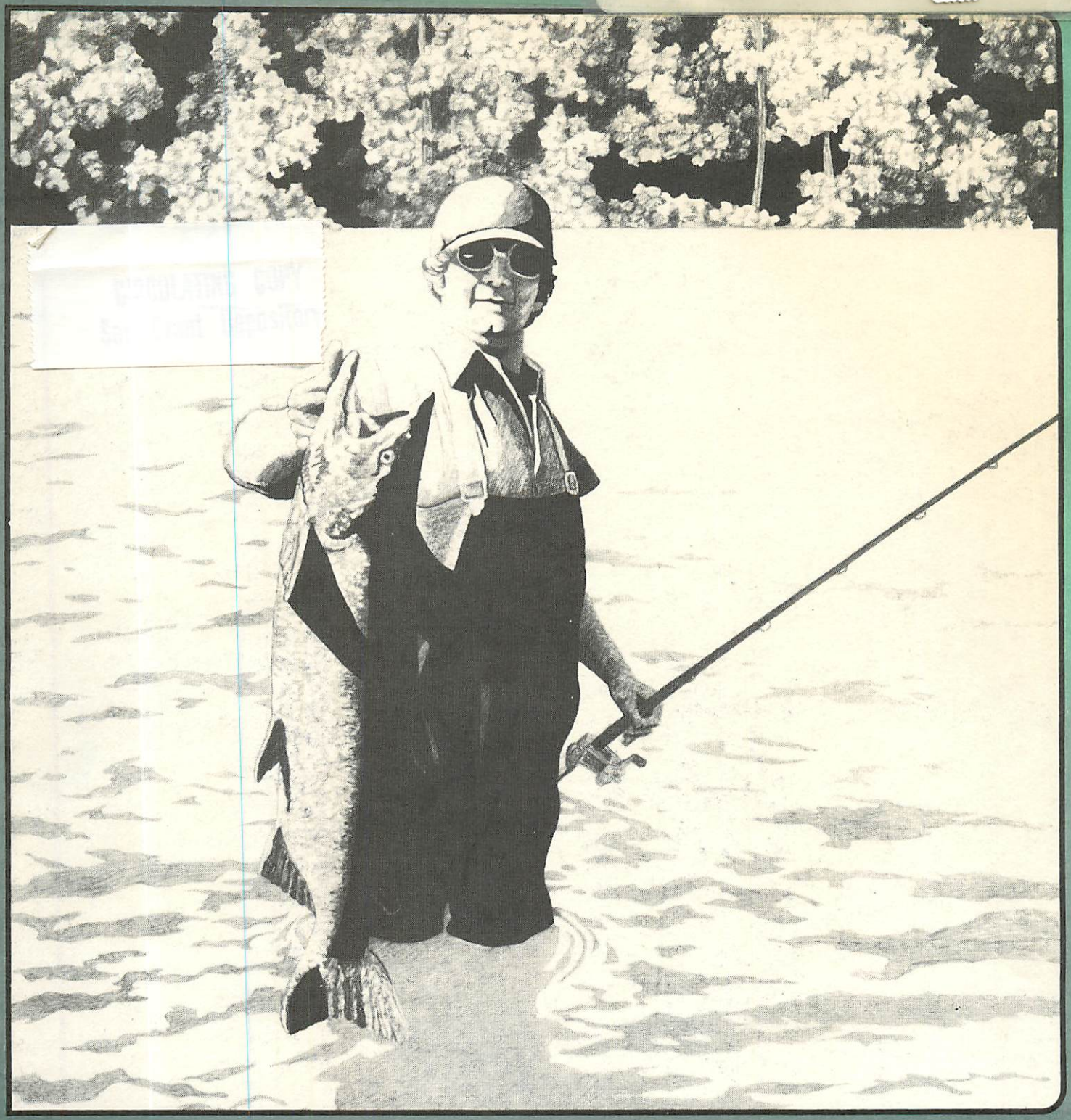

The Lake Michigan Angler: A Wisconsin Profile

By Karl C. Samples and Richard C. Bishop

THE LAKE MICHIGAN ANGLER

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by

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and
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The authors assume responsibility for any errors in this report.

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Introduction

Suddenly, line screams off the reel and disappears into the depths of Lake Michigan. A powerful trout or salmon is fighting desperately to regain its freedom. The angler grips the rod more firmly, determined not to lose control. Will his quarry end its run before the line runs off the spool? Only then is there a chance of landing a fine fish.

The thrill of fighting and landing a trophy-size trout or salmon is unforgettable. Recent successes in managing Lake Michigan's fishery resources have enabled more and more Wisconsin anglers to enjoy this experience. The sport now provides recreation for tens of thousands of fishermen, and their ranks swell with each passing season. As a group, these anglers spend a considerable amount of money on equipment, bait and lodging, thus affecting the economies of many coastal communities. As a result, trout and salmon fishing has become economically and socially important to many Wisconsin residents during the last decade.

Who are these fishermen who come from near and far to test their angling skills? How can their fishing behavior be best described, and what are their attitudes toward fishing quality and fisheries management? How much do they spend for fishing?

In an attempt to answer these questions, we surveyed anglers who fish for trout and salmon in Wisconsin waters of Lake Michigan. In the most general terms, our questionnaire sought to create a data base from which we could deduce the socio-economic characteristics of trout and salmon anglers and learn about their fishing behavior. Such information is vital to present and future management of the Lake Michigan fishery. It is needed to set budget priorities, determine the mix of sport and commerical fish species to be stocked in the lake, develop strategies for managing the commercial fisheries, and assess the need for new facilities, such as piers, marinas and hatcheries.

In addition, this study will help fill the void of information on sport fishermen that has inhibited research on the relationship between sport and commercial use of the fisheries so that use conflicts can be better understood and resolved.

Historical Perspective

As recently as 1965, very few anglers could enjoy the thrill of fighting and landing Lake Michigan trout and salmon. Fishing was poor. Stocks of lake trout -- historically an important sport and commercial species -- were all but destroyed in the 1940s through a combination of sea lamprey predation and heavy fishing pressure.

Fortunately, the poor fishing of those days is now past. Successful efforts to reduce the sea lamprey population and intensive stocking of a variety of trout and salmon in Lake Michigan led to a spectacular rebirth of Lake Michigan sport fishing.

TABLE 1
Annual Planting of Trout and Salmon
in Lake Michigan by Wisconsin 1965-80

Year	Lake Trout	Coho	Chinook	Trout[a]
1965	205,000	--	--	27,000
1966	762,000	--	--	100,000
1967	1,129,000	--	--	143,000
1968	817,000	25,000	--	324,000
1969	884,000	217,000	66,000	392,000
1970	900,000	340,000	119,000	427,000
1971	945,000	267,000	264,000	488,000
1972	1,284,000	258,000	317,000	1,384,000
1973	1,170,000	510,000	757,000	1,276,000
1974	880,000	318,000	616,000	958,000
1975	1,054,000	432,000	926,000	815,000
1976	1,045,000	647,000	1,275,000	1,266,000
1977	970,000	419,000	912,000	2,122,000
1978	985,000	499,000	2,107,000	2,087,000
1979	943,000	430,000	1,872,000	2,239,000
1980	(N/A)	458,000	2,394,500	2,005,000

[a] Includes rainbow, brown and brook trout.

SOURCE: Wisconsin Department of Natural Resources.

Today's large-scale stocking program began in 1965, when the first lake trout were planted cooperatively by the states of Wisconsin and Michigan and the U.S. Fish and Wildlife Service. Michigan later successfully introduced coho salmon in 1966 and chinook (king) salmon in 1967. Wisconsin began planting its own coho and chinook salmon in 1968 and 1969, respectively. The history of Wisconsin's trout and salmon plantings in Lake Michigan is shown in Table 1.

The return of the first planted coho in the fall of 1968 generated tremendous excitement, and interest in this new sport grew quickly. From 1970 to 1971, total sport catches of trout and salmon doubled; by 1977, sport harvests reached a record of more than 600,000 fish, marking a 20-fold increase over 1968 levels (Table 2). The harvest levels of chinook salmon perhaps show the most impressive gains: while only 165 chinook salmon were caught in 1969, landings increased to nearly 100,000 fish by 1978. Today, the king salmon holds the distinction of being the most frequently landed of all of the lake's salmon and trout species.

TABLE 2
Annual Catch of Trout and Salmon
in Wisconsin Waters of Lake Michigan

Year	Lake Trout	Coho	Chinook	Other Trout[a]	Total
1969	3,020	11,508	165	17,795	32,488
1970	13,019	20,011	577	32,457	66,064
1971	43,112	33,984	6,151	32,306	115,553
1972	40,278	60,621	11,465	49,160	161,524
1973	68,929	52,766	27,660	57,787	207,142
1974	82,619	131,079	71,250	132,001	416,949
1975	75,562	88,794	89,324	136,090	389,770
1976	25,208	38,255	56,134	82,190	201,787
1977	60,678	180,974	156,037	224,257	621,954
1978	27,854	64,528	96,012	131,337	319,802

[a]Includes rainbow, brown and brook trout.

SOURCE: Wisconsin Department of Natural Resources.

Widespread publicity about excellent catches had a "snowballing" effect. In only nine years (1969-77), fishing trips increased by a factor of 10 -- from 104,000 trips to 1.12 million trips (Table 3).

During the 10-year period ending in 1978, the number of fishing trips had an average annual growth rate of 37.6 percent. This growth has tended to level off in recent years, however.

Of all the types of fishing in Wisconsin waters, trout and salmon trolling has shown the most phenomenal growth in angler participation. The popularity of this fishing method stems from its success in catching large fish by using West Coast trolling techniques.

As one might suspect, there are significant differences in catch rates, participation rates, types of fish landed and fishing methods used among Lake Michigan anglers. These differences depend largely on the location on Wisconsin's Lake Michigan coastline. Figure 1 provides some examples. In the northern counties (Marinette, Oconto, Door), anglers tend to land more trout than salmon. High average daily catch rates and the esthetic appeal of this area help explain why the northern counties account for 15 percent of all fishing trips in the state in spite of the relatively long distances from population centers. Many of the trips are taken by trollers and stream fishermen.

TABLE 3
Angler Participation in Wisconsin's
Lake Michigan Fishery

	Type of Fishing (in thousands of trips)				
Year	Stream	Pier/Breakwater	Trolling	Shore	Total
1969	15.4	55.8	33.0	N/A	104.3
1970	26.2	86.3	75.3	55.1	242.9
1971	42.1	132.3	206.5	37.4	418.0
1972	47.9	250.3	208.9	77.1	584.3
1973	120.2	223.3	268.2	57.2	668.9
1974	123.2	343.7	380.5	114.7	962.6
1975	246.5	285.6	378.2	184.6	1094.9
1976	172.2	181.1	261.4	156.1	770.8
1977	164.9	370.9	413.7	222.0	1171.6
1978	95.2	198.4	307.9	105.7	707.3

SOURCE: Wisconsin Department of Natural Resources.

The more populated central coastal counties attract more fishing trips than do the northern counties. About a third of all of Wisconsin's trout and salmon fishing occurs at sites in Manitowoc, Kewaunee and Sheboygan counties, where anglers enjoy a relatively high catch rate for trout and salmon. Lake trout are most often caught by trolling the deeper waters offshore. Shallow-water trollers and shore-based anglers land coho and chinook salmon and rainbow trout during the fall migration.

Though Wisconsin's southernmost coastal counties do not have high catch rates, they nevertheless are the site of over half of the annual total number of fishing trips. The fact that about 30 percent of the state population resides in Ozaukee, Milwaukee, Racine and Kenosha counties perhaps accounts for the popularity of this area. In the southern counties, trolling predominates, though a significant pier and breakwater fishery has also developed. Salmon comprise most of the catch, with coho the most common type of salmon caught.

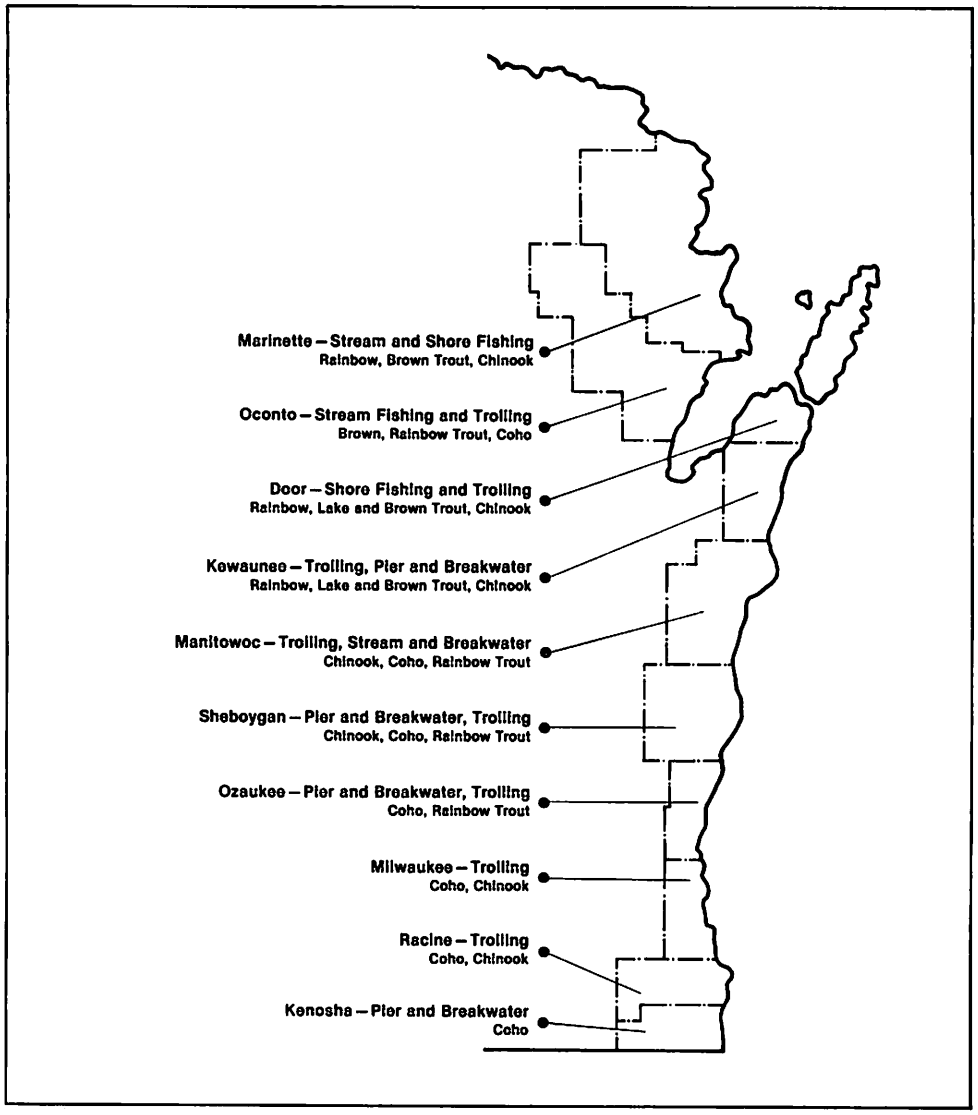


FIGURE 1
Wisconsin's Lake Michigan Trout and Salmon Fishery:
Types of Fishing and Predominate Species Landed

Survey Method

For intensive study of the burgeoning popularity of Lake Michigan trout and salmon fishing, it was clear that a sample had to be drawn from the overall angler population. For this study, it was decided that a suitable random sample of anglers could be drawn from names and addresses in the Wisconsin Department of Natural Resources creel census. This would presumably guarantee a sample of anglers who fished at least once during 1978 for trout and salmon. Moreover, it would increase the likelihood of obtaining a cross section of angler types (e.g., boat, shore and pier anglers) that spanned different times of the year.

Through the spring, summer and fall of 1978, creel census clerks collected and returned name-and-address cards. By the end of the fishing season (late November), 846 cards had been collected. From the cards, a sample of 700 participants was randomly selected. Of those, 116 (17%) were nonresidents, and 584 (83%) were Wisconsin residents. This breakdown corresponded closely with DNR estimates of residents and nonresidents active in the fishery.

The mail survey was completed by late January 1979. Table 4 summarizes the overall response rates by sample category. An overall response rate of 85.3 percent yielded 592 usable questionnaires. Residents and nonresidents did not differ significantly in their rates of response. Of the questionnaires returned, 84 percent were complete, with the exception of an answer or two. A copy of the survey questionnaire is reproduced in full in Appendix B.

TABLE 4
Survey Response Rate

Sampling Group	Questionnaires Sent	Questionnaires Returned	Response Rate
Nonresidents	114	97	85%
Residents	580	495	85.4%
TOTALS	694	592	85.3%

The Average Angler

DEMOGRAPHICS

It is no overstatement to say that men, women and children who actively fish for trout and salmon in Lake Michigan exhibit a very wide range of lifestyles. The survey showed that sport fishing is still predominantly a male activity, however. Eighty-eight percent of the anglers surveyed were male; only 12 percent were female.

Though sport fishing attracts all ages, the average age for anglers (both sexes combined) was 42 years -- an indication that trout and salmon fishermen tend to be somewhat older than other Wisconsin sportsmen like deer or goose hunters, whose average ages are about 35 (Table 5). This may be explained in part by three factors. First, a significant number of the anglers (16%) were retired people. Second, because trout and salmon fishing is a relatively new sport here in

TABLE 5
Age of Lake Michigan Trout and Salmon Anglers
Compared with Other Sportsmen

Age Group	Lake Michigan Anglers	Deer Hunters[a]	Horicon Goose Hunters[a]
20 yrs. or less	5%	15%	21%
21-30 yrs.	16	30	24
31-40 yrs.	29	19	20
41-50 yrs.	22	20	19
51-60 yrs.	11	10	9
61 yrs. or over	17	6	8
TOTALS	100%	100%	101%[b]

[a] Data from Heberlein and Laybourne 1978.

[b] Deviation from 100 due to rounding error.

Wisconsin, there may not be a strong tradition of introducing younger people to the sport, as is often the case with deer or goose hunting. Third, young people are less able to afford a fishing boat than are older, more financially secure individuals. Since the most successful fishing is usually done from boats, young people may be less inclined to take up the sport.

This is not to say trout and salmon fishing is only for the well-to-do. The survey indicates that a majority of anglers have annual household incomes of $12,000 to $27,000 (Table 6). The average annual income in 1978 was $19,500. These figures suggest that trout and salmon fishing is largely a middle-class pursuit, yet at the same time a leisure activity for many lower-income families. Compared with other Wisconsin recreationists, Lake Michigan anglers generally have slightly higher family incomes than do deer hunters and Brule River anglers, but somewhat lower incomes than do goose hunters.

TABLE 6
Annual Family Income of Lake Michigan Anglers
Compared with Other Sportsmen

Levels of Annual Family Income	Lake Michigan Anglers	Deer Hunters[a]	Goose Hunters[a]	Brule River Anglers[a]
$0-$7,999	8%	11%	3%	21%
$8,000-$15,999	29	40	16	30
$16,000-$23,999	36	31	36	23
$24,000-$31,999	16	9	28	14
$32,000-$39,999	7	4	10	6
$40,000-$47,999	2	3	4	0
$48,000 or more	2	2	4	2
TOTALS	100%	100%	101%[b]	100%

[a]Data from Heberlein and Laybourne 1978.

[b]Deviation from 100% due to rounding error.

In terms of education, 78 percent of all surveyed anglers had graduated from high school, and 11 percent had earned a college degree (Table 7). On the other hand, Wisconsin deer and goose hunters tend to be less educated, while Brule River anglers generally have received more academic training than have Lake Michigan trout and salmon fishermen. As a reflection of their education, anglers who were not retired classified themselves as blue-collar workers (40%) and professionals (14%), with 10 percent in other occupations (Table 8).

Trout and salmon fishing in Lake Michigan attracts anglers from a wide geographic area, as is illustrated in Figure 2. A majority of the anglers surveyed (62%) lived in counties directly adjacent to Lake Michigan. Other anglers may come from great distances, some from as far away as Texas and Mississippi. The survey indicated that 68 percent lived in cities or suburbs, and 32 percent on farms or in small towns.

TABLE 7
Education Levels of Lake Michigan Anglers
Compared with Other Sportsmen

Level of Education	Lake Michigan Anglers	Deer Hunters[a]	Goose Hunters[a]	Brule River Anglers[a]
Less than High School Diploma	22%	27%	23%	15%
High School Diploma	28	42	40	13
Some College	24	20	21	21
B.S. or B.A.	11	9	10	29
Advanced Degree (M.S., Ph.D. or equivalent)	5	2	6	23
TOTALS	100%	100%	100%	101%[b]

[a]Data from Heberlein and Laybourne 1978.

[b]Deviation from 100% due to rounding error.

TABLE 8
Primary Occupations of Lake Michigan Anglers

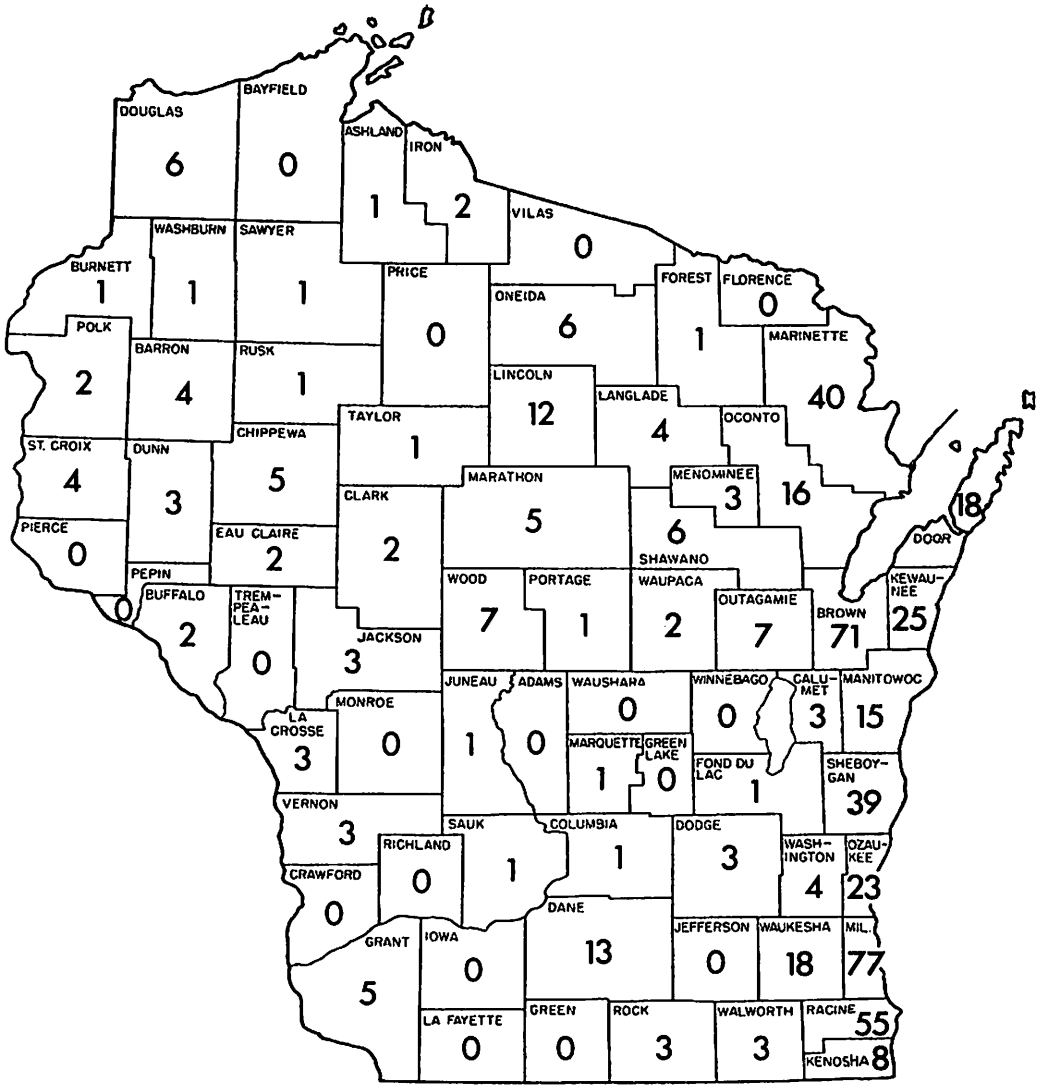
Occupation	Percentage of Anglers
Fully retired	12%
Semi-retired	4
Blue Collar	40
Professional	14
Other	10
TOTAL	100%

FISHING CHARACTERISTICS

Experience and skill are important ingredients of successful fishing. At the present time, people of widely varied experience are fishing for trout and salmon in Lake Michigan. Presumably because this particular fishing activity is a fairly recent development, a large majority of anglers (80%) began fishing within the last eight years (Table 9). Nearly 20 percent of the anglers started fishing as recently as two years ago, and 10 percent had fished only a single season. The average level of trout and salmon fishing experience was a little over six years.

TABLE 9
Years of Experience Fishing for Trout
and Salmon in Lake Michican Waters

Years of Fishing	Number of Anglers	Percentage
1	65	11
2	53	9
3	53	9
4	65	11
5	89	15
6	47	8
7	41	7
8	53	9
9	17	3
10	47	8
11	31	5
Over 11	31	5
TOTALS	592	100%



Nonresidents	
Iowa	16
Illinois	34
Michigan	20
Indiana	3
Minnesota	18
Mississippi	1
Texas	1

FIGURE 2
Residence of Surveyed Anglers

In terms of regularity in fishing activity, nearly all of the fishermen (91%) had fished most or all of the years since they first began trout and salmon fishing (Table 10). Just 7 percent fished only occasionally or very seldom after the first time. That anglers seems to "get hooked" on the sport is supported by the fact that about half (49%) of the surveyed fishermen claimed they were then devoting more time to trout and salmon fishing than initially. Conversely, only 12 percent of the surveyed fishermen were fishing less than before.

During the 1978 fishing season, anglers made frequent trips to Wisconsin's shoreline. On average, surveyed anglers took 24 trips that year. A large majority (82%) were single-day excursions. For trips that involved one or more nights away from home, 56 percent of the anglers camped for the night, 34 percent stayed in motels or hotels, and 10 percent found accommodations with friends or relatives (Table 11).

In light of the frequency of trips made, it might be expected that fishermen would include other activities in their travels, such as sightseeing, business or visiting friends and relatives. But the survey suggests that a majority of the anglers (86%) devoted most of each trip to fishing. About 12 percent of the anglers spent only half of the time fishing, and a small fraction of anglers (2%) devoted very little time to fishing (Table 12).

TABLE 10

Fishing Regularity Since

First Year of Fishing

Regularity of Fishing Since the First Year	Number of Anglers	Percentage
Every Year	497	84
Most Years	41	7
Half of the Years	12	2
Only Occasionally	24	4
Very Seldom	18	3
TOTAL	592	100%

Almost half of the anglers (49%) actively pursued other Lake Michigan gamefish besides trout and salmon. Some of the more popular species were perch, walleye, northern pike and smelt. Nonetheless, 83 percent of the respondents clearly preferred fishing for trout and salmon; only 12 percent did not really care what type of fish they caught.

Particularly active were those fishermen who have access to fishing boats. Boat fishermen generally fish more frequently and more successfully than shore-based fishermen. Just over half (51%) of those surveyed owned some type of fishing boat, ranging in value from under $100 to over $20,000. The time they used their boats for fishing compared to other boating activities (e.g., cruising, water skiing, etc.) varied considerably. Most boat-owning anglers used their boats primarily for trout and salmon fishing (Table 13).

TABLE 11
Overnight Accommodations Used on Fishing Trips

Type of Accommodation	Number of Anglers	Percentage
Camping	332	56
Hotel or Motel	201	34
Friends or Relatives	59	10
TOTAL	592	100%

TABLE 12
Time Devoted to Fishing During a Fishing Trip

Use of Time	Number of Anglers	Percentage
Most of the time devoted to fishing while on a fishing trip	509	86
About half of the time devoted to fishing trip and half used for other activities (business, visiting, sightseeing, etc.)	71	12
Very little time spent fishing and most of the time used for other activities (business, visiting, sightseeing, etc.)	12	2
TOTALS	592	100%

In comparison, a sizeable 16 percent indicated that less than half of their boat usage was for trout and salmon fishing. For anglers who do not have access to private boats, there are charter boats. However, only 10 percent of those surveyed used charter boats during the 1978 season, taking an average of 1.2 trips.

Whether an angler owns a boat or not, the decision about where to fish is important. The location will largely determine what type of fish can be caught and if the catch will be high, moderate or low. Anglers select a particular site for a variety of reasons. A list of reasons was presented in the survey, and respondents were asked to state whether each reason was important to them or not. Their responses, tabulated in Table 14, indicate that most preferred sites that offer a good chance of catching fish. Availability of public access was another popular reason for choosing a fishing site, for obvious reasons. On the other hand, factors not generally viewed as important were "friends or relatives close by" and "owning property in a certain area." This is consistent with the finding that anglers are generally more interested in actually fishing than in other activities possible during fishing trips.

A final topic of interest is the anglers' dedication to their sport. To measure this attitude, the survey asked anglers to state how much they would miss trout and salmon fishing if, for some reason, it was no longer available. Presumably, dedicated anglers would suffer more than anglers only casually involved in the sport.

TABLE 13
Use of Boats for Lake Michigan
Trout and Salmon Fishing

Amount of Total Boat Usage for Trout and Salmon Fishing	Number of Anglers	Percentage
Less than one-fourth	59	10
One-fourth to one-half	36	6
One-half to three-fourths	30	5
More than three-fourths	177	30
Do not own a fishing boat	290	49
TOTAL	592	100%

Reponses to the question show that over half (52%) of the surveyed anglers would miss trout and salmon fishing more than all or most of the other interests they currently enjoy. An additional 34 percent believed they would indeed miss trout and salmon fishing if it were no longer available, but not as much as they would miss many other activities they now enjoy. Only 14 percent said they could easily find something equally or more enjoyable. When compared with those of other Wisconsin sportsmen, these responses indicate that Lake Michigan trout and salmon fishermen may be somewhat less dedicated than deer hunters (a group with a very high commitment), but just as dedicated as Brule River anglers, and considerably more dedicated than goose hunters to their sport (Table 15).

From these findings, the following profile of the active Lake Michigan angler can be made. Typically, he is male, about 40 years old and earns about $20,000 a year. He has probably fished for trout and salmon for six years and has fished frequently over the years. A dedicated sportsman, he takes about 24 fishing trips during the season. He devotes most of the time during his fishing trips to fishing and not unrelated activities. He prefers to pursue trout and salmon over other species while fishing in Lake Michigan. And he would sorely miss this avocation if it were denied him for some reason.

TABLE 14
Reasons for Choosing a Particular Fishing Site

	Percentage of Anglers Claiming the Reason Is:	
Reasons	"Important"	"Not Important"
Good Success in Past Trips	95	5
Reports of Good Fishing	92	8
Availability of Public Access	85	15
Advice from Other Anglers	77	23
Preferences of Those in Group	69	31
Facilities in the Area	66	34
Solitude of the Area	62	38
Distance from Home	56	44
Friends or Relatives Close by	30	70
Own Property in the Area	16	84

TABLE 15
Anglers' Dedication to their Sport
Compared with Other Sportsmen

"If I could not go, I would":	Trout/Salmon Anglers	Deer Hunters	Goose Hunters	Brule River Fishermen
Probably find something else just as enjoyable.	14%	8%	35%	15%
Miss it, but not as much as a lot of other things.	34	25	44	30
Miss it more than most other interests.	32	44	18	36
Miss it more than all other interests.	20	23	3	20
TOTALS	100%	100%	100%	101%[a]

[a]Deviation due to rounding error.

Angling Impacts, Costs & Benefits

A WORD ABOUT ECONOMIC TOOLS

This part of the report discusses the economic impacts of recreational fishing in Lake Michigan and its benefits and costs. The goal of this analysis is to judge how much economic activity in a given region is directly related to fishing. These are estimates of the amount of money spent by anglers fishing for trout and salmon in Wisconsin's Lake Michigan, the breakdown of total expenditures into components (such as boats, travel and tackle) and how much is spent at various locations.

This section will also examine whether the benefits of fishing exceed the costs. Unfortunately, this is not as straightforward as impact analysis, and there is a great deal of confusion among people who are not economists about the relationship between fishing benefits and fishing expenditures. Before examining the actual impacts, benefits and costs of Lake Michigan fishing, we will explain what benefit/cost analysis is all about and what the relationship is between the amount anglers spend and the benefits they receive.

Benefit/cost analysis involves judgments about economic feasibility. A comparison with the private sector may help: How would one judge whether it will be feasible for a private business to continue operations? It would be misleading to look only at how much the business is spending; to survive, a business must also be earning revenues. It is feasible to continue operation only if revenues exceed costs by a sufficient margin to earn a reasonable profit. The criterion for judging economic feasibility would be whether or not profits are being earned.

In looking at the benefits and costs of recreational fishing, economic feasibility is still the issue, and we will examine something akin to profits, but more general. Rather than the private viewpoint applied in looking at a business, we want to take a social viewpoint and ask whether fishery management and stocking programs are an economically feasible use of public funds. Economic feasibility takes on a different meaning here. The question becomes whether fishery programs generate services that have sufficient value to anglers to cover public costs.

Expenditures alone do not measure the value of fishery programs to consumers. Just as the private feasibility of a firm could not be judged on the basis of how much was being spent, so the social feasibility of fishery programs cannot be based on how much fishermen spend. Just as we would have to look at firm profits, we now have to consider consumer surplus in order to judge the social feasibility of fishery programs.

Though analogous to firm profits, consumer surplus is not so obvious or easiliy measured, but it exists nevertheless. Consider this illustration. Suppose Mr. Jones lives across the street from a good Lake Michigan fishing pier.

When the fish are hitting, he can walk across the street and fish for nothing. Just to make the argument as clear as possible, suppose everything Jones needs to fish is given to him free by his rich uncle. Jones' total annual expenditure is then zero. Do we then conclude that since Jones pays nothing to fish, the value of fishing to him is zero? Certainly not. Now assume that if a gate were put up across the pier entrance, Jones would pay up to $15 per year for admission. If the price of the season ticket were higher than $15 a year, he would fish elsewhere. Jones' consumer surplus from fishing off that pier is $15 per year. Stated differently, even though Jones is actually spending nothing to fish, he is receiving services that are worth $15 a year to him.

To be sure, most anglers are not so lucky as Jones. They must spend a large sum of money each year to fish Lake Michigan for trout and salmon. Still, many of them would be willing to pay more rather than give up the opportunity to fish there. It is this consumer surplus, over and above what is actually spent, that is the true measure of fishing benefits. To get technical for a moment, consumer surplus (fishing benefits) is defined as the maximum amount that anglers would be willing to pay for fishing opportunities beyond their current expenditures before they would completely give up those opportunities.

By way of review, consider three completely contrived figures. Suppose that anglers spend $10 million a year to fish Lake Michigan, that maintaining the fishery costs public agencies an additional $2 million annually, and that anglers have a consumer surplus over all Lake Michigan fishing opportunities of $6 million annually. If the goal is to understand the impacts that fishermen have on the level of economic activity, their total expenditure of $10 million is the relevant figure. If the question is whether fishery programs are an economically feasible use of public funds, then the relevant figures to compare are the $6 million in consumer surplus and the $2 million in public costs. Stated differently, the benefit/cost ratio for fishery programs is 3:1 (i.e., fishery programs return $3 in social benefits for each dollar of social costs).

That should be enough theory to help interpret our estimates for Lake Michigan. Let's now turn to some actual numbers.

ANGLER EXPENDITURES

Based on expanded results of the survey (explained in Appendix A), it is estimated that anglers spent $16.6 million while taking over 700,000 fishing trips to Wisconsin waters of Lake Michigan in 1978. Average fishing costs are estimated to be $335 per angler per season, excluding boat-related expenditures. Most angling expenses involve equipment and travel. Equipment costs include heavy-duty rods, reels, lines, lures, bait and landing nets needed for combative fish that often weight more than 5 pounds. Travel expenditures incurred for gasoline, oil, lodging and meals can often be as high as equipment costs. Fishermen who own boats have additional expenses averaging $150 annually for the purchase and upkeep of boats, motors, trailers and electronic fishing aids.

A breakdown of annual expenses for important fishing items appears in more detail in Table 16.

An expenditure of nearly $17 million annually must have an effect on local economies, particularly those along the coast. Table 17 shows rough estimates of how this sum is divided among Wisconsin's coastal and noncoastal counties, and with other states as well. That these figures are probably close, but inexact, deserves emphasis, since they are based on plausible, but untested, assumptions listed below the table. Still, several of Wisconsin's more popular fishing counties must be receiving more than $1 million annually from consumer spending directly attributable to trout and salmon fishing.

TABLE 16
Breakdown of Average Annual Expenditures
For Lake Michigan Trout and Salmon Fishing

Item	Average Annual Expenditures
Gas and Oil	$104.00
Food and Beverages	61.00
Lodging	23.00
Charters	4.50
Rods, Reels and Line	68.00
Baits, Lures and Hooks	42.70
Nets and Coolers	12.20
Miscellaneous	19.60
Total Expenses for Anglers without Boats	$335.00
Boats, Motors and Trailer[a]	114.00
Electronic Fishing Equipment[a]	36.00
Total Expenses for Anglers with Boats	$484.00

[a] Includes new equipment purchases and maintenance costs.

TABLE 17
Estimated Angler Expenditures in Coastal Communities, Other Wisconsin Counties, and Out of State for 1978[a]

Wisconsin Coastal Counties[b]	Expenditures
Marinette	$600,000
Oconto	300,000
Door	800,000
Kewaunee	1,300,000
Manitowoc	1,400,000
Sheboygan	1,200,000
Ozaukee	1,000,000
Milwaukee	1,700,000
Racine	1,000,000
Kenosha	500,000
Total Expenditures in Wisconsin Coastal Counties	9,800,000
Total Expenditures in Wisconsin Noncoastal Counties	1,800,000
Total Expenditures by Nonresidents in Home States	4,800,000
TOTAL EXPENDITURES	$16,400,000[c]

a Allocation of total expenditures among locations was based on the following assumptions:
(1) that spending for boats, motors, trailers, rods, reels, electronic fishing equipment, coolers, landing nets and gaffs, down riggers and fishing seats occurred in the home community.
(2) that spending for gas, oil, food, beverages, lures and dodgers, fishing line, snag hooks and miscellaneous items was divided 50-50 between home communities and coastal counties.
(3) that all spending for overnight lodging, boat charters and natural bait occurred in coastal counties.
(4) that total expenditures in coastal counties were divided among the coastal counties in proportion to the number of trips to each county reported in the Wisconsin Department of Natural Resources creel census.

b Obviously, Brown County is also on the coast. However, there is little salmonid fishing that far south on Green Bay, so residents of Brown County are in roughly the same situation as those in other inland counties not far from the coast as far as salmonid fishing is concerned. Consequently, Brown County was treated as a noncoastal county for this study.

c This total diverges from the $16.6 million reported in the text because of rounding in subtotals.

FISHING BENEFITS AND COSTS

There are a number of techniques for estimating the consumer surplus anglers receive from fishing. Employing one such method, the 1978 survey directly asked fishermen what maximum amount they would be willing to pay to be able to engage in trout and salmon fishing. Another method used in the study, called the "travel-cost approach," uses information about the anglers' actual travel expenses and participation rates to estimate the level of angler benefits. Both methods are far from perfect, but they did indicate that, based on 1978 conditions, anglers would be willing to pay at least $7.2 million annually to fish for Lake Michigan trout and salmon rather than to do without this pastime altogether. This is a conservative estimate of angler benefits -- conservative in the sense that the true benefits are probably larger.

On the cost side, it is difficult to be as precise, because costs are often not broken down so that one can tell exactly how much is spent on Wisconsin's Lake Michigan trout and salmon fisheries. Table 18 gives a rough estimate. If our assumptions (explained in the table) are acceptable, then the expenditures by the state and federal government to keep the fishery going were about $2.5 million in 1978. Almost all of this money was from fishing license fees and various federal programs, with minor amounts from miscellaneous sources.

Benefits exceed costs by about $4.7 million annually ($7.2 million in benefits minus $2.5 million in costs). In other words, operating the fishery is providing members of society (anglers) with services they value at $4.7 million per year more than the social costs. Stated differently, the benefit/cost ratio is about 2.8:1. That is, the fishery is contributing a total of $2.80 in public benefits for each dollar of public costs. In economic terms, this is considered to be a favorable return.

However, it does not necessarily follow that more (or less) stocking of fish or sea lamprey control is economically feasible. It may be -- but that is a separate issue from the economic feasibility of the overall program. One would need to know more about how benefits and costs would change in response to alterations in stocking and lamprey control strategies to judge the economic feasibility of such alterations. This is a subject of current Sea Grant research at the University of Wisconsin.

Second, our analysis would be more correct economically if we had been able to analyze a large number of years and incorporated compound interest into our calculations. The data for other years were unavailable, and it is unlikely that the conclusion would have been different anyway.

TABLE 18
Estimated Public Costs of Wisconsin's
Lake Michigan Sport Fishing, 1978

	Expenditures
State and Federal Fish Stocking[a]	$840,000
DNR Fish Management Costs[b]	250,000
Law Enforcement[c]	200,000
Sea Lamprey Control[d]	500,000
Miscellaneous[e]	750,000
TOTAL	$2,540,000

a Stocking figures (in numbers of fish) from Table 1 of this report were converted into pounds using conversion ratios for fiscal year 1977-78 from Wisconsin DNR unpublished data. The same unpublished data gave per-pound stocking costs for Great Lakes fish.

b This includes all nonpropagation costs for Great Lakes fish management that could not be attributed to commercial fishing, Lake Superior or warm water species. The unpublished data was supplied by the Wisconsin DNR.

c In fiscal year 1977-78, the Wisconsin DNR spent just over $4 million on law enforcement from the Conservation Fund's Fish, Wildlife and Enforcement Account. However, the personnel involved were active statewide and were involved in game and environmental enforcement as well as in fisheries. Estimates for Lake Michigan cold water recreational fishery enforcement alone were not available. As an educated guess, we allocated 5 percent of all enforcement costs to this category.

d Total expenditures for Great Lakes lamprey control by the U.S. and Canada are about $5 million a year (Talhelm et al. 1979). This includes research and administration as well as stream treatment. In 1975, the most recent year for which we could get data, 20 percent of all the lampreycides used were applied to Lake Michigan (Great Lakes Fishery Commission 1978), implying a rough allocation of $1 million to that lake as a whole. Roughly half ($500,000) of that total was allocated to Wisconsin.

e Several costs in addition to those itemized should be attributed to the Lake Michigan fishery, including some DNR administrative and miscellaneous services, Wisconsin Sea Grant research, U.S. Fish and Wildlife Service activities (other than lamprey control and fish propagation) and the like. The $750,000 allocated to these miscellaneous items is very rough, but adequate for the purposes of this study.

Angler Views on Fishing Quality

Fishing -- like any personal experience -- may be all things to all people. Every angler has his/her own idea of what makes a good fishing trip. It is possible, however, to get an idea of what anglers on the average think has improved or diminished fishing quality. It should be emphasized that our sample was drawn from people who actually fished and thus did not include those who may have quit fishing prior to 1978 or who did not become involved in the fishery because of what they viewed as its poor quality.

From what was learned from the 1978 survey, it appears that a slight majority of Lake Michigan anglers (51%) felt that fishing quality had improved during the previous five years, while only 12 percent thought the fishing had become worse. For 13 percent, fishing quality remained unchanged. A sizeable number (24%) of the anglers surveyed believed they had not been fishing long enough to form an opinion.

Most surveyed anglers agreed that two principle factors have contributed to improved fishing quality. They seemed pleased with both the increased number and the kinds of fish being stocked. Sixty-four percent of the anglers thought that increased stocking had improved fishing quality. Only 19 percent believed that fewer trout and salmon were available to fishermen and that fishing quality had therefore suffered.

Generally, anglers also seem to be satisfied with the species of trout and salmon being stocked. About 30 percent of all the fishermen in the survey rated chinook salmon as their favorite of all the trout and salmon. The next most popular fish was rainbow trout (22 percent of the anglers rated it as their favorite), followed by brown trout, lake trout and coho salmon. Table 19 contains a complete description of anglers' ratings for favorite game fish. Interestingly, Table 19 shows that the anglers' ratings of the different trout and salmon follow fairly closely the percentages of those fish stocked in Wisconsin waters. Only lake trout seems to be stocked at a rate far exceeding its popularity with sport fishermen. However, it should be noted that the intensive stocking of lake trout has the goal of reestablishing naturally reproducing populations of a native fish as well as contributing to current catches. Salmon have not been able to reproduce successfully in Wisconsin tributaries of Lake Michigan.

Though fishermen may differ over which type of trout or salmon is the most enjoyable to catch, they generally agree that further increases in the number of fish being stocked would further improve fishing quality. About 91 percent of the surveyed anglers favored stocking additional trout, while 83 percent preferred increased stocking of coho or chinook salmon.

While most of the anglers felt that overall quality had improved, they felt several factors have run counter to that trend. These included crowded fishing sites, commercial fishing operations and contamination of fish with polychlorinated biphenyls (PCBs).

The 1978 survey indicates that crowding and congestion are negative side effects associated with the growing popularity of Lake Michigan trout and salmon fishing. When asked about conditions at fishing sites, 56 percent believed that there are usually too many fishermen around and that fishing tends to be crowded. In comparison, about 42 percent did not notice any crowding and thought that the number of fishermen was just about right at that time (1978). The survey did not address the question of how many more fishermen the latter group would tolerate before they began to feel crowded.

While crowds enhance the appreciation of many sports, there are several reasons why fishing is not one of them. First, 62 percent of the anglers in the survey considered quiet and solitude to be important objectives of going fishing in the first place. Congestion may also affect how many fish are caught. When fishermen compete for space, fishing lines get tangled, gear is fouled, tempers flare and fish are lost. Of those who fished from boats, 60 percent found that trolling was often almost impossible because of the large number of boats at the better fishing locations. Even more frustrating, crowds at public launching ramps can strand boating fishermen on shore during prime fishing time.

A second factor that some anglers believed had influenced fishing quality is commercial fisning. Nearly 55 percent of the anglers felt that commercial fishing was somehow responsible for reducing sport fishing quality. Most of these anglers (84%) were boat owners.

TABLE 19
Angler Ratings of Trout and Salmon in Lake Michigan
Compared with Relative Stocking Rates in Wisconsin Waters

Species	Percentage of Anglers Ranking It "Favorite"	Percentage of Total Numbers Stocked in Wisconsin Waters of Lake Michigan (1968-1978)
Chinook Salmon	31	21
Rainbow Trout	22	15
Brown Trout	18	15
Lake Trout	14	32
Coho Salmon	13	13
Brook Trout	2	4
TOTALS	100%	100%

In comparison, 37 percent of all surveyed anglers thought that commercial operations did not affect sport fishing quality. It is important to note, however, that a clear majority (70%) of the anglers believed that commercial fishermen provide a service by making fresh fish available to consumers. Further, another 70 percent thought that fish boils -- with fish supplied by commercial fishermen -- are an attractive feature of living near or visiting the Lake Michigan area. Therefore, while some anglers view commercial fishing as conflicting with sport fishing, a majority look favorably upon the services provided by commercial fishermen.

A third factor, which 47 percent of anglers believed had contributed to reducing fishing quality, is the contamination of trout and salmon with PCBs. PCBs are industrial chemcials that until recently were widely used in fluorescent light fixtures, electrical transformers, hydraulic fluids, carbonless copy paper and other industrial products. While they are now being phased out, these chemicals have been shown to be persistent in the environment, and many scientists are concerned about possible ill effects on human health from ingestion of fish and other foods contaminated with PCBs. There is apparently a consensus among fishermen, however, that the presence of PCBs in fish is no reason to stop fishing. Over 93 percent of the anglers in the survey claimed that recent health warnings about PCBs have not influenced how often they go fishing. Only 6 percent said they fish less often because of PCBs in the fish. Furthermore, a majority (60%) of the survey respondents indicated that they have not changed how they prepare their catch for eating -- though after learning of PCB health hazards, about 30 percent said they ate less of their catch. These findings suggest that despite some perceptions that PCB contamination has reduced fishing quality, the impact on sport fishing and fish consumption seems to be minimal. In fact, 93 percent agreed that stocking of trout and salmon should definitely continue despite the fact that the fish may contain significant levels of PCBs upon reaching adult size.

Angler Views on Fisheries Management

Angler opinions on several aspects of fisheries management have already been mentioned. For example, most anglers seemed to be pleased with the current stocking program and would like to have even more fish put in the lake. But what about their views on other management issues, such as snagging regulations, special fishing permits and public access to Lake Michigan?

Just over half (56%) of Wisconsin's Lake Michigan sport fishermen engage in snagging for trout and salmon during the fall snagging season. Snagging is popular primarily because it provides an opportunity for those who fish from shore to land mature fish. Over the years, snagging has become an annual social event, attracting eager fishermen from all over the Midwest and beyond.

Despite its popularity, not all fishermen agree that snagging is a sportsman-like way to take fish. Though 60 percent of the surveyed anglers thought snagging is quite acceptable, 40 percent found snagging distasteful and thought it should be disallowed. Its defenders counter that most snagged fish are spawning mature salmon, which are already close to death. It is further argued that spawning salmon do not actively feed, and snagging is the only practical way to harvest them. But critics insist that snagging also catches many immature trout and salmon and may be reducing the number of trout and salmon available the following spring.

To reduce accidental snagging of immature fish, the Wisconsin DNR in 1978 declared it illegal to snag from piers or breakwaters. Snagging after sunset was also banned. Over 90 percent of those surveyed who do not snag fish were pleased with the ban on pier and breakwater snagging. In comparison, about 82 percent of the surveyed anglers who liked snag fishing opposed the new rules primarily because they believed the rules reduced the success of this form of fishing. For example, about half (48%) thought that rules prohibiting night snagging have lowered the chances of landing a fish.

While anglers are sharply divided on the issue of snagging, they generally agree on a number of other issues. At least 80 percent of those surveyed agreed that there is a need for more public access to Lake Michigan. As already mentioned, boat fishermen often must contend with long lines because of the limited number of public launching ramps. Similarly, shore fishermen often must share the limited space available at public fishing piers and breakwaters.

To better manage the Lake Michigan sport fishery, it might be effective to require a special fishing permit or license. This would presumably cut down on the number of participating fishermen (i.e., reduce crowding). At the same time it would generate revenue from license sales to help pay for increased stocking, new fishing piers, marinas and other improvements.

Despite the appeal of these arguments, a clear majority (74%) of surveyed anglers opposed any requirements for a special Lake Michigan fishing license. A small segment (14%) did not really care if a special license were required, and only 12 percent favored such a proposal. However, this negative attitude toward fees may change, depending on the circumstances. When confronted with the possibility of reduced stocking because of budget restrictions, a sample of anglers in southern Wisconsin favored a Lake Michigan trout stamp as a means to maintain or increase stocking (Soffle 1980).

Future Prospects

However measured -- total participation, commitment to the sport, fish caught, angler enthusiasm, money spent by anglers or net social benefits -- the Lake Michigan fish stocking and sea lamprey control programs have had tremendous success. It is therefore imperative for anglers and public decision-makers to recognize that this fishing bonanza will not automatically endure. We close this report with a call for continued stewardship of Lake Michigan fishery resources.

First, it is apparent that the viability of the Lake Michigan trout and salmon fishery depends on continued control of the sea lamprey. The present method of control involves treating lamprey spawning streams with chemicals. These chemicals have not yet been found to present any serious environmental hazards. But whenever large amounts of chemicals are introduced into an ecosystem, the possibility exists that their use might have to be discontinued. Furthermore, experience with other pesticides raises fears that the lamprey will develop a tolerance for the chemicals currently in use. There is no choice, therefore, except to continue a well-supported program of sea lamprey control and of research on alternative control methods in the Great Lakes. To do otherwise is to risk loss of the fishery.

Second, the trout and salmon fishery presently depends on stocking. In time, fisheries biologists may succeed in reestablishing naturally reproducing lake trout populations. Nonetheless, the popularity of this "put-and-take" salmon fishery means that continued salmon stocking would probably remain economically justifiable, though this question was not examined specifically in connection with this work.

As noted previously, the Wisconsin stocking program underwent rather substantial budget cuts in 1980. The Wisconsin DNR proposed to reduce coho stocking in favor of increased stocking of the less expensive chinook. This proposal was ultimately dropped in response to strong protests from southern Wisconsin anglers. There was some fear that chinook salmon would not provide the catch rates that coho provided. Cohos and chinooks are nearly identical in appearance except that the chinooks eventually get much larger. Little is known about the ability of anglers to perceive flavor differences or about which species might be preferred as table fare.

In view of the popularity of chinooks on a lake-wide basis and their lower production costs, additional research to see if chinooks will do well in southern Lake Michigan and whether they can be made acceptable to fishermen would appear warranted, particularly in this era of tight budgets and rapid inflation of costs.

Regarding PCBs, the angler viewpoint is clear. Anglers are aware of and concerned about the problem. Many are changing the ways they prepare their catch, and many are eating less of what they catch. However, over 90 percent were opposed to a reduction in stocking because of the PCB problem.

Preliminary evidence indicates that PCB levels in Lake Michigan trout and salmon are falling. In the long run, it is hoped that this trend -- combined with public education and voluntary limits on the ingestion of contaminated fish in the short run -- will constitute a satisfactory solution to the PCB issue.

Another problem, not so widely recognized, may also be developing. The widespread support among anglers for further increases in stocking presupposes that increased catches would follow. But any productive system has its limits, and Lake Michigan is no exception. Recent Sea Grant research by biologists at the University of Wisconsin indicates that the current stocking program may be introducing about as many fish as the ecosystem can support. In fact, the alewife is a very important food source for trout and salmon, and declining populations of this forage fish may indicate that the capacity of the system has already been exceeded. Accelerated trout and salmon stocking could create instability and possibly lead to a collapse of the fishery. Again, the need for intensive research, with the results implemented in sound management strategies, is very clear.

Beyond Lake Michigan's biological capacity, there are management issues related to its maximum recreational capacity. Though potentially less drastic than collapse of the fish populations, there is the very real prospect that increasing numbers of people taking advantage of the lake's excellent fishing may ultimately reduce the enjoyment of it for all. To some extent, problems of crowding and intensive use can be resolved through increased public facilities and access. Beyond that, it may be necessary to ration the resource. Many alternative devices to reduce use do exist: special permits limiting seasonal catch; advanced reservations to launch from specific sites or fish from piers, breakwaters and shoreline locations; and lowering daily bag limits. These are time-tested methods applied in other fish and game management efforts. Economists often argue for higher fees. Such charges not only serve as a rationing device comparable to private market prices, but also raise money for further resource improvements. The threat of stocking cutbacks due to tight budgets may make higher fees both necessary and more acceptable.

There are reasons to be concerned about the future of Lake Michigan's trout and salmon fishery. Nevertheless, except for the years it was dominated by the sea lamprey, Lake Michigan has continually demonstrated a remarkable capacity for meeting human wants and needs. Careful, dedicated stewardship of the lake, based on a sound scientific foundation, may well succeed in maintaining productive trout and salmon fisheries for many years to come.

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Appendix A

HOW SAMPLE DATA WERE EXPANDED TO ESTIMATE FISHING EXPENDITURES

Boat owners in our sample took 8,857 trips. DNR data show 307,913 trips involving trolling. Thus, each boat trip by members of our sample was assumed to represent 34.76 trips for all boat owners. Multiplying 34.76 trips by the total expenditures of boat owners in our sample ($310,399) yielded total estimated expenditures by all boat owners of $12,348,504. Anglers in our sample who did not own boats took 5,879 trips; while the DNR estimated 404,418 trips in 1978 that did not involve trolling (shore, pier, breakwater and stream fishing). Thus, each trip without boating in our sample was taken to represent 68.79 trips to all who were not boat owners. Anglers without boats in our sample spent $61,890, so that our estimate for all nonboat anglers is $4,257,430 ($61,890 x 68.79 trips). Combining boat-owning and nonboat anglers yielded $16,605,934, which we rounded to $16.6 million.

Appendix B

SPECIAL WISCONSIN LAKE MICHIGAN
SPORT FISHING SURVEY

IT IS IMPORTANT THAT THIS QUESTIONNAIRE BE COMPLETED BY THE PERSON TO WHOM IT IS ADDRESSED.

Please try to answer every question since a single missing answer will decrease the value of all your other answers. Answer what you believe is true for you. The best answer is the one which most closely reflects your own feelings and beliefs or what you actually did.

We realize that you may have fished many times in Lake Michigan waters during the 1978 season, and thus you may find it difficult to remember exact details about the past fishing season. The details, however, are important so we must ask you to take a moment and think back to the times you went fishing this last season and then try to answer the questions as accurately as possible.

The questionnaire has been divided into sections to make it easier for you to complete.

WE ARE INTERESTED IN LEARNING ABOUT YOUR VIEWS AND OPINIONS ON TROUT AND SALMON MANAGEMENT IN WISCONSIN.

1. From your trout and salmon fishing experience, which of the following statements about trout and salmon fishing in Lake Michigan best reflects your opinion?

____The quality of trout and salmon fishing in Lake Michigan has improved over the last five years.

____The quality of trout and salmon fishing in Lake Michigan has neither improved nor gotten worse over the last five years.

____The quality of trout and salmon fishing in Lake Michigan has gotten worse over the last five years.

____I have only fished for trout and salmon in Lake Michigan for a short time and cannot tell whether the quality of fishing has changed or not.

2. Your answer to the previous question may have been influenced by many of the items listed below. For each item, please circle the response which best indicates how you feel it has affected the quality of trout and salmon fishing in Lake Michigan.

	Gotten worse over the years		No effect	Improved over the years	
the availability of trout	-2	-1	0	+1	+2
the availability of salmon	-2	-1	0	+1	+2
regulations governing anglers	-2	-1	0	+1	+2

	Gotten worse over the years		No effect	Improved over the years	
congestion from too many anglers	-2	-1	0	+1	+2
the conduct of anglers	-2	-1	0	+1	+2
the expenses associated with fishing	-2	-1	0	+1	+2
management of trout and salmon stocks	-2	-1	0	+1	+2
the operations of commercial fishermen	-2	-1	0	+1	+2
the accumulation of PCBs in the fish	-2	-1	0	+1	+2

IN THIS SECTION WE ARE INTERESTED IN LEARNING WHERE YOU FISHED DURING THE 1978 FISHING SEASON IN LAKE MICHIGAN FOR TROUT AND SALMON, AND HOW MUCH TIME AND MONEY YOU SPENT ON YOUR FISHING.

1. To answer the following questions, please use the map of Wisconsin's Lake Michigan coast that is inside the cover of this questionnaire. Notice that the coast has been divided into 12 "Zones". We are interested in finding out how often you fished for trout and salmon in each of the Zones. For each Zone, please indicate how many trips you made during the past 1978 fishing season. (PLEASE PUT THE NUMBER OF TRIPS TO EACH ZONE IN THE APPROPRIATE BLANK. IF YOU MADE NO TRIPS TO A PARTICULAR ZONE, PLEASE ENTER A "0" IN THAT BLANK).

____ # of trips to Zone A

____ # of trips to Zone B

____ # of trips to Zone C

____ # of trips to Zone D

____ # of trips to Zone E

____ # of trips to Zone F

____ # of trips to Zone G

____ # of trips to Zone H

____ # of trips to Zone I

____ # of trips to Zone J

____ # of trips to Zone K

____ # of trips to Zone L

2. As nearly as you can remember, how much did you personally spend on the following items to fish for trout and salmon in Lake Michigan during the 1978 fishing season?

gas and oil for transportation $____

food and beverage $____

overnight lodging $____

boat charters $____

3. Do you normally share travel expenses (oil, gas, tolls, etc.) with others?

Yes ____ How many people? ____

No ____

4. Do you personally own a boat and/or trailer that you use on Lake Michigan for trout and salmon fishing?

____ Yes ____ No

5. In regard to your boat that you use for trout and salmon fishing, about how much did your boat (or boat/trailer combination) cost when you first bought it?

$_____ is approximately what my boat (or boat/trailer combination) originally cost.

_____ I do not own a boat (or boat/trailer combination) that I use for trout and salmon fishing.

6. How long have you personally owned your boat (or boat/trailer combination) that you use for trout and salmon fishing.

_____ years

_____ I do not own a boat (or boat/trailer combination) that I use for trout and salmon fishing.

7. In the following question we are interested in learning <u>two</u> things. <u>First</u>, what types of fishing trips did you take to Lake Michigan during this past 1978 fishing season for trout and salmon? <u>Second</u>, how many trips of each type did you take? (IN THE BLANKS BELOW, PLEASE CHECK ALL THE TYPES OF TRIPS YOU TOOK IN THE 1978 SEASON, <u>AND</u> PUT THE NUMBER OF TRIPS OF EACH TYPE IN THE APPROPRIATE BLANK).

	<u>NUMBER OF TRIPS</u>
_____ I traveled a short distance and returned the same day	_____
_____ I was away from home 1 night	_____

NUMBER OF TRIPS

_____ I was away from home 2-3 nights _____

_____ I was away from home 4-5 nights _____

_____ I was away from home more than 5 nights _____

8. When some people go on a trip for trout and salmon fishing in Lake Michigan, all they do is fish. Others combine fishing with other activities such as visiting relatives, working on business, or just sight-seeing. Please indicate which of the responses below is usually true for you. (CHOOSE ONE).

_____ When I am away from home on a fishing trip, I usually spend most of my time fishing for trout and salmon.

_____ When I am away from home on a fishing trip, I usually spend about half my time fishing and the other half doing something else (such as business, visiting, sight-seeing).

_____ When I am away from home and do some fishing, I usually spend very little time fishing and most of my time I spend doing something else (such as business, visiting, sight-seeing).

9. When you stayed overnight while on a trip trout and salmon fishing in Lake Michigan, did you normally: (CHECK ONE).

_____ camp?

_____ stay in a hotel or motel?

_____ stay with friends or relatives?

_____ I did not ever stay overnight while trout and salmon fishing in Lake Michigan.

10. In the following question we are interested in learning what are the three kinds of trout and salmon you prefer to fish for. In the spaces below, please place a "1" for your first choice, a "2" for your second choice, and a "3" for your third choice. Do not go beyond your third choice.

_____ Lake trout

_____ Coho salmon

_____ Chinook salmon

_____ Rainbow trout

_____ Brown trout

_____ Brook trout

_____ Splake

11. Do you fish for any other gamefish besides trout and salmon in Lake Michigan?

_____ Yes Which ones?

_____ Perch
_____ Walleye
_____ Bass
_____ Smelt
_____ Northern
_____ Other _____

_____ No

12. If the choice was entirely up to you to make, would you prefer to fish for trout and salmon or for some other type of gamefish when you fish in Lake Michigan?

_____ I prefer fishing for trout and salmon when I fish in Lake Michigan.

_____ I prefer fishing for other gamefish when I fish in Lake Michigan.

_____ I usually don't care what I fish for when I fish in Lake Michigan.

13. How many years have you been fishing for trout and salmon in Lake Michigan? (CHOOSE ONE).

_____ 1 year (1977)
_____ 2 years (1976)
_____ 3 years (1975)
_____ 4 years (1974)
_____ 5 years (1973)
_____ 6 years (1972)
_____ 7 years (1971)
_____ 8 years (1970)
_____ 9 years (1969)
_____ 10 years (1968)
_____ 11 years (1967)
_____ 12 years (1966)
_____ 13 years (1965)
_____ 14 years (1964)
_____ 15 years (1963)
_____ 15-20 years
_____ 20-25 years
_____ over 25 years

14. Since you first began fishing for trout and salmon in Lake Michigan, how regularly have you been going over the years? (CHOOSE ONE).

_____ I've gone trout and salmon fishing in Lake Michigan every year since I started.

_____ I've gone trout and salmon fishing in Lake Michigan most years since I started.

_____ I've gone trout and salmon fishing in Lake Michigan about half the years since I started.

_____ I've gone trout and salmon fishing in Lake Michigan only occasionally since I started.

_____ I've gone trout and salmon fishing in Lake Michigan very seldom since I started.

15. Some people use their boats for many different recreational activities (such as fishing, water skiing, exploring) and others use their boats only for trout and salmon fishing. About what percentage of the total time that you use your boat is it for trout and salmon fishing in Lake Michigan? (PLEASE INDICATE WHICH OF THE RESPONSES MOST CLOSELY REFLECTS HOW YOU USE YOUR BOAT).

_____ less than one quarter of the time that I use my boat it is for trout and salmon fishing in Lake Michigan.

_____ between one quarter and one half of the time that I use my boat it is for trout and salmon fishing in Lake Michigan.

_____ between one half and three quarters of the time that I use my boat it is for trout and salmon fishing in Lake Michigan.

_____ over three quarters of the time that I use my boat it is for trout and salmon fishing in Lake Michigan.

_____ I do not own a boat that I use for trout and salmon fishing in Lake Michigan.

16. Did you ever take a commercial charter boat to fish for trout and salmon during the 1978 fishing season?

_____ Yes How many times? _____ times.

_____ No

17. About how much did you spend on tackle and other fishing equipment for trout and salmon fishing in Lake Michigan during 1978? (PLEASE INDICATE THE AMOUNT YOU SPEND FOR EACH OF THE ITEMS BELOW. BE SURE TO INCLUDE ONLY EQUIPMENT BOUGHT IN 1978).

$ _____	Fishing rods	$ _____	Landing nets and gaffs
$ _____	Fishing reels	$ _____	Down riggers
$ _____	Natural baits	$ _____	Fishing seats
$ _____	Lures and dodgers	$ _____	Snag hooks
$ _____	Fishing line	$ _____	Boat

$ _____	Electronic fishing equipment	$ _____	Motor
		$ _____	Trailer
$ _____	Coolers	$ _____	Other _____

18. Has the amount of time you spend fishing for trout and salmon in Lake Michigan changed over the years since you first started? (CHOOSE ONE).

_____ Yes, I spend more time fishing in Lake Michigan than I used to.

_____ Yes, I spend less time fishing in Lake Michigan than I used to.

_____ No, the time I spend fishing for trout and salmon in Lake Michigan has stayed about the same.

_____ I only started fishing in Lake Michigan recently.

19. For some people, salmon and trout fishing in Lake Michigan may be one of the most important recreational activities in their lives. To others, it may be just one of a number of interests they have, something which they enjoy but are not strongly committed to. Please check the single statement below which best describes your feelings about trout and salmon fishing in Lake Michigan. (CHOOSE ONE).

_____ If I could not go trout and salmon fishing in Lake Michigan I would easily find something else to do that would be equally enjoyable.

_____ If I could not go trout and salmon fishing in Lake Michigan I would miss it, but not as much as a lot of other things I now enjoy.

_____ If I could not go trout and salmon fishing in Lake Michigan I would miss it more than most of the other interests I now have.

_____ If I could not go trout and salmon fishing in Lake Michigan I would miss it more than all the other interests I now have.

20. If for some reason there no longer were trout and salmon found in Lake Michigan waters, would this change the other types of fishing that you do? For each of the following statements please circle the response which best indicates how your fishing activities might change if trout and salmon fishing in Lake Michigan suddenly ended.

Y—Definitely yes N—Definitely no

y—Probably yes n—Probably no

I would fish for other types of fish (perch, bass, smelt) in Lake Michigan waters than I do now.	Y	y	n	N
I would fish more in inland waters.	Y	y	n	N
I would fish more in Lake Superior waters.	Y	y	n	N
I would not fish at all.	Y	y	n	N

WE ARE INTERESTED IN LEARNING WHAT TYPES OF FISH YOU CAUGHT IN LAKE MICHIGAN DURING THE 1978 SEASON, AND HOW MANY.

1. In the table below, please indicate approximately how many of each species you caught and how many you kept. If you did not catch a particular type of fish, leave the space blank.

	COHO SALMON	CHINOOK SALMON	LAKE TROUT	BROWN TROUT
Total numbers of fish caught				
Total numbers of fish kept				

	RAINBOW TROUT	BROOK TROUT	PERCH	OTHER
Total numbers of fish caught				
Total numbers of fish kept				

2. How many days (or part of a day) did you go snagging for trout and salmon in Lake Michigan this past season?

_____ number of days (or part of a day).

THE NEXT SERIES OF QUESTIONS HAS ABSOLUTELY NO CONNECTION WITH CURRENT OR FUTURE PLANS FOR FISH MANAGEMENT IN WISCONSIN. WE ARE INTERESTED IN LOOKING FOR WAYS TO FIND OUT HOW MUCH AN ACTIVITY SUCH AS LAKE MICHIGAN TROUT AND SALMON FISHING IS ACTUALLY WORTH. IN THE SET OF QUESTIONS BELOW, WE ASK YOU TO PUT YOURSELF IN SOME HYPOTHETICAL SITUATIONS. NONE OF THESE SITUATIONS ARE REAL BUT WE HOPE THAT YOU WILL ANSWER THE QUESTIONS AS IF THEY WERE REAL SITUATIONS.

1. For most of you, the 1978 fishing season is now past and you might be looking forward to the upcoming 1979 season. Now that you are thinking about fishing next season, suppose we offered to pay you a certain amount of money not to fish at all in Lake Michigan for trout and salmon during the upcoming 1979 season. If this amount of money was $_____, would you be willing to agree to sign a contract with us not to fish in Lake Michigan for trout and salmon. Remember, entering into this contract at this price would mean giving up an entire season of fishing for trout and salmon in Lake Michigan. However, you would still be able to fish in all inland waters as well as fish for other types of fish (other than trout and salmon) in Lake Michigan waters. Just your trout fishing in Lake Michigan would be stopped for one season if you take our offer and sign a contract. (CHOOSE ONE).

   _____ Yes, I would take this offer.

   _____ No, I would not take this offer.

2. We have just made a money offer to keep you from fishing for trout and salmon in Lake Michigan for the 1979 fishing season. You could take it or leave it.

Suppose we did not make a specific offer, but let you set the price. How much money would we have to offer before you would be willing to sign our contract not to fish for trout and salmon in Lake Michigan in the 1979 fishing season? (PUT YOUR MINIMUM SELLING PRICE IN THE APPROPRIATE BLANK BELOW. CHOOSE ONE).

_____ I would not be willing to sign such a contract for any price.

$_____ is the lowest amount I would take before I would give up fishing next season for trout and salmon in Lake Michigan. If you offered me this amount I would be willing to sign a contract not to fish for trout and salmon in Lake Michigan during the upcoming 1979 season.

3. Suppose that the state of Wisconsin was considering requiring a special fishing license for trout and salmon fishing in Lake Michigan waters. If such a license was proposed, would you be in favor of the idea? (CHOOSE ONE).

_____ No, I would not be in favor of a special license for trout and salmon fishing in Lake Michigan.

_____ Yes, I would be in favor of a special license for trout and salmon fishing in Lake Michigan.

_____ I do not really care if a special license is required or not.

4. Next, assume for the moment that it was decided that such a license would be required even though some people may be against the idea. We realize that you personally may be against the idea too, but suppose the matter was already decided. Your only choice is whether to purchase the license or not. If such a license was offered for sale for $ _____, would you purchase the special license? Remember, this license would allow you to fish as often as you wished for trout and salmon in Lake Michigan for a season. If you do not purchase the license, you will not be allowed to fish for trout and salmon in Lake Michigan. (CHOOSE ONE).

_____ Yes, I would buy a license at this price so that I can fish for trout and salmon in Lake Michigan.

_____ No, I would not buy a license at this price.

5. We have described a specific offer to sell you a special license for trout and salmon fishing in Lake Michigan. You could take it or leave it.

Suppose that we did not make a specific offer but let you set the price. How much would you be willing to pay for such a license if it was required? (PUT YOUR HIGHEST BUYING PRICE IN THE BLANK BELOW).

$ _____ is the <u>highest amount</u> I would be willing to pay for trout and salmon in Lake Michigan. If my choice was only whether to buy a license or not, and if it was offered at this price, I would pay this amount.

6. Many types of recreation activities are provided by private industry and normally a price of admission is charged. For example, it may cost you $2.50 to get into a movie, over $75.00 for season tickets to see the Green Bay Packers, or $1000.00 per week to cruise the Caribbean.

Try to think of yourself as having to buy a season pass for a full season's worth of trout and salmon fishing in Lake Michigan. Considering the price of admission to movies, football games, or Caribbean cruises, what would be a reasonable price for a season pass to fish for trout and salmon in Lake Michigan?

$ _____ is the highest price that I would consider reasonable for a season pass to fish for trout and salmon in Lake Michigan.

7. Most of the trout and salmon which are in Lake Michigan have been stocked by State and Federal hatcheries. By increasing the number of fish which are stocked, it is possible to increase the chances that you will be able to catch a trout or salmon on any given day. Suppose that there was a plan to increase the number of fish stocked so that the average fisherman would be able to catch on average one extra fish per day. The costs of this increased stocking effort would be in part paid for by requiring fishermen to buy a special Lake Michigan stocking stamp.

What would you be willing to pay for a special stocking stamp if the money was spent to increase stocking so that your average catch would increase by an extra fish per day?

$ _____ is the maximum amount I would be willing to pay for a special Lake Michigan stocking stamp.

IN THE FOLLOWING SET OF QUESTIONS WE ARE INTERESTED IN FINDING OUT WHETHER THE RECENT PUBLICITY AND WARNINGS ISSUED BY THE D.N.R. ABOUT PCBs (POLYCHLORINATED BIPHENYLS) IN LAKE MICHIGAN TROUT AND SALMON HAS AFFECTED ANGLER'S HABITS.

1. Do you personally eat the trout and salmon you catch in Lake Michigan? (CHOOSE ONE).

_____ Yes, always

_____ Yes, usually

_____ Yes, sometimes

_____ Yes, but very seldom

_____ No, never

_____ I have never caught a trout or salmon in Lake Michigan.

2. About how often do you personally eat the trout and salmon you catch in Lake Michigan? (CHOOSE ONE).

_____ less than once a month

_____ once a month

_____ twice a month

_____ three times a month

_____ four times a month

_____ five times a month

_____ six times a month

_____ over six times a month

3. Has the recent publicity and warnings issued by the D.N.R. about PCBs changed your habits about eating Lake Michigan trout and salmon? Please indicate which of the following statements is most true for you personally. (CHOOSE ONE).

The warnings about PCBs has:

_____ not influenced my decision to eat my catch at all.

_____ made me eat less of my catch than before.

_____ made me stop eating my catch altogether.

_____ made me eat more of my catch than before.

4. Has the recent publicity and warnings issued by the D.N.R. about PCBs changed how you prepare the trout and salmon you catch for eating? Please indicate which of the following statements is most true for you personally. (CHOOSE ONE).

The warnings about PCBs has:

_____ not influenced how I prepare my trout and salmon for eating.

_____ made me change how I prepare my trout and salmon for eating.

5. About how many pounds of Lake Michigan trout and salmon did you personally eat last season?

_____ pounds

6. Has the recent publicity and warnings issued by the D.N.R. about PCBs changed the number of times you go fishing? Please indicate which of the following statements is most true for you personally. (CHOOSE ONE).

The warnings about PCBs has:

_____ not influenced the number of times I go fishing for trout and salmon in Lake Michigan.

_____ made me fish less often for trout and salmon in Lake Michigan.

_____ made me stop fishing altogether for trout and salmon in Lake Michigan.

_____ made me fish more often for trout and salmon in Lake Michigan.

7. How do you feel about the following statement? "Stocking of trout and salmon should continue even though the fish have high concentrations of PCBs in their meat when they are adults." (CHOOSE ONE).

_____ Strongly agree

_____ Probably agree

_____ Probably disagree

_____ Strongly disagree

IN THE FOLLOWING SET OF QUESTIONS WE ARE INTERESTED IN LEARNING HOW YOU PERSONALLY FEEL ABOUT A WIDE RANGE OF FISHING ISSUES.

How do you personally feel about each of the statements below? For each item, please circle the response which is closest to the way that you feel. If a statement does not apply to you, please circle "NA".

DD—Definitely disagree
pd—Probably disagree
DA—Definitely agree
pa—probably agree

1.	Snagging is an acceptable way of taking trout and salmon.	DD	pd	pa	DA	NA
2.	Snagging should not be done from piers and breakwaters.	DD	pd	pa	DA	NA
3.	Commercial fishing does not seem to affect the quality of sport-fishing for trout and salmon.	DD	pd	pa	DA	NA
4.	Gill nets of commercial fishermen interfere with the operations of my boat.	DD	pd	pa	DA	NA
5.	Fish boils are fun and are an attractive feature of living and visiting the Lake Michigan coast.	DD	pd	pa	DA	NA
6.	There needs to be more public access to Lake Michigan.	DD	pd	pa	DA	NA
7.	Commercial fishermen provide a service by making fresh fish available to Wisconsin residents.	DD	pd	pa	DA	NA

8.	Often there are so many boats at the good fishing locations that effective trolling is impossible.	DD	pd	pa	DA	NA
9.	When it comes to numbers of anglers, "the more the merrier".	DD	pd	pa	DA	NA
10.	If, on the average, I caught one less fish per year, I would not feel upset.	DD	pd	pa	DA	NA
11.	Stopping the night snagging has harmed my success.	DD	pd	pa	DA	NA
12.	Fishing is more fun when there are a lot of other fishermen around.	DD	pd	pa	DA	NA
13.	Next year, I do not plan to go trout and salmon fishing as much as I did during the past 1978 season.	DD	pd	pa	DA	NA
14.	I prefer catching one larger fish as compared with two smaller fish.	DD	pd	pa	DA	NA
15.	I would like to see more trout stocked.	DD	pd	pa	DA	NA
16.	I would like to see more salmon stocked.	DD	pd	pa	DA	NA
17.	Commercial fishermen's pound nets do <u>not</u> intefere with my fishing.	DD	pd	pa	DA	NA
18.	I have never seen a D.N.R. game warden while I was fishing during 1978.	DD	pd	pa	DA	NA

19. The number of other fishermen at a location can sometimes make a difference as to whether a day of fishing is pleasant or not. This is true if you are fishing from a boat, the shoreline, or a pier. In general, do you feel that the numbers of other fishermen at the locations you fish for trout and salmon in Lake Michigan are: (CHOOSE ONE).

_____ too few in number?

_____ just about right in number?

_____ too many in number?

20. When you are making a trip to go fishing in Lake Michigan for trout or salmon, do you ever travel an extra distance (over three miles) to reach a fishing location that has fewer anglers?

_____ yes _____ no

21. There are many reasons why a fisherman chooses a particular place to fish. For each of the items below, please indicate how important each item is in your choice of where to fish for trout and salmon in Lake Michigan. (CHOOSE THE RESPONSE THAT IS MOST CORRECT FOR YOU).

VI—Very important NI—Not important at all
si—somewhat important ni—not very important

Good success in past trips	VI	si	ni	NI
Reported availability of good fishing	VI	si	ni	NI
Friends and/or relatives close by	VI	si	ni	NI
Distance from my home	VI	si	ni	NI
Advice from other anglers	VI	si	ni	NI
The solitude of the area	VI	si	ni	NI
Availability of public access	VI	si	ni	NI
Facilities in the area	VI	si	ni	NI
Preferences of those in my party	VI	si	ni	NI
Owning property in a certain area	VI	si	ni	NI

22. In the space below, we would like you to write down what you believe to be the most important fish management problem facing the managers of trout and salmon in Lake Michigan today.

IN THIS SECTION WE WOULD LIKE TO ASK YOU SOME QUESTIONS ABOUT YOUR BACKGROUND WHICH WILL HELP US COMPARE YOUR ANSWERS TO THOSE OF OTHER PEOPLE. WE WOULD STRESS THAT ALL OF YOUR ANSWERS ARE STRICTLY CONFIDENTIAL.

1. How old are you? _____ years old

2. Are you _____ male _____ female

3. How many years of school are you completed?

   ___1 ___2 ___3 ___4 ___5 ___6 ___7 ___8 ___9 ___10

   ___11 ___12 ___some college ___B.A. or equivalent

   ___M.A. or equivalent ___Advanced degree (M.D., Ph.D., etc.)

4. What is your primary occupation? Please be as specific as possible. If you are a homemaker or student, please indicate the occupation of your spouse or parent. If retired, give your former occupation.

   _____

5. With reference to your primary occupation, are you currently:

   _____ fully retired

   _____ semi-retired, working part time

   _____ retired, working at a different job part time

   _____ none of the above.

6. Please check the response that comes closest to your total family income before taxes. If you are a student, and unmarried, please give your parents' income.

_____ $0 to $3,999
_____ $4,000 to $7,999
_____ $8,000 to $11,999
_____ $12,000 to $15,999
_____ $16,000 to $19,999
_____ $20,000 to $23,999
_____ $24,000 to $27,999
_____ $28,000 to $31,999
_____ $32,000 to $35,999
_____ $36,000 to $39,999
_____ $40,000 to $43,999
_____ $44,000 to $47,999
_____ more than $48,000

7. Are you:

_____ single
_____ separated, divorced or widowed
_____ married
_____ other

8. How many children do you have? _____ children

9. Where do you presently live?

_____ farm or rural area

_____ small town (4,999 population or less)

_____ small city (5,000 to 49,999 population)

_____ large city (50,000 to 500,000 population)

_____ very large city (over 500,000 population)

_____ suburb—within 15 miles of a large or very large city

10. Where did you live (mostly) when you were growing up?

_____ farm or rural area

_____ small town (4,999 population or less)

_____ small city (5,000 to 49,999 population)

_____ large city (50,000 to 500,000 population)

_____ very large city (over 500,000 population)

_____ suburb—within 15 miles of a large or very large city

WE HOPE YOU FOUND THIS QUESTIONNAIRE AN INTERESTING AND ENJOYABLE EXPERIENCE.

PLEASE RETURN THE QUESTIONNAIRE AT YOUR EARLIEST CONVENIENCE IN THE ENCLOSED SELF-ADDRESSED, STAMPED ENVELOPE.

THANK YOU AGAIN FOR YOUR HELP AND COOPERATION.
