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**Comparison of Two Angler Data
Collection Methods
In North Dakota**

**James F. Baltezore
Jay A. Leitch
Shawn R. Vachal**

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Comparison of Two Angler Data Collection Methods In North Dakota

James F. Baltezare, Jay A. Leitch,
and Shawn R. Vachal*

Introduction

North Dakota's recreational fishing industry is an important part of the state's economic base. Resident and nonresident anglers spent nearly \$260 million dollars on fishing-related activities in the state in 1990 (Baltezare and Leitch 1992). Management of a resource that generates this amount of economic activity requires accurate and periodic information.

Management uses information in at least two ways. Information is initially used to make a decision. Once a decision is made, additional information is collected to assess the results or outcomes of that decision. In effect, information is used to make a decision and monitor changes resulting from that decision (Kerestes and Leitch 1983). Periodic information is needed to monitor the outcomes of management's decision.

Informational Needs

Data collection is an early step in the management process. Analysts translate primary (survey) and secondary (published or recorded) data into useable information, which is used in the management process to make decisions. Managers need to identify information required for the management process. Management must decide when data should be collected (i.e., semi-annually, annually, once every five years) and develop an appropriate data collection procedure. Some data may be accessible through day-to-day operations and routine bookkeeping. Other data may not be readily available, requiring a more formalized data collection method.

Management considerations in the data gathering process are the amount, the accuracy, and the cost of the data to be collected. Managers must ensure that only data essential to the management process are collected. Collecting nonessential data increases costs and reduces agency efficiency, since the money may be spent more effectively in another program area.

Managers must also decide upon the desired accuracy level of the data collected. The number of "observations" to be made is related to the desired accuracy (i.e., 85 percent, 90 percent, or 95 percent certain of a particular outcome) of the data to be collected. Managers must decide upon the accuracy level appropriate for management decisions. The accuracy or confidence level will vary

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based upon the type of data to be gathered and the type of decision to be made. Management must achieve a balance between the amount and accuracy of the data and the relative cost of collecting the data.

Purpose

The purpose of this study was twofold. The first purpose was to determine a cost-effective procedure for collecting data concerning resident fishing activities among major water bodies (fishing programs) in North Dakota. Specific objectives were

- to estimate and compare response rates and costs of the trip-card and the end-of-season survey methods,
- to estimate and compare average days fished between trip-card and end-of-season surveys among fishing programs and type of fishing,
- to estimate total anglers, angler days, angler hours, total catch and harvest, and gamefish catch and harvest among fishing programs and type of fishing,
- to estimate sample sizes for future survey efforts, and
- to develop recommendations for conducting future angler surveys.

These objectives complement the work of Vachal (1993), which also compared trip-card and end-of-season survey methods for collecting North Dakota angler data.

The second purpose was to develop a procedure to project and to provide point estimates of angler participation and fish harvest. Specific objectives were

- to estimate total anglers, angler days, and angler hours,
- to estimate total fish caught and harvested, and
- to estimate total gamefish caught and harvested.

Participation and harvest were projected for fishing programs in the state and according to the type of fishing (i.e., open water or ice).

Procedures

Two survey methods, trip-cards and end-of-season surveys, were used to collect data from North Dakota resident anglers. Various procedures were used to administer surveys, to estimate days fished, to conduct significance tests, and to estimate future sample sizes. The following discussion identifies those methods.

Surveys

Trip-card and end-of-season surveys were used to collect primary data on North Dakota resident fishing activities. The trip-card method asked anglers to complete and send in a postcard detailing their fishing activities after each day fished. The end-of-season survey asked anglers to respond to a mail questionnaire sent out at the end of both the summer and the winter fishing seasons.

Survey Sample

The North Dakota Game and Fish Department (NDGF) provided a list of names and addresses from the nearly 100,000 licensed resident anglers during the 1990-91 season. A computer program was used to draw a random sample of 7,000 angler names. The sample size was based on response rates from previous NDGF surveys and the expected turnover in license buyers from one year to the next. Response rates from similar NDGF surveys were about 10 percent. The expected turnover in license buyers from one year to the next was 25 percent (Baltezare and Leitch 1992a). The sample size was large enough to ensure a statistically valid sample sufficient to provide enough responses for statistical analyses.

Survey Instruments

Trip-card and end-of-season survey instruments were developed based on management information needs of the fisheries division of the NDGF. Questions for the trip-card survey instrument (Appendix A) were designed to elicit responses concerning daily fishing activities, including

- lake or river fished,
- county where the lake or river was located,
- date fished,
- number of people in the fishing party,
- day, night, and total hours fished,
- type of fishing (boat, shore, or ice),
- and the number of fish caught and kept according to fish species.

Each trip card was stamped with an identification number so that responses could be assigned to the respondent's license number to facilitate analysis. The card also asked if additional trip cards were needed and the name and address of the person wanting more trip cards. Nearly 700 requests were made for additional trip cards.

Questions on the winter and summer end-of-season survey instruments were designed to elicit responses concerning the angler's demographic characteristics (age, gender, marital status, residing children under 16 years of age, occupation, and residence), experiences with the trip-card survey, fishing participation, and fishing effort (Appendix B). Trip-card survey participation questions were used to estimate the percentage of respondents receiving and returning trip cards and to learn of reasons respondents may not have

participated in the trip-card survey. Fishing participation questions were used to estimate the percentage of the sample that purchased a 1992-93 fishing license and fished during 1992-93 and the days they fished, the number of one-way miles to where the angler fished most, and the number of companions with whom the angler usually fished. Fishing effort questions were to estimate the number of days of fishing during each season among the various bodies of water in the state.

Mailings

The initial trip-card mailing was sent on May 5, 1992, to 7,000 potential North Dakota resident anglers. Each angler was mailed an instructional letter (Appendix A) and five trip cards. The instructional letter was used to introduce the survey sponsor, to describe the survey objective, and to encourage participation. Reminder trip cards were mailed periodically during the fishing season. Mailing dates and the number of trip cards mailed were

<u>Reminder Mailing Date</u>	<u>Trip Cards Mailed</u>
June 3, 1992	6,183
July 10, 1992	6,070
Sept. 25, 1992	5,949
Jan. 19, 1993	5,734

The number of trip cards declined in each mailing because of bad addresses and individuals no longer willing to participate in the survey. Each reminder contained a letter thanking those who had returned trip cards and encouraging them as well as others to continue or start participating in the survey effort. All trip-card mailings were sent third class mail at the bulk rate.

Additional trip cards were mailed to those respondents who asked for more cards. Respondents were mailed a packet of five trip cards and a letter (Appendix A) thanking them for their continued participation. The additional trip-card packets were sent first class mail.

Summer end-of-season questionnaires were mailed November 20, 1992. Only one mailing of 5,918 questionnaires was sent. An instructional letter (Appendix B) was included, asking them to return any trip cards they might have previously forgotten and to complete the enclosed survey.

Winter end-of-season questionnaires were sent April 1, 1993. One mailing of 5,672 questionnaires was sent. The questionnaire included a letter asking them to return any past due trip cards and to complete the questionnaire. Both summer and winter questionnaires were sent third class mail at the bulk rate.

Program Groups

Fishing activity was separated into five NDGF program areas according to the body of water fished. Program areas and the associated water bodies were

<u>Program Area</u>	<u>Water Bodies Included</u>
(1) Missouri River System	Lake Sakakawea, Lake Oahe, Missouri and Yellowstone Rivers
(2) Devils Lake	Devils Lake
(3) Mid-sized Reservoirs	Lake Darling, Dickinson Reservoir, Bowman-Haley, Heart Butte, Nelson Lake, Audubon, New John's Lake, Pipestem Reservoir, Jamestown Reservoir, Lake Lamoure, Lake Astabula
(4) Small Lakes and Reservoirs	All other lakes and reservoirs
(5) Rivers and Streams	Includes all rivers and streams except the Yellowstone/Missouri

The trip-card questionnaire required the respondent to identify the specific body of water fished. The NDGF provided a list of water bodies in the state and a corresponding lake code to facilitate organizing into program areas. The summer and winter end-of-season questionnaires contained a state map showing water bodies to help respondents indicate days fished for respective water bodies.

Significance Tests

Significance tests were used to determine if differences existed in responses to the trip-card and the end-of-season surveys and among the program areas. A T-test was used to determine if a significant difference existed between surveys and among program areas based on the average number of days fished. The T-test was used to determine if the means from two different groups did not differ statistically.

A 90 percent confidence level ($\alpha=0.05$, two tailed) was used as the criterion for significant differences. This confidence level was selected based on the type of data collected and the management decisions to be made.

Sample Sizes

Choosing an appropriate sample size is essential because collecting information involves cost, time, and effort. The correct sample size depends on the type and amount of information needed. Money, time, and effort are wasted if the sample is too large or too

small. Statistically inadequate information is collected if the sample is too small, and it may be difficult and expensive to increase the sample size at a later date.

Sample sizes were determined using procedures outlined in Kerestes and Leitch (1983). The equation used to estimate sample size was

$$n = ((1.645)^2 * (\sigma)^2) / B^2$$

where: n = estimated sample size,

σ = population or estimated population standard deviation,

B = bound on error of estimation.

The number 1.645 assumes a 90 percent confidence level. Estimated sample size must be adjusted to compensate for expected nonresponse. The estimated sample size divided by the expected percentage response equals the nonresponse adjusted sample size.

Nonresponse adjusted sample sizes were estimated for trip-card and end-of-season questionnaires based on the variable, total number of days anglers fished. Sample sizes were also estimated for each of the five program areas. Sample sizes between surveys and among program areas were compared.

Participation Estimation

End-of-season surveys were used to project total angler numbers and total angler days for the 1992-93 fishing season. Both the end-of-season and the trip-card surveys were used to project total angler days. Total angler numbers, angler days, and angler hours were projected statewide and by program areas for open water and ice fishing.

Data from the summer and winter end-of-season surveys were merged by license identification number to develop a complete angler profile for the entire 1992-93 season. Responses to the summer and winter surveys without a license identification number were not used. Angler respondents who did not indicate whether they purchased a license in both the summer and winter surveys were not used.

The total number of North Dakota fishing licenses purchased during the 1992-93 season was 100,256. However, not all individuals who purchased a license actually fished. The projected number of active anglers is the percentage of respondents who fished during the season times the number of licenses sold. The number of survey respondents who fished during the 1992-93 season divided by the total survey respondents represents the proportion of respondents who actually fished.

The projected number of open water anglers is the number of active open water and ice anglers times the percentage of respondents who open water fished during the 1992-93 season. The percentage of respondents who open water fished is

$$\frac{\# \text{ of open water anglers}}{\# \text{ of open water} + \# \text{ of ice anglers}} = \% \text{ who open water fished}$$

The projected number of ice anglers is the projected number of open water and ice anglers multiplied by the percentage of respondents who ice fished during the season. The total number of survey respondents who were ice anglers divided by the total number of survey respondents who were open water and ice anglers is the percentage of respondents who ice fished.

Projected open water and ice anglers for each program area were estimated using a slightly different procedure. Summer and winter survey questionnaires did not specifically ask respondents if they fished in a particular program area. Consequently, the number of anglers had to be estimated using the number responding to the question of days fished in each program area. There were 91 respondents who indicated that they had fished, but did not provide estimates of the number of days fished. Therefore, the total number of state-wide anglers used to determine the percentage of anglers in each program area (and for open water and ice anglers) was less than the number of anglers used to project the total state-wide anglers.

The projected number of anglers for a particular program area is the percentage of anglers who fished in the program area multiplied by the projected number of state-wide anglers. The number of survey respondents who fished in a program area divided by the number of respondents who fished statewide is the percentage of state-wide anglers who fished in the program area. The projected number of open water anglers for each program area is the percentage of anglers who open water fished in the program area multiplied by the projected number of state-wide anglers.

The number of survey respondents who open water fished in a program area divided by the number of respondents who fished statewide is the percentage of anglers who open water fished in the program area. The projected number of ice anglers for each program area is the percentage of anglers who ice fished in the program area multiplied by the projected number of state-wide anglers. The number of survey respondents who ice fished in a program area divided by the number of respondents who fished statewide is the percentage of anglers who ice fished in the program area.

Projected total anglers multiplied by average angler days is projected total angler days. The average number of angler days is a simple average of days respondents fished in North Dakota waters. State-wide total, open water, and ice average angler days are based on the sum of days fished among the program areas. Program area total, open water, and ice average angler days are simple averages of days respondents fished in each program area for each fishing type.

Projected total anglers multiplied by weighted (see "Weighting" section for details) average angler hours is projected total angler hours. Angler hours reported on the trip-card survey were used to estimate average angler hours. Angler hours were weighted because the trip-card survey allowed respondents to report the activity for their entire fishing party.

Catch and Harvest

Projected angler catch/harvest was divided into two groups: all fish and gamefish. The all fish group represents catch/harvest of all fish species listed on the trip-card survey (Appendix A). The gamefish group includes the catch/harvest of all fish species listed on the questionnaire except for bullheads and those included in the "other" category.

The number of fish caught/harvested for each species was divided by the number of anglers reported on the trip card to estimate the number of fish caught/harvested per angler. The number of fish caught/harvested was summed among appropriate species to estimate the total number of all fish and gamefish caught/harvested for each returned trip card. Total fish and game fish caught/harvested was weighted by the number of anglers represented on the trip-card questionnaire to develop weighted averages for total catch per angler day, gamefish catch per angler day, total harvest per angler day, and gamefish harvest per angler day. These weighted averages were used in conjunction with total angler days to estimate projected total catch, total gamefish catch, total harvest, and total gamefish harvest state-wide and among program areas for open water, ice, and combined fishing.

Weighting

A weighting procedure was used to adjust the trip-card sample to account for survey returns reporting the activity of more than one angler. Failing to adjust the sample would mean that the activity of anglers who fished in a party would be underrepresented. Angler hours, total catch/harvest per angler day, and gamefish catch/harvest per angler day were weighted by the number of anglers in the party. Projected total angler hours, total catch and harvest, and total gamefish catch and harvest are based on weighted averages.

Results

Comparisons were made between the trip-card and the end-of-season surveys based on response rates, survey costs, days fished, and estimated future sample sizes. Responses from the summer and winter end-of-season questionnaires were aggregated and compared with trip-card returns during the 1992-93 fishing season. Differences were investigated for potential cost-precision trade-offs between the two survey methods.

Response

The level of response is important in assessing cost effectiveness of survey methods. A trip card was to be completed each day the angler fished, making the response rate directly related to the amount of fishing activity. Anglers returned 4,620 trip cards during the 1992-93 fishing season. The number of responding anglers was 1,375. The average number of trip cards returned per angler was 3. Summer anglers returned an average of just over 3 trip cards. Winter anglers returned an average of 2 trip cards.

The trip-card survey response rate was estimated by dividing the number of responding anglers by an adjusted survey sample size. The adjusted sample size is the original sample size (7,000) minus unusable addresses,¹ refusals, or individuals who indicated that they did not fish during the 1992-93 season.² The adjusted sample size was 5,211 anglers.³ The trip-card survey response rate was 26 percent $(1,375/5,211 * 100)$.

The summer end-of-season survey response rate was 39 percent (2,009 returns from 5,211 sent). Fifty-six percent of the questionnaires returned were from anglers who fished during the summer season (2,009 returned questionnaires and 1,134 summer anglers). The difference between the number of summer anglers and returned questionnaires was the number of individuals who either had not purchased a North Dakota fishing license for the 1992-93 season or had not fished in North Dakota during the 1992-93 fishing season.

The winter end-of-season survey response rate was 24 percent (1,257 questionnaires returned and a sample size of 5,211). Thirty percent (1,257 returned questionnaires and 382 winter anglers) of the questionnaires returned were from anglers who fished during the winter season. The difference between the number of winter anglers and returned questionnaires was the number of individuals who either did not purchase a North Dakota fishing license for the 1992-93 season, did not fish in North Dakota during the 1992-93 fishing season, or fished only in summer.

¹Unusable addresses included undeliverable questionnaires, mailings to deceased individuals, and mailings to individuals who had moved out of North Dakota.

²This included those individuals who indicated at some point during the survey process that they were not going to buy a North Dakota fishing license during the 1992-93 season plus the 367 respondents to the winter end-of-season survey who indicated that they did not purchase a North Dakota fishing license during the season.

³The adjusted sample size was used to estimate response rates for the summer and winter end-of-season surveys.

Ninety-three percent of the respondents to the trip-card survey were summer anglers compared to 85 percent for the end-of-season surveys (Table 1). Nearly 30 percent of the respondents to the end-of-season surveys were winter anglers, which was more than two times higher than the percentage of winter anglers for the trip-card survey. Previous surveys have estimated that 84 percent of North Dakota's licensed anglers are summer anglers and that 22 percent are winter anglers (Baltezare and Leitch 1992a). The end-of-season surveys appeared to provide a more consistent distribution of the actual percentage of North Dakota summer and winter anglers than did the trip-card survey.

TABLE 1. NUMBER AND PERCENTAGE OF ANGLERS RESPONDING AMONG PROGRAM AREAS, BY SURVEY AND SEASON, NORTH DAKOTA, 1993

Survey/ Season	Program Area					State-wide
	1	2	3	4	5	
----- number of anglers -----						
Trip-Card						
Summer	689	188	252	391	118	1,272 ^a
Winter	44	42	54	80	3	202 ^a
Overall						1,375 ^b
End-of-season						
Summer	680	245	375	329	98	1,134 ^a
Winter	117	96	143	186	16	382 ^a
Overall						1,332 ^b
----- percentage of overall anglers -----						
Trip-Card						
Summer	50	14	18	28	9	93 ^c
Winter	3	3	4	6	<1	14 ^c
End-of-season						
Summer	51	18	28	25	7	85 ^c
Winter	9	7	11	14	1	29 ^c

^aThe sum of the number of anglers among the five program areas does not equal the state-wide total because anglers can fish in more than one program area.

^bThe sum of the number of anglers between the two fishing seasons does not equal the overall state total because anglers can fish during more than one season.

^cThe sum of the percentages of anglers among the five program areas does not equal 100 percent because anglers can fish in more than one program area.

The percentages of summer anglers for program areas 1, 2, 4, and 5 were similar between the two surveys (Table 1). However, a considerable difference in the percentage of summer anglers for program area 3 was found (18 percent for the trip-card survey and 28 percent for the end-of-season survey). A higher percentage of end-of-season survey respondents were winter anglers than were respondents from the trip-card survey among all program areas. The percentage of winter anglers for the end-of-season survey was more than two times higher than for the trip-card survey.

Survey Costs

Expenses for the trip-card and end-of-season surveys were based on printing, mailing and return postage, and labor expenses.⁴ The total expense for the trip-card survey was \$15,323 (Table 2). The total expense for the summer and winter end-of-season surveys was \$5,149. The total expense of administering the trip-card and end-of-season surveys was \$20,472.⁵

TABLE 2. SURVEY EXPENSES, TRIP CARD AND END-OF-SEASON (SUMMER AND WINTER), BY EXPENSE, NORTH DAKOTA ANGLER SURVEYS, 1993

Expense	Trip Card	End-of-season			Totals
		Summer	Winter	Totals	
		----- dollars -----			
Printing	2,317	610	509	1,119	3,436
Mailing Postage	3,482 ^a	657	537	1,194	4,676
Return Postage	970	623	390	1,013	1,983
Bad Address Postage	748	196	36	232	980
Labor	<u>7,806</u>	<u>928</u>	<u>663</u>	<u>1,591</u>	<u>9,397</u>
Totals ^b	15,323	3,014	2,135	5,149	20,472

^aIncludes the cost of mailing additional cards to anglers requesting more trip cards.

^bOffice, travel, clerical, and indirect costs of approximately \$2,600 are not included.

⁴Labor costs include bulk mail preparation and sorting, daily questionnaire processing, and data entry.

⁵Office, travel, clerical, and indirect costs of approximately \$2,600 are not included.

The total cost for each usable return for the trip-card survey was \$3.32 (\$15,323/4,620). The total cost per usable return for the end-of-season surveys was \$1.58 (\$5,149/3,266), which is less than half the cost of the trip-card method. The costs per return for the summer and winter surveys were \$1.50 (\$3,014/2,009) and \$1.70 (\$2,135/1,257), respectively.

Days Fished

The average total number of days anglers fished statewide (summer and winter) based on the trip-card survey was 3.25 for the 1992-93 season (Table 3). The average number of days anglers fished among program areas ranged from a high of 3.28 for program area 1 to a low of 1.75 days for program area 5.

TABLE 3. AVERAGE TOTAL DAYS FISHED, TRIP-CARD AND END-OF-SEASON SURVEYS, NORTH DAKOTA ANGLERS, 1993

Program Area	Trip-Card	End-of-season	Difference ^a	Significant Difference ^b	Percentage of End-of-season ^c
	----- days -----				-- percent--
State-wide	3.25	12.94	9.69	Y	25
1	3.28	11.70	8.42	Y	28
2	2.29	5.87	3.58	Y	39
3	2.14	6.71	4.57	Y	32
4	1.98	6.61	4.63	Y	30
5	1.75	5.35	3.60	Y	33
Average ^d			5.75		31

^aEnd-of-season average day minus trip-card average day.

^bA "Y" means a significant difference, using a T-test with a 90 percent confidence level. An "N" means no significant difference.

^cTrip-card average day divided by the end-of-season average day.

^dThe simple average of the difference in days between the trip-card and end-of-season surveys.

The average total number of days anglers fished statewide, based on the end-of-season survey, was 12.94. The average total number of days fished among program areas ranged from 11.7 for area 1 to 5.35 for area 5.

Significant differences in the average total number of days anglers fished were found between the trip-card and end-of-season surveys among program areas (Table 3). Average total days fished for the end-of-season survey was significantly higher than for the trip-card survey. The differences in the average total number of days fished ranged from 9.69 state-wide to 3.58 for program area 2. The simple average difference among program areas was 5.75 days.

The average number of trip-card days fished statewide was only 25 percent of the end-of-season average days fished (Table 3). This implies that trip-card survey participants sent in only one card for every four days fished (as reported at the end of season). The number of trip-card days as a percentage of end-of-season days ranged from 39 percent for program area 2 to 25 percent state-wide. The simple average among all program areas was 31 percent.

Baltezore and Leitch (1992a), using an end-of-season survey, estimated that resident anglers spent an average of 13 days fishing in 1990. The average number of days fished according to the 1990 survey was similar to the 1993 state-wide end-of-season survey estimate. This suggests that the end-of-season survey may provide more consistent estimates of the number of days fished among program areas than the trip-card survey.

No significant difference was found in the average total number of days fished between the state-wide and the number 1 program area for the trip-card survey (Table 4). However, significant differences were found among the state-wide and the number 2, 3, 4, and 5 program areas for the trip-card survey. No significant differences were found among program areas 3, 4, and 5 based on the average total days fished for the trip-card survey.

Significant differences in the average total number of days fished were found among state-wide and all program areas for the end-of-season survey (Table 4). Significant differences were found among program area 1 and the remaining program areas. No significant differences were found among program areas 2, 3, 4, and 5.

Significant differences in the average total number of days fished were found among the trip-card and end-of-season surveys among all program areas (Table 4). This suggests one or even both of the surveys may not be representative of the population of North Dakota anglers. The actual average number of days the population of North Dakota anglers fished may be somewhere between the estimates from the two survey methods.

An analysis was conducted to determine if a significant difference in the average total days fished existed between the same angler responding to both the trip-card and the end-of-season surveys. Nearly 820 anglers responded to both surveys. The average total days fished was 3.98 and 13.75 for the trip-card and end-of-season surveys, respectively. These averages were slightly higher than the averages for all anglers (3.25 and 12.94 for the trip-card and end-of-season surveys, respectively). A significant difference existed between the average total days of anglers who responded to both surveys fished.

TABLE 4. COMPARISON OF AVERAGE TOTAL DAYS FISHED AMONG PROGRAM AREAS, TRIP-CARD AND END-OF-SEASON SURVEYS, NORTH DAKOTA ANGLERS, 1993

Survey/ Program Area	Trip-Card					End-of-season						
	State-wide	1	2	3	4	5	State-wide	1	2	3	4	5
----- significant difference* -----												
Trip-Card												
State-wide	-	-	-	-	-	-	-	-	-	-	-	-
1	N	-	-	-	-	-	-	-	-	-	-	-
2	Y	Y	-	-	-	-	-	-	-	-	-	-
3	Y	Y	N	-	-	-	-	-	-	-	-	-
4	Y	Y	Y	N	-	-	-	-	-	-	-	-
5	Y	Y	Y	N	N	-	-	-	-	-	-	-
End-of-season												
State-wide	Y	Y	Y	Y	Y	Y	-	-	-	-	-	-
1	Y	Y	Y	Y	Y	Y	Y	-	-	-	-	-
2	Y	Y	Y	Y	Y	Y	Y	Y	-	-	-	-
3	Y	Y	Y	Y	Y	Y	Y	Y	N	-	-	-
4	Y	Y	Y	Y	Y	Y	Y	Y	N	N	-	-
5	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	-

*A "Y" means a significant difference, using a T-test with a 90 percent confidence level. An "N" means no significant difference.

The average angler returned only 55.8 percent of the trip cards that should have been returned based on the number of days reported on the end-of-season survey.⁶

A scatter plot of trip-card days as a percentage of end-of-season days and end-of-season days shows that the percentage of end-of-season days decreases as the number of end-of-season days increases (Figure 1). A regression analysis using trip-card days as a percentage of end-of-season days as the dependent variable and total end-of-season days as the independent variable was used to estimate their relationship. The equation estimated from the regression analysis was (Figure 2)

$$1/\text{PERDAYS} = 2.208 + 0.199 * \text{DAYSTOT},^7$$

where,

PERDAYS = trip-card days fished as a percentage of end-of-season days and

DAYSTOT = total end-of-season days fished.

⁶The number of trip-card days fished divided by the number of end-of-season days fished times 100 equals trip-card days as a percentage of end-of-season days.

⁷The F value for the model was 247.56 which was significant at the 99 percent confidence level. T values for the intercept and DAYTOT estimates were 8.351 and 15.734, respectively, which were significant at the 99 percent confidence level.

Days reported on trip cards and end-of-season surveys were more likely to be consistent as the number of end-of-season days decreased for those anglers who responded to both surveys. As the end-of-season days increased, the number of trip cards returned as a percentage of end-of-season days decreased. This provides evidence that anglers did not send in trip cards after every day fished and/or that they over-estimated the number of days actually fished at the end of each season.

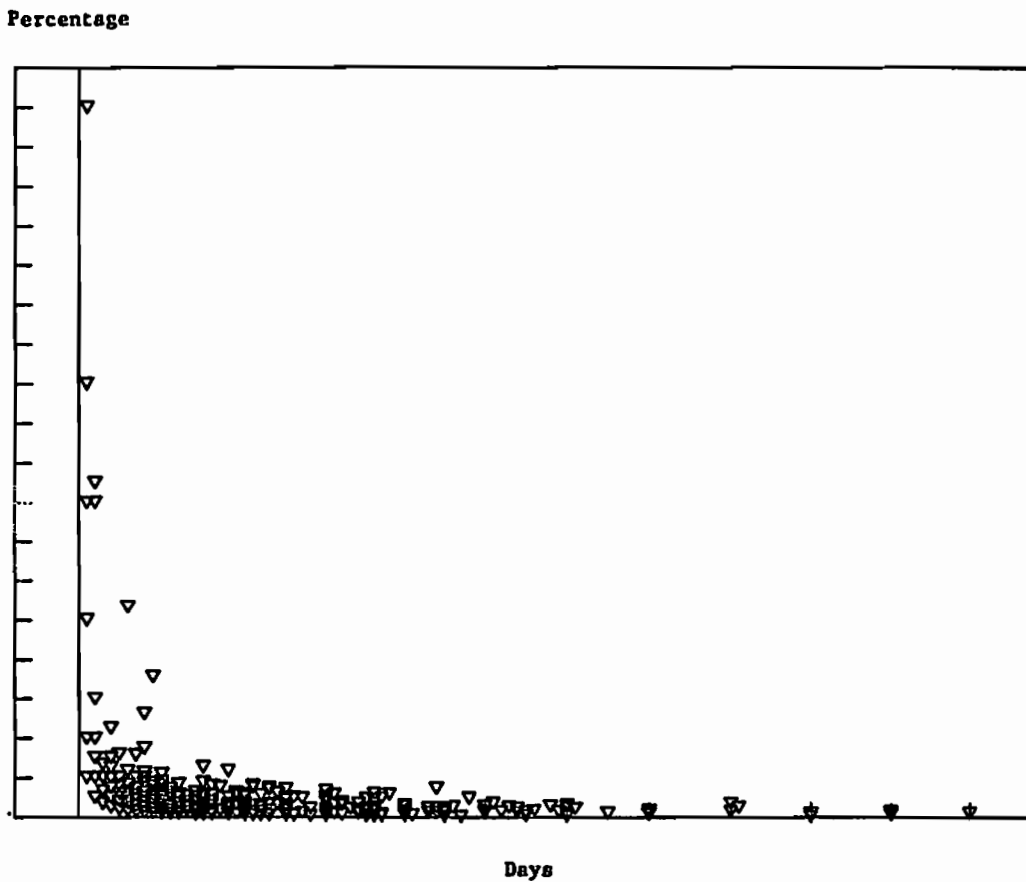


Figure 1. Scatter Plot of Trip-Card Days as a Percentage of End-of-season Days Versus End-of-season Days, North Dakota Anglers, 1993.

Percentage

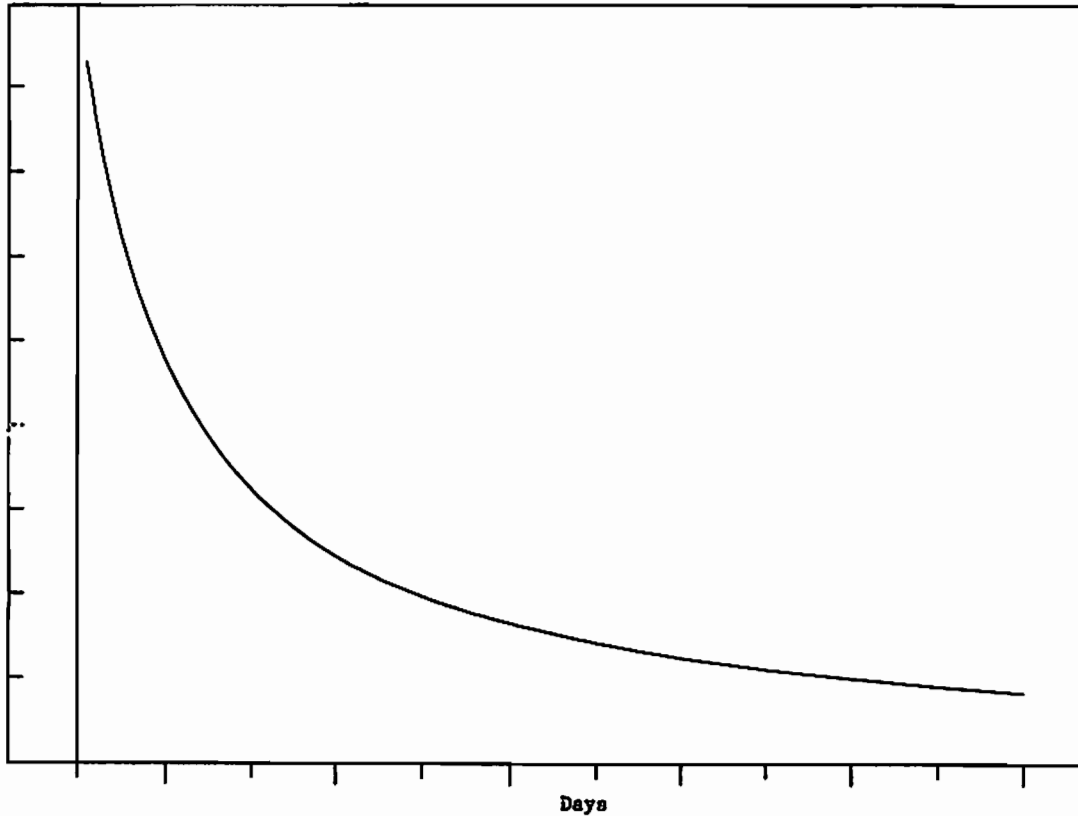


Figure 2. Regression Equation of Trip-Card Days as a Percentage of End-of-season Days Versus End-of-season Days, North Dakota Anglers, 1993.

Future Sample Sizes

Future sample sizes were estimated for the trip-card and end-of-season survey methods (Table 5). Sample sizes varied according to confidence level and survey technique. Trip-card sample sizes to estimate state-wide average angler days ranged from 958 for an 80 percent confidence level to 2,238 for a 95 percent confidence level. The end-of-season state-wide sample sizes varied from 743 to 1,736 based on 80 and 95 percent confidence levels, respectively.

End-of-season sample sizes were smaller than trip-card sample sizes state-wide and for program area 1 (Table 5). However, the trip-card sample sizes were smaller than the end-of-season for program areas 2 through 5.

TABLE 5. SAMPLE SIZES NEEDED TO ESTIMATE CONFIDENCE INTERVALS ± 10 PERCENT OF THE AVERAGE NUMBER OF DAYS FISHED, TRIP-CARD AND END-OF-SEASON SURVEYS, NORTH DAKOTA ANGLERS, 1993

Survey/ Program Area	Confidence Level		
	80	90	95
	----- sample size ^a -----		
Trip-Card			
State-wide	958	1,577	2,238
1	997	1,642	2,331
2	724	1,191	1,691
3	749	1,234	1,752
4	601	989	1,404
5	893	1,470	2,087
End-of-season			
State-wide	743	1,223	1,736
1	765	1,259	1,788
2	925	1,523	2,162
3	957	1,575	2,236
4	965	1,589	2,255
5	1,228	2,021	2,870
Difference^b			
State-wide	215	354	503
1	232	383	543
2	-202	-332	-471
3	-207	-341	-485
4	-364	-600	-851
5	-335	-551	-782

^aSample sizes for the trip-card and end-of-season surveys were based on 26 percent and 33 percent response rates, respectively. The end-of-season survey response rate is a weighted average of summer and winter response rates.

^bTrip-card sample size less end-of-season sample size.

The number of expected returns between the two surveys was similar for state-wide and for program area 1 (Table 6). However, considerably more returns were expected for the end-of-season survey in program areas 2 through 5.

Costs of the trip-card survey ranged from \$518 for program area 4 with an 80 percent confidence level to \$2,012 for program area 1 with a 95 percent confidence level (Table 6). Costs of the end-of-season survey ranged from \$387 state-wide with an 80 percent confidence level to \$1,496 for program area 5 with a 95 percent confidence level. Cost differences between the two surveys ranged from \$15 for program area 4 (based on an 80 percent confidence level) to \$1,080 for program area 1 (based on a 95 percent confidence level).

TABLE 6. EXPECTED QUESTIONNAIRES RETURNED AND COST OF RETURNED QUESTIONNAIRES, TRIP-CARD AND END-OF-SEASON SURVEYS, NORTH DAKOTA ANGLERS, 1993

Survey/ Program Area	Expected Returns ^a Confidence Level			Estimated Cost ^b Per Questionnaire Returned Confidence Level		
	80	90	95	80	90	95
	---- questionnaires ----			----- dollars -----		
Trip-Card						
State-wide	249	410	582	3.32	3.32	3.32
1	259	427	606	3.32	3.32	3.32
2	188	310	440	3.32	3.32	3.32
3	195	321	455	3.32	3.32	3.32
4	156	257	365	3.32	3.32	3.32
5	232	382	543	3.32	3.32	3.32
End-of-season						
State-wide	245	403	573	1.58	1.58	1.58
1	252	416	590	399	657	932
2	305	503	714	482	794	1,127
3	316	520	738	499	821	1,166
4	318	524	744	503	828	1,176
5	405	667	947	1.58	1.58	1.58
Difference ^c						
State-wide	4	7	9	439	723	1,027
1	7	11	16	462	761	1,080
2	-117	-193	-274	142	234	332
3	-121	-199	-283	148	244	346
4	-162	-267	-379	15	25	36
5	-173	-285	-404	131	215	305

^aReturns for the trip-card and end-of-season surveys were based on 26 percent and 33 percent response rates, respectively. The end-of-season survey response rate is a weighted average of summer and winter response rates.

^bCosts based on \$3.32 and \$1.58 per returned questionnaire for the trip-card and end-of-season surveys, respectively. Costs are for postage and printing only.

^cTrip-card questionnaires minus end-of-season questionnaires.

Projected Participation

Seventy-eight percent (n=2,007) of respondents to the summer and winter end-of-season questionnaires purchased a North Dakota fishing license during the 1992-93 fishing season. Seventy-one percent (n=1,423) of these respondents open water or ice fished or both during the 1992-93 season. Over 70 percent of the respondents only open water fished. Fifteen percent only ice fished, and 14 percent open water and ice fished.

Over 85 percent of anglers open water fished, and nearly 30 percent ice fished (Table 7). The percent of anglers who fished among program areas ranged from 8 percent in program area 5 to 55 percent in program area 1. The percent of anglers who fished was higher for open water than for ice fishing among all program areas.

The projected number of anglers for the 1992-93 season was 71,182 (Table 7). The estimated number of anglers among program areas ranged from a low of 5,800 (program area 5) to a high of 39,100 (program area 1). The projected number of open water anglers ranged from 5,196 in program area 5 to 36,000 in program area 1, while the number of ice anglers ranged from 850 (program area 5) to 6,200 (program area 1).

Anglers spent an average of 13 days fishing in North Dakota during the 1992-93 season (Table 7). Anglers spent an average of nearly 2 days more open water fishing (12 days) than ice fishing (10 days). Average days angling ranged from 5 in program area 5 to nearly 12 in program area 1.

Projected total angler days state-wide were more than 922,500 (Table 7). The majority of angler days was spent open water fishing. Program area 1 had the highest projected number of angler days, and program area 5 had the lowest.

Anglers fished nearly 6 hours each day fished (Table 7). Average hours angling per day ranged from over 4 in program area 5 to more than 6 in program area 1. Except for program area 1, average hours per day spent ice fishing exceeded open water fishing.

Projected angler hours state-wide exceeded 5 million hours during the 1992-93 season (Table 7). The majority of the hours were spent open water fishing. The projected number of hours fishing were lowest for program area 5 and highest for program area 1.

Projected Harvest

The average number of total fish caught per day statewide was 5 (Table 7). Open water anglers caught an average of less than 5 fish per day, and ice anglers caught an average of nearly 9 fish per day. Except for program area 1, the average number of total fish caught per day was higher for ice anglers than for open water anglers.

More than 4.6 million fish were caught in North Dakota during the 1992-93 season (Table 7). The majority of fish were caught during the open water season. Most of the fish caught were from waters in program areas 1 and 3. More fish were caught ice fishing than open water fishing in program area 4.

The average number of total fish harvested per day statewide was 3 (Table 7). North Dakota anglers harvested (kept for consumption) 56 percent (2.81 fish harvested per day divided by 5.04 fish caught per day) of the fish caught during the fishing season. Open water angling average total fish harvested ranged from a low of 1.39 (program area 5) to a high of 4.36 (program area 4). Ice angling average total fish harvested ranged from 1.6 in area 1 to 13.9 in area 4.

TABLE 7. PROJECTED TOTAL ANGLERS, ANGLER DAYS, ANGLER HOURS, CATCH, GAMEFISH CATCH, AND HARVEST, NORTH DAKOTA ANGLERS, 1992-93 SEASON

Program Area	Percent Fished	Average Days Angling	Total Angler Days	Average Hours Angling ^b Per Day	Total Angler Hours ^b	Average Catch Per Day ^b	Total Catch ^b	Average Gamefish Catch Per Day ^b	Total Gamefish Catch ^b	Average Harvest Per Day ^c	Total Harvest ^b	Total Gamefish Harvest ^b
State Total	0.710	12.96	922,516	5.72	5,277,000	5.04	4,649,479	4.75	4,381,949	2.81	2,592,269	2,518,468
Open water	0.851	11.87	719,036	5.71	4,106,000	4.77	3,429,800	4.46	3,206,899	2.50	1,797,589	1,740,066
Ice	0.293	10.03	209,189	5.94	1,243,000	8.92	1,865,965	8.81	1,842,955	7.27	1,520,804	1,518,712
Program 1 Total	0.550	11.72	458,839	6.06	2,781,000	4.31	1,977,597	4.09	1,876,652	2.23	1,023,211	1,009,446
Open water	0.510	11.28	409,496	6.07	2,486,000	4.35	1,781,307	4.12	1,687,123	2.24	917,271	904,986
Ice	0.088	7.93	49,674	5.66	281,000	2.79	138,589	2.36	117,230	1.59	78,981	77,988
Program 2 Total	0.238	5.87	99,446	6.02	599,000	4.32	429,605	4.31	428,610	1.93	191,930	190,935
Open water	0.184	5.51	72,167	5.91	427,000	4.22	308,545	4.21	303,824	1.74	125,571	124,849
Ice	0.072	5.34	27,368	6.83	187,000	5.40	147,787	5.39	147,514	4.04	110,567	110,567
Program 3 Total	0.351	6.73	168,148	5.76	969,000	4.19	704,541	3.74	628,874	2.33	391,785	358,156
Open water	0.280	5.50	109,620	5.63	617,000	3.96	434,096	3.43	375,998	2.09	229,106	203,894
Ice	0.107	7.67	58,418	6.45	377,000	5.44	317,796	5.43	317,212	3.64	212,643	212,059
Program 4 Total	0.349	6.62	164,457	4.87	801,000	8.47	1,392,955	8.13	1,337,039	5.68	934,118	917,673
Open water	0.246	5.72	100,162	4.82	483,000	7.32	733,183	6.93	694,120	4.36	436,705	425,687
Ice	0.140	6.46	64,377	5.20	335,000	15.74	1,013,294	15.71	1,011,363	13.94	897,415	897,415
Program 5 Total	0.082	5.36	31,286	4.41	138,000	4.03	126,082	2.61	81,656	1.42	44,426	33,476
Open water	0.073	5.06	26,293	4.41	116,000	3.96	104,121	2.56	67,311	1.39	36,548	26,819
Ice	0.012	5.81	4,963	4.57	23,000	9.50	47,147	7.00	34,740	4.50	22,333	22,333

^aThe number of total state-wide anglers is based on 100,256 resident licenses sold during the 1992-93 season. The number of anglers for open water and ice fishing state-wide and among program area is 71,182 (100,256 anglers times .71 percent that fished).

^bThe total is less than the sum of the two parts because extrapolations were based on data provided by those who reported fishing both summer and winter.

^cRepresents a weighted average based on the number of anglers in the party.

Projected total state-wide harvest was 2.6 million fish for the 1992-93 season (Table 7). Harvest during the open water season was nearly 1.8 million fish compared to 1.5 million fish during the ice fishing season. Most of the fish harvested were from program area 1.

The average number of gamefish caught per day statewide was 4.75 (Table 7). Open water anglers caught an average of 4.5 gamefish per day. Ice anglers caught on average twice as many gamefish per day as open water anglers. Except for program area 1, the average number of gamefish caught per day ice fishing exceeded the average caught open water fishing.

Projected total gamefish caught during the 1992-93 season was 4.4 million (Table 7). Open water anglers caught the majority of the gamefish. Most of the gamefish caught were in program areas 1 and 3. The number of gamefish caught in program area 4 was higher for ice anglers than for open water anglers.

Anglers harvested an average of 2.7 gamefish per day statewide during 1992-93 (Table 7). The average number of gamefish harvested statewide per day for ice anglers was three times higher than the average for open water anglers. The average number of gamefish harvested per day by ice anglers was higher than that of open water anglers for all program areas except program area 1.

Projected total state-wide gamefish harvest exceeded 2.5 million fish during the 1992-93 season (Table 7). Anglers kept 57 percent of the gamefish caught for consumption. Due to their numbers, open water anglers harvested the majority of fish. Most of the gamefish harvested were from program areas 1 and 4.

Conclusions

There are three possible explanations for differences in the average total days fished between the trip-card and end-of-season surveys. First, participants in the trip-card survey may not have sent in cards if fish were not caught on a particular day. Survey instructions repeatedly stated that anglers were to return a card even if no fish were caught. However, some anglers may not have returned trip cards because they did not want to disclose that they did not catch any fish or they may have thought that responses were only necessary if fish were caught.

Second, participants in the trip-card survey may have stopped sending in cards after participating for part of the season or only sent in a card when it was convenient. This may apply in particular to the more avid anglers who spend more than 10 to 15 days fishing each year. It may be somewhat optimistic to expect anglers to maintain a supply of trip cards, record fishing activity, and then return the cards after each day fished for an entire year of fishing.

Third, respondents to the end-of-season survey may have overstated the number of days actually fished. The end-of-season survey has the potential for memory bias since the questionnaire is asking for responses concerning fishing activity that occurred as many as six months ago. Respondents typically respond to the next highest multiple of 5 (i.e., 5, 10, 15) when asked a question such as the number of days fished during the year.

The trip-card and end-of-season survey results differ significantly based on the average total number of days fished. The end-of-season survey provides a more consistent estimate of the actual average total number of days North Dakota anglers fished than the trip-card survey, based on results of previous surveys.

Consistencies between the two survey methods suggest that no significant difference exists among the average total days anglers fish in program areas 3, 4, and 5. Further investigation is needed to determine if program area number 2 differs significantly from 3, 4, and 5. Additional efforts are needed to determine if a significant difference exists between state-wide and program area 1 average total days fished.

Sample sizes for the end-of-season survey among the majority of program areas and confidence levels are greater than sample sizes for the trip-card survey. However, survey costs (postage and printing) for the end-of-season survey are considerably less than the costs for the trip-card survey. The cost differential increases substantially as the confidence level increases.

The end-of-season survey method is less costly and likely provides more consistent estimates of the number of days anglers fished than the trip-card survey method. The implications are that some form of an end-of-season survey method should be used to estimate the number of days North Dakota anglers fished among program areas. Additional investigations are needed to determine if the end-of-season survey provides better estimates of fishing activity and fish harvests than the trip-card survey.

Future Survey Recommendations

Managers need to carefully identify informational needs before collecting data to ensure that only necessary data are collected. Collecting unnecessary or irrelevant data increases survey costs and reduces response rates. Data are only useful if they can be transformed into information for use in the planning and decision-making process.

Managers must select appropriate levels of error and of confidence for the type of data collected. Management must consider the importance of the decisions to be made from information derived from the data before collection. The level of error and confidence level have a direct impact on the magnitude of the survey effort.

Trade-offs among potential error, confidence levels, and costs need to be examined and made explicit. Data costs increase as the level of error decreases and the confidence level increases. Managers need to determine an acceptable level of error and confidence level based on the decisions to be made and the resources and time (financial and human) available to collect the data and process it into information.

Future surveys should be modeled after the end-of-season format with some modifications. For example, the open water and ice fishing seasons could be divided into several parts. Questionnaires could be sent once halfway through the summer season to record fishing activity from the opening of the fishing season through the July 4th holiday. A second questionnaire would be sent at the end of the open water season to collect data for fishing activity from the end of the July 4 holiday through the end of the open water season. A similar procedure could be followed for the ice fishing season. Implementing this procedure may reduce memory bias and more accurately represent the variability of the data collected.

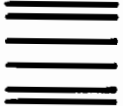
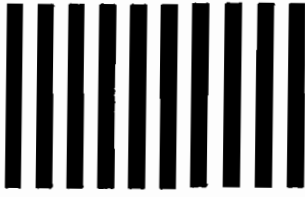
References

- Baltezore, James F. and Jay A. Leitch. 1992. Expenditures and Economic Impact of Resident and Nonresident Hunters and Anglers in North Dakota 1990-91 Season. Agricultural Economics Report No. 289, Department of Agricultural Economics, Agricultural Experiment Station, North Dakota State University, Fargo.
- Baltezore, James F. and Jay A. Leitch. 1992a. Characteristics, Expenditures, and Economic Impact of Resident and Nonresident Hunters and Anglers in North Dakota, 1990-91 Season. AE92003, Department of Agricultural Economics, Agricultural Experiment Station, North Dakota State University, Fargo.
- Kerestes, Daniel E. and Jay A. Leitch. 1983. An Analysis of Sportsman Activity Data Collection Methods for North Dakota. Agricultural Economics Report No. 180, Department of Agricultural Economics, Agricultural Experiment Station, North Dakota State University, Fargo.
- Vachal, Shawn R. 1993. A Comparison of Trip-Card and End-of-season Methods for Angler Data Collection. Unpublished M.S. thesis, North Dakota State University, Fargo.

Appendix A

Trip-Card Questionnaire, Instructional Letter,
Reminder Trip-Card Questionnaire, and Thank You Letter

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES



BUSINESS REPLY MAIL
FIRST-CLASS MAIL PERMIT NO. 884, FARGO, ND

POSTAGE WILL BE PAID BY ADDRESSEE

DEPARTMENT OF AGRICULTURAL ECONOMICS
NORTH DAKOTA STATE UNIVERSITY
P O BOX 5636
FARGO ND 58105-9982



NAME _____
ADDRESS _____
CITY & STATE _____ ZIP CODE _____

Nº 6709

Your cooperation is needed to manage North Dakota's sport fishery. Please fill out and mail one card after EACH day you personally fished. Fill out cards even if no fish were caught. NO POSTAGE REQUIRED.

Lake or River _____

County _____ Date ____/____/____ Number in party ____
mo. day yr.

Total hours fished by party: Day _____ Night _____ Total _____

Kind of fishing (check one): Boat _____ Shore _____ Ice _____

FILL IN TOTAL NUMBER CAUGHT AND KEPT OF EACH SPECIES BY YOUR PARTY:

Species	Caught	Kept	Species	Caught	Kept
Walleye	_____	_____	Northern Pike	_____	_____
Yellow Perch	_____	_____	Largemouth Bass	_____	_____
Sauger	_____	_____	Smallmouth Bass	_____	_____
Crappie	_____	_____	White Bass	_____	_____
Bluegill	_____	_____	Catfish	_____	_____
Salmon	_____	_____	Bullhead	_____	_____
Trout	_____	_____	Other (specify)	_____	_____
(rainbow/brown)	_____	_____		_____	_____

If you need more cards, please fill in name and address and check here. I

Name: _____

Address: _____

City: _____ State: _____ Zip: _____

Dear Angler:

An important part of our fisheries management program is monitoring the amount of fishing and fishing success throughout the state. You have been selected to supply us with information about your fishing activities in North Dakota during this coming fishing season (May 1992-March 1993). Because only one in twenty-five anglers is being asked to assist us with gathering this information, **your responses do matter.**

To participate, please fill out one of the enclosed cards after **each day** of fishing and return the card. It is very important **EVEN IF YOU DO NOT CATCH FISH** that you fill out the cards and return them. No postage is necessary. Name and address are not needed unless you need additional cards sent immediately to you. During the next few months, we will send you additional cards and a questionnaire concerning your fishing experience.

The information you fill out should represent the number of hours fished and the catch. If you fish in a party with others, report everyone's catch and effort, but do it only for the time that you personally fished. To accurately project survey results, it is important that you don't transfer your cards to another person--spouse, friend, or relative--who fishes a lot. If you have any questions, call Janice Vetter at (701) 221-6349. Thank you for your cooperation.

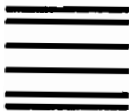
**NORTH DAKOTA GAME AND FISH DEPARTMENT IN CONJUNCTION WITH THE
DEPARTMENT OF AGRICULTURAL ECONOMICS, NORTH DAKOTA STATE UNIVERSITY**

NAME

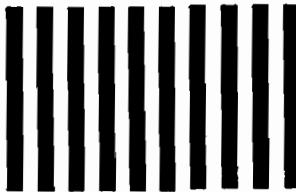
ADDRESS

CITY & STATE

ZIP CODE



NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES



BUSINESS REPLY MAIL

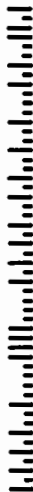
FIRST-CLASS MAIL PERMIT NO. 884, FARGO, ND

POSTAGE WILL BE PAID BY ADDRESSEE

DEPARTMENT OF AGRICULTURAL ECONOMICS
NORTH DAKOTA STATE UNIVERSITY

P O BOX 5636

FARGO ND 58105-9882



Dear Angler,

Prior to this year's fishing season, you were mailed a packet of cards like the one attached and asked to cooperate with our fisheries management program. We are asking your continued cooperation with this reminder. Only about one in ten of the people contacted to participate in our survey in past years has responded. If you are one of these we sincerely thank you. We are hoping, however, that with reminders we will achieve a greater representation of our angling public and thus more accurate results. Please return cards for each day fished, even if no fish are caught, throughout the entire season. There is a box to check on each card if you need an additional supply of cards sent. If you have any questions, call Janice Vetter at (701) 221-6349. Thank you for your cooperation.

North Dakota Game and Fish Department in conjunction with the
Department of Agricultural Economics, North Dakota State University

Dear Angler:

Thank you for participating in our survey. You will find enclosed additional trip cards to be completed after each day you personally fished. Remember to fill out a card even if no fish were caught. Your continued participation in this survey effort is greatly appreciated.

Thank you!

Appendix B

Summer End-of-season Questionnaire,
Winter End-of-season Questionnaire, and
Instructional Letter

1992 NORTH DAKOTA ANGLER QUESTIONNAIRE

NOTE: This survey is intended for open-water fishing only. Do not include any ice-fishing experiences.

SECTION 1: Angler Profile

1. What is your age? (*Check one*)
 18 years or less 19 to 45 years 46 to 65 years over 65 years
 2. What is your gender? (*Check one*) male female
 3. What is your marital status? (*Check one*) single married divorced widow/widower
 4. How many children under 16 years of age reside with you? persons
How many of these children fished during 1992-93 season? persons
If you had a child living with you and you did not take them fishing, why not? _____
-

5. What is your occupation? (*Check one*)
 farming (includes forestry and commercial fishing)
 professional/management (includes teachers, registered nurses)
 technical, sales, or administrative support (includes office workers, salespersons, nurses--LPNs, mail carriers, health care support jobs)
 service jobs (includes health care aides, law enforcement, firemen, cooks, barbers, janitors)
 precision production, craft, and repair jobs (includes mechanics, welders, construction trades)
 equipment operators and fabricators (includes bus/truck drivers, laborers)
 retired
 other (*specify*) _____
6. Which of the following best describes where you live?
 city over 50,000 population city between 2,500 and 50,000 population
 community under 2,500 population farm or ranch
 rural nonfarm

SECTION 2: Participation

7. Did you receive any angler trip cards during the 1992-93 fishing season?
 yes
 no If NO, go to question 9
8. Did you complete and return any angler trip cards during the 1992-93 season? yes no
IF NO, why not? _____
9. Did you purchase a North Dakota fishing license during the 1992-93 season (May 2, 1992 through March 31, 1993)?
 yes no

If NO, it would help if we knew why not. Then please return the survey.

Please Complete Reverse Side

10. Did you fish in North Dakota during the 1992-93 season? ___ yes ___ no

If NO, it would help us if we knew why not. Then please return the survey.

11. How many days have you fished in North Dakota since the start of the 1992-93 season (May 2, 1992 until now)? ___ days

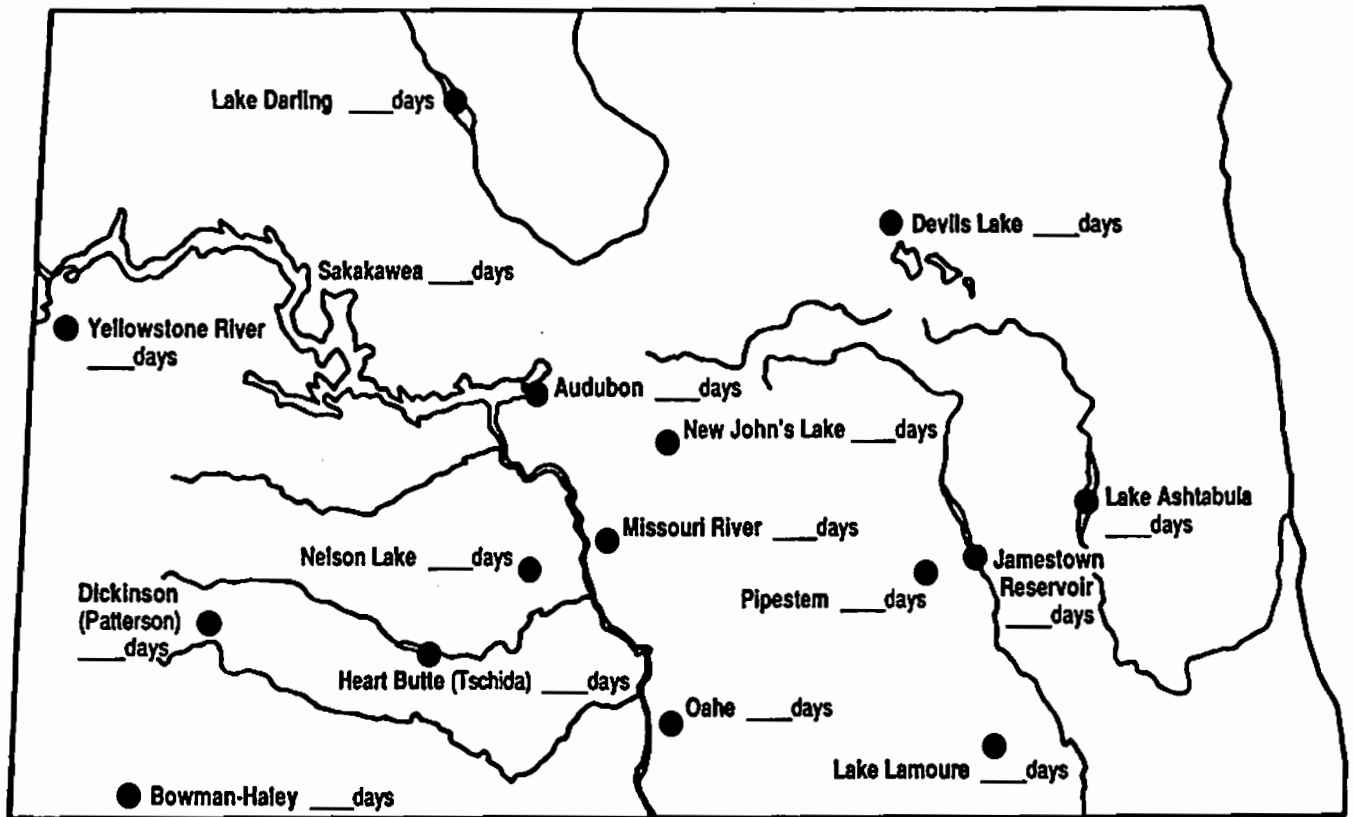
12. How many miles do you drive one-way, to where you fish most often? ___ miles

11. Who do you usually fish with?

- | | |
|----------------------|---------------------------|
| ___ self | ___ immediate family |
| ___ extended family | ___ people from work |
| ___ other companions | ___ other (specify) _____ |

SECTION 3: Effort Among Programs

Please fill in the number of days during the 1992 summer fishing season you fished on each of the waters listed on the map below. Write the number of days in the space provided for each body of water and/or category.



● Rivers and streams other than Missouri, Red and Yellowstone ___ days

● Small lakes and reservoirs (those not shown on map) ___ days

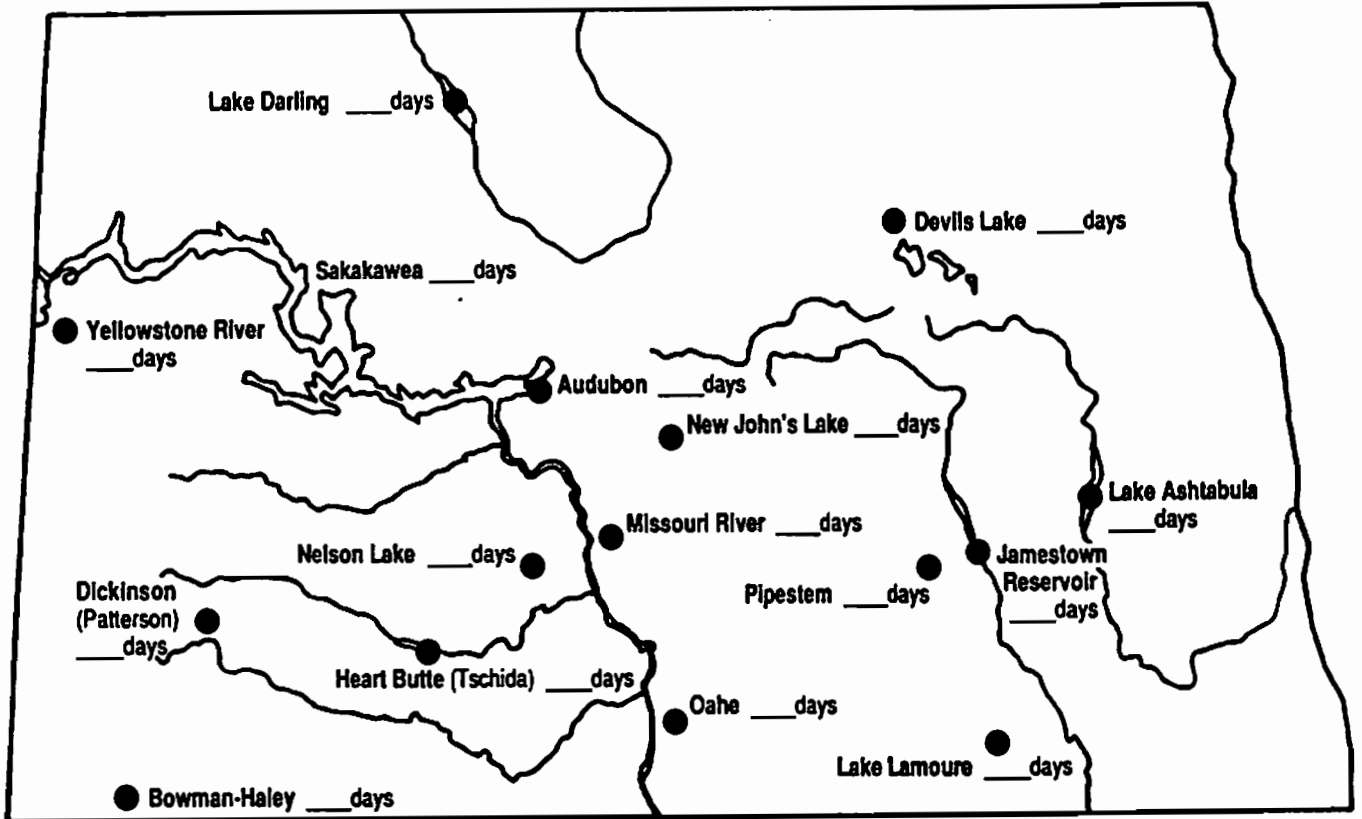
Please list rivers and streams fished most often:

Please list small lakes and reservoirs fished most often:

MAILING LABEL

SECTION 2:

Please fill in the number of days during the 1992-93 fishing season you ice-fished on each of the waters listed on the map below. Write the number of days in the space provided for each body of water and/or category.



● Small lakes and reservoirs (those not shown on map) ___ days

● Rivers and streams other than Missouri, Red and Yellowstone ___ days

Please list small lakes and reservoirs fished most often:

Please list rivers and streams fished most often:

Do you have any comments or suggestions about ice-fishing in North Dakota?

MAILING LABEL

November 1, 1992

Dear Angler

You were notified this past spring of your selection to participate in a **North Dakota angler survey**. Part of this survey involved you sending in trip cards about your fishing experiences. If you have forgotten to send in some of your trip cards with fishing information, please do so now.

This is the final part of the **summer angler survey**. Even if you did not fish this year, please take the time to fill out the following **angler questionnaire** and place it in the return envelope provided. No postage is necessary. The information you provide should represent your fishing experience and not that of another person (spouse, friend, etc.). Information should not include any ice-fishing experiences.

Thank you for your cooperation.

**North Dakota Game and Fish Department in conjunction with the
Department of Agricultural Economics, North Dakota State University**