , ETA=.1678]										
YES	381	84.9	107	81.7	57	68.7	33	71.7	8	57.1
NO	68	15.1	24	18.3	26	31.3	13	28.3	6	42.9
TOTAL	449	100.0	131	100.0	83	100.0	46	100.0	14	100.0

Table 9. Stream trout anglers who also hunt analyzed by fly-fishing specialization and non-consumptive orientation.

HUNT	LEVEL 1		LEVEL 2		LEVEL 3		LEVEL 4		LEVEL 5	
	#	%	#	%	#	%	#	%	#	%
FLY-FISHING SPECIALIZATION: [ $\chi^2=15.9484$ , $DF=4$ , $P=.0031$ , ETA=.1500]										
YES	270	73.0	207	79.0	17	81.0	25	73.5	11	44.0
NO	100	27.0	55	21.0	4	19.0	9	26.5	14	56.0
TOTAL	370	100.0	262	100.0	21	100.0	34	100.0	25	100.0
NON-CONSUMPTIVE ORIENTATION: [ $\chi^2=28.7159$ , $DF=4$ , $P<.0001$ , ETA=.2007]										
YES	136	79.5	79	76.0	190	77.6	101	74.3	26	45.6
NO	35	20.5	25	24.0	55	22.4	35	25.7	31	54.4
TOTAL	171	100.0	104	100.0	245	100.0	136	100.0	57	100.0



Table 12. Importance of "success" in satisfactions of Michigan stream trout anglers analyzed by non-consumptive orientation.

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<u>IMPORTANCE OF SUCCESS SCALE</u>			
4 <-----> 16			
NOT IMPORTANT		VERY IMPORTANT	
NON-CONSUMPTIVE ORIENTATION	MEAN SUCCESS	STD DEV	NUMBER
[F=6.4351, DF=4/708, P<.0001, ETA SQUARED=.035]			
LEVEL 1	8.3	3.02	170
LEVEL 2	9.1	2.93	102
LEVEL 3	8.1	2.76	248
LEVEL 4	7.4	2.43	136
LEVEL 5	7.5	2.94	<u>57</u>
TOTAL	8.1	2.81	713

---

Table 13. Importance of trout fishing method in satisfaction of Michigan stream trout anglers analyzed by fly-fishing specialization, non-consumptive orientation and trout fishing intensity.

IMPORTANCE OF FISHING METHOD SCALE			
1	<-----> 4		
NOT IMPORTANT	VERY IMPORTANT		
SEGMENTATION	MEAN		
BASE	IMPORTANCE	STD DEV	NUMBER
FLY-FISHING SPECIALIZATION: [F=6.8226, DF=4/712, P<.0001, ETA SQUARED=.037]			
LEVEL 1	2.6	1.02	372
LEVEL 2	2.8	1.01	264
LEVEL 3	3.1	0.89	22
LEVEL 4	3.1	0.79	34
LEVEL 5	3.4	0.92	<u>25</u>
TOTAL	2.8	1.00	717
NON-CONSUMPTIVE ORIENTATION: [F=3.7478, DF=4/713, P=.0050, ETA SQUARED=.021]			
LEVEL 1	2.6	1.15	171
LEVEL 2	2.7	0.93	103
LEVEL 3	2.7	0.94	249
LEVEL 4	2.9	0.95	138
LEVEL 5	3.2	1.05	<u>57</u>
TOTAL	2.8	1.00	718
TROUT FISHING INTENSITY: [F=8.7500, DF=4/716, P<.0001, ETA SQUARED=.047]			
LEVEL 1	2.6	1.03	447
LEVEL 2	3.0	0.98	131
LEVEL 3	2.7	0.94	83
LEVEL 4	3.3	0.70	46
LEVEL 5	3.4	0.84	<u>14</u>
TOTAL	2.8	0.99	721



Table 14. Percent of legal trout voluntarily released in 1986 by Michigan stream trout anglers analyzed by fly-fishing specialization, non-consumptive orientation and trout fishing intensity.

SEGMENTATION BASE	PERCENT TROUT RELEASED	STD DEV	NUMBER
FLY-FISHING SPECIALIZATION: [F=12.7555, DF=4/428, P<.0001, ETA SQUARED=.1065			
LEVEL 1	22.6	32.66	193
LEVEL 2	25.4	31.90	176
LEVEL 3	31.7	37.91	19
LEVEL 4	51.9	39.63	27
LEVEL 5	71.3	33.26	<u>18</u>
TOTAL	28.0	33.26	433
-----			
NON-CONSUMPTIVE ORIENTATION: [F=29.8787, DF=4/430, P<.0001, ETA SQUARED=.2175			
LEVEL 1	10.4	20.99	106
LEVEL 2	17.1	23.58	61
LEVEL 3	26.3	32.17	144
LEVEL 4	42.8	38.17	88
LEVEL 5	17.3	41.69	<u>36</u>
TOTAL	27.9	31.07	435
-----			
TROUT FISHING INTENSITY: [F=2.3389, DF=4/429, P=.0545, ETA SQUARED=.021]			
LEVEL 1	23.2	33.20	191
LEVEL 2	32.1	35.17	116
LEVEL 3	25.8	33.01	69
LEVEL 4	37.0	38.83	44
LEVEL 5	37.0	46.60	<u>14</u>
TOTAL	27.8	34.78	434
-----			

Table 15. Residency of Michigan stream trout anglers analyzed by fly-fishing specialization and non-consumptive orientation.

	<u>LEVEL 1</u>		<u>LEVEL 2</u>		<u>LEVEL 3</u>		<u>LEVEL 4</u>		<u>LEVEL 5</u>	
<u>RESIDENCE</u>	<u>#</u>	<u>%</u>	<u>#</u>	<u>%</u>	<u>#</u>	<u>%</u>	<u>#</u>	<u>%</u>	<u>#</u>	<u>%</u>
FLY-FISHING SPECIALIZATION: [ $\chi^2=11.0391$ , $DF=4$ , $P=.0261$ , ETA=.1238]										
MICHIGAN	347	93.0	243	91.4	20	95.2	34	97.1	19	76.0
OTHER	<u>26</u>	<u>7.0</u>	<u>23</u>	<u>8.6</u>	<u>1</u>	<u>4.8</u>	<u>1</u>	<u>2.9</u>	<u>6</u>	<u>24.0</u>
TOTAL	373	100.0	266	100.0	21	100.0	35	100.0	25	100.0
NON-CONSUMPTIVE ORIENTATION: [ $\chi^2=9.96309$ , $DF=4$ , $P=.0411$ , ETA=.1176]										
MICHIGAN	164	95.9	99	94.3	228	91.6	125	89.9	48	84.2
OTHER	<u>7</u>	<u>4.1</u>	<u>6</u>	<u>5.7</u>	<u>21</u>	<u>8.4</u>	<u>14</u>	<u>10.1</u>	<u>9</u>	<u>15.8</u>
TOTAL	171	100.0	105	100.0	249	100.0	139	100.0	57	100.0

#### APPENDIX T (TABLES)

Trout fishing regulation variable related to  
segmentation bases for stream trout anglers --  
Au Sable River and Michigan stream trout anglers

Table 1. Opinions related to fishing regulations  
analyzed by fly-fishing specialization levels.

OPINION SCORE			
2 = STRONGLY AGREE			
1 = AGREE			
0 = UNDECIDED			
-1 = DISAGREE			
-2 = STRONGLY DISAGREE			
FLY-FISHING SPECIALIZATION	MEAN OPINION SCORE	STD DEV	NUMBER
OPINION: Trout fishing regulations are overly protective and should be relaxed some.			
LEVEL 1	-0.7	1.04	128
LEVEL 2	-0.9	0.84	91
LEVEL 3	-0.8	1.07	19
LEVEL 4	-1.1	0.98	70
LEVEL 5	<u>-1.3</u>	<u>0.77</u>	<u>95</u>
Mean	-1.0	0.95	403
[F=8.1064, DF=4/398, P<.0001, ETA SQUARED=.075] [X <sup>2</sup> =34.2666, P<.0001] <sup>1</sup> [R <sup>2</sup> =.072, 2-TAILED SIGN.<.0001] <sup>2</sup>			
OPINION: Each stream or local area should have its own set of trout fishing regulations which is best suited for that particular stream or area.			
LEVEL 1	-0.2	1.33	127
LEVEL 2	0.2	1.27	92
LEVEL 3	-0.1	1.37	19
LEVEL 4	0.5	1.28	70
LEVEL 5	<u>0.8</u>	<u>1.30</u>	<u>96</u>
Mean	0.2	1.30	404
[F=7.8321, DF=4/399, P<.0001, ETA SQUARED=.073] [X <sup>2</sup> =31.0490, P<.0001] [R <sup>2</sup> =.067, 2-TAILED SIGN.<.0001]			

Table 1. Continued.

FLY-FISHING SPECIALIZATION	MEAN OPINION SCORE	STD DEV	NUMBER
OPINION: Fishing regulations detract from my trout fishing experience.			
LEVEL 1	-0.9	0.95	128
LEVEL 2	-0.9	0.91	92
LEVEL 3	-1.2	0.69	19
LEVEL 4	-1.3	0.83	70
LEVEL 5	<u>-1.4</u>	<u>0.87</u>	<u>96</u>
Mean	-1.1	0.89	405
[F=6.9946, DF=4/400, P<.0001, ETA SQUARED=.065] [X <sup>2</sup> =35.5992, P<.0001] [R <sup>2</sup> =.065, 2-TAILED SIGN.<.0001]			

OPINION: Competing with my trout fishing companions is an important part of my trout fishing experience.			
LEVEL 1	-0.4	1.26	128
LEVEL 2	-0.4	1.26	92
LEVEL 3	-0.5	1.43	19
LEVEL 4	-1.0	0.99	70
LEVEL 5	<u>-1.1</u>	<u>0.94</u>	<u>97</u>
Mean	-0.7	1.16	406
[F=6.7841, DF=4/401, P<.0001, ETA SQUARED=.063] [X <sup>2</sup> =23.1900, P=.0001] [R <sup>2</sup> =.057, 2-TAILED SIGN.<.0001]			

OPINION: Trout fishing regulations are not enforced adequately.			
LEVEL 1	0.0	1.06	128
LEVEL 2	0.1	1.04	92
LEVEL 3	0.5	1.07	19
LEVEL 4	0.4	1.16	70
LEVEL 5	<u>0.7</u>	<u>0.94</u>	<u>96</u>
Mean	0.3	1.05	405
[F=6.4584, DF=4/400, P<.0001, ETA SQUARED=.061] [X <sup>2</sup> =25.4857, P<.0001] [R <sup>2</sup> =.056, 2-TAILED SIGN.<.0001]			

Table 1. Continued.

FLY-FISHING SPECIALIZATION	MEAN OPINION SCORE	STD DEV	NUMBER
OPINION: DNR Law Enforcement is too strict in its enforcement of trout fishing regulations.			
LEVEL 1	-0.9	0.84	128
LEVEL 2	-1.0	0.78	92
LEVEL 3	-1.2	0.76	19
LEVEL 4	-1.1	0.73	70
LEVEL 5	<u>-1.3</u>	<u>0.61</u>	<u>97</u>
Mean	-1.1	0.75	406
[F=3.5378, DF=4/401, P=.0075, ETA SQUARED=.034] [X <sup>2</sup> =13.3297, P=.0098] [R <sup>2</sup> =.031, 2-TAILED SIGN.=.0004]			

OPINION: I trust the DNR Fisheries Division to manage the State's trout fisheries resource in a fair and reasonable manner.			
LEVEL 1	0.7	0.88	128
LEVEL 2	0.7	0.94	92
LEVEL 3	0.4	0.90	19
LEVEL 4	0.6	0.98	70
LEVEL 5	<u>0.3</u>	<u>1.03</u>	<u>96</u>
Mean	0.6	0.95	405
[F=3.1388, DF=4/400, P=.0147, ETA SQUARED=.030] [X <sup>2</sup> =13.0633, P=.0110] [R <sup>2</sup> =.019, 2-TAILED SIGN.=.0056]			

OPINION: Most fishing regulations have a sound biological basis.			
LEVEL 1	0.7	0.77	128
LEVEL 2	0.8	0.74	92
LEVEL 3	0.4	0.96	19
LEVEL 4	0.6	0.84	70
LEVEL 5	<u>0.4</u>	<u>0.96</u>	<u>97</u>
Mean	0.6	0.83	406
[F=2.9384, DF=4/401, P=.0205, ETA SQUARED=.029] [X <sup>2</sup> =10.1442, P=.0381] [R <sup>2</sup> =.018, 2-TAILED SIGN.=.0062]			

Table 1. Continued.

FLY-FISHING SPECIALIZATION	MEAN OPINION SCORE	STD DEV	NUMBER
OPINION: It would upset me to be checked by a Conservation Officer while I am trout fishing.			
LEVEL 1	-1.2	0.74	128
LEVEL 2	-1.2	0.89	92
LEVEL 3	-1.4	0.77	19
LEVEL 4	-1.4	0.81	69
LEVEL 5	<u>-1.5</u>	<u>0.81</u>	<u>97</u>
Mean	-1.3	0.81	405

[F=2.2275, DF=4/400, P=.0654, ETA SQUARED=.022]\*

[X<sup>2</sup>=15.1620, P=.0044] [R<sup>2</sup>=.020, 2-TAILED

SIGN.=.0040]

<sup>1</sup>Kruskal-Wallis one-way ANOVA, CHI SQUARE corrected for ties

<sup>2</sup>SIMPLE LINEAR REGRESSION

\*not significant at 0.05 alpha level

Table 2. Trout anglers' opinions about penalties for trout fishing violations analyzed by fly-fishing specialization level.\*

	FLY-FISHING SPECIALIZATION LEVEL				
	1	2	3	4	5
	% (N=128)	% (N=92)	% (N=19)	% (N=70)	% (N=97)
OPINION: Penalties for trout fishing violations should be:					
INCREASED	28.9	27.2	21.1	41.4	54.6
THE SAME	46.1	44.6	47.4	31.4	26.8
DECREASED	10.2	7.6	5.3	1.4	0.0
NO OPINION	<u>14.8</u>	<u>20.7</u>	<u>26.3</u>	<u>25.7</u>	<u>18.6</u>
Total	100.0	100.1	100.1	99.9	100.0

\*CHI-SQUARE=38.99458, DF=12, P=.0001

Table 3. Opinions related to fishing regulations analyzed by non-consumptive orientation level.

OPINION SCORE			
2 = STRONGLY AGREE			
1 = AGREE			
0 = UNDECIDED			
-1 = DISAGREE			
-2 = STRONGLY DISAGREE			
NON-CONSUMPTIVE ORIENTATION	MEAN OPINION SCORE	STD DEV	NUMBER
OPINION: Trout fishing regulations are overly protective and should be relaxed some.			
LEVEL 1	-0.4	1.15	77
LEVEL 2	-0.6	0.92	47
LEVEL 3	-0.9	0.87	107
LEVEL 4	-1.2	0.89	88
LEVEL 5	<u>-1.5</u>	<u>0.55</u>	<u>84</u>
Mean	-1.0	0.88	403
[F=17.9136, DF=4/398, P<.0001, ETA SQUARED=.153] [X <sup>2</sup> =62.7782, P<.0001] <sup>1</sup> [R <sup>2</sup> =.151, 2-TAILED SIGN.<.0001] <sup>2</sup>			
OPINION: Fishing regulations detract from my trout fishing experience.			
LEVEL 1	-0.7	1.10	77
LEVEL 2	-0.8	0.94	47
LEVEL 3	-1.0	0.88	109
LEVEL 4	-1.3	0.74	87
LEVEL 5	<u>-1.6</u>	<u>0.62</u>	<u>85</u>
Mean	-1.1	0.86	405
[F=15.2644, DF=4/400, P<.0001, ETA SQUARED=.132] [X <sup>2</sup> =37.2321, P<.0001] [R <sup>2</sup> =.128, 2-TAILED SIGN.<.0001]			
OPINION: Competing with my trout fishing companions is an important part of my trout fishing experience.			
LEVEL 1	-0.5	1.22	78
LEVEL 2	-0.0	1.27	47
LEVEL 3	-0.6	1.11	108
LEVEL 4	-0.9	1.14	88
LEVEL 5	<u>-1.1</u>	<u>1.06</u>	<u>85</u>
Mean	-0.7	1.15	406
[F=7.7565, DF=4/401, P<.0001, ETA SQUARED=.072] [X <sup>2</sup> =37.3848, P=.0001] [R <sup>2</sup> =.051, 2-TAILED SIGN.<.0001]			



Table 3. Continued.

NON-CONSUMPTIVE MEAN OPINION			
ORIENTATION	SCORE	STD DEV	NUMBER
OPINION: Trout fishing regulations are not enforced adequately.			
LEVEL 1	0.0	1.17	78
LEVEL 2	-0.2	0.96	47
LEVEL 3	0.3	0.99	107
LEVEL 4	0.4	1.13	88
LEVEL 5	<u>0.7</u>	<u>0.97</u>	<u>85</u>
Mean	0.3	1.05	405

[F=6.9077, DF=4/400, P<.0001, ETA SQUARED=.065]  
[X<sup>2</sup>=26.9163, P<.0001] [R<sup>2</sup>=.055, 2-TAILED  
SIGN.<.0001]

OPINION: It would upset me to be checked by a Conservation Officer while I am trout fishing.			
LEVEL 1	-1.1	0.78	78
LEVEL 2	-1.2	0.84	46
LEVEL 3	-1.3	0.84	108
LEVEL 4	-1.4	0.93	88
LEVEL 5	<u>-1.6</u>	<u>0.55</u>	<u>85</u>
Mean	-1.3	0.80	405
[F=5.1907, DF=4/400, P=.0004, ETA SQUARED=.049]			
[X <sup>2</sup> =26.5017, P<.0001] [R <sup>2</sup> =.044, 2-TAILED]			
SIGN.<.0001]			

OPINION: DNR Law Enforcement is too strict in its enforcement of trout fishing regulations.			
LEVEL 1	-0.9	0.90	78
LEVEL 2	-0.9	0.67	47
LEVEL 3	-1.0	0.68	108
LEVEL 4	-1.1	0.77	88
LEVEL 5	<u>-1.4</u>	<u>0.69</u>	<u>85</u>
Mean	-1.1	0.75	406
[F=5.1228, DF=4/401, P=.0005, ETA SQUARED=.049]			
[X <sup>2</sup> =23.4706, P=.0001] [R <sup>2</sup> =.043, 2-TAILED]			
SIGN.<.0001]			

Table 3. Continued.

NON-CONSUMPTIVE ORIENTATION	MEAN OPINION SCORE	STD DEV	NUMBER
OPINION: Each stream or local area should have its own set of trout fishing regulations which is best suited for that particular stream or area.			
LEVEL 1	0.1	1.38	78
LEVEL 2	-0.1	1.26	47
LEVEL 3	0.1	1.32	107
LEVEL 4	0.4	1.34	87
LEVEL 5	<u>0.6</u>	<u>1.31</u>	<u>85</u>
Mean	0.2	1.30	404
[F=3.4319, DF=4/399, P=.0090, ETA SQUARED=.033] [X <sup>2</sup> =14.5805, P=.0057] [R <sup>2</sup> =.021, 2-TAILED SIGN.=.0032]			

OPINION: Most trout fishing violations occur because anglers do not know the regulations, not because anglers deliberately break the laws.			
LEVEL 1	-0.2	1.24	78
LEVEL 2	-0.1	1.06	47
LEVEL 3	-0.5	1.07	108
LEVEL 4	-0.5	1.04	87
LEVEL 5	<u>-0.7</u>	<u>0.98</u>	<u>85</u>
Mean	-0.4	1.08	405
[F=3.1152, DF=4/400, P=.0152, ETA SQUARED=.030] [X <sup>2</sup> =11.5690, P=.0209] [R <sup>2</sup> =.024, 2-TAILED SIGN.=.0020]			

OPINION: Conservation Officers are usually fair in their treatment of anglers.			
LEVEL 1	0.8	0.86	78
LEVEL 2	0.7	0.64	47
LEVEL 3	0.7	0.82	108
LEVEL 4	0.8	0.84	87
LEVEL 5	<u>1.1</u>	<u>0.70</u>	<u>85</u>
Mean	0.8	0.79	405
[F=2.8697, DF=4/400, P=.0229, ETA SQUARED=.028] [X <sup>2</sup> =12.7269, P=.0127] [R <sup>2</sup> =.011, 2-TAILED SIGN.=.0324]			

<sup>1</sup>Kruskal-Wallis one-way ANOVA, CHI SQUARE corrected for ties  
<sup>2</sup>SIMPLE LINEAR REGRESSION

Table 4. Trout anglers' opinions about penalties for trout fishing violations analyzed by non-consumptive orientation level.\*

	NON-CONSUMPTIVE ORIENTATIONS LEVEL				
	1	2	3	4	5
	% (N=79)	% (N=47)	% (N=108)	% (N=88)	% (N=84)
OPINION: Penalties for trout fishing violations should be:					
INCREASED	22.8	23.4	30.6	44.3	54.8
THE SAME	39.2	57.4	41.7	37.5	26.2
DECREASED	16.5	4.3	3.7	3.4	0.0
NO OPINION	<u>21.5</u>	<u>14.9</u>	<u>24.1</u>	<u>14.8</u>	<u>19.0</u>
Total	100.0	100.0	100.1	100.0	100.0

\*CHI-SQUARE=51.02684, DF=12, P<.0001

Table 5. Opinions related to fishing regulations analyzed by trout fishing intensity levels.

OPINION SCORE			
2 = STRONGLY AGREE			
1 = AGREE			
0 = UNDECIDED			
-1 = DISAGREE			
-2 = STRONGLY DISAGREE			
TROUT FISHING INTENSITY	MEAN OPINION SCORE	STD DEV	NUMBER
OPINION: Trout fishing regulations are overly protective and should be relaxed some.			
LEVEL 1	-0.7	1.02	166
LEVEL 2	-0.9	0.98	64
LEVEL 3	-1.0	0.88	66
LEVEL 4	-1.2	0.79	54
LEVEL 5	<u>-1.4</u>	<u>0.77</u>	<u>54</u>
Mean	-1.0	0.93	404
[F=6.6418, DF=4/399, P<.0001, ETA SQUARED=.062]			
[X <sup>2</sup> =28.0201, P<.0001] <sup>1</sup> [R <sup>2</sup> =.062, 2-TAILED			
SIGN.<.0001] <sup>2</sup>			

Table 5. Continued.

TROUT FISHING INTENSITY	MEAN OPINION SCORE	STD DEV	NUMBER
OPINION: Competing with my trout fishing companions is an important part of my trout fishing experience.			
LEVEL 1	-0.5	1.27	166
LEVEL 2	-0.4	1.23	64
LEVEL 3	-0.8	1.05	68
LEVEL 4	-1.1	1.01	54
LEVEL 5	<u>-1.1</u>	<u>0.93</u>	<u>55</u>
Mean	-0.7	1.15	407
[F=6.4248, DF=4/402, P=.0001, ETA SQUARED=.060] [X <sup>2</sup> =24.2340, P=.0001] [R <sup>2</sup> =.052, 2-TAILED SIGN.<.0001]			
OPINION: Fishing regulations detract from my trout fishing experience.			
LEVEL 1	-0.8	1.00	165
LEVEL 2	-1.1	0.82	64
LEVEL 3	-1.2	0.71	68
LEVEL 4	-1.4	0.87	54
LEVEL 5	<u>-1.4</u>	<u>0.87</u>	<u>55</u>
Mean	-1.1	0.90	406
[F=6.2601, DF=4/401, P=.0001, ETA SQUARED=.059] [X <sup>2</sup> =27.5159, P<.0001] [R <sup>2</sup> =.055, 2-TAILED SIGN.<.0001]			
OPINION: Trout fishing regulations are not enforced adequately.			
LEVEL 1	0.0	0.99	166
LEVEL 2	0.3	1.18	64
LEVEL 3	0.4	1.05	68
LEVEL 4	0.5	1.13	54
LEVEL 5	<u>0.7</u>	<u>1.06</u>	<u>54</u>
Mean	0.3	1.06	406
[F=4.9580, DF=4/401, P=.0007, ETA SQUARED=.047] [X <sup>2</sup> =19.5140, P=.0006] [R <sup>2</sup> =.046, 2-TAILED SIGN.<.0001]			

Table 5. Continued.

TROUT FISHING INTENSITY	MEAN OPINION SCORE	STD DEV	NUMBER
OPINION: DNR Law Enforcement is too strict in its enforcement of trout fishing regulations.			
LEVEL 1	-0.9	0.81	166
LEVEL 2	-1.1	0.71	64
LEVEL 3	-1.1	0.65	68
LEVEL 4	-1.2	0.75	54
LEVEL 5	<u>-1.3</u>	<u>0.72</u>	<u>55</u>
Mean	-1.1	0.75	407

[F=4.2104, DF=4/402, P=.0024, ETA SQUARED=.040]

[X<sup>2</sup>=17.8071, P=.0013] [R<sup>2</sup>=.038, 2-TAILED

SIGN=.0001]

OPINION: Each stream or local area should have its own set of trout fishing regulations which is best suited for that particular stream or area.

LEVEL 1	0.0	1.32	165
LEVEL 2	0.3	1.32	63
LEVEL 3	0.3	1.29	68
LEVEL 4	0.6	1.34	54
LEVEL 5	<u>0.6</u>	<u>1.40</u>	<u>55</u>
Mean	0.2	1.33	405

[F=3.7231, DF=4/400, P=.0055, ETA SQUARED=.036]

[X<sup>2</sup>=15.6021, P=.0036] [R<sup>2</sup>=.033, 2-TAILED

SIGN=.0002]

OPINION: Conservation Officers are usually fair in their treatment of anglers.

LEVEL 1	0.7	0.79	166
LEVEL 2	0.8	0.90	64
LEVEL 3	0.8	0.85	68
LEVEL 4	0.9	0.61	53
LEVEL 5	<u>1.1</u>	<u>0.74</u>	<u>55</u>
Mean	0.8	0.79	406

[F=2.9110, DF=4/401, P=.0214, ETA SQUARED=.028]

[X<sup>2</sup>=12.7968, P=.0123] [R<sup>2</sup>=.025, 2-TAILED

SIGN=.0013]

Table 5. Continued.

TROUT FISHING INTENSITY	MEAN OPINION SCORE	STD DEV	NUMBER
OPINION: It would upset me to be checked by a Conservation Officer while I am trout fishing.			
LEVEL 1	-1.2	0.74	166
LEVEL 2	-1.3	0.93	64
LEVEL 3	-1.4	0.93	68
LEVEL 4	-1.5	0.80	53
LEVEL 5	<u>-1.6</u>	<u>0.71</u>	<u>55</u>
Mean	-1.3	0.81	406

[F=2.6681, DF=4/401, P=.0320, ETA SQUARED=.026]

[X<sup>2</sup>=18.5100, P=.0010] [R<sup>2</sup>=.025, 2-TAILED

SIGN=.0013]

<sup>1</sup>Kruskal-Wallis one-way ANOVA, CHI SQUARE corrected for ties  
<sup>2</sup>SIMPLE LINEAR REGRESSION

Table 6. Trout anglers' opinions about penalties for trout fishing violations analyzed by trout fishing intensity level.\*

	TROUT FISHING INTENSITY LEVEL				
	1	2	3	4	5
	%	%	%	%	%
	(N=167)	(N=64)	(N=67)	(N=54)	(N=55)
OPINION: Penalties for trout fishing violations should be:					
INCREASED	24.6	40.6	37.3	46.3	56.4
THE SAME	46.7	39.1	35.8	27.8	29.1
DECREASED	9.0	4.7	3.0	1.9	1.8
NO OPINION	<u>19.8</u>	<u>15.6</u>	<u>23.9</u>	<u>24.1</u>	<u>12.7</u>
Total	100.1	99.9	100.0	100.1	100.0

\*CHI-SQUARE=30.48227, DF=12, P=.0024

#### APPENDIX U (TABLES)

Changes in trout fishing attitudes and practices  
related to fly-fishing specialization, non-consumptive  
orientation and trout fishing intensity

Table 1. Changes in attitudes and practices (since they first started trout fishing) self reported by anglers which were not related to fly-fishing specialization.

	SCALE				
	1 DECREASED	2	3 STAYED THE SAME	4	5 INCREASED
VARIABLES			MEAN	STD DEV	NUMBER
NUMBER OF DAYS YOU FISH EACH SEASON			2.8	1.35	483
USE OF VACATION TIME FOR TROUT FISHING			3.1	1.14	472
INTEREST IN CATCHING LARGER (TROPHY) TROUT			3.2	1.08	478
TENDENCY TO SPECIALIZE FOR CERTAIN SPECIES			3.3	0.93	457
TROUT FISHING WITH A PARTNER			3.3	0.99	475
TROUT FISHING WITH FAMILY			3.3	1.01	456
DISTANCE TRAVELED TO FISH TROUT			3.4	1.05	489
DESIRE TO TRY NEW EQUIPMENT, TECHNIQUES, AND METHODS			3.6	1.05	467
DESIRE TO FISH NEW HABITAT AND WATERS			3.7	1.01	471
DESIRE TO FIND SOLITUDE IN FISHING			3.9	0.92	475
ENJOYMENT OF NATURE WHILE FISHING			4.1	0.85	491

Table 2. Changes in attitudes and practices (since they first started trout fishing) self reported by anglers analyzed by fly-fishing specialization.

	SCALE				
	1 DECREASED	2	3 STAYED THE SAME	4	5 INCREASED
VARIABLES			MEAN	STD DEV	NUMBER
FLY-FISHING SPECIALIZATION LEVEL					
FLY FISHING:	1		2.1	1.13	104
	2		3.0	1.09	179
	3		3.9	0.94	19
	4		3.9	1.13	28
	5		4.1	1.10	19

[F=30.367, DF=4/344, P<.0001, ETA SQUARED=.261]

[X<sup>2</sup>=89.0298, P<.0001]<sup>1</sup>

[R<sup>2</sup>=.228, 2-TAILED SIGN.<.0001]<sup>2</sup>



Table 2. Continued.

VARIABLES	FLY-FISHING SPECIALIZATION LEVEL	MEAN	STD DEV	NUMBER
<u>BAIT FISHING:</u>	1	3.3	0.89	212
	2	3.1	1.04	176
	3	3.4	1.27	17
	4	2.0	1.02	22
	5	1.4	0.81	11

[F=19.142, DF=4/433, P<.0001, ETA SQUARED=.150]

[X<sup>2</sup>=54.8113, P<.0001]

[R<sup>2</sup>=.118, 2-TAILED SIGN.<.0001]

<u>SPINNER FISHING:</u>	1	3.5	1.03	197
	2	3.4	0.96	178
	3	3.3	1.31	17
	4	2.5	1.07	19
	5	1.4	0.84	10

[F=14.526, DF=4/416, P<.0001, ETA SQUARED=.123]

[X<sup>2</sup>=37.5958, P<.0001]

[R<sup>2</sup>=.089, 2-TAILED SIGN.<.0001]

INTEREST IN LIMITING OUT:

1	3.0	1.02	211
2	2.6	0.98	184
3	2.8	1.34	19
4	2.2	1.13	28
5	2.2	1.08	19

[F=7.809, DF=4/456, P<.0001, ETA SQUARED=.064]

[X<sup>2</sup>=26.8970, P<.0001]

[R<sup>2</sup>=.051, 2-TAILED SIGN.<.0001]

OFF SEASON ACTIVITIES (TYING FLIES, CONSTRUCTING RODS, ETC.):

1	2.5	1.19	145
2	2.6	1.02	138
3	3.1	1.11	18
4	3.1	1.01	23
5	3.6	1.33	17

[F=5.015, DF=4/336, P=.0006, ETA SQUARED=.056]

[X<sup>2</sup>=17.6221, P=.0015]

[R<sup>2</sup>=.049, 2-TAILED SIGN.<.0001]

Table 2. Continued.

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FLY-FISHING				
VARIABLES	SPECIALIZATION LEVEL	MEAN	STD DEV	NUMBER
<u>INTEREST IN CATCH-AND-RELEASE:</u>				
	1	2.7	1.12	187
	2	2.7	1.11	173
	3	2.9	1.20	19
	4	3.5	1.37	28
	5	3.5	1.39	19

---

[F=5.444, DF=4/421, P=.0003, ETA SQUARED=.049]

[X<sup>2</sup>=17.9129, P=.0013][R<sup>2</sup>=.042, 2-TAILED SIGN.<.0001]HANDICAPPING (LIGHT LINE, ROD, ETC.):


---

1	3.4	1.08	185
2	3.6	1.03	178
3	4.2	1.00	18
4	3.7	0.99	27
5	4.1	0.80	18

---

[F=5.049, DF=4/421, P=.0006, ETA SQUARED=.046]

[X<sup>2</sup>=18.8203, P=.0009][R<sup>2</sup>=.032, 2-TAILED SIGN.=.0002]INTEREST IN CATCHING TROUT TO EAT:


---

1	3.2	1.05	218
2	3.1	1.00	195
3	3.3	1.16	19
4	2.6	1.15	19
5	2.2	1.08	19

---

[F=5.361, DF=4/475, P=.0003, ETA SQUARED=.043]

[X<sup>2</sup>=19.6847, P=.0006][R<sup>2</sup>=.042, 2-TAILED SIGN.<.0001]IMPORTANCE OF FISHING METHOD:


---

1	3.5	0.98	205
2	3.5	0.91	187
3	4.0	1.00	20
4	3.9	0.82	29
5	4.1	0.76	18

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[F=3.716, DF=4/454, P=.0055, ETA SQUARED=.032]

[X<sup>2</sup>=17.1633, P=.0018][R<sup>2</sup>=.023, 2-TAILED SIGN.=.0012]

Table 2. Continued.

FLY-FISHING				
VARIABLES	SPECIALIZATION LEVEL	MEAN	STD DEV	NUMBER
<u>INTEREST IN LEARNING ABOUT TROUT HABITAT, FOOD, ETC.:</u>				
	1	3.6	1.01	213
	2	3.8	0.91	190
	3	4.2	0.79	19
	4	4.1	0.93	26
	5	4.2	0.86	18

[F=3.400, DF=4/461, P=.0093, ETA SQUARED=.029]

[X<sup>2</sup>=12.0495, P=.0170]

[R<sup>2</sup>=.025, 2-TAILED SIGN.=.0006]

NUMBER OF FISHING AREAS USED:

1	3.3	1.06	215
2	3.5	1.07	191
3	3.8	1.03	19
4	3.7	1.00	29
5	4.1	0.74	19

[F=3.336, DF=4/468, P=.0104, ETA SQUARED=.028]

[X<sup>2</sup>=14.1135, P=.0069]

[R<sup>2</sup>=.026, 2-TAILED SIGN.=.0005]

MONEY SPENT ON TROUT FISHING:

1	3.4	1.14	224
2	3.5	1.16	194
3	4.3	0.93	19
4	3.7	0.97	29
5	3.7	1.37	19

[F=3.152, DF=4/480, P=.0142, ETA SQUARED=.027]

[X<sup>2</sup>=18.8203, P=.0009]

[R<sup>2</sup>=.013, 2-TAILED SIGN.=.0127]

CONFIDENCE IN CATCHING TROUT: [F=3.084, DF=4/483, P=.0159, ETA SQUARED=.025]

1	3.4	1.05	227
2	3.5	1.15	193
3	3.7	1.03	20
4	4.1	0.80	29
5	3.9	1.13	19

[F=3.084, DF=4/483, P=.0159, ETA SQUARED=.025]

[X<sup>2</sup>=12.9966, P=.0113]

[R<sup>2</sup>=.019, 2-TAILED SIGN.=.0020]

<sup>1</sup>Kruskal-Wallis one-way ANOVA, CHI-SQUARE corrected for ties.

<sup>2</sup>SIMPLE LINEAR REGRESSION

Table 3. Changes in attitudes and practices (since they first started trout fishing) self reported by anglers which were not related to non-consumptive orientation.

SCALE					
1	2	3	4	5	
DECREASED		STAYED		INCREASED	
THE SAME					
VARIABLES			MEAN	STD DEV	NUMBER
OFF SEASON ACTIVITIES (TYING FLIES, CONSTRUCTING RODS, ETC.)			2.7	1.13	343
NUMBER OF DAYS YOU FISH EACH SEASON			2.8	1.37	485
FLY FISHING			2.9	1.27	351
USE OF VACATION TIME FOR TROUT FISHING			3.1	1.14	474
INTEREST IN CATCHING TROPHY TROUT			3.2	1.08	480
TROUT FISHING WITH A PARTNER			3.3	1.00	477
TROUT FISHING WITH FAMILY			3.3	1.01	458
TENDENCY TO SPECIALIZE FOR CERTAIN SPECIES			3.3	0.92	459
DISTANCE TRAVELED TO FISH			3.4	1.05	491
SPINNER FISHING (LURES)			3.4	1.08	423
MONEY SPENT ON TROUT FISHING			3.5	1.15	487
NUMBER OF FISHING AREAS USED			3.5	1.07	475
DESIRE TO TRY NEW EQUIPMENT, TECHNIQUES, AND METHODS			3.6	1.05	469
IMPORTANCE OF FISHING METHOD			3.6	0.95	461
HANDICAPPING (LIGHT LINE, ROD, ETC.)			3.6	1.06	428
DESIRE TO FISH NEW HABITATS AND WATERS			3.7	1.00	473
INTEREST IN LEARNING ABOUT TROUT HABITAT, FOOD, ETC.			3.8	0.96	468
DESIRE TO FIND SOLITUDE IN FISHING			3.9	0.91	477
ENJOYMENT OF NATURE WHILE FISHING			4.1	0.85	493

Table 4. Changes in attitudes and practices (since they first started trout fishing) self reported by anglers analyzed by non-consumptive orientation.

SCALE					
1	2	3	4	5	
DECREASED		STAYED		INCREASED	
THE SAME					
NON-CONSUMPTIVE					
VARIABLES	ORIENTATION LEVEL		MEAN	STD DEV	NUMBER
<u>INTEREST IN CATCHING TROUT TO EAT:</u>					
	1		3.8	1.05	114
	2		3.4	0.78	68
	3		3.0	0.82	171
	4		2.4	0.91	93
	5		2.0	1.00	36
[F=45.196, DF=4/477, P<.0001, ETA SQUARED=.275] [X <sup>2</sup> =128.3579, P<.0001] <sup>1</sup> [R <sup>2</sup> =.271, 2-TAILED SIGN.<.0001] <sup>2</sup>					
<u>INTEREST IN CATCH-AND-RELEASE:</u>					
	1		2.3	1.08	105
	2		2.7	0.96	60
	3		2.7	1.09	141
	4		3.2	1.18	86
	5		3.7	1.28	36
[F=14.399, DF=4/423, P<.0001, ETA SQUARED=.120] [X <sup>2</sup> =48.8617, P<.0001] [R <sup>2</sup> =.111, 2-TAILED SIGN.<.0001]					
<u>INTEREST IN LIMITING OUT:</u>					
	1		3.1	1.11	107
	2		3.1	0.98	65
	3		2.7	0.95	163
	4		2.3	0.97	92
	5		2.4	1.20	36
[F=11.076, DF=4/458, P<.0001, ETA SQUARED=.088] [X <sup>2</sup> =41.3640, P<.0001] [R <sup>2</sup> =.081, 2-TAILED SIGN.<.0001]					

Table 4. Continued.

NON-CONSUMPTIVE				
VARIABLES	ORIENTATION LEVEL	MEAN	STD DEV	NUMBER
<u>BAIT FISHING:</u>	1	3.4	1.08	109
	2	3.2	0.99	62
	3	3.1	0.95	155
	4	3.0	1.07	82
	5	2.5	1.16	32

[F=5.754, DF=4/435, P=.0002, ETA SQUARED=.050]

[X<sup>2</sup>=18.2939, P=.0011][R<sup>2</sup>=.045, 2-TAILED SIGN.<.0001]CONFIDENCE IN CATCHING TROUT:

1	3.5	1.11	115
2	3.4	1.13	67
3	3.4	1.05	173
4	3.6	1.16	97
5	4.0	1.04	38

[F=2.692, DF=4/485, P=.0305, ETA SQUARED=.022]

[X<sup>2</sup>=11.8698, P=.0187] [R<sup>2</sup>=.011, 2-TAILED SIGN.=.0217]<sup>1</sup>Kruskal-Wallis one-way ANOVA, CHI-SQUARE corrected for ties.<sup>2</sup>SIMPLE LINEAR REGRESSIONTable 5. Changes in attitudes and practices (since they first started trout fishing) self reported by anglers which were not related to trout fishing intensity.

VARIABLES	SCALE					MEAN	STD DEV	NUMBER
	1 DECREASED	2	3 STAYED THE SAME	4	5 INCREASED			
OFF SEASON ACTIVITIES (TYING FLIES, CONSTRUCTING RODS, ETC.)						2.7	1.14	343
INTEREST IN CATCH AND RELEASE						2.8	1.18	428
INTEREST IN LIMITING OUT						2.8	1.07	463
INTEREST IN CATCHING TROUT TO EAT						3.1	1.06	482
BAIT FISHING						3.1	1.05	440
TROUT FISHING WITH A PARTNER						3.3	0.99	477
TROUT FISHING WITH FAMILY						3.3	1.01	458
TENDENCY TO SPECIALIZE FOR CERTAIN SPECIES						3.3	0.93	459
SPINNER FISHING (LURES)						3.4	1.08	423
DESIRE TO FIND SOLITUDE IN FISHING						3.9	0.91	477

Table 6. Changes in attitudes and practices (since they first started trout fishing) self reported by anglers analyzed by trout fishing intensity.

SCALE				
1	2	3	4	5
DECREASED		STAYED THE SAME		INCREASED
VARIABLES	TROUT FISHING INTENSITY LEVEL	MEAN	STD DEV	NUMBER
<u>INTEREST IN LEARNING ABOUT TROUT HABITAT, FOOD, ETC.:</u>				
	1	3.5	0.97	256
	2	4.0	0.86	100
	3	4.0	0.92	61
	4	4.2	0.83	40
	5	4.4	0.81	11
[F=9.469, DF=4/463, P<.0001, ETA SQUARED=.076] [X <sup>2</sup> =36.1197, P<.0001] <sup>1</sup> [R <sup>2</sup> =.064, 2-TAILED SIGN.<.0001] <sup>2</sup>				
<u>NUMBER OF DAYS YOU FISH EACH SEASON:</u>				
	1	2.6	1.30	264
	2	3.0	1.41	104
	3	2.9	1.31	65
	4	3.6	1.32	41
	5	4.0	1.00	11
[F=8.715, DF=4/480, P<.0001, ETA SQUARED=.068] [X <sup>2</sup> =33.0744, P<.0001] [R <sup>2</sup> =.059, 2-TAILED SIGN.<.0001]				
<u>CONFIDENCE IN CATCHING TROUT:</u>				
	1	3.3	1.03	267
	2	3.8	1.11	104
	3	3.8	1.04	67
	4	4.0	0.97	41
	5	3.8	1.60	11
[F=8.564, DF=4/485, P<.0001, ETA SQUARED=.066] [X <sup>2</sup> =36.2561, P<.0001] [R <sup>2</sup> =.049, 2-TAILED SIGN.<.0001]				

Table 6. Continued.

VARIABLES	TROUT FISHING INTENSITY LEVEL	MEAN	STD DEV	NUMBER
<u>MONEY SPENT ON TROUT FISHING:</u>				
	1	3.3	1.15	266
	2	3.8	1.12	104
	3	3.6	1.06	65
	4	4.0	1.00	41
	5	4.1	1.04	11

[F=8.461, DF=4/482, P&lt;.0001, ETA SQUARED=.066]

[X<sup>2</sup>=33.8973, P<.0001][R<sup>2</sup>=.048, 2-TAILED SIGN.<.0001]NUMBER OF FISHING AREAS USED:

1	3.3	1.05	258
2	3.8	0.93	100
3	3.5	1.17	66
4	4.0	1.05	41
5	3.8	0.79	10

[F=7.049, DF=4/470, P&lt;.0001, ETA SQUARED=.057]

[X<sup>2</sup>=27.5408, P<.0001][R<sup>2</sup>=.035, 2-TAILED SIGN.<.0001]USE OF VACATION TIME FOR TROUT FISHING:

1	2.9	1.07	257
2	3.4	1.12	101
3	3.1	1.30	64
4	3.4	1.11	42
5	3.5	0.99	10

[F=5.439, DF=4/469, P=.0003, ETA SQUARED=.044]

[X<sup>2</sup>=20.6324, P=.0004][R<sup>2</sup>=.025, 2-TAILED SIGN.=.0006]DISTANCE TRAVELED TO FISH:

1	3.3	1.06	266
2	3.7	0.92	102
3	3.5	1.12	69
4	3.9	0.89	42
5	3.3	1.15	12

[F=5.578, DF=4/486, P=.0002, ETA SQUARED=.044]

[X<sup>2</sup>=23.0278, P=.0001][R<sup>2</sup>=.021, 2-TAILED SIGN.=.0011]



Table 6. Continued.

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VARIABLES	TROUT FISHING INTENSITY LEVEL	MEAN	STD DEV	NUMBER
<u>FLY FISHING:</u>	1	2.7	1.19	196
	2	3.1	1.23	68
	3	3.0	1.43	48
	4	3.5	1.43	30
	5	3.7	1.00	9

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[F=3.967, DF=4/346, P=.0037, ETA SQUARED=.044]

[X<sup>2</sup>=15.6636, P=.0035][R<sup>2</sup>=.039, 2-TAILED SIGN.=.0002]INTEREST IN CATCHING LARGER (TROPHY) TROUT:


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1	3.0	1.05	264
2	3.4	1.05	101
3	3.5	1.05	63
4	3.6	1.14	41
5	3.5	1.21	11

---

[F=5.183, DF=4/475, P=.0004, ETA SQUARED=.042]

[X<sup>2</sup>=19.4241, P=.0006][R<sup>2</sup>=.035, 2-TAILED SIGN.<.0001]IMPORTANCE OF FISHING METHOD:


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1	3.4	0.92	251
2	3.8	0.89	98
3	3.7	1.03	61
4	3.8	1.03	41
5	3.6	0.70	10

---

[F=4.788, DF=4/456, P=.0009, ETA SQUARED=.040]

[X<sup>2</sup>=18.6709, P=.0009][R<sup>2</sup>=.021, 2-TAILED SIGN.=.0017]ENJOYMENT OF NATURE WHILE FISHING:


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1	4.0	0.86	268
2	4.3	0.79	103
3	4.2	0.82	69
4	4.5	0.80	42
5	3.9	1.14	11

---

[F=4.207, DF=4/488, P=.0023, ETA SQUARED=.033]

[X<sup>2</sup>=16.7924, P=.0021][R<sup>2</sup>=.015, 2-TAILED SIGN.=.0064]

Table 6. Continued.

TROUT FISHING				
VARIABLES	INTENSITY LEVEL	MEAN	STD DEV	NUMBER
DESIRE TO TRY NEW EQUIPMENT, TECHNIQUES AND METHODS:				
	1	3.5	1.06	257
	2	3.8	0.96	100
	3	3.8	1.11	62
	4	3.9	1.06	40
	5	4.1	0.88	10

[F=3.444, DF=4/464, P=.0087, ETA SQUARED=.029]

[X<sup>2</sup>=13.9440, P=.0075]

[R<sup>2</sup>=.024, 2-TAILED SIGN.=.0009]

HANDICAPPING (LIGHT LINE, ROD, ETC.):

1	3.4	1.06	228
2	3.7	1.00	94
3	3.8	1.06	56
4	3.8	1.09	39
5	3.6	1.03	11

[F=3.083, DF=4/423, P=.0160, ETA SQUARED=.028]

[X<sup>2</sup>=10.6357, P=.0310]

[R<sup>2</sup>=.019, 2-TAILED SIGN.=.0041]

DESIRE TO FISH NEW HABITAT AND WATERS:

1	3.6	1.02	259
2	3.9	0.95	101
3	3.8	1.03	62
4	4.1	1.01	41
5	3.8	0.79	10

[F=3.289, DF=4/468, P=.0113, ETA SQUARED=.027]

[X<sup>2</sup>=13.9825, P=.0074]

[R<sup>2</sup>=.019, 2-TAILED SIGN.=.0030]

<sup>1</sup>Kruskal-Wallis one-way ANOVA, CHI-SQUARE corrected for ties.

<sup>2</sup>SIMPLE LINEAR REGRESSION

APPENDIX V (FIGURES)

Motivations for trout fishing

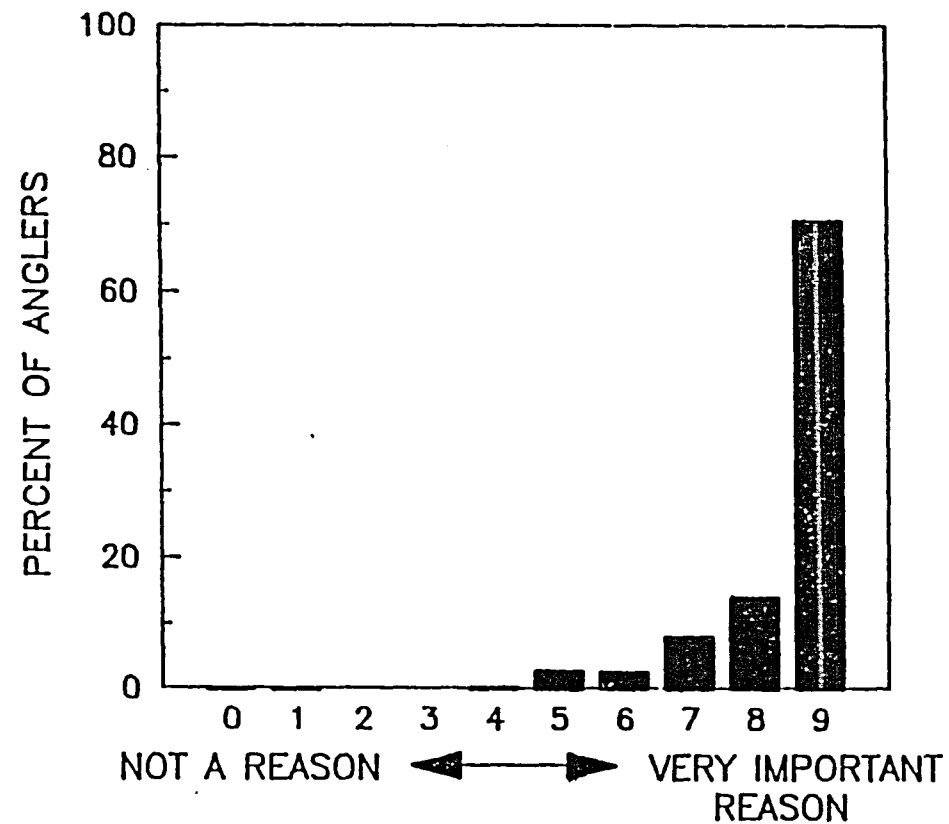


Figure 1. Frequency distribution of the importance rating for the motivation for stream trout fishing, "to enjoy nature", given by Au Sable River anglers.

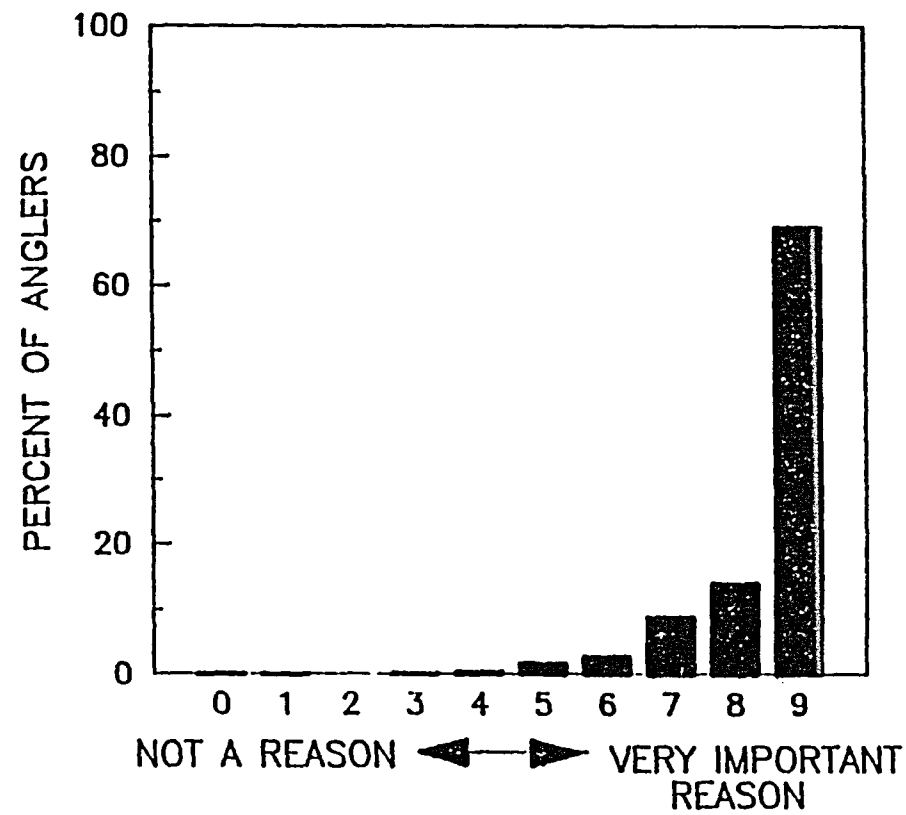


Figure 2. Frequency distribution of the importance rating for the motivation for stream trout fishing, "to get away and relax", given by Au Sable River anglers.

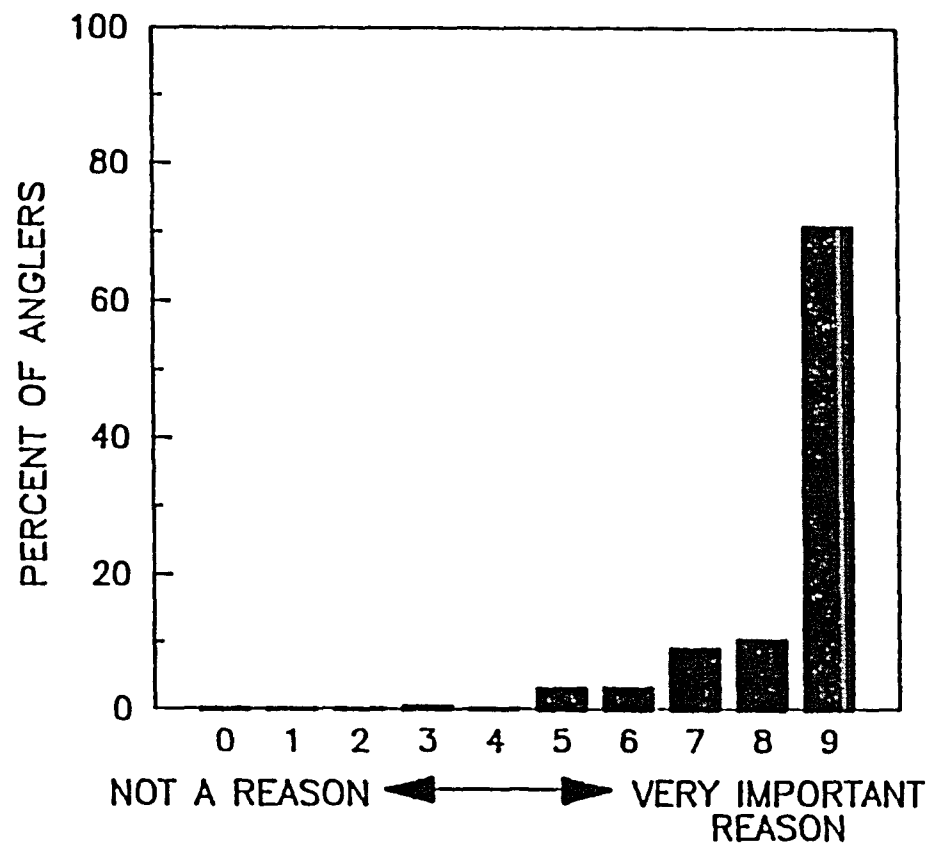


Figure 3. Frequency distribution of the importance rating for the motivation for stream trout fishing, "to catch fish for fun and excitement", given by Au Sable River anglers.

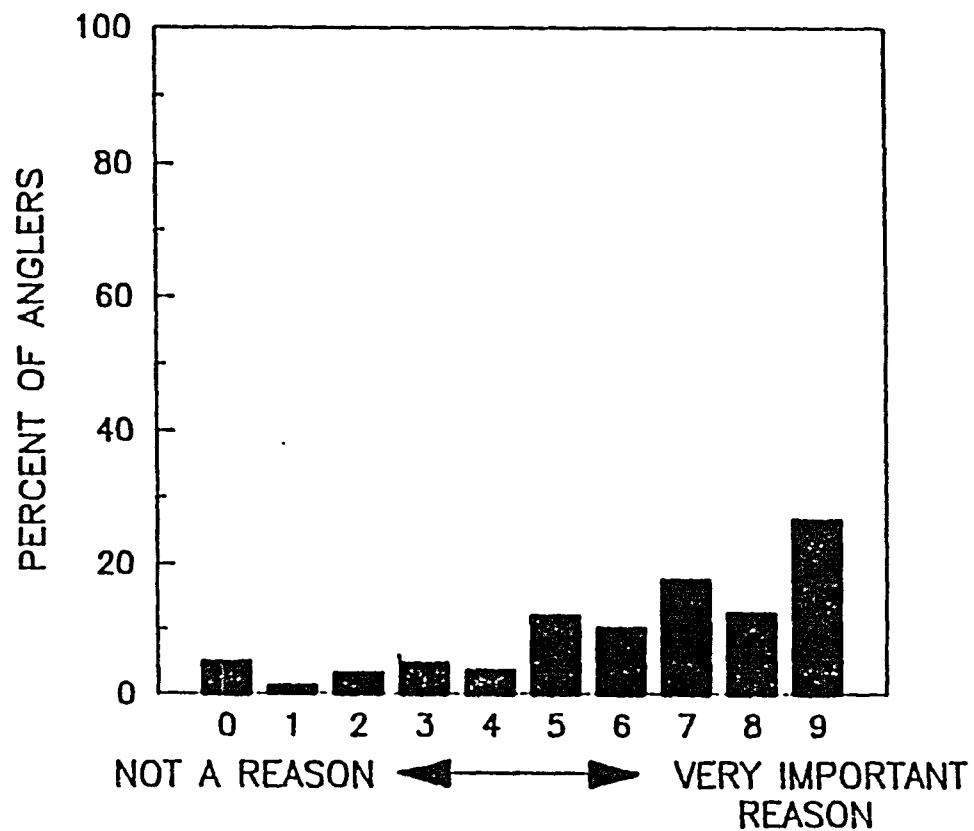


Figure 4. Frequency distribution of the importance rating for the motivation for stream trout fishing, "for companionship", given by Au Sable River anglers.

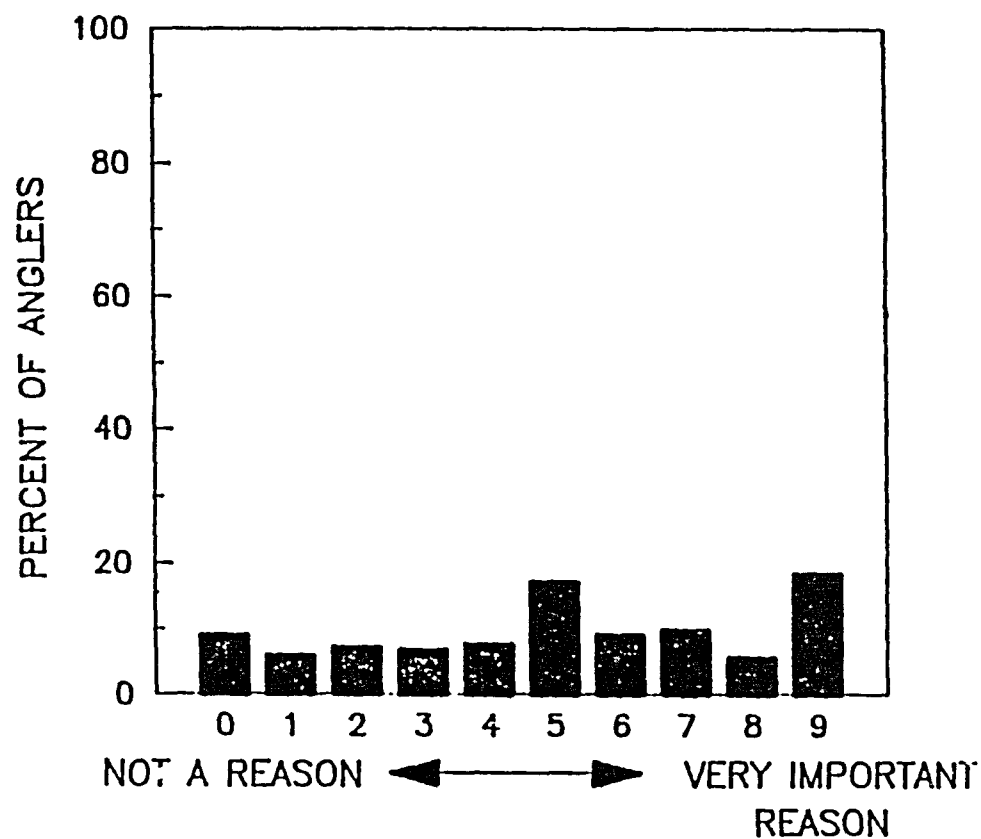


Figure 5. Frequency distribution of the importance rating for the motivation for stream trout fishing, "to enjoy fishing equipment", given by Au Sable River anglers.



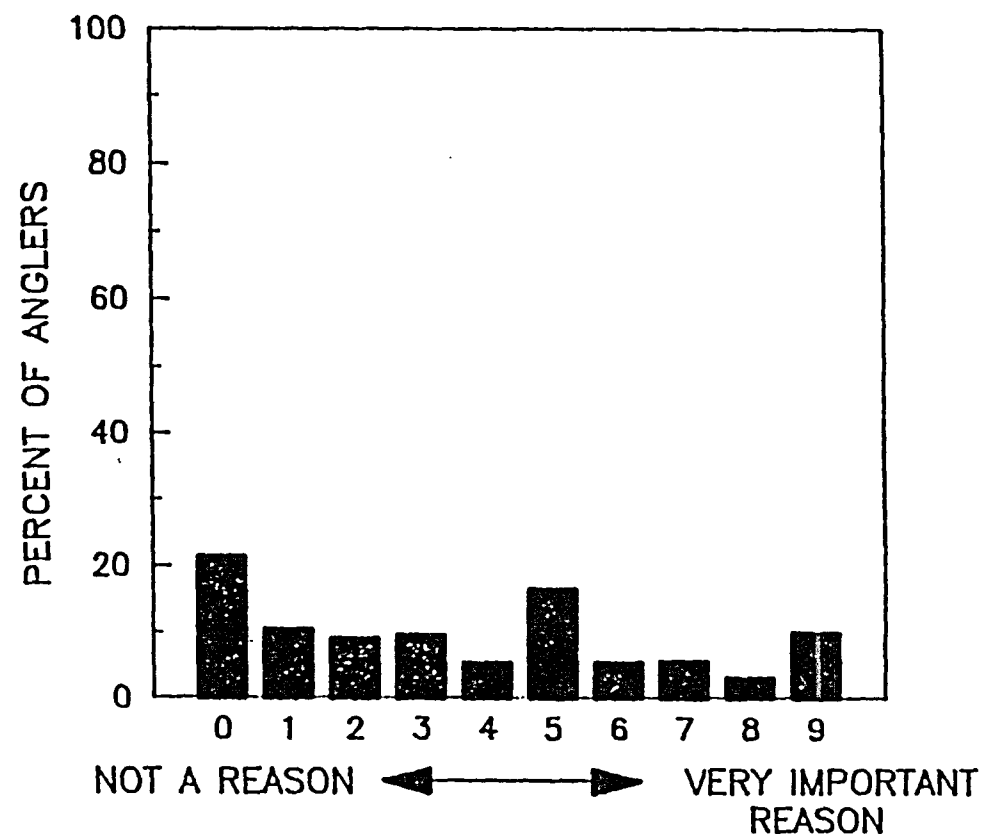


Figure 6. Frequency distribution of the importance rating for the motivation for stream trout fishing, "to catch trophy sized fish", given by Michigan trout anglers.