Fishery Data Series No. 95-16

Assessment of Harvest and Participation Characteristics in the Northern Pike Fisheries of the Tanana River Drainage, Alaska

by

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and

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Alaska Department of Fish and Game

Division of Sport Fish

Symbols and Abbreviations

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Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
metric ton	mt
milliliter	ml
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
ounce	oz
pound	lb
quart	qt
yard	yd

Spell out acre and ton.

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
hour (spell out for 24-hour clock)	h
minute	min
second	s

Spell out year, month, and week.

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

All commonly accepted abbreviations.	e.g., Mr., Mrs., a.m., p.m., etc.
All commonly accepted professional titles.	e.g., Dr., Ph.D., R.N., etc.
and	&
at	@
Compass directions:	
east	E
north	N
south	S
west	W
Copyright	©
Corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
et alii (and other people)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.,
id est (that is)	i.e.,
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
number (before a number)	# (e.g., #10)
pounds (after a number)	# (e.g., 10#)
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S. state and District of Columbia abbreviations	use two-letter abbreviations (e.g., AK, DC)

Mathematics, statistics, fisheries

alternate hypothesis	H_A
base of natural logarithm	e
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	F, t, χ^2, etc.
confidence interval	C.I.
correlation coefficient	R (multiple)
correlation coefficient	r (simple)
covariance	cov
degree (angular or temperature)	°
degrees of freedom	df
divided by	÷ or / (in equations)
equals	=
expected value	E
fork length	FL
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_2$, etc.
mideye-to-fork	MEF
minute (angular)	'
multiplied by	x
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
standard length	SL
total length	TL
variance	Var

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ABSTRACT

Questionnaires were sent by mail to northern pike *Esox lucius* angling households in the Tanana River drainage, to assess the characteristics of the fishery and estimate the seasonal distribution of northern pike fishing participation and harvest. Of the 872 surveys mailed, 652 (75%) were successfully delivered and 549 were completed and returned. Of the returned surveys, 546 (84% of the deliverable surveys) were used for estimates. Evaluation of nonresponse bias was conducted on three mailings of the survey. Eighty-four percent (SE = 0.1%) of all reported days fished were expended during the open-water season. Open-water fishing occurred more on rivers (51%, SE = 1.0%) than on lakes (49% SE = 1.0%). Only 14% (SE = 0.7%) of the days of annual participation reported occurred during the ice-covered season, of which 86% (SE = 1.6%) occurred on lakes. Two hundred fifty-nine households reported fishing during the survey period. The responding households harvested a total of 2,074 northern pike. Approximately 82% (SE = 0.8%) of northern pike harvested by the responding households were taken during the open-water season.

Key words: Northern pike, *Esox lucius*, mail questionnaire, nonresponse bias, participation, harvest, open water, ice cover, lakes, rivers, fishing gear, angler opinions.

INTRODUCTION

Northern pike *Esox lucius* are popular with sport fishers in Alaska. Average sport harvest in the Tanana River drainage since 1983 (11 years) is 9,981 fish (Figure 1), which is 48% of the average statewide harvest (20,701) of northern pike (Mills 1994). The Tanana River drainage northern pike fishery occurs mainly in remote lakes and streams and covers a large geographic area Figure 2). The Alaska Department of Fish and Game (ADF&G) has conducted estimates of

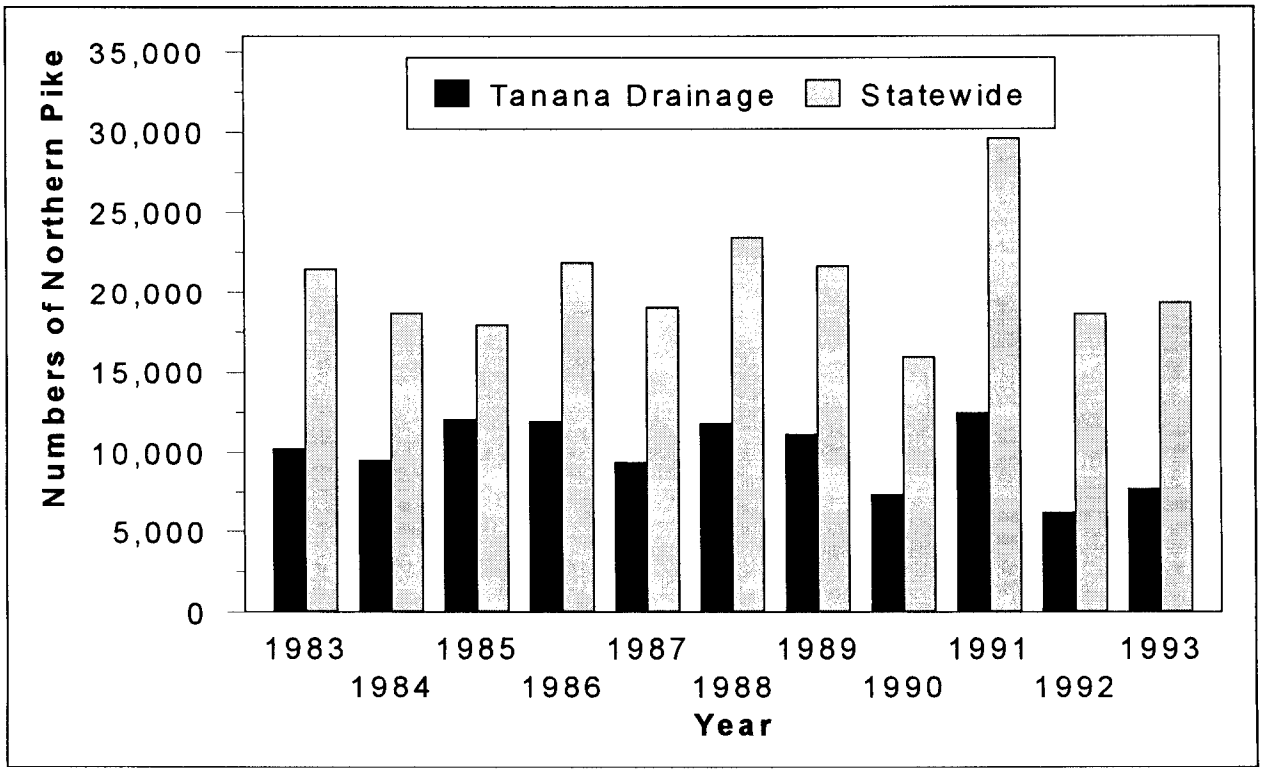

Figure 1.-Statewide and Tanana River drainage harvests of northern pike (Mills 1994).

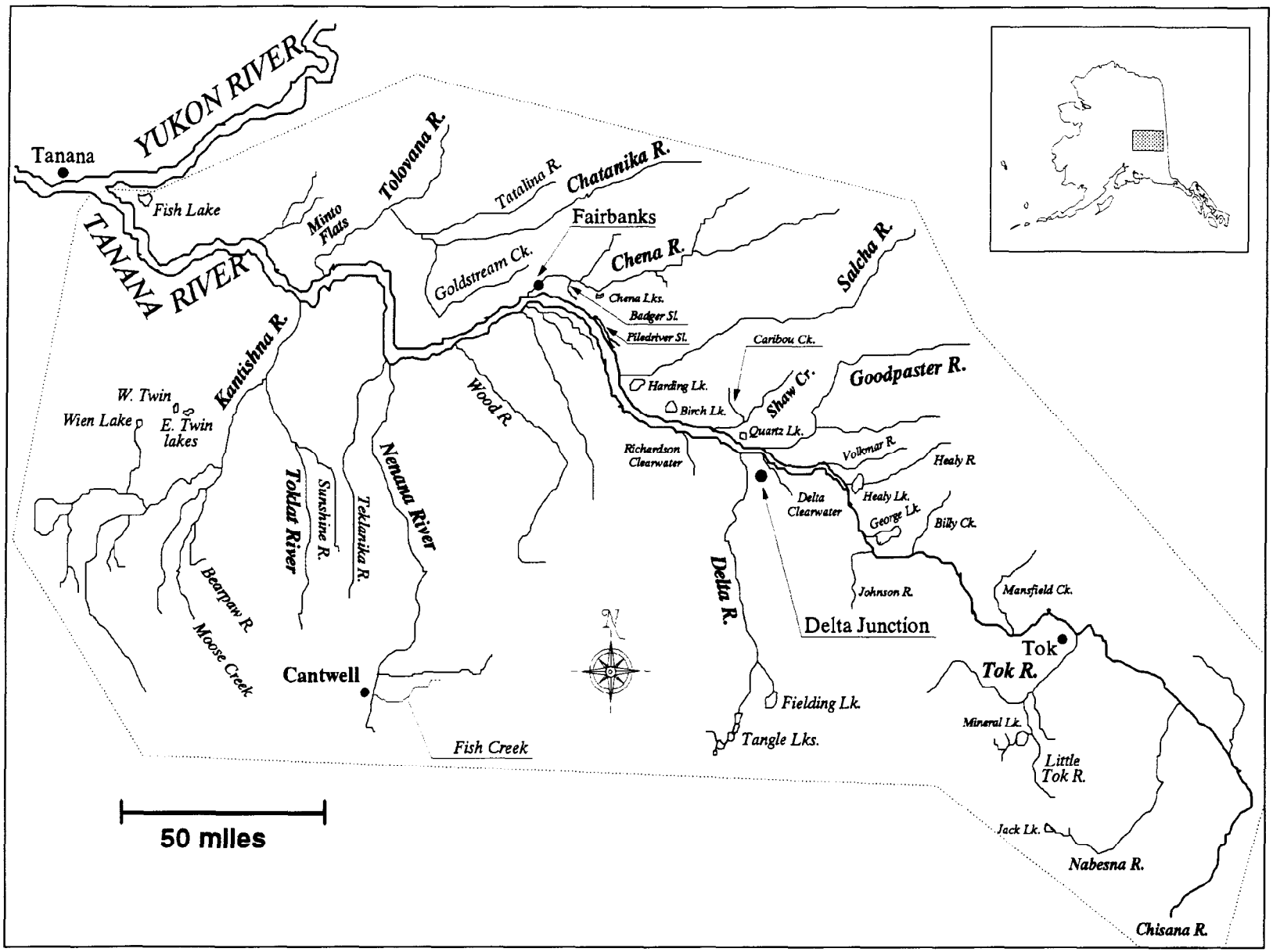

Figure 2.-The Tanana River drainage.

abundance and composition in four lakes since 1985, where 27% of the 1992 (Pearse and Hansen 1993) and 35% of the 1991 (Pearse and Burkholder 1993) total harvests in the drainage occurs. Because northern pike fisheries occur over a large area throughout the year, methods of data collection such as onsite interviews or direct observations would be very labor intensive and expensive. Information concerning timing and gear used to catch northern pike in the Tanana River drainage is difficult to obtain in an efficient, inexpensive manner.

This survey was designed to provide information on attributes of the northern pike fishery within the Tanana River drainage. A questionnaire was mailed to all respondents to the annual mail survey of Alaskan sport fishers (also known as the Statewide Harvest Survey, hereafter referred to as SWHS), who indicated they caught or harvested northern pike in the Tanana River drainage from 1988 to 1992. Additionally, a second select survey of households with recent ice house permits (for the 1992-1993 season) was sent concurrently with the survey of respondents to the SWHS.

Several management plans for public review have been developed for water bodies in which northern pike fisheries occur. In order to proceed with special management or regulatory alternatives, better knowledge of certain characteristics of the northern pike fishery were desired including seasonal participation and harvest, gear types, and opinions of anglers toward regulatory changes. The specific objectives of this study were to:

1. Estimate the proportion of angler-days directed at fishing for northern pike and the proportion of northern pike harvested in the Tanana River drainage according to the following categories:

   a1. rivers, streams, or sloughs during the open-water season

   a2. rivers, streams, or sloughs during the ice-covered season

   a3. lakes during the open-water season

   a4. lakes during the ice-covered season

   b1. using spears

   b2. using hand-held lines (jigging)

   b3. using casting (with rod and reel or fly gear)

   b4. using tip-ups (with bait)

   such that the estimate for each of the proportions are within 5 percentage points of the true value 95% of the time. Estimates of the proportions associated with the categories b1-b4 above, were estimated in total and broken down by categories a1-a4.

2. Estimate the sex composition of harvested northern pike during the ice-covered season in Tanana River drainage area fisheries such that each estimated proportion is within 10 percentage points of the true value 95% of the time.

3. Estimate the distribution of the minimum lengths of northern pike harvested by Tanana River drainage northern pike fishers such that the estimated proportions (length categories) are each within 5 percentage points of the true value 95% of the time.

4. Estimate the distribution of opinions of households regarding the relative efficiency of different spear sizes, where efficiency refers to the frequency of successful landing of northern pike after hitting with a spear such that the estimated proportional distributions of opinions are each within 5 percentage points of the true values 95% of the time.
5. estimate the preference of northern pike fishing households in regards to the following options in the event of a conservation emergency in northern pike fisheries in the Tanana River drainage area:
    a. length limits (e.g., minimum, slot, and/or maximum)
    b. gear type restrictions
    c. reduced bag limits
    d. catch and release fishing only
    e. fishery closure (seasonal, area, total).

    such that proportional estimates are each within 5 percentage points for the true values 95% of the time.

METHODS

STUDY DESIGN

The parameters to be estimated were calculated from responses to a questionnaire (Appendix A1) mailed to sport fishers in two survey groups. Mail surveys were chosen over telephone interviews because of the lower survey cost, and because of possible problems with response error and bias (i.e., the respondent may need to examine a map to understand area descriptions). In addition, many license holders in rural areas of the Tanana River drainage do not have phones.

The following were steps taken to increase the number of respondents and reduce bias that might be introduced by nonresponse to the surveys. First, the questionnaire was kept short and as simple as possible. Second, a cover letter (Appendix A2) requesting cooperation and explaining why, and by whom the study is being performed was included. Third, a stamped, self addressed return envelope was included with each questionnaire. Fourth, a second letter (Appendix A3) and a questionnaire were sent to all initial non-respondents one month after the first mailing. Finally, a third letter (Appendix A4) and a questionnaire were sent to all remaining non-respondents one month after the second mailing. The second survey of ice house permit holders was similar to the above procedures, with a modified cover letter for the first mailing (Appendix A5). However results of the two surveys were combined for analysis (primarily due to the small number of ice house permit holders).

The primary sample unit in the survey was a household. The sample size was the total number of households reporting to the SWHS, catching northern pike from 1988-1992. A Monte Carlo simulation with 1,000 iterations was used in conjunction with prior survey response data (Evenson and Hansen 1991, Burr and Hansen 1993) to estimate the expected total number of respondents and the number of respondents reporting fishing for northern pike during the survey period. The simulation predicted that 310 households out of 859 initial mailings were expected to report fishing for northern pike. Additional surveys were sent to households with current ice house permits that were assumed to be spear fishers. The list of individuals with these permits was

only 16 in number; three of these individuals were also members of the list of SWHS respondents that were surveyed as noted above. The Monte Carlo simulation predicted that all objectives would be estimated within the goal levels of precision (see Objectives section, above).

SURVEY DESCRIPTION

The survey (Appendix A1) consisted of eight questions concerning fishing for northern pike in waters of the Tanana River drainage. All of the questions pertained to fishing that occurred from June 1, 1992 to March 31, 1993. The purpose of these dates was to include one full open-water (summer) and ice-covered (winter) season. Note that fishing for northern pike in the Tanana River drainage is closed by regulation each year from April 1 to May 31.

Because the respondent was asked to remember all the northern pike that their household harvested during the ten month survey period, the questions were worded to not require any recalls of exact dates or locations. Seasons were selected for ease of recall by the respondent. Data collected to answer the first objective (proportions of harvest and participation) were the number of northern pike harvested and the days of participation directed at catching northern pike (Appendix A1, questions 1-4).

The numbers of male, female, and unknown sex, northern pike harvested during the ice-covered season by each responding household was requested in question 5. The reported minimum length of northern pike harvested by all responding household was asked in question 6.

The numbers of households reporting their opinion regarding the efficiency of the two predominant spear sizes used to spear northern pike is requested in question 7. The selection of five choices to categorize opinions instead of an open-ended question was made to simplify coding of responses, and to provide a consistent conceptual framework for potential respondents (i.e., to increase the probability that all respondents are answering the "same" question). The particular choices were made to provide the full range of possible efficiencies without too many resultant categories.

Finally, each household was asked in question 8 to rate on a scale of 1 to 5 a set of five possible management alternatives for reducing the harvest of northern pike in the event of a conservation emergency. The numbers of each household responding for each alternative at each rating level was used to estimate the proportions.

DATA ANALYSIS

All parameters estimated were simply multinomial parameters that were estimated by the usual equation for proportions. With $\hat{p}_u$ being the estimated proportion of the angler-days, northern pike harvested, or number of households that are classified as category *u*, calculated as:

$$\hat{p}_u = \frac{y_u}{y'} \tag{1}$$

where y_u is the number of angler-days, northern pike harvested, or number of households categories as "type u", and y' is the number of angler-days, northern pike harvested, or number of households, which could be categorized.

The variance of the estimated proportion (for each parameter) was calculated using the usual equation for proportions (Cochran 1977):

$$\hat{V}[\hat{p}_u] = \frac{\hat{p}_u(1-\hat{p}_u)}{y' - 1} \quad (2)$$

Standard errors were calculated as the square root of the variances.

ANALYSIS OF BIAS

A problem inherent with all survey sampling is the effects of nonrespondents on the parameters being estimated. Analysis of nonresponse bias from the SWHS indicates that nonrespondents fish less and catch fewer fish than respondents. Nonresponse would bias high the estimates of harvest if it was not considered in the model.

Nonresponse bias can be detected directly by gathering information from nonrespondents, usually by some method other than that used for the initial contact (Salant and Dillman 1994), in other words "converting" nonrespondents to respondents. Nonresponse bias itself can seriously affect estimates especially if the rate of nonresponse is large. If the nonresponse rate is small (e.g., 0% to 5%, say) then the affect of nonresponse on parameter estimates would be expected to be rather small. Similarly, if nonrespondents have similar characteristics to respondents, then even large rates of nonresponse would not be expected to severely affect parameter estimates (other than reducing the precision of estimates due to smaller sample sizes).

In this study nonresponse bias was indirectly evaluated by comparing the responses of households that responded "immediately" to the first mailing of the survey to those households that responded later to either the second or third mailing. If differences occurred among respondents from the first mailing compared to the follow-up mailings then one can assume that households that failed to respond to any of the mailings would have different characteristics from the respondents. Conversely if respondents gave similar answers to questions regardless of the mailing to which they responded to, then the nonrespondents might be assumed to be similar to the respondents (at least for the questions asked in the survey). Typically, the largest "nonresponse bias" occurs between the first and second mailing. Possible nonresponse bias was evaluated by conducting three contingency table tests. These contingency table tests tested the following null hypotheses:

1. H_o: proportion of households that reported fishing for northern pike is independent of the mailing;
2. H_o: proportional composition of the households reporting fishing for northern pike in terms of the number of people who fished in each household is independent of the mailing; and,
3. H_o: proportional composition of the management alternative preferred by households to reduce northern pike harvest is independent of the mailing.

If the χ^2 statistic used to test each null hypothesis was significant (at $\alpha = 0.05$) then we inferred that some type of nonresponse bias existed.

This survey also had the added source of potential bias in that it was not a random sample. While the SWHS is a random sample of fishing households, the recipients of this survey had to have

cooperated with SWHS in the past. As stated above, respondents usually tend to fish more and catch more fish than nonrespondents. In this study, we were interested in the distribution of catch and participation among different terminal gears, and seasons, along with other parameters that are not directly related to harvest or the amount of fishing participation. The assumption is made that while the harvest and participation of respondents from this survey may be biased high, the estimated proportions of how and when northern pike were caught is not biased. In similar studies on burbot (Evenson and Hansen 1991) and lake trout, (Burr and Hansen 1993) this assumption was found to be valid.

RESULTS

POSSIBLE BIASES

As noted above, three separate evaluations of nonresponse bias were conducted. All of the evaluations involved comparing information given by the respondents from the three mailings.

The first evaluation involved comparing the proportion of households that reported fishing for northern pike in the Tanana River drainage during the survey period. The contingency table test indicated no significant nonresponse bias (Table 1). Similarly, a contingency table test of the proportions of households that reported one, two, three, and four or more people fishing during the survey period indicated no significant nonresponse bias (Table 2).

An analysis of the most preferred management alternative for reducing harvest of northern pike did indicate a significant nonresponse bias (Table 3). Noting that proportionately fewer of the households responding to the follow-up mailings preferred the closure alternative, the contingency table was "collapsed" by ignoring this alternative. The resultant statistics were $\chi^2 = 12.0$, with $df = 6$, and $P = 0.061$, which is just nonsignificant (at $\alpha = 0.05$). Apparently, households who responded to the first mailing (without needing follow-up surveys or reminders) were somewhat more likely to choose closure of a fishery as the preferred management

Table 1.-Contingency table test summary comparing the number of households who reported fishing for northern pike with the number of households who did not fish for northern pike during the June 1, 1992 to March 31, 1993 period by successive waves of mailing of the survey. Summary does not include responses from seven households that did not answer the question regarding this item.

Responded to Mailing	Number of Households that Fished % of Respondents by Mailing	Number of Households that Did Not Fish % of Respondents by Mailing	Total
1st Mailing	185 50.4%	182 49.6%	367
2nd Mailing	51 41.8%	71 58.2%	122
3rd Mailing	23 46.0%	27 54.0%	50
Total	259 48.1%	280 51.9%	539
$\chi^2 = 2.81$		$df = 2$	$P = 0.245$

Table 2.-Contingency table test summary comparing the number of households with 1, 2, 3, and 4 or more persons who reported fishing for northern pike during the June 1, 1992 to March 31, 1993 period by successive waves of mailing of the survey. Summary does not include households that failed to respond to this item in the survey.

Responded to Mailing	Number of Households with Noted Number of People Who Fished % of Respondents by Mailing				Total
	1 Person	2 Person	3 Person	4 or more Persons	
1st Mailing	86 46.7%	53 28.8%	28 15.2%	17 9.3%	184
2nd Mailing	28 58.3%	14 29.2%	2 4.2%	4 8.3%	48
3rd Mailing	12 54.6%	3 13.6%	4 18.2%	3 13.6%	22
Total	126 49.6%	70 27.6%	34 13.4%	24 9.4%	254
$\chi^2 = 7.21$		df = 6		P = 0.302	

Table 3.-Contingency table test summary comparing the number of households expressing a preference among management alternatives for reducing the potential harvest of northern pike by successive waves of mailing of the survey. Summary does not include households that failed to respond to this item in the survey.

Responded to Mailing	Number of Households that Preferred the Noted Management Alternative to Reduce Northern Pike Harvest With Percent of Households Responding					Total
	Length Limits	Gear Restrictions	Bag or Possession Limit Reduction	Catch & Release Fishing Only	Closure of Fishery	
1st Mailing	68 27.8%	25 10.2%	64 26.1%	53 21.6%	35 14.3%	245
2nd Mailing	8 15.7%	3 5.9%	20 39.2%	18 35.3%	2 3.9%	51
3rd Mailing	9 34.6%	5 19.2%	4 15.4%	6 23.1%	2 7.7%	22
Total	85 26.4% SE = 2.5%	33 10.2% SE = 1.7%	88 27.3% SE = 2.5%	77 23.9% SE = 2.4%	39 12.1% SE = 1.8%	322
$\chi^2 = 17.7$			df = 8		P = 0.024	

alternative. The resultant conclusion was that a significant degree of nonresponse bias exists for this question, and as such estimates should be obtained separately for each group of respondents (each mailing). Meaningful inference to the total population (all 872 households originally surveyed) can only be made due to the high overall response rate to the survey as a whole (84% responding, see below). Note, however that only 241 households responded to this particular question giving a response rate of 37.0% of the delivered surveys.

An additional evaluation of the responses and the structure of the questionnaire indicated that a structural bias probably exists in estimates of proportions relating to total participation. Since

question number 3 (see Appendix A1) asked households to record their participation by gear type in whole days, and multiple gear types could be used within a day, the estimated proportions of the total participation expended by season and type of water body may be biased (since the total participation expended was calculated as a sum of the participation expended by gear type). The degree of this possible bias is expected to be rather low due to two factors: (1) multiple gear usage within a single angler-day is not as likely during the open-water season periods compared to the ice-covered periods and, (2) the total participation expended during the ice-covered period was comparatively low (see estimates below). Since the potential bias is expected to be rather minor during the period of most angling participation then the total bias is expected to be low.

SUMMARY OF RESPONSES

A total of 872 surveys were addressed and mailed to unique households in the course of three mailings (Table 4). Six hundred and fifty-two surveys were successfully delivered of which 549 surveys were completed and returned. A total of 220 of the 872 surveys mailed were returned by the Postal Service as undeliverable. Accordingly, the total nonresponse rate as a function of the delivered surveys was 84.2%. However, 3 surveys that were returned could not be used due to either incomplete responses (all items left blank) or illegible responses. As such a total of 83.7% of the households who received surveys provided responses used to estimate parameters. Additional item nonresponse is outlined in Appendix B1, which also contains a summary of the frequency of the different types of responses to each question by mailing.

Table 4.-Response to the northern pike survey of households who had previously reported catching northern pike in the Tanana River drainage during 1988-1992 or households with an ice house permit.

Mailing	Number of Surveys Mailed	Undeliverable Surveys	Number of Surveys Returned by Respondents	Number of Surveys Used for Estimates of Parameters (maximum)	Percent Responded of Total Deliverable Households
1	872	191	371	368	56.4%
2	336	17	124	124	19.0%
3	217	12	54	54	8.3%
Total (unique households)	872	220	549	546	83.7%

The proportion of households who reported fishing for northern pike during the survey period is 48.1% (SE = 2.2%) (Table 1). The 254 households (Table 2) responding to question 2 represented 473 individual anglers (Appendix B1), an average of 1.86 persons per household.

PROPORTIONS OF PARTICIPATION

A total of 2,804 days were fished (Table 5) by the responding 254 households that reported one or more persons fishing for northern pike (Table 2), for an average of 11 days per household or 6 days (2,804/473) per person. The proportion of fishing participation that occurred during the open-water or summer season was 84% (SE = 0.7%). During the open-water season, 51% (SE = 1.0%) of the fishing participation occurred in flowing water and 49% (SE = 1.0%) in lakes. Ninety-nine percent (SE = 0.2%) of the open-water anglers used casting with rod and reel to catch northern pike. During the survey period, 55% (SE = 0.9%) of the annual fishing

participation was on lakes, greater than the 45% (SE = 0.9%) which occurred on flowing waters. Overall, the least amount of fishing participation between four gear types was using spears (at approximately 5%, with SE = 0.4%, Table 5). However, during winter, participation on lakes to catch northern pike was equally distributed between hand-held lines, baited tip-ups, and spears.

Table 5.-Days of northern pike fishing participation and proportion of fishing participation by gear type and season or type of water body. Responses to survey relate to fishing activities between June 1, 1992 and March 31, 1993.

Type of Fishing	Season and Type of Water Body (Days of Fishing Participation)				
	Ice-Covered Rivers, Streams, or Sloughs	Open Rivers, Streams, or Sloughs	Ice-Covered Lakes or Ponds	Open Lakes or Ponds	Totals
Casting with rod and reel or fly	18	1,195	15	1,128	2,356
Using hand-held lines (Jigging)	20	2	127	1	150
Using tip-ups (with bait)	19	0	128	6	153
Spearing	6	0	127	12	145
Totals[a]	63	1,197	397	1,147	2,804
	Percent of Fishing Participation with SE in parentheses				
Casting with rod and reel or fly	0.6 (0.2)	42.6 (0.9)	0.5 (0.1)	40.2 (0.9)	84.0 (0.7)
Using hand-held lines (Jigging)	0.7 (0.2)	0.1 (0.1)	4.5 (0.4)	<0.1 (<0.1)	5.3 (0.4)
Using tip-ups (with bait)	0.7 (0.2)	0.0 (0.0)	4.6 (0.4)	0.2 (0.1)	5.5 (0.4)
Spearing	0.2 (0.1)	0.0 (0.0)	4.5 (0.4)	0.4 (0.1)	5.2 (0.4)
Totals[a]	2.2 (0.3)	42.7 (0.9)	14.2 (0.7)	40.9 (0.9)	100.0 (0.0)

[a] Totals days fished and hence the proportional estimates are possibly biased since anglers could conceivably use more than one gear type in an angler-day.

PROPORTIONS OF HARVEST

A total of 2,074 northern pike were harvested by the responding households (Table 6). Of all pike harvested, 82% (SE = 0.8%) were harvested during the open-water season. Of those caught during the open-water season, 54% (SE = 1.2%) were harvested in rivers and 46% (SE = 1.2%) from lakes. Similar to fishing participation, annual harvest of northern pike was more in lakes (53%, SE = 1.1%) than rivers (47%, SE = 1.1%), as winter harvest occurred predominantly in lakes (88%, SE = 1.7%). Harvest of northern pike by spear fishers accounted for 40% (SE = 2.6%) of the ice-covered seasonal harvest. Hand-held lines (26%, SE =2.3%) and tip-ups with bait (26%, SE = 2.3%) accounted for approximately equivalent amounts of the ice-covered harvest. Casting with rod and reel accounted for only 8% of the winter harvest and can be lumped with hand-held lines, as some anglers use rod and reels to catch fish through the ice. Only 2% of the spear fishing harvest occurred in rivers during the ice-covered season (Table 6).

OPINION QUESTIONS

Of the 46 households who responded about the sex of northern pike caught through the ice, 20 (43%, SE = 7.4%) did not know the sex of the fish they caught. Of the 26 households who indicated the sex of fish they caught, 13 (50%, SE = 10%) marked equal numbers of male and female northern pike, seven (27%, SE = 8.9%) said more female northern pike, and six (23%, SE = 8.4%) caught more male northern pike.

Table 6.-Harvest of northern pike and proportion of harvest by gear type and season or type of water body. Responses to survey relate to fishing activities between June 1, 1992 and March 31, 1993.

Type of Fishing	Season and Type of Water Body (Number of Northern Pike Harvested)				
	Ice-Covered Rivers, Streams, or Sloughs	Open Rivers, Streams, or Sloughs	Ice-Covered Lakes or Ponds	Open Lakes or Ponds	Totals
Casting with rod and reel or fly	8	923	20	774	1,725
Using hand-held lines (Jigging)	12	1	82	0	95
Using tip-ups (with bait)	17	0	79	3	99
Spearing	8	0	137	10	155
Totals	45	924	318	787	2,074
	Percent of Northern Pike Harvest with SE in parentheses				
Casting with rod and reel or fly	0.4 (0.1)	44.5 (1.1)	1.0 (0.2)	37.3 (1.1)	83.2 (0.8)
Using hand-held lines (Jigging)	0.6 (0.2)	<0.1 (<0.1)	4.0 (0.4)	0.0 (0.0)	4.6 (0.5)
Using tip-ups (with bait)	0.8 (0.2)	0.0 (0.0)	3.8 (0.4)	0.1 (0.1)	4.8 (0.5)
Spearing	0.4 (0.1)	0.0 (0.0)	6.6 (0.5)	0.5 (0.2)	7.5 (0.6)
Totals	2.2 (0.3)	44.6 (1.1)	15.3 (0.8)	37.9 (1.1)	100.0 (0.0)

The average size of the smallest northern pike caught during the survey period (question 6) was 22 inches (SE = 0.45 in). The distribution of the responses was approximately bell-shaped about the average of 22 inches with a slight skew towards larger fish (Figure 3). There were 179 households who responded to this question (or only 27% of the delivered surveys).

Households were polled in question 7 for their opinion on the efficiency of two different spear head sizes to catch northern pike. A total of 65 households gave opinions about the efficiency of small-headed spears, whereas 69 households gave opinions about the large-headed spear efficiency (Appendix B1). The distributions of responses given by these two (non-independent) groups were significantly different (Table 7). Small spears being judged as slightly less efficient than large spears: with 65% (SE = 6.0%) of the responding households indicating that either "no" or "less than half" of the northern pike hit with small-headed spears are landed. Comparatively,

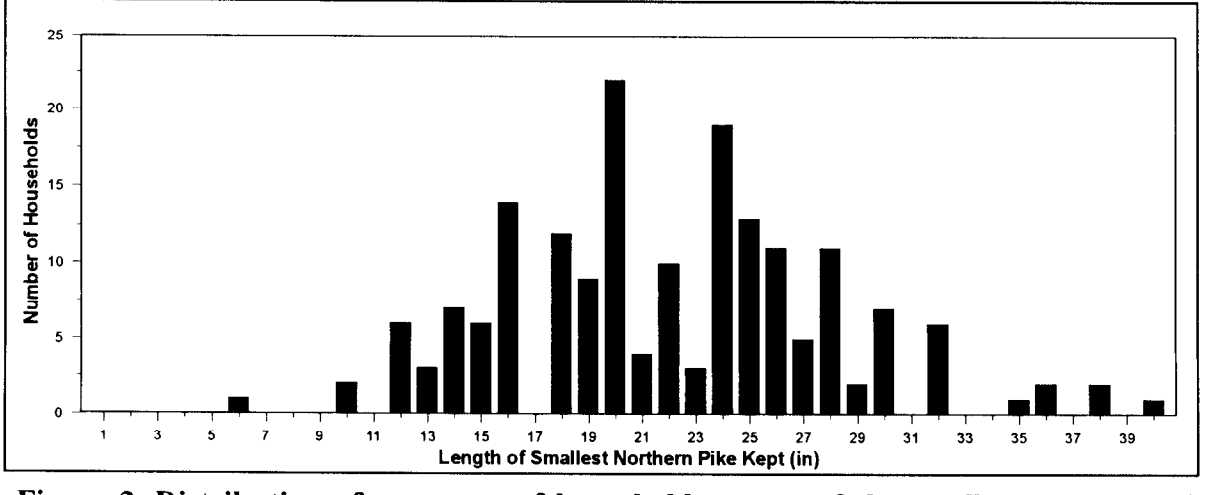

Figure 3.-Distribution of responses of household reports of the smallest northern pike harvested.

only 36% (SE = 5.8%) of the responding households indicated that large-headed spears landed "no" or "less than half" of the northern pike hit by these spears.

Table 7.-Contingency table summary of the opinions regarding the efficiency of different sized spear heads in catching northern pike.

Spear-head Size	Number of Households that Indicated the Noted Opinion Regarding the Efficiency of Different Spear-head Sizes in Catching Northern Pike With Percent of Households and SE's of Percent					Total
	No northern pike hit with spear are landed	Less than half of the northern pike hit with spear are landed	About half of the northern pike hit with spear are landed	More than half of the northern pike hit with spear are landed	All of the northern pike hit with spear are landed	
Small	18 27.7% SE = 5.6%	24 36.9% SE = 6.0%	8 12.3% SE = 4.1%	11 16.9% SE = 4.7%	4 6.2% SE = 3.0%	65
Large	14 20.4% SE = 4.9%	11 15.9% SE = 4.4%	11 15.9% SE =	17 24.6% SE = 5.2%	16 23.2% SE = 5.1%	69
	$\chi^2 = 14.181$		df = 4		P = 0.007	

Similarly, the proportion of households that reported the opinion that "all" northern pike hit by small-headed versus large-headed spears were quite different: 6% (SE = 3.0%) for small-headed and 23% (SE = 5.1%) for large-headed spears.

Households were polled in question 8 about their preference about emergency measures to reduce harvest of northern pike. Of the 322 households responding to this question, the most preferred alternative is reduced bag and possession limits (88 of 322 or 27%, SE = 2.5%, Table 3). Comparatively, both the use of length limits and catch and release only fishing were favored by similar proportions: with 26% (SE = 2.5%) favoring length limits and 24% (SE = 2.4%) favoring catch and release fishing. The least preferred alternative was any type of gear restrictions (33 of 322 or 10%, SE = 1.7%). Closure of the fishery was nearly as "unpopular" with only 12% (SE = 1.8%) of the responding households preferring this alternative.

DISCUSSION

The purpose of this survey was to gather information on the distribution of participation and harvest, and the kinds of gear used by successful northern pike anglers. However, the results do not apply equally to all lakes and streams in the study area because of differences in angler accessibility. For example, Volkmar Lake may have a higher winter harvest rate than other lakes since this remote lake is much easier to access in the winter by snowmachine, than the summer by float plane (Pearse and Burkholder 1993).

Significant bias due to nonresponse to the questionnaire was detected in one question. However due to the relatively large overall response rate (84% of all households) inference to the total population was judged as appropriate. However, in some instances only a few households responded to particular questions in the survey (for example only 65 households proffered an opinion regarding the efficiency of small-headed spears in capturing northern pike). In any of

these instances of low item response rates, decision-makers should be cautious in making any far-reaching conclusions.

To reduce harvest of northern pike in the Tanana drainage, managers should first consider regulatory measures during the open-water months since 84% of the participation and 82% of the harvest occurs at this time. Anglers approve of a reduced bag and possession limit, catch and release season, or length limits to accomplish this objective.

At the onset of this study managers were concerned that anglers using spears during the winter may be selectively targeting female northern pike. Knowing that anglers would have difficulty recalling the sex of pike they caught, the question was kept simple by asking if more of one sex was caught than the other. Only 27% of the anglers who responded and who remembered the sex of fish harvested, indicated that more female pike were harvested. Apparently, concerns regarding the possibility of selective harvest of female northern pike may have been unfounded. Unfortunately, due the low overall response rate to this question this conclusion may itself be unfounded.

Spearing on lakes during the winter is considered to be more effective than other gear groups. Anglers reported that small spear head size less than six inches wide may not be as efficient in harvesting northern pike. To prevent unnecessary waste of northern pike by spearing, anglers should be encouraged or required to use larger spear heads.

ACKNOWLEDGMENTS

We would like to thank the anglers that took the time to answer the mail survey; without their assistance the research would not be possible. Hearty thanks to all the Sport Fish staff at Regional Technical Services for conducting the mailings of the questionnaire and processing the returns. Thanks to Peggy Merritt and John H. Clark for their support during the project. Bob Marshall is thanked for his careful peer review of this report, his comments and suggestions were instrumental in improving the quality of this report.

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LITERATURE CITED (Continued)

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APPENDIX A

Appendix A1.-Facsimile of the questionnaire on northern pike fishing in the Tanana River drainage.

The following questions apply to the June 1, 1992 to March 31, 1993 period and apply only to yourself and those people living in your home (your household). Do not include visiting relatives or friends.

1. Did you or members of your household fish for northern pike during the June 1, 1992 to March 31, 1993 period within the drainage of the Tanana River? Please refer to the map below.

   Check the appropriate box:

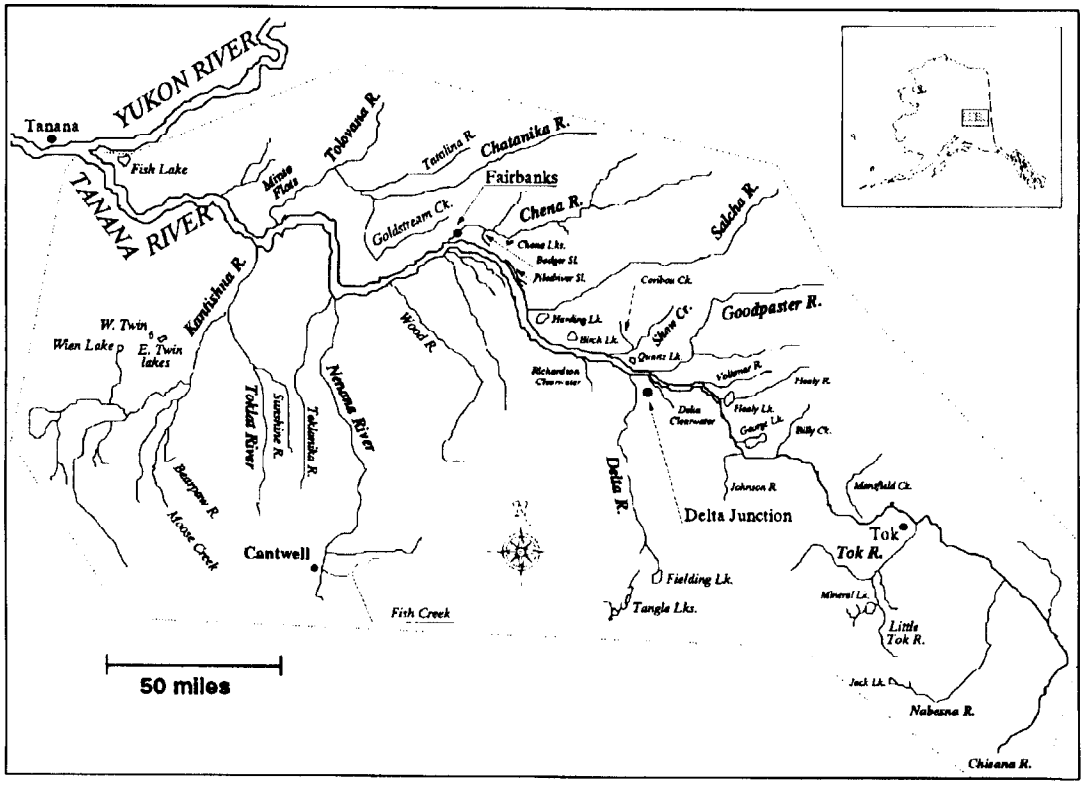
   ☐ **NO** - Please return your survey in the provided envelope. Thank you for your assistance.

   ☐ **YES** - Please continue the survey.

2. How many members of your household fished for northern pike in the Tanana River drainage during June 1, 1992 to March 31, 1993?

   ☐ **Enter the number of people who fished.**

Map of the Tanana River.



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3. Please write the **total number of days fished (consider any part of a day fished as one whole day) for northern pike by all members of your household** by season, type of water body, and the fishing method used (see example below):

Type of Fishing	Season and Type of Water Body			
	Ice-Covered Rivers, Streams, or Sloughs	Open Rivers, Streams, or Sloughs	Ice-Covered Lakes or Ponds	Open Lakes or Ponds
Casting with rod and reel or fly				
Using hand held lines (jigging)				
Using tip-ups (with bait)				
Spearing				

EXAMPLE: Three (3) members of the household fished 10 days each using lures on rod and reel to catch northern pike in the Chena River for a total of 30 days (10 + 10 +10). In addition, two members of the same household speared northern pike from an ice-house on Volkmar Lake for 5 days, and the respondent spent an additional 4 days spearing alone through the ice, resulting in a total of 14 days (5 + 5 + 4) spent fishing at an ice-covered lake. No members of the household did any more fishing for northern pike in the Tanana River drainage during the survey period.

EXAMPLE Type of Fishing	Season and Type of Water Body			
	Ice-Covered Rivers, Streams, or Sloughs	Open Rivers, Streams, or Sloughs	Ice-Covered Lakes or Ponds	Open Lakes or Ponds
Casting with rod and reel or fly	30			
Using hand held lines (jigging)				
Using tip-ups (with bait)				
Spearing				14

4. Please write the **number of northern pike harvested (caught and kept) by all members of your household** by season, type of water body, and the fishing method used:

Type of Fishing	Season and Type of Water Body			
	Ice-Covered Rivers, Streams, or Sloughs	Open Rivers, Streams, or Sloughs	Ice-Covered Lakes or Ponds	Open Lakes or Ponds
Casting with rod and reel or fly				
Using hand held lines (jigging)				
Using tip-ups (with bait)				
Spearing				

-continued-

5. If you or any member of your household caught northern pike through or under the ice, please check the appropriate box, below.

☐ **Mostly Female Northern Pike were Caught.**

☐ **Mostly Male Northern Pike were Caught.**

☐ **About Equal Male and Female Northern Pike were Caught.**

☐ **I (we) Don't Know or can't remember.**

6. What was the length (tip of snout to end of tail) of the smallest northern pike harvested (caught and kept) from waters in the Tanana River drainage by any member of your household during the June 1, 1992 to March 31, 1993 period?

☐ **Enter approximate size in inches of smallest northern pike harvested.**

7. Please check the appropriate boxes in the following table concerning your household's opinion on the efficiency of using the two widely used spear head sizes to catch northern pike:

CHECK ONLY ONE BOX PER ROW Spear Head	No northern pike speared are caught	Less than half of the northern pike speared are caught	About half of the northern pike speared are caught	More than half of the northern pike speared are caught	All of the northern pike speared are caught
Small (head less than 6 inches wide, weighing about one pound)					
Large (head is from 6 to 10 inches wide, generally 2 to 4 pounds)					

8. Occasionally Department of Fish and Game must take emergency action to reduce the harvest of northern pike in a particular fishery. In some instances harvest can be reduced through one of several alternative regulations. Please indicate your household's preference for the following alternatives to reduce the harvest of northern pike:

Enter your rating below: 1 = preferred 2 = second most preferred 3 = third most preferred 4 = fourth most preferred 5 = least preferred	ENTER ONE RATING FOR EACH ALTERNATIVE-You may enter the same rating for more than one of the alternatives. Alternative Regulations for Reducing harvest of northern pike
	Length limits including any of the following possibilities: (1) minimum length limit (for example: 20 inches), (2) maximum length limit (for example: 30 inches), or (3) slot limits (with fish harvestable below one size limit or above another limit).
	Gear type restrictions (for example no bait fishing during certain periods or certain waters, or banning of certain types of gear)
	Reduced bag or possession limits (fewer fish can be kept per day of fishing)
	Catch and Release Only fishing during certain seasons or certain waters
	Closure of a fishery either during certain seasons, or certain waters

-continued-

When you are done filling out this survey, please fold and return in the provided postage-paid envelope. Thank you for your participation in the survey. Please provide any comments or questions in the space below:

Appendix A2.-Facsimile of the cover letter for the first mailing of the survey, addressed to households previously responding to the Statewide Harvest Survey as having caught northern pike during the years of 1988 through 1992.

STATE OF ALASKA

WALTER J. HICKEL, GOVERNOR

DEPARTMENT OF FISH AND GAME

P.O. BOX 605
DELTA JUNCTION, ALASKA 99737-0605

July 15, 1993

Dear Alaskan Angler,

The Alaska Department of Fish and Game, Division of Sport Fish is surveying anglers who have fished for northern pike in the drainage of the Tanana River. Your name was selected from a list of anglers who have responded to the Statewide Harvest Survey and who have caught northern pike in the streams, lakes, and sloughs within this drainage. Your help is much appreciated and has helped to perpetuate our opportunities to enjoy Alaska through recreational fishing. We again ask for your cooperation as we try to further our understanding of our recreational fisheries for northern pike.

Our questions concern the fishing you and members of your household did for northern pike within the period June 1, 1992 to March 31, 1993 within the watershed of the Tanana River. Even if you or members of your household fished very little or not at all during this time, your answers are important in making the survey accurate and complete. Please take a few minutes to complete the enclosed questionnaire, and return it to us in the pre-addressed, postage-paid envelope. Your specific answers will remain confidential; only summaries of all answers from all respondents will be published.

If you have any questions, need help, or want to discuss this survey, please contact me. Thank you for your help.

Sincerely,

James F. Parker

James F. Parker
Area Management Biologist
Delta Junction
Sport Fish Division
(907) 895-4632

Appendix A3.-Facsimile of the cover letter for the first followup mailing of the survey, addressed to households who failed to respond to the first mailing of the survey.

STATE OF ALASKA

WALTER J. HICKEL, GOVERNOR

DEPARTMENT OF FISH AND GAME

P.O. BOX 605
DELTA JUNCTION, ALASKA 99737-0605

August 19, 1993

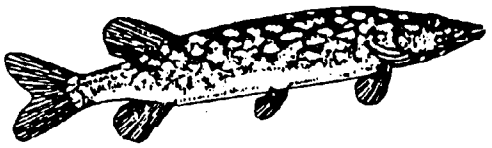
Dear Alaskan Angler,

Last July, we sent you a questionnaire about your experience fishing for northern pike in the drainage of the Tanana River. We have enclosed another copy of the questionnaire with this letter in case the first never reached you or if it has been lost. Please take a few moments and fill out the questionnaire and send it back to us in the enclosed, stamped envelope. We are interested in your experiences from June 1, 1992 through March 31, 1993 while fishing for northern pike in the Tanana River drainage. Even if you or other anglers in your household fished very little or not at all for northern pike during this time and in the Tanana River drainage, please respond because your answers are important in making results from this survey accurate. Your individual answers will remain confidential; only summaries of the answers from all respondents will be published.

If you have already returned your questionnaire, please disregard this letter, and we thank you for your assistance.

Sincerely,

James F. Parker
Area Management Biologist
Delta Junction
Sport Fish Division
(907) 895-4632



Appendix A4.-Facsimile of the cover letter for the second followup mailing of the survey, addressed to households who failed to respond to both the first and the second mailing of the survey.

STATE OF ALASKA

WALTER J. HICKEL, GOVERNOR

DEPARTMENT OF FISH AND GAME

P.O. BOX 605
DELTA JUNCTION, ALASKA 99737-0605

September 16, 1993

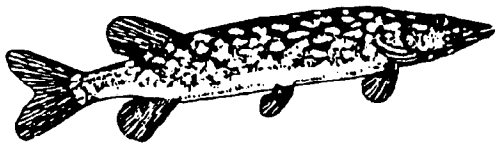
Dear Alaskan Angler,

Some time has passed since we first requested information about your experiences while fishing for northern pike in the Tanana River drainage. If you are having problems with the questionnaire and want to discuss the survey please feel free to give me a call, I would be happy to talk with you. Your responses to this survey are important in making the results of the survey accurate, even if you and other anglers in you household fished little or not at all from June 1, 1992 to March 31, 1993. Won't you give a few minutes of your time to help us maintain the opportunity for you and your family to fish for northern pike in the Tanana Valley? I have enclosed a copy of the questionnaire, please fill it out and return it to us in the stamped envelope enclosed with this letter. Your individual answers will remain confidential. Only summary results will be made public.

If you have already returned your questionnaire, please disregard this letter and we thank you for your assistance.

Sincerely,

James F. Parker
Area Management Biologist
Delta Junction
Sport Fish Division
(907) 895-4632



Appendix A5.-Facsimile of the cover letter for the first mailing of the survey, addressed to households known to possess ice house permits.

STATE OF ALASKA

WALTER J. HICKEL, GOVERNOR

DEPARTMENT OF FISH AND GAME

P.O. BOX 605
DELTA JUNCTION, ALASKA 99737-0605

July 15, 1993

Dear Alaskan Angler,

The Alaska Department of Fish and Game, Division of Sport Fish is surveying anglers who have fished for northern pike in the drainage of the Tanana River. Your name was selected from a list of anglers who have recent ice house permits, or have recently fished during the winter for northern pike. We ask for your cooperation as we try to further our understanding of our recreational fisheries for northern pike.

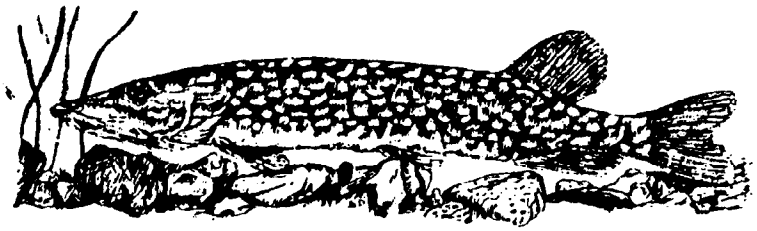
Our questions concern the fishing you and members of your household did for northern pike within the period June 1, 1992 to March 31, 1993 within the watershed of the Tanana River. Even if you or members of your household fished very little or not at all during this time, your answers are important in making the survey accurate and complete. Please take a few minutes to complete the enclosed questionnaire, and return it to us in the pre-addressed, postage-paid envelope. Your specific answers will remain confidential; only summaries of all answers from all respondents will be published.

If you have any questions, need help, or want to discuss this survey, please contact me. Thank you for your help.

Sincerely,

James F. Parker

James F. Parker
Area Management Biologist
Delta Junction
Sport Fish Division
(907) 895-4632



APPENDIX B

Appendix B1.-Basic frequency listing of responses to the 1993 postal survey of Tanana River drainage northern pike anglers. Responses to survey relate to fishing activities between June 1, 1992 and March 31, 1993.

	Nonrespondents	Responded to Mailing #			Total of Nonrespondents and Respondents
		Responded to 1st Mailing	Responded to 2nd Mailing	Responded to 3rd Mailing	
Household Fished					
No response	106	1	2	4	113
Yes	---	185	51	23	259
No	---	182	71	27	280
Number of People Fished					
0	106	184	76	32	398
1	---	86	28	12	126
2	---	53	14	3	70
3	---	28	2	4	34
4	---	12	3	1	16
5	---	5	1	1	7
6	---	---	---	1	1
Days Fished/Casting/Ice/Rivers					
---	106	184	76	32	398
0	---	182	48	21	251
3	---	1	---	---	1
5	---	---	---	1	1
10	---	1	---	---	1
Days Fished/Hand-held/Ice/Rivers					
---	106	184	76	32	398
0	---	184	48	21	253
20	---	---	---	1	1
Days Fished/Tip-ups/Ice/Rivers					
---	106	184	76	32	398
0	---	181	48	22	251
2	---	1	---	---	1
5	---	1	---	---	1
12	---	1	---	---	1
Days Fished/Spears/Ice/Rivers					
---	106	184	76	32	398
0	---	184	47	21	252
2	---	---	---	1	1
4	---	---	1	---	1

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Appendix B1.-Page 2 of 17.

	Nonrespondents	Responded to Mailing #			Total of Nonrespondents and Respondents
		Responded to 1st Mailing	Responded to 2nd Mailing	Responded to 3rd Mailing	
Days Fished/Casting/Ice/Lakes					
---	106	184	76	32	398
0	---	181	48	20	249
1	---	---	---	1	1
2	---	1	---	---	1
3	---	1	---	---	1
4	---	1	---	---	1
5	---	---	---	1	1
Days Fished/Hand-held/Ice/Lakes					
---	106	184	76	32	398
0	---	169	46	21	236
1	---	2	---	---	2
2	---	3	---	---	3
3	---	3	2	---	5
9	---	1	---	---	1
10	---	2	---	1	3
15	---	3	---	---	3
20	---	1	---	---	1
Days Fished/Tip-ups/Ice/Lakes					
---	106	184	76	32	398
0	---	165	47	19	231
1	---	3	---	1	4
2	---	4	1	---	5
3	---	2	---	---	2
4	---	3	---	---	3
5	---	1	---	---	1
6	---	1	---	---	1
7	---	1	---	---	1
8	---	1	---	---	1
10	---	1	---	1	2
15	---	1	---	1	2
20	---	1	---	---	1

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Appendix B1.-Page 3 of 17.

	Nonrespondents	Responded to Mailing #			Total of Nonrespondents and Respondents
		Responded to 1st Mailing	Responded to 2nd Mailing	Responded to 3rd Mailing	
Days Fished/Spears/Ice/Lakes					
---	106	184	76	32	398
0	---	171	47	19	237
1	---	1	---	---	1
2	---	2	---	2	4
3	---	1	---	1	2
4	---	2	---	---	2
5	---	1	---	---	1
6	---	1	---	---	1
8	---	1	---	---	1
10	---	2	---	---	2
15	---	1	---	---	1
20	---	1	---	---	1
30	---	---	1	---	1
Days Fished through the ice					
---	106	---	---	---	106
0	---	330	119	47	496
1	---	5	---	2	7
2	---	3	1	---	4
3	---	7	2	1	10
4	---	5	1	1	7
5	---	2	---	---	2
6	---	1	---	---	1
7	---	1	---	---	1
8	---	1	---	---	1
9	---	1	---	---	1
10	---	3	---	1	4
12	---	1	---	---	1
14	---	2	---	---	2
15	---	2	---	---	2
22	---	---	---	1	1
30	---	3	1	---	4
35	---	---	---	1	1
60	---	1	---	---	1

-continued-

Appendix B1.-Page 4 of 17.

		Responded to Mailing #			Total of
	Nonrespondents	Responded to 1st Mailing	Responded to 2nd Mailing	Responded to 3rd Mailing	Nonrespondents and Respondents
Days Fished/Casting/Open/Rivers					
---	106	184	76	32	398
0	---	72	21	11	104
1	---	11	5	1	17
2	---	14	5	3	22
3	---	11	2	1	14
4	---	14	2	---	16
5	---	3	1	1	5
6	---	12	2	---	14
8	---	8	1	---	9
9	---	---	---	2	2
10	---	15	3	1	19
12	---	3	2	---	5
14	---	1	1	---	2
15	---	4	2	---	6
16	---	1	---	---	1
18	---	1	---	---	1
20	---	7	1	1	9
21	---	1	---	---	1
25	---	3	---	---	3
26	---	1	---	---	1
35	---	1	---	---	1
40	---	1	---	---	1
50	---	---	---	1	1
Days Fished/Hand-held/Open/Rivers					
---	106	184	76	32	398
0	---	184	48	21	253
2	---	---	---	1	1
Days Fished/Tip-ups/Open/Rivers					
---	106	184	76	32	398
0	---	184	48	22	254
Days Fished/Spears/Open/Rivers					
---	106	184	76	32	398
0	---	184	48	22	254

-continued-

Appendix B1.-Page 5 of 17.

	Nonrespondents	Responded to Mailing #			Total of Nonrespondents and Respondents
		Responded to 1st Mailing	Responded to 2nd Mailing	Responded to 3rd Mailing	
Days Fished/Casting/Open/Lakes					
---	106	184	76	32	398
0	---	74	19	10	103
1	---	9	4	2	15
2	---	15	6	2	23
3	---	14	1	1	16
4	---	15	4	1	20
5	---	10	4	2	16
6	---	8	2	1	11
7	---	5	---	---	5
8	---	3	---	---	3
9	---	2	---	---	2
10	---	9	3	---	12
12	---	5	---	---	5
14	---	2	2	---	4
15	---	3	---	---	3
20	---	7	---	2	9
25	---	---	---	1	1
30	---	2	1	---	3
40	---	---	1	---	1
50	---	1	1	---	2
Days Fished/Hand-held/Open/Lakes					
---	106	184	76	32	398
0	---	183	48	22	253
1	---	1	---	---	1
Days Fished/Tip-ups/Open/Lakes					
---	106	184	76	32	398
0	---	183	48	22	253
6	---	1	---	---	1
Days Fished/Spears/Open/Lakes					
---	106	184	76	32	398
0	---	182	48	22	252
6	---	2	---	---	2

-continued-

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		Responded to Mailing #			Total of
	Nonrespondents	Responded to 1st Mailing	Responded to 2nd Mailing	Responded to 3rd Mailing	Nonrespondents and Respondents
Days Fished on open water					
---	106	---	---	---	106
0	---	201	79	38	318
1	---	12	2	2	16
2	---	16	13	3	32
3	---	13	2	2	17
4	---	22	4	---	26
5	---	9	3	---	12
6	---	13	5	2	20
7	---	9	2	---	11
8	---	6	1	1	8
9	---	2	---	1	3
10	---	14	3	1	18
11	---	1	---	---	1
12	---	6	2	1	9
13	---	2	---	---	2
14	---	3	2	---	5
15	---	5	1	---	6
16	---	4	---	---	4
18	---	2	---	---	2
20	---	8	---	---	8
21	---	3	---	---	3
22	---	2	---	---	2
25	---	3	1	---	4
27	---	1	---	---	1
28	---	---	1	---	1
30	---	2	---	---	2
34	---	---	---	1	1
35	---	1	---	---	1
40	---	4	1	1	6
50	---	3	1	---	4
55	---	1	---	---	1
60	---	---	1	---	1
70	---	---	---	1	1

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		Responded to Mailing #			Total of
	Nonrespondents	Responded to 1st Mailing	Responded to 2nd Mailing	Responded to 3rd Mailing	Nonrespondents and Respondents
Total Days Fished					
---	106	---	---	---	106
0	---	187	78	34	299
1	---	15	2	3	20
2	---	17	14	3	34
3	---	16	2	3	21
4	---	22	4	---	26
5	---	7	3	1	11
6	---	11	5	2	18
7	---	11	2	---	13
8	---	6	1	---	7
9	---	4	---	1	5
10	---	12	2	1	15
11	---	1	---	---	1
12	---	5	2	---	7
13	---	4	---	---	4
14	---	4	2	---	6
15	---	6	1	---	7
16	---	2	---	---	2
17	---	---	1	---	1
18	---	2	---	---	2
19	---	3	---	---	3
20	---	5	---	---	5
21	---	2	---	---	2
22	---	2	---	1	3
24	---	1	---	---	1
25	---	2	1	---	3
27	---	3	---	---	3
28	---	---	1	---	1
30	---	4	---	1	5
33	---	1	---	---	1
34	---	1	---	1	2
35	---	2	---	1	3
40	---	3	---	1	4
43	---	---	1	---	1
46	---	1	---	---	1
50	---	3	---	---	3
55	---	1	---	---	1
60	---	1	1	---	2
70	---	1	---	1	2
80	---	---	1	---	1

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	Nonrespondents	Responded to Mailing #			Total of Nonrespondents and Respondents
		Responded to 1st Mailing	Responded to 2nd Mailing	Responded to 3rd Mailing	
Northern Pike Kept/Casting/Ice/Rivers					
---	106	184	76	32	398
0	---	182	48	21	251
2	---	1	---	---	1
3	---	1	---	1	2
Northern Pike Kept/Hand-held/Ice/Rivers					
---	106	184	76	32	398
0	---	184	48	21	253
12	---	---	---	1	1
Northern Pike Kept/Tip-ups/Ice/Rivers					
---	106	184	76	32	398
0	---	182	48	22	252
5	---	1	---	---	1
12	---	1	---	---	1
Northern Pike Kept/Spears/Ice/Rivers					
---	106	184	76	32	398
0	---	184	47	21	252
2	---	---	---	1	1
6	---	---	1	---	1
Northern Pike Kept/Casting/Ice/Lakes					
---	106	184	76	32	398
0	---	182	48	21	251
2	---	---	---	1	1
8	---	1	---	---	1
10	---	1	---	---	1
Northern Pike Kept/Hand-held/Ice/Lakes					
---	106	184	76	32	398
0	---	173	47	20	240
2	---	3	1	---	4
3	---	1	---	1	2
4	---	1	---	---	1
5	---	2	---	---	2
8	---	2	---	1	3
15	---	2	---	---	2

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	Nonrespondents	Responded to Mailing #			Total of Nonrespondents and Respondents
		Responded to 1st Mailing	Responded to 2nd Mailing	Responded to 3rd Mailing	
Northern Pike Kept/Tip-ups/Ice/Lakes					
---	106	184	76	32	398
0	---	170	47	19	236
1	---	1	---	---	1
2	---	5	---	1	6
3	---	1	1	---	2
4	---	4	---	---	4
6	---	1	---	---	1
8	---	1	---	---	1
10	---	1	---	2	3
Northern Pike Kept/Spears/Ice/Lakes					
---	106	184	76	32	398
0	---	172	47	19	238
2	---	2	---	1	3
4	---	2	---	---	2
5	---	2	---	---	2
6	---	1	---	1	2
8	---	2	---	1	3
12	---	1	---	---	1
15	---	2	---	---	2
35	---	---	1	---	1

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		Responded to Mailing #			Total of
	Nonrespondents	Responded to 1st Mailing	Responded to 2nd Mailing	Responded to 3rd Mailing	Nonrespondents and Respondents
Harvest of Northern Pike through the ice					
---	106	---	---	---	106
0	---	339	120	47	506
1	---	1	---	---	1
2	---	7	1	1	9
3	---	2	1	1	4
4	---	2	---	---	2
5	---	---	---	1	1
6	---	---	1	1	2
7	---	1	---	---	1
8	---	5	---	---	5
10	---	---	---	1	1
11	---	1	---	---	1
12	---	3	---	---	3
13	---	2	---	---	2
15	---	1	---	---	1
17	---	1	---	---	1
18	---	1	---	---	1
20	---	1	---	1	2
22	---	---	---	1	1
30	---	1	---	---	1
35	---	---	1	---	1

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	Nonrespondents	Responded to Mailing #			Total of Nonrespondents and Respondents
		Responded to 1st Mailing	Responded to 2nd Mailing	Responded to 3rd Mailing	
Northern Pike Kept/Casting/Open/Rivers					
---	106	184	76	32	398
0	---	107	34	11	152
1	---	14	6	---	20
2	---	11	2	1	14
3	---	4	1	---	5
4	---	7	---	2	9
5	---	9	1	3	13
6	---	12	1	1	14
7	---	---	1	---	1
8	---	1	---	---	1
10	---	7	---	1	8
11	---	1	---	---	1
12	---	2	---	1	3
15	---	1	1	1	3
20	---	2	---	---	2
21	---	1	---	---	1
25	---	1	---	---	1
27	---	1	---	---	1
35	---	1	---	---	1
40	---	---	1	---	1
50	---	---	---	1	1
100	---	1	---	---	1
150	---	1	---	---	1
Northern Pike Kept/Hand-held/Open/Rivers					
---	106	184	76	32	398
0	---	184	48	21	253
1	---	---	---	1	1
Northern Pike Kept/Tip-ups/Open/Rivers					
---	106	184	76	32	398
0	---	184	48	22	254
Northern Pike Kept/Spears/Open/Rivers					
---	106	184	76	32	398
0	---	184	48	22	254

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	Nonrespondents	Responded to Mailing #			Total of Nonrespondents and Respondents
		Responded to 1st Mailing	Responded to 2nd Mailing	Responded to 3rd Mailing	
Northern Pike Kept/Casting/Open/Lakes					
---	106	184	76	32	398
0	---	102	33	13	148
1	---	13	4	---	17
2	---	13	1	3	17
3	---	8	2	1	11
4	---	8	1	---	9
5	---	5	2	2	9
6	---	7	1	---	8
7	---	1	---	---	1
8	---	5	---	---	5
9	---	1	---	---	1
10	---	5	2	1	8
12	---	1	---	---	1
15	---	5	1	1	7
17	---	1	---	---	1
18	---	2	---	---	2
20	---	5	1	---	6
25	---	1	---	1	2
85	---	1	---	---	1
Northern Pike Kept/Tip-ups/Open/Lakes					
---	106	184	76	32	398
0	---	183	48	22	253
3	---	1	---	---	1
Northern Pike Kept/Spears/Open/Lakes					
---	106	184	76	32	398
0	---	183	48	22	253
10	---	1	---	---	1

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		Responded to Mailing #			Total of
	Nonrespondents	Responded to 1st Mailing	Responded to 2nd Mailing	Responded to 3rd Mailing	Nonrespondents and Respondents
Harvest of Northern Pike on open water					
---	106	---	---	---	106
0	---	238	97	40	375
1	---	18	8	---	26
2	---	21	2	3	26
3	---	12	4	---	16
4	---	10	---	2	12
5	---	7	4	---	11
6	---	14	2	---	16
7	---	2	1	---	3
8	---	5	---	2	7
9	---	1	---	---	1
10	---	9	2	2	13
11	---	3	---	---	3
12	---	3	---	---	3
13	---	1	---	1	2
14	---	1	---	---	1
15	---	1	2	2	5
16	---	1	---	---	1
17	---	2	---	---	2
18	---	2	---	---	2
20	---	5	1	1	7
21	---	3	---	---	3
25	---	2	---	---	2
30	---	1	---	---	1
35	---	1	---	---	1
40	---	1	1	---	2
42	---	1	---	---	1
50	---	1	---	---	1
75	---	---	---	1	1
150	---	1	---	---	1
185	---	1	---	---	1

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		Responded to Mailing #			Total of
	Nonrespondents	Responded to 1st Mailing	Responded to 2nd Mailing	Responded to 3rd Mailing	Nonrespondents and Respondents
Total Harvest of Northern Pike					
---	106	---	---	---	106
0	---	223	96	36	355
1	---	17	8	---	25
2	---	25	2	4	31
3	---	14	4	1	19
4	---	13	---	1	14
5	---	6	4	---	10
6	---	14	2	1	17
7	---	3	1	---	4
8	---	6	---	---	6
9	---	1	---	---	1
10	---	8	2	2	12
11	---	2	1	---	3
12	---	2	---	---	2
13	---	2	---	2	4
14	---	---	---	1	1
15	---	1	2	2	5
17	---	3	---	---	3
18	---	3	---	---	3
20	---	6	---	1	7
21	---	3	---	---	3
22	---	---	---	1	1
23	---	1	---	---	1
24	---	1	---	---	1
25	---	2	---	---	2
26	---	1	---	---	1
28	---	---	---	1	1
30	---	3	---	---	3
35	---	2	---	---	2
40	---	1	1	---	2
41	---	1	---	---	1
42	---	1	---	---	1
50	---	1	---	---	1
55	---	---	1	---	1
75	---	---	---	1	1
150	---	1	---	---	1
185	---	1	---	---	1

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	Nonrespondents	Responded to Mailing #			Total of Nonrespondents and Respondents
		Responded to 1st Mailing	Responded to 2nd Mailing	Responded to 3rd Mailing	
Sex composition of ice caught Northern Pike					
No response	106	334	119	47	606
Mostly Female	---	4	---	2	6
Mostly Male	---	5	1	1	7
About the Same	---	9	1	3	13
Don't Know/Remember	---	16	3	1	20
Smallest Northern Pike kept TL (in)					
---	106	233	98	36	473
6	---	---	1	---	1
10	---	2	---	---	2
12	---	5	1	---	6
13	---	3	---	---	3
14	---	5	1	1	7
15	---	4	1	1	6
16	---	11	1	2	14
18	---	9	2	1	12
19	---	8	1	---	9
20	---	14	5	3	22
21	---	4	---	---	4
22	---	5	2	3	10
23	---	2	1	---	3
24	---	13	3	3	19
25	---	12	---	1	13
26	---	9	1	1	11
27	---	3	1	1	5
28	---	9	2	---	11
29	---	2	---	---	2
30	---	6	1	---	7
32	---	5	1	---	6
35	---	1	---	---	1
36	---	1	1	---	2
38	---	1	---	1	2
40	---	1	---	---	1

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	Nonrespondents	Responded to Mailing #			Total of Nonrespondents and Respondents
		Responded to 1st Mailing	Responded to 2nd Mailing	Responded to 3rd Mailing	
Opinion of efficiency of small spears					
No response	106	318	114	49	587
No Northern Pike caught	---	14	2	2	18
Less than half Northern Pike caught	---	17	5	2	24
About half Northern Pike caught	---	7	1	---	8
More than half Northern Pike caught	---	10	---	1	11
All Northern Pike caught	---	2	2	---	4
Opinion of efficiency of large spears					
No response	106	315	115	47	583
No Northern Pike caught	---	11	2	1	14
Less than half Northern Pike caught	---	8	3	---	11
About half Northern Pike caught	---	7	2	2	11
More than half Northern Pike caught	---	15	1	1	17
All Northern Pike caught	---	12	1	3	16
Opinion regarding length limit alternative					
No response	106	189	78	33	406
Most Preferred	---	67	8	9	84
2nd Most Preferred	---	46	12	5	63
3rd Most Preferred	---	33	9	2	44
4th Most Preferred	---	16	11	1	28
Least Preferred	---	17	6	4	27
Opinion regarding gear type restriction alternative					
No response	106	192	79	34	411
Most Preferred	---	24	3	5	32
2nd Most Preferred	---	24	8	2	34
3rd Most Preferred	---	37	12	3	52
4th Most Preferred	---	46	15	6	67
Least Preferred	---	45	7	4	56
Opinion regarding reduced bag or possession limit alternative					
No response	106	190	78	33	407
Most Preferred	---	63	20	4	87
2nd Most Preferred	---	51	15	6	72
3rd Most Preferred	---	31	5	6	42
4th Most Preferred	---	20	2	1	23
Least Preferred	---	13	4	4	21

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	Nonrespondents	Responded to Mailing #			Total of Nonrespondents and Respondents
		Responded to 1st Mailing	Responded to 2nd Mailing	Responded to 3rd Mailing	
Opinion regarding Catch and Release fishing only alternative					
No response	106	192	79	33	410
Most Preferred	---	52	18	6	76
2nd Most Preferred	---	28	7	4	39
3rd Most Preferred	---	26	9	2	37
4th Most Preferred	---	41	5	4	50
Least Preferred	---	29	6	5	40
Opinion regarding Close fishery alternative					
No response	106	193	79	33	411
Most Preferred	---	35	2	2	39
2nd Most Preferred	---	17	5	---	22
3rd Most Preferred	---	15	3	1	19
4th Most Preferred	---	15	5	5	25
Least Preferred	---	93	30	13	136