

**A Fish Consumption Survey
of the
Nez Perce Tribe**

*This draft interim report was prepared under
EPA Contract EP W14 020 Task Order 10
and Contract EP W09 011 Task Order 125
with SRA International.*

Nayak L Polissar, PhD^a
Anthony Salisbury^b
Callie Ridolfi, MS, MBA^c
Kristin Callahan, MS^c
Moni Neradilek, MS^a
Daniel S Hippe, MS^a

^aThe Mountain-Whisper-Light Statistics

^bPacific Market Research

^cRidolfi, Inc.

May 12, 2015

Preface

This draft interim report of fish consumption rates among the Nez Perce Tribe is the first step in quantitatively documenting the role of fish in the life of the Tribe. The authors of this report hope that this work will help to protect the health of tribal members and Idaho residents who are fish consumers, especially those who enjoy a high fish consumption rate. This draft interim report is based only on part of the data collected in a survey of the Tribe. In order to meet the schedule of the Idaho Department of Environmental Quality, this interim report, based on a substantial part—but not all—of the interviews collected in the survey, is being provided at this time. This draft interim report is the precursor to a final report to be issued in September, 2015. The final report will be based on all of the data collected in the survey and will also include additional methods of analysis and results not presented here.

While the main results of this draft interim report are numeric, the numbers are only a companion to the Nez Perce culture, heritage and vision for their future. It may help the readers to know more about the Nez Perce Tribe, the role of fish in the lives of its members and the activities of the Tribe in relation to fish and fishing. The Nez Perce Tribe Final Survey Design document provides more detailed information on the Nez Perce Tribe. The design report covers a number of topics, including the background and purpose of the survey, the survey objectives for the Tribe, the importance of heritage fish consumption rates to the Tribe, the suppression of fish consumption over time, the role of the current survey and a historic assessment. (See Appendix E, Design of a Survey on Fish Consumption by the Nez Perce Tribe.)

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1.0 Acknowledgments

The authors wish to thank the following for invaluable help in designing and implementing the survey and in preparation of this draft interim report: the governing Council and staff of the Nez Perce Tribe; the staff of the Columbia River Inter-Tribal Fish Commission; the staff of EPA's Region 10 and its Conflict Prevention and Resolution Center; the staff of SRA International and Ross Strategic; the Nez Perce Tribal interviewers and other interviewers; and, support staff of Pacific Market Research, Ridolfi, Inc., and The Mountain-Whisper-Light Statistics.

Most of all we wish to thank the members of the Nez Perce Tribe who served as respondents to this survey, patiently sitting through our long interviews and sharing important aspects of their lives. Without their stories, this draft interim report would not have been written.

We are grateful to all of those mentioned and to others who helped us. An important addition to any acknowledgment such as this is our affirmation that any errors of fact, method, numeric values or interpretation in this draft interim report belong to the authors and not to any of the people, organizations or sources that were consulted.

2.0 Acronyms

AWQC	Ambient water quality criteria
CAPI	Computer-Assisted Personal Interviews
EPA	Environmental Protection Agency
FCR	Fish consumption rate(s)
FFQ	Food Frequency Questionnaire
HSSRO	Human Subjects Research Review Official
ID DEQ	Idaho Department of Environmental Quality
IRB	Institutional Review Board
NCI	National Cancer Institute
NPT	Nez Perce Tribe
SBT	Shoshone-Bannock Tribes

3.0 Executive Summary

3.1 Introduction and Purpose

This is a draft interim report on fish consumption by the Nez Perce Tribe (NPT). It is based on one part of the questionnaire used in the survey—the food frequency questionnaire (FFQ). A large fraction—but not all—of the interviews conducted in the survey have been used for the data analysis. The purpose of the draft interim report is to quantitatively describe current fish consumption and related activities of the Nez Perce Tribe. The fish consumption rates from this survey can be used by the Tribe, by the State of Idaho and by other bodies to inform and guide the effort to assess risks posed by contaminants in fish for populations with a high level of fish consumption.

The data analyzed in this draft interim report is based on interview data available to our statistical team on February 20, 2015. The earliest interview that supplied useable data for this draft interim report occurred on May 10, 2014. The last interview that provided data for use in this interim report occurred on February 20, 2015. The survey interviewing continued after that date, and the truncated dataset serves as the basis for the analyses presented in this interim report. The interviewing will have stopped on April 30—prior to the release of this report—and a re-analysis using the full dataset will be presented in a final report to be released in September 2015. The contents of the final report will differ from the present, interim report by including analyses based on all interviews that occurred in the survey. In addition, new sections of the report will cover an analysis of fish consumption rates based on a statistical methodology (the NCI method) whose description and results are not covered in this draft interim report. The NCI method is mentioned briefly later in this report. Other planned differences between this interim report and the final report will consist mainly of updates to methods and results.

3.2 Survey Methods

The survey covered tribal members residing in zip codes falling within approximately 50 miles of two major tribal centers. The geographic scope was selected in consideration of the logistics of interviewers needing to reach respondents as well as to select a sample that would represent Nez Perce fish consumers specific to Idaho. A stratified random sample was drawn from tribal enrollment files. Within each stratum, members were drawn randomly. Tribal fishers (“Tribal members who fish”) were identified from a roster of tribal fishers maintained by the Tribe; a number of fishers were included in the sample and were interviewed. A fish consumption rate is reported for the fishers as a distinct population.

Tribal interviewers were employed and trained to administer the questionnaire. In order to facilitate coordination and maintain data quality, interviewers worked closely with the staff of the survey research firm charged with implementing the survey. Respondents to the survey answered questions about species consumed (frequency and quantity), covering consumption over the past year as well as answering questions about fish consumption “yesterday.” The questions on 24-hour fish consumption “yesterday” were repeated in a separate interview (usually by telephone) administered on a later, independent day. An attempt was made to match

the first and second interview timing during the seven days of the week so that the two interviews would either both be on a weekday or both be on a weekend day.

The questions about consumption over the past year followed the format of a food frequency questionnaire (FFQ), which is common in dietary studies. The analysis of the FFQ data provides an estimated daily fish consumption rate in grams/day for each respondent and for any species or species group referenced in the survey. Data from the two 24-hour recall interviews will be used in a separate analysis based on the “NCI method”—a methodology developed by the National Cancer Institute and other researchers. The NCI method also yields a usual consumption rate in grams/day. The results of the NCI method will be included in the final September 2015 report.

Our statistical analysis included development of appropriate statistical weights in an effort to provide unbiased estimates of fish consumption for the Tribe. These weights are expected to correct for some or all of the potential response bias due to differential response rates across demographic groups of the Tribe. The mean, median and percentiles of fish consumption are reported for all species combined (species Group 1) and for near coastal, estuarine, freshwater and anadromous species (species Group 2). Additional fish consumption statistics are provided for demographic sub-groups of the Tribe.

This survey project includes an analysis of heritage rates—the fish consumption rates of the Tribe that were in place prior to modern environmental and social interference with its fishing practices. Those heritage rates and a discussion of them will be presented either separately from or as part of the final report of this survey. The current consumption rates presented here and the heritage rates to be presented later provide a menu of potential future fish consuming populations (and associated fish consumption rates) to be considered in the effort to protect people with a high level of fish consumption.

3.3 Results

A sample of 1,250 adult tribal members (age 18 or older) was drawn from enrollment files. Over the course of this truncated interview period, 384 members were interviewed and provided sufficient information to classify them as fish consumers or non-consumers. The response rate for the survey is 31%. Only 1 (0.3%) respondent was a non-consumer. The fish consumption rates for the Tribe are summarized briefly in Tables E1 and E2. Additional fish consumption rates are provided in the body of the draft interim report.

The Tribe’s estimated current consumption rates are high relative to the U.S. general population (Table E3), and the rates for the population of fishers in the Tribe is substantially higher. The consumption rates are skewed toward large consumption rates for each of the population and species groups presented in Tables E1 and E2; the 95th percentile is several-fold larger than the median, typically an indication of skewness toward large values.

Table E1. Mean, median and selected percentiles of fish consumption rates (g/day); consumers only. Estimates are weighted.

Species	N Consumers	Mean	Percentiles			
			50%	90%	95%	99%
Group 1	375	125.4	74.2	260.0	402.8	794.1
Group 2	370	86.6	49.3	195.7	245.0	660.3

Table E2. Mean, median and selected percentiles of fish consumption rates (g/day) for fishers and non-fishers; consumers only. All rates are for total (all species, Group 1) consumption. Estimates are weighted.

Group	N Consumers	Mean	Percentiles		
			50%	90%	95%
Fishers	119	160.0	101.1	298.0	489.0
Non-fishers	256	114.3	69.6	242.4	343.8

3.4 Discussion

The fish consumption rates presented here are generally high compared to those observed in other Pacific Northwest tribal fish consumption surveys, such as the Columbia River Inter-Tribal Fish Consumption survey (which included the Nez Perce Tribe), with an exception being the survey of the Suquamish Tribe. The rates are also many-fold higher than fish consumption rates for the U.S. general population. See Table E3.

Table E3. Total fish consumption rates of adults in Pacific Northwest Tribes (with consumption rates available) and the U.S. general population. Consumers only.

Population	No. of Respondents*	Mean	Percentiles	
			Median	95 th
Nez Perce Tribe	375	125.4	74.2	402.8
Tulalip Tribes	73	82.2	44.5	267.6
Squaxin Island Tribe	117	83.7	44.5	280.2
Suquamish Tribe	92	213.9	132.1	796.9
Columbia River Tribes	464	63.2	40.5	194.0
USA/NCI	9,129	18.4	11.8	57.5

*Consumers only.

Data for populations outside of Idaho extracted from Polissar, et al, 2014.

This survey has strengths and limitations. One strength is the use of a unique frame for drawing the sample: tribal enrollment records. The random sampling and the adjustment for non-response through statistical weighting are additional strengths. Yet another strength is the presence in the survey team of considerable experience in: survey field work, conducting surveys of other Native American tribes, conducting statistical analysis and reporting results of Native American fish consumption surveys, and working with Native Americans on environmental issues.

One limitation of the survey is the relatively low response rate. While the statistical weighting may have addressed the potential selection bias that may occur when there is in a low response rate, it is possible that those in the sample who were not reached and interviewed do have a different consumption rate regimen, on average, than those included. That is an unknown at this time, and the low response rate by itself does not discredit this survey. The 95% confidence interval widths presented later in this draft interim report allow interpretation of uncertainty in the FCRs presented. The estimated value that the confidence interval brackets is the best statistic to use in assessing fish consumption risks.

An important lesson learned from this survey experience is that the involvement of the leadership and staff of the Tribe was critical to the success of this project and should be an important factor in developing other fish consumption surveys of Native Americans.

3.5 Conclusion

The Nez Perce Tribe has fish consumption rates that are among the highest in the Pacific Northwest and are many-fold higher than consumption rates of the U.S. general population. (See Table E3.)

4.0 Introduction

4.1 Background and Purpose

The Native American tribal governments in the State of Idaho have been collaborating with the U.S. Environmental Protection Agency (EPA) Region 10 and other stakeholders to gather data on tribal fish consumption rates (FCR) in Idaho. One objective of this effort is to support the effort to assess risks posed by contaminants in fish for populations who consume fish at high levels. More generally, this effort was intended to enhance tribal environmental capacity in the area of water quality. The tribes worked collaboratively with the State of Idaho in developing tribal surveys that would support Idaho's efforts to develop ambient water quality criteria (AWQC) protective of high fish consumers. This draft interim report presents survey methodology and results, specifically FCRs, for the Nez Perce Tribe. The survey is focused on both current and heritage rates. Heritage rates will be supplied in a separate report or in the final report, which will include results based on all completed interviews and quantitative heritage rates and the methodology used in deriving them.¹

Water quality is of great importance to the Native American tribes in Idaho, since a substantial portion of their diet consists of fish and shellfish² which may acquire contaminants from water. As the FCRs for populations consuming fish increase, the water must become cleaner in order to keep human exposures to toxic chemicals in fish at acceptable levels. It has been found that Puget Sound and Columbia River tribes have much higher FCRs than the general U.S. population, with consequences for target water quality. EPA Region 10 is supporting Idaho's tribal governments in identifying appropriate FCRs to use in protecting the health of the Idaho tribes. The FCR statistics (i.e., averages and percentiles) included in this draft interim report are provided in terms of the grams of uncooked fish and shellfish consumed by a person on a daily basis over the course of a one-year period.

A fish consumption study fits into a larger context, There are three eras of importance for such a study: the past, present, and the future. Considering the past, over an extended period of time the Nez Perce Tribe has experienced environmental and social changes that have reduced fish abundance, access to fish, safety of fish consumption, and fish consumption itself. The Tribe is seeking to increase fish availability, reduce contamination of fish, and increase fish consumption in the future. Thus, current consumption does not reflect the Tribe's past nor its goals. Assessing consumption through a current cross-sectional survey will provide relatively precise information about current consumption only. For the overall goals of this survey, the current consumption rates should not be considered in isolation, and the survey team will be reporting later on heritage rate levels of consumption. Assessing past consumption through an assessment of historical materials and, potentially, interviews with some older individuals whose history reaches back a long lifetime may be highly informative, but rates so derived are likely not as precise as current-survey rates because they involve longer-term recall and unknown quality and completeness of past documentation.

¹ Hereafter, "survey" will refer to the survey of current fish consumption of the Nez Perce Tribe, unless the context makes it clear that the heritage rate survey or another survey is being referenced.

² Hereafter, "fish" will refer to fish and shellfish.

The heritage rate study will fit into this framework as well, as part and parcel of the final report. There have been many studies of historic rates and suppression in the past, but their isolation from a report on current rates may have denied them the attention they deserve. The primary quantitative results from the heritage rate study are likely to be mean (average) consumption per day with a plausible range bracketing the mean. To the extent possible, the rates will be categorized by broad species groups.

The rates and supporting materials generated by this study will be used to protect the health of tribal members and other Idaho residents who consume large quantities of fish. The strength of the current rates is that they are derived by a technically defensible methodology, and these rates can be compared to those of other populations. The strength of the heritage rates is their relevance to the goals of the Tribe.

The survey was implemented largely consistent with the final survey design report of the Nez Perce Tribe. Some design modifications were made while the survey was underway to improve response rates without introducing bias. At the time this draft interim report is issued, the interviewing for this survey will have been recently completed. This interim report does not use all of the interviews that will be available from the survey. Due to the need to accommodate scheduling requirements of the Idaho Department of Environmental Quality (ID DEQ), less than the full anticipated survey dataset has been used for this draft interim report. The survey data available for analysis on February 20, 2015 were “frozen” and used to derive all of the results presented in this interim report. A final report on the survey will be issued in September 2015. The final report will be based on all interviews obtained from the Nez Perce Tribe and will provide a complete analysis to support project objectives. The present document is a draft interim report, prepared before the end of data collection.

4.2 A Brief Description of the Nez Perce Tribe

The Nez Perce Tribe of today is a self-governing, Federally Recognized Tribe located on a reservation in north central Idaho which lies primarily in the Camas Prairie region south of the Clearwater River, covering parts of Nez Perce, Lewis, Idaho, and Clearwater Counties. The tribal government seat is at Lapwai, which also contains the largest population of Nez Perce, and the largest community overall within the reservation boundary is the City of Orofino.

Additional material about the Nez Perce Tribe can be found in the document, “Design of a Survey on Fish Consumption by the Nez Perce Tribe,” that is located in Appendix E of this draft interim report.

4.3 Heritage Rates

Heritage rates refer to rates of fish consumption by the Tribe prior to interference by modern environmental and social changes. The draft interim report does not include quantitative heritage rates. These will be supplied in a separate report or in the final report, which will include results

based on all completed interviews and quantitative heritage rates and the methodology used in deriving them.

While this document does not report heritage rates, we do wish to recognize that the determination of heritage rates is a scientific discipline, including both quantitative calculations and scientific judgment. The results of that endeavor by this contractor team will be presented as part of the work effort.

4.4 Populations

The tribal populations described quantitatively in this draft interim report are the Nez Perce Tribe as a whole and the population of “documented” fishers within the Tribe. Identification of the fisher group was done through a list of fishers that was derived from Department of Fisheries Resources Management (DFRM) records of sampling activities that are conducted annually for certain fisheries. Information is collected and compiled for specific individual tribal members who fish at certain rivers/areas. Tribal members were observed or interviewed for their fishing activities at a certain area during a certain fishery season. This fisher data was collected either during the actual fishery or collected post-season. This list represents only those tribal members who provided in-season and/or post-season catch/harvest data to DFRM staff. Thus, the fisher list is not a comprehensive representation of all “fishers” of the Tribe, but, rather, a “fisher indicator” (i.e., includes a subset) of the true fisher population. When the term “fisher” is used in this draft interim report, it refers to persons listed on this fishers list. When there is reference to a non-fisher, it means a person not on the fishers list, but a certain fraction of those not on the fishers list do, in fact, harvest fish. Despite any inaccuracies in designation of fishers and non-fishers, the fishers list is a useful roster of persons, most of whom are engaged in fishing and harvesting activities. Those on the fishers list constitute one of the populations identified in this draft interim report, with a presentation of their consumption rates.

4.5 Guide to Report Sections

This document follows the commonly used IMRD format for scientific articles and reports: **I**ntroduction, **M**ethods, **R**esults and **D**iscussion. After this introduction, we describe the methods used to prepare for and then execute the survey in the field and the methods used to analyze the data obtained from the survey. The Results section contains demographic statistics about the population, the selected sample and the survey respondents, survey response rates, quantitative fish consumption rates (overall and by demographic subgroups) and other statistics related to tribal fishing and fish consumption. The Discussion section recaps the main findings and discusses the strengths and limitations of the survey and its analysis. Appendices include supporting technical material.

5.0 Methods

5.1 Methods—Overview

This section describes the basis for choosing the survey sample, including sample size, inclusion/exclusion eligibility criteria, and geographic area from which to select survey-eligible tribal members. It discusses the review and approval process, by both tribal and external sources, for determining the survey's approach and procedures.

This section also reviews the development of the questionnaire, the methods used to draw the sample from tribal enrollment records, identification of fishers³ to be used in calculating fisher consumption rates, allocation of selected tribal members to sample waves of interviewing in order to provide interviewing throughout the one-year survey period, re-interviewing of initial respondents, and the relevance to this survey of computer-assisted personal interviewing.

Selection and training of interviewers is discussed, along with methods for calculating survey response rates, methods for weighting the sample to adjust for differential response rates in different sample strata and for differentials in the probability of response related to demographic factors. Finally, this section covers methods to convert respondent data on frequency and portion sizes of consumed species to quantitative consumption rates, and methods to obtain means and percentiles of fish consumption and their confidence intervals.

5.2 Methods—Sample Selection

The planned sample size was developed to fulfill two goals: (a) a sufficient sample size so that means and percentiles of fish consumption rates calculated from the FFQ portion of the questionnaire would be reasonably precise; and, (b) a sufficient sample size to provide reasonable assurance of an adequate number of respondents with two separate 24-hour recall interviews, both of which reported some fish consumption during the preceding 24-hour day (“yesterday”).

The second goal was considerably more challenging to plan than the first. The criterion of at least 50 “double hits” from the survey—two separate, independent interviews wherein a respondent recalled eating fish on the preceding day—is a requirement of one of the methods used to calculate a distribution of usual fish consumption. The “NCI method” refers to a statistical procedure for calculating the distribution of usual consumption of episodically consumed foods (Dodd, KW, et al. 2006; Tooze, JA, et al. 2006; Kipnis V, et al. 2009). Fish

³ Identification of the fisher group was done through a list of fishers that was derived from Department of Fisheries Resources Management (DFRM) records of sampling activities that is conducted annually for certain fisheries. Information is collected and compiled for specific individual tribal members who fish at a certain rivers/areas. Tribal members were observed or interviewed for their fishing activities at a certain area during a certain fishery season. This data was collected either during the actual fishery or collected post-season. This list represents only those tribal members that provided in-season and/or post-season catch/harvest data to department staff. Thus, it is not a comprehensive representation of all “fishers” of the Tribe, but rather a “fisher indicator” (i.e., subset) of the true fisher population number.

consumption would fall into the “episodically consumed” category, since most people do not eat fish every day. This technical method was designed to exploit data collected about consumption (or non-consumption) of a food item on two or more independent days. The NCI method will be applied to analyze the data of this survey and the results of the analysis will be provided in the final report.

Part of the challenge in planning the sample size is the lack of relevant data or tabulations. Among the fish consumption survey reports about Native American tribes in the Pacific Northwest, there is no survey that includes tabulations specifically on the frequency of consumption of fish (all species combined), with frequency reported as consumption days per week, per month, per year or per other time unit. The tabulations closest to this framework are in a Columbia River Inter-Tribal Fish Commission (CRITFC) survey report (CRITFC Technical Report 94-3, 1994), which reports on the frequency of fish meals (not days with fish meals).

The CRITFC survey (CRITFC, 1994) was carried out among four Columbia Basin tribes and is applicable to the Nez Perce Tribe who fish, among other areas, in waters located within the State of Idaho. The Nez Perce Tribe’s CRITFC survey respondents constituted 19% of the statistical weight used in determining the CRITFC combined-tribe consumption rates, such as means and percentiles of fish consumption⁴.

We carried out some calculations on expected number of double hits with various assumed sample sizes and some assumptions which allowed us to convert fish meals per week, as tabulated in the CRITFC report, to days with fish meals per week. Using these planning assumptions and the CRITFC input tabular data, we estimated that a sample of approximately 1,800 tribal members would provide good confidence that those completing the interviews of the survey would include at least 50 individuals who would report eating fish on both of the two independent days targeted by a 24-hour recall questionnaire (i.e., 50 double hits).

Initially, five tribes of Idaho (the Kootenai, Shoshone Paiute, Coeur d’Alene, Shoshone-Bannock, and Nez Perce) were contemplating participation in the survey during this planning phase. To employ the NCI method for each tribe individually, 50 double hits would have been needed for each tribe. This was not possible given the resources available. Consequently, the 1,800 interviews were to be distributed over the five participating tribes with the intention of getting 50 double hits from the pooled results of all participating tribes. Thus, as will be more completely described in the final report, we decided to report separate FCR distributions per participating tribe, using the NCI method, although the data from multiple tribes would need to be pooled as input to the NCI method. The rates for individual tribes would be obtained through the use of covariates in the NCI modeling process. The NCI method includes provisions for the use of covariates, and thus each tribe would receive its own set of rates based on the NCI method.

⁴ See CRITFC, 1994, Appendix 1, pages 106-107. The value of 19% statistical weight for the Nez Perce Tribe is the Nez Perce population divided by the total population of all four tribes as listed in the CRITFC report, page 106. The listed population of the four tribes (which determines the statistical weight of each tribe in calculating the combined CRITFC rates) are as follows: Umatilla, 818; Nez Perce, 1440; Warm Springs, 1531; Yakama, 3872. Total of the four tribes: 7661

After further deliberations by the Idaho tribes, the Nez Perce and Shoshone-Bannock Tribes were the tribes who chose to participate in surveying current fish consumption. Based on discussions with staff of these Tribes, the planned approximate sample size of 1,800 was allocated as a sample of approximately 1,200 from the Nez Perce Tribe and 600 from the Shoshone-Bannock Tribes. Based on available information regarding fisheries and harvest levels, it was thought that the Nez Perce Tribe had higher fish consumption rates than the Shoshone-Bannock Tribes. Allocating more interviews to the Nez Perce Tribe improved the chances of obtaining 50 double hits. The two tribes recognized that they both needed to achieve the necessary number of “double hits” and that this part of the survey would require a joint effort to do so.

The anticipated percentage of sampled members providing two 24-hour interviews was calculated as an anticipated 60% response rate for the first 24-hour interview (and FFQ-based interview), followed by an anticipated 80% response rate for the second interview among those participating in the first interview. The 60% for the first interview response rate was selected as a conservative value given that response rates above 60% have been obtained for other Northwest tribal fish consumption surveys (see Toy, et al, 1996 and Suquamish Tribe, 2000). The 80% continuation rate for those completing the first interview was simply an assumed reasonable value for continuation among those who had participated in the first interview. The net response rate for completion of both interviews would thus be 48%--approximately half of the sampled members.

5.3 Methods—Inclusion/Exclusion Criteria

The survey was designed to assess the consumption rate of adults, defined as individuals age 18 and over. Specifically excluded from the survey were any members who were living in an institutional setting (e.g., a nursing home). The reason for this exclusion is that a person in the institutional setting would typically not be in control of their diet and might not be living a tribal lifestyle in terms of diet. The enrollment files did not indicate this status, and such members were identified during the initial contacts with potential respondents.

During the interview process, an additional exclusion was incorporated: tribal members who could not participate in the interview process due to physical, mental or other reasons were excluded as they were encountered.

There were no exclusions based on language issues. In advance of the survey, the contractor team was informed by the tribal authorities that there would be no need to prepare for interviews in any other language than English. No instances of non-response due to language issues were reported to the contractors.

5.4 Methods—Geographic Sample Selection Criteria

Initial exploration showed that this survey could not use the entire population of adult tribal members as a target population for interviews. Data (not containing any personally identifying information) from the tribal enrollment office showed that the tribal members live throughout the United States, with the greatest concentration on and near the reservation. There would clearly be

a limitation on the travel resources available for interviewing people in person; persons living very far from the reservation would need to be excluded. Secondly, there was a concern that members living very far from the reservation and far from the fisheries used by tribal members might be different in some way from those living close; fish consumption habits, lifestyle, and other known or unknown factors might substantially differ from those living closer to or on the reservation. The travel limitations were the deciding factor in limiting the geographic scope of the survey. A fifty-mile travel limit was considered acceptable for practical survey operation. The selection of geographic areas was based on zip codes, and the selected zip codes for the survey, described below, were approved by the Tribe.

The process for selecting samples for the Nez Perce Tribe survey was based on ZIP code boundaries on the Nez Perce reservation delineated using a Geographic Information System (GIS)—specifically, the ArcGIS software program. ZIP code boundaries were downloaded from the U.S. Census Bureau, circa 2010. To subset the ZIP codes from national to local scale, buffers of 25 and 50 miles (called sampling “hubs”) were created around the primary population centers of Lapwai and Kamiah using ArcGIS. Any ZIP code boundary that included any portion of the land area within either buffer was then selected for inclusion in the first iteration of the ZIP code subset.

Using this ZIP code subset, a population center for each ZIP code was identified using the U.S. Postal Service ZIP code lookup tool. These population centers were then selected in ArcGIS from the “Cities and Towns” dataset available from the National Atlas of the United States (NAUS). If the population center was not present in the NAUS dataset, it was instead digitized in ArcGIS through aerial interpretation of high-resolution basemaps. Once the population centers were assigned to every ZIP code, a second iteration of the ZIP code subset was created. For this second iteration, any ZIP code whose population center was not included within the 25- or 50-mile buffer from either sampling hub was removed from the ZIP code subset.

Using this second iteration of the ZIP code subset, each code was first assigned to a sampling hub (either Lapwai or Kamiah) based on the closest aerial distance of the ZIP code population center to the sampling hub. Once each ZIP code was assigned to a sampling hub, it was then assigned to a buffer zone of either 25 or 50 miles (depending on the distance from the ZIP code’s population center to the sampling hub). The ZIP codes were then plotted on a map, symbolizing each ZIP code as either 25 or 50 miles from either sampling hub, as shown in Figure 1.

The distances between each ZIP code population center and the sampling hubs were calculated in ArcGIS using an automatic straight-line distance-calculation tool. Since the geographical coordinates of the population centers were provided in feet according to the Idaho State Plane Coordinate System, the distances were measured in feet and then converted to miles. The distances calculated from each population center to Lapwai and Kamiah, according to ZIP code, are provided in [Table 1](#).

Figure 1. Nez Perce reservation and surrounding eligible ZIP codes for inclusion in the Nez Perce Tribe fish consumption survey.

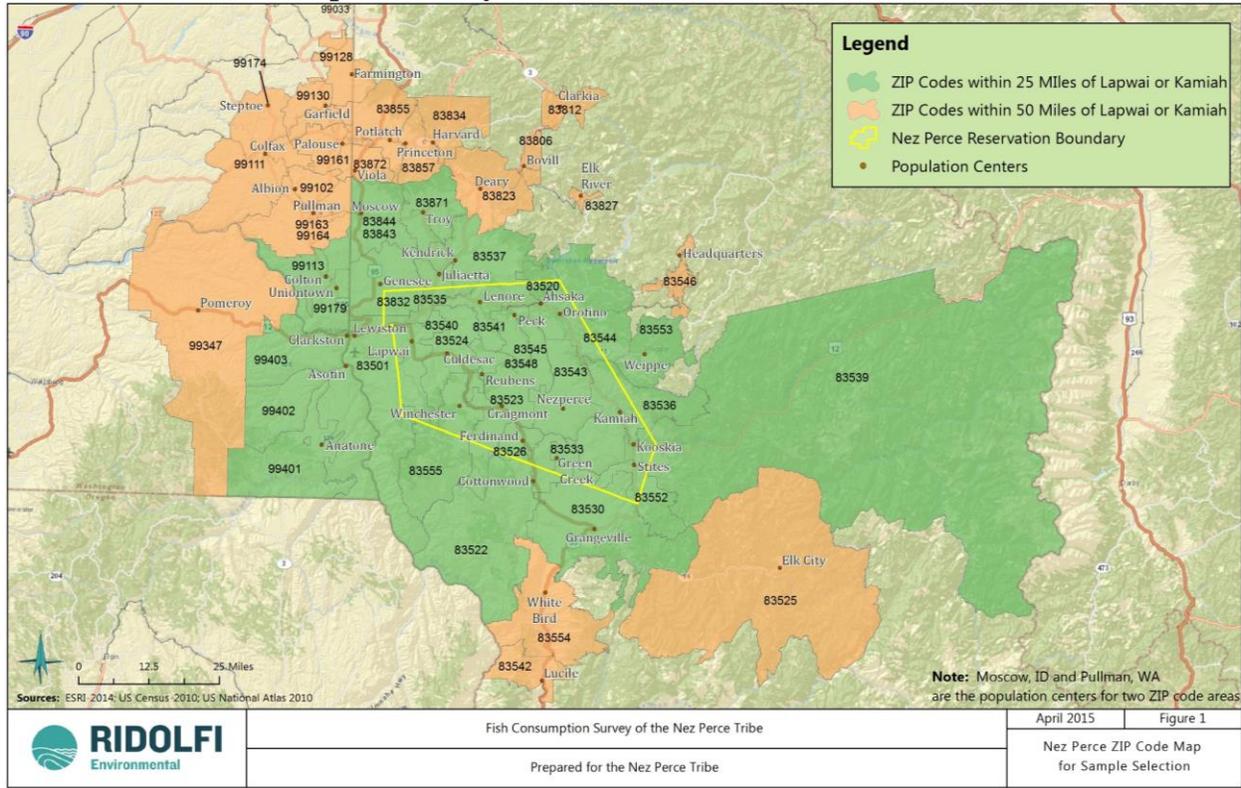


Table 1. Nez Perce reservation ZIP codes, corresponding population centers, and distances to sampling hubs for the Nez Perce Tribe survey.

ZIP Code	Population Center	Distance to Lapwai (Miles)	Distance to Kamiah (Miles)	Buffer Distance	Closest Sampling Hub
83501	Lewiston	10.21	49.14	25	Lapwai
83520	Ahsaka	23.93	23.91	25	Kamiah
83522	Cottonwood	32.94	19.74	25	Kamiah
83523	Craigmont	19.75	21.03	25	Lapwai
83524	Culdesac	6.64	32.50	25	Lapwai
83525	Elk City	76.90	39.69	50	Kamiah
83526	Ferdinand	26.50	18.04	25	Kamiah
83530	Grangeville	46.58	21.26	25	Kamiah
83533	Green Creek	33.15	13.88	25	Kamiah
83535	Juliaetta	12.92	40.49	25	Lapwai
83536	Kamiah	39.15	0.00	25	Kamiah
83537	Kendrick	16.33	39.84	25	Lapwai
83539	Kooskia	43.54	6.20	25	Kamiah
83540	Lapwai	0.00	39.14	25	Lapwai
83541	Lenore	14.01	31.71	25	Lapwai

83542	Lucile	64.69	49.77	50	Kamiah
83543	Nezperce	29.48	10.16	25	Kamiah
83544	Orofino	26.78	20.52	25	Kamiah
83545	Peck	18.84	25.53	25	Lapwai
83546	Headquarters	50.03	29.80	50	Kamiah
83548	Reubens	13.80	25.48	25	Lapwai
83552	Stites	45.28	9.71	25	Kamiah
83553	Weippe	41.52	11.18	25	Kamiah
83554	White Bird	50.68	34.75	50	Kamiah
83555	Winchester	14.32	28.57	25	Lapwai
83806	Bovill	37.01	47.01	50	Lapwai
83812	Clarkia	49.39	55.32	50	Lapwai
83823	Deary	29.75	46.88	50	Lapwai
83827	Elk River	39.67	39.14	50	Kamiah
83832	Genesee	11.62	48.37	25	Lapwai
83834	Harvard	35.61	58.43	50	Lapwai
83843	Moscow	24.50	58.08	25	Lapwai
83844	Moscow	24.50	58.08	25	Lapwai
83855	Potlatch	36.02	63.44	50	Lapwai
83857	Princeton	35.24	61.21	50	Lapwai
83871	Troy	23.02	49.93	25	Lapwai
83872	Viola	32.06	63.84	50	Lapwai
99102	Albion	34.13	70.16	50	Lapwai
99111	Colfax	42.33	78.09	50	Lapwai
99174	Steptoe	49.21	83.14	50	Lapwai
99113	Colton	19.14	57.64	25	Lapwai
99128	Farmington	48.70	76.76	50	Lapwai
99130	Garfield	44.68	75.66	50	Lapwai
99161	Palouse	37.26	68.73	50	Lapwai
99163	Pullman	28.80	65.09	50	Lapwai
99164	Pullman	28.80	65.09	50	Lapwai
99179	Uniontown	16.41	55.07	25	Lapwai
99347	Pomeroy	38.47	77.29	50	Lapwai
99401	Anatone	24.47	53.46	25	Lapwai
99402	Asotin	12.50	49.47	25	Lapwai
99403	Clarkston	11.52	50.40	25	Lapwai

5.5 Methods—Reviews and Approvals

The survey team developed a Survey Design Report in 2014 in collaboration with the Nez Perce Tribe and the EPA that outlined the approach and procedures for implementing the fish consumption survey. In order to meet accepted standards of protection for survey respondents, the Survey Design Report was submitted for review and approval to two Institutional Review

Boards (IRB) and the EPA Human Subjects Research Review Official (HSRRO), the latter of which has the final authority for all human subjects research supported by the EPA.

First, the Northwest Indian College (NWIC) IRB reviewed the design protocol, suggested modifications to the survey questionnaire to ensure protection of tribal respondents, and gave “consultative approval” for the survey to proceed on March 14, 2014. The design team felt that it was important to include an IRB associated with Native American tribes in order to fully assess any issues the research might pose for unique Native American cultures. Subsequently, Quorum Review IRB reviewed the design protocol, including revisions made according to the NWIC IRB recommendations, and issued a “notice of exemption determination” on March 26, 2014 acknowledging that the survey met the criteria for protection of human subjects’ personally identifiable information and did not require further review or restrictions. Quorum IRB was the official IRB on record for the survey, since the NWIC IRB played a consultative role. Finally, the EPA HSRRO reviewed the design protocol and supporting documentation, including the IRB letters, and approved the survey design. Ultimately, the Nez Perce Tribe gave final approval for the survey to proceed.

The survey was implemented largely consistent with the methods as described in the final survey design document. Some modifications to the design—in a manner that would not bias the survey—were implemented during the field work to increase the response rate.

5.6 Methods—Stratification and Drawing the Sample

The survey statistical team visited the Nez Perce Tribe on April 3, 2014 to draw the sample for interviewing, which was carried out on-site in its offices. The Tribe provided us with a tribal enrollment list of 2,849 members which contained gender, age, physical address, and mailing address for each tribal member (though a physical address was not always available).

Members eligible for sampling were determined by first restricting the list to those 18 years or older and with a physical address ZIP code on the eligible ZIP code list (see Section 5.4.) For records without a physical address, the ZIP code of the mailing address was used instead. For records in which both addresses were available, the ZIP codes of the physical and mailing addresses matched in 2,011 of 2,061 cases, or 98% of them. This close matching supported the use of mailing address ZIP codes as a surrogate for physical address ZIP code when needed. Of the original list of 2,749 members eligible for sampling, 2 were less than 18 years old, 68 were missing both physical and mailing addresses, and 1,085 were located outside of the eligible ZIP codes, leaving 1,574 eligible for the sample.

Each eligible members was assigned a unique PMRID (Pacific Market Research Identification Number). A stratified random sample size of 1,250 was drawn from the 1,574 eligible members, with strata defined by each combination of gender and age group (18–29, 30–39, 40–49, 50–59, 60+). No other demographic variables were available in the tribal enrollment list. The percentage of each stratum in the population of the 1,574 eligible members was then determined. The sample size allocated per stratum was determined by multiplying 1,250 by the population percentage computed for each stratum, thus creating a stratified sample with strata sizes proportional to the corresponding strata in the original population of interest. The sampled

members were then randomly partitioned into four waves (to be successively allocated to interviewers approximately every three months) within each stratum. The remaining 324 members were retained as a reserve sample to either augment the original sample in case of low response or to subsequently oversample documented fishers if that information became available. The reserve sample has not been utilized.

Personally identifying information (PII) was utilized to draw the sample, but all such information was left with the Nez Perce Tribe after generating the list of sampled members. The Tribe retained full control of PII and its use for interviewing.

5.7 Methods—Internal Reviews

5.7.1 Review by the Tribe and Other Organizations

A design report containing planned procedures was prepared for review by the Tribe, as well as by two affiliated tribal organizations, the EPA, SRA (the contracting organization managing multiple related contracts for the EPA), and Ross Strategic. These Tribe and organizations provided feedback or approval, and their suggestions were addressed or considered in preparation of a final design document.

5.7.2 Review of Statistical Computing

Two statisticians verified the calculation of the fish consumption rates per respondent, for all species combined (total consumption rate) and also per species for the 45 pre-specified species and species group used in the survey questionnaire. The checking involved two activities: checking of the consumption rates for “fully reported” species that a respondent consumed, and checking of the individual values imputed when a respondent did not supply the complete set of responses needed to calculate a consumption rate for a particular species.

Fully reported entries consisted of combinations of the respondent’s CAPI-supplied (“Computer-Assisted Personal Interviewing”—see Section 5.10) species category with the following items fully supplied by the respondent: frequency of consumption, specification of typical portion size per eating occasion for the species, and (for respondents reporting a variation in consumption during the preceding year) duration of the high-consumption season for that species.

The calculation of the consumption rates for the fully reported entries were independently calculated by the two statisticians and then compared. Any differences were discussed (without comparing codes), after which each statistician modified his code independently until there was perfect agreement for all respondents and all species.

For the second type of activity, in which imputed values were checked, one statistician calculated the imputed frequencies, portion sizes, and length of seasons for entries where any of these were missing. The second statistician independently verified the tables of the imputation rules (the imputed values were means from available values for the same species and tribe). The second statistician then checked the imputation code, which applied the imputation rules to the

incomplete entry. Based on this extensive comparison checking, the statistical team feels that the probability of errors in the calculated consumption rates is extremely low.

5.8 Methods—Questionnaire Development

The survey team developed an interview questionnaire to gather information from tribal members to help determine current tribal fish consumption rates. Questionnaires from several other surveys were reviewed, specifically other Pacific Northwest regional fish consumption surveys employing a Food Frequency Questionnaire approach (Suquamish 2000, Toy et al. 1996, Sechena et al. 1999, CRITFC 1994). A draft questionnaire drew on components of these questionnaires. After several iterations and refinements, the final Food Frequency Questionnaire (FFQ) became the critical survey instrument used to ask respondents about their dietary patterns and activities related to fish consumption over the preceding 12 months.

Drawing primarily from U.S. national dietary surveys (NCHS, 2005), additional questions were included in the questionnaire to assess fish consumption during the preceding 24 hours (“yesterday”). These 24-hour recall questions were needed in order to enable use of the NCI method of determining the distribution of usual fish consumption. At least two independent days of fish consumption (or non-consumption) need to be assessed for the NCI method. This requirement was met by conducting two 24-hour dietary recall interviews in addition to the FFQ. An attempt was made to match the first and second interview timing during the seven days of the week so that the two interviews would either be both on a weekday or both on a weekend day. In practice, there was some mixing of weekend and weekdays for the two interviews. This mixture can be addressed as part of the NCI method analysis to be presented in the final report.

After first contacting potential respondents through a telephone screening process, interviewers administered the first 24-hour dietary recall interview and the FFQ in person to willing participants. The second 24-hour dietary recall interview was intended for telephone administration 1-4 weeks after the first interview.

Data collected during the interviews included fish species consumed, frequency of consumption and portion size, with additional information gathered about fish parts eaten, preparation methods and special events. Qualitative data were collected regarding both changes in fish consumption patterns as compared to the past and expectations for future consumption in order to provide additional context around the quantitative consumption rates. Demographic information was also collected, such as height and weight (to calculate and check fish consumption rates) and education and income ranges (to determine fish consumption rates for various population groups). A subset of respondents will be re-interviewed by telephone, which involves asking a subset of the same questions a second time.

The FFQ survey questionnaire is presented in Appendix A. The survey team developed this questionnaire with input from the Tribe, the EPA, and the IRBs (discussed above in Section 5.5) as well as through pilot testing, during which the interviewers tried out the questionnaire on tribal members and provided feedback to the survey team on any problems with the questionnaire. These pilot interviews were not used in the analysis for this draft interim report. The questionnaire was ultimately transferred to a Computer-Assisted Personal Interviewing

(CAPI) software program on tablets, as described in Section 5.10, to facilitate more efficient and accurate reporting during the interviews. The questionnaire was then used to conduct interviews via CAPI, along with other visual instruments such as portion models and species identification photographs, as discussed in Appendix B.

5.9 Methods—Portion Models, Photos, Portion-to-Mass Conversions

To facilitate questionnaire administration during the survey, interviewers used portion model displays and species identification photographs (presented in Appendix B). The survey team selected species and developed these visual representations in collaboration with tribal technical and cultural staff to reflect the appropriateness of the fish species and preparation methods most commonly consumed by tribal members.

To aid in accurate determination of portion sizes, three-dimensional (3-D) and two-dimensional (2-D) model displays were used during the in-person interviews. These models can be broadly grouped into three types: realistic depictions of the part of an organism consumed (e.g. a fillet), measures of volume (e.g. bowls of various volumes), or photos of numbers of organisms consumed. Each interviewer had one full set of models to bring to the interviews. A set of photographs depicting those same models, printed at full-scale, were left behind with each respondent after the first interview for use during the follow-up (second 24-hour dietary recall) telephone interview. This allowed respondents to report portion sizes using the same models consistently throughout the survey.

The survey team developed the following portion model displays for this survey, each of which included pre-determined serving sizes (as described in Appendix B):

1. A urethane rubber replica of a cooked whole salmon fillet, cut into multiple servings.
2. A flexible plastic replica of a single-serving, cooked trout-like (white fish) fillet.
3. A gray PVC pipe to represent lamprey, marked with portions sizes.
4. A package of salmon jerky to represent dried (or similarly shaped) fish tissue.
5. A set of measuring bowls for different portions of fish soup.
6. Photograph displays of selected shellfish (crayfish, mussels, and shrimp).

Interviewers displayed portion models to respondents in familiar cooked forms (e.g., baked or dried); however, associated uncooked weights were calculated for application during data analysis. Each portion model had a specific (unique) code attached to it, and a separate table was created to show the volume and/or weight per species corresponding to each portion identified on a display. To maintain interview efficiency, respondents answered the questions in terms of simple portion marks or codes on each display, saving the interviewer from having to refer to a look-up table for the species-specific weight of the noted portion. Mass conversions of each model serving, corrected according to appropriate published moisture loss factors, were tabulated and used following the interviews to analyze the data and determine fish consumption rates. Details of the portion-to-mass calculations are provided in Appendix B.

In addition to the portion models (and the photographs of them which were left with each respondent), each interviewer had a laminated sheet with illustrations or photographs of each species to facilitate identification by the respondents, if necessary, during the interviews. The species identification photographs used to help respondents identify unfamiliar species during the interviews are also provided in Appendix B.

5.10 Methods—CAPI (Computer-Assisted Personal Interviewing)

The implementation team explored many modes for data collection. After careful consideration, we identified Computer-Assisted Personal Interviewing (CAPI) as the most efficient and best data-collection process for this survey.

With a CAPI system, the respondent or interviewer uses a computer to answer survey questions. This is the preferred mode when a questionnaire is long and complex, such as in this case, when the in-person portion of the first interview (FFQ plus first 24-hour recall) lasted over an hour. This is due to the way that computer-assisted interviewing improves data quality; the computer script increases interviewer efficiency and decreases the likelihood of human error related to skip-pattern problems (i.e. moving to different sections of the survey based on the answers to previous questions) or misprinted questionnaires. Additionally, the CAPI system provides help screens and error checking and messages at the time of input. This ensures that surveys are completely filled out and enhances the accuracy of the entered data, decreasing backend data cleaning and processing tasks. Finally, there is no need to transcribe results.

We selected Confirmit as our CAPI software because it provides interviewing software on-demand via Software as a Service (SaaS), on-premise, and we used both SaaS and on-premise products for the interviews. When interviews were conducted in remote locations without internet or telephone access, the on-premise application, loaded on the tablets, was integral to the data collection process, allowing interviewers to conduct interviews and data entry, then synchronizing their data files the next time their tablets were connected to Wi-Fi.

Each interviewer received a Windows 8 tablet for this study. We selected these tablets based on their reliability, durability, and especially their small and unobtrusive form factor. Not only was it important that the tablets were easily portable, but we sought to minimize the technological “footprint” and the sometimes off-putting nature of a physical barrier between the interviewer and the respondent.

Interviewers brought the tablets with them to each in-person interview where the interviewer, not the respondent, would enter all data on them. The tablets included detachable screens and keyboards, as well as touchpad mice and power adapters for AC outlets and car lighters—a necessity in some rural areas where power was not always guaranteed.

The tablets were password-protected, and all data files were automatically removed from the tablets after synchronization with the master database. No personally identifiable information from respondents was stored either on the tablets or in the master database.

5.11 Methods—Calculation of Consumption Rates

Respondents described their consumption using portion models to indicate portion size and portion frequency (e.g., once per week or two times per month). For each species separately, respondents were permitted to describe their consumption in two ways: over the whole year using a single portion size and frequency (constant throughout the year) or over two different periods of higher and lower fish consumption, which may or may not correspond to when the specific species was in season and out of season, respectively. In the case of consumption varying between a high and a low season, respondents would provide portion size and frequency for each of the two periods separately, as well as the duration of the higher consumption period in days, weeks, or months. Stated again for clarity, the duration of high and low seasons (or designation of only one regimen of portion size and frequency throughout the entire year) was reported per each individual species consumed.

Note that the higher consumption period duration was entirely up to the respondent to provide for each species as he or she wished and was also optional if the respondent preferred to mentally average over the whole year rather than two periods; or if a single period was a better approximation to the respondent's consumption pattern than two periods. For the two-period responses, the duration of the higher consumption period provided by the respondent may have been shorter than the biological season of the species or the period may have been longer, for example by preserving fish caught in season and consuming it over an extended period. Most responses (82% of the 2,323 per species responses from all respondents combined) were provided using a single, whole-year period rather than a pair of higher and lower consumption periods.

The FFQ asked separately about consumption at and outside of special events and gatherings. The total consumption rate in grams/day (*Rate_Total* in the equations here) was calculated as the sum of the rate which excluded special events and gatherings (*Rate_Nonevents*) and the rate for special events and gatherings only (*Rate_Events*). *Rate_Nonevents* was calculated either based on consumption information provided to represent an entire year as a single period, (*Rate_Nonevents_Whole*) or by combining annualized rates of consumption during a higher consumption period (*Rate_Nonevents_Higher*) and the consumption rate in the remaining lower period (*Rate_Nonevents_Lower*). Each of these rates were calculated per species first, then species-specific rates were summed together to produce species-group rates (see Section 5.16).

If the respondent reported consumption over the whole year as a single period (rather than varying during the year), the consumption rate was determined by the following equation:

$$Rate_Nonevents_Whole = SIZE \times FREQ, \quad (1)$$

where *SIZE* = total grams consumed on an occasion when the species was consumed (which quantity is determined based on the portion model used by the respondent, the portion-to-mass conversion factor for the combination of the portion model and species, and the number of portion units consumed) and where *FREQ* = number of portions consumed per day, which may be converted to a daily amount from the number of portions reported per week, per month or per year. Any frequency per week was converted to frequency per day using 7 days/week. Any

frequency per month was converted to frequency per day by dividing by the factor 365/12 days/month. Any frequency per year was converted to frequency per day by dividing by the factor 365 days/year. Of note, the year preceding any interview in the survey did not overlap a leap year.

If the respondent reported consumption over two periods (higher and lower consumption), the rates (non-annualized) for each period were computed in the same way as equation (1), above. The two rates were then annualized and combined using the following equation:

$$Rate_Nonevents = \%HIGH \times Rate_Nonevents_Higher + \%LOW \times Rate_Nonevents_Lower, \quad (2)$$

where *%HIGH* = the length of the higher consumption period expressed as a proportion of the year; *%LOW* = the length of the lower consumption period expressed as a proportion of the year (*%HIGH* + *%LOW* = 1); *Rate_Nonevents_Higher* = consumption rate in g/day during the higher consumption period; and *Rate_Nonevents_Lower* = consumption rate in g/day during the lower consumption period. The higher-period duration was reported in either weeks or months. Weeks' duration of a high-consumption season were converted to a proportion of a year by multiplying by the factor 7/365. Months' duration of a season were converted to a proportion of a year by multiplying by the factor 1/12.

For special events and gatherings, the only specific species the respondent was asked about were suckers and whitefish (as a single group), salmon (all species combined), resident trout (all species combined) and sturgeon. For each of these four species/groups, the corresponding consumption rate was computed as

$$Rate_Events = EFREQ \times \%EVENTS \times SIZE \times FREQ, \quad (3)$$

where *EFREQ* = number of events per day (converted from the number of events per week, month, or year); *%EVENTS* = proportion of events where the given species is consumed; *SIZE* = total grams of portion consumed, which is determined based on the model used by the respondent, the portion-to-mass conversion factors, and the number of units consumed (multiplicative factor); and *FREQ* = number of portions consumed per day (which may be converted from the number of portions per week, month, or year, as for *Rate_Nonevents*).

The final individual consumption rate (g/day), which also includes consumption both at and outside of special events and gatherings, is determined using the following equation:

$$Rate_Total = Rate_Nonevents + Rate_Events. \quad (4)$$

As *Rate_Nonevents* was calculated for each individual species (e.g. chinook, coho or sockeye salmon) while *Rate_Events* was calculated at the group level (e.g. all salmon), *Rate_Nonevents* in equation (4) was first aggregated to the group level by summing individual species rates as appropriate before the summation with *Rate_Events*.

5.12 Methods—Interviewer Recruitment and Training, Pilot Tests

In February 2014, prior to the start of data collection, we initiated a widespread recruitment campaign, searching for local candidates to hire as interviewers. We worked closely with the Tribe to spread the word, advertising online, in the newspaper, on tribal bulletin boards, and using word-of-mouth among the tribal council and the fisheries and water quality personnel.

Interviewers were required to be *current* enrolled members of the Tribe.

Applicants were screened on paper and over the telephone. Following a successful initial vetting, acceptable candidates were interviewed in person. After these in-person job interviews, we culled non-qualified candidates and provided a short list of candidates to the tribal council for review and approval. As a professional courtesy, the Tribe had “first right of refusal.” Candidates who passed the screening process, the in-person interview, and tribal approval were offered year-long positions on the project.

After hiring, we conducted an extensive training and mentoring process. The initial training was a full-day session during which interviewers were presented with the background of the survey, its purpose, and the development of the questionnaire. The interviewers were also taught about the project objectives. We briefed the interviewers on the history of survey research, the guidelines and principles of in-person and telephone interviews, and the Belmont Report (a document which explains the importance of human subject protections). We also trained the interviewers how to use the technology associated with the survey as well as how to use the various display models.

We taught the interviewers how to properly screen respondents, how to conduct in-person interviews, and how to conduct telephone interviews, explaining that the first (typically hour-long) interviews would be conducted in person while the second (20-minute or less) follow-up interviews would be administered over the phone. The interviewers were taught how to read all questions verbatim without influencing the respondents’ answers. They were also taught how to record all answers exactly as presented to them. We stressed the importance of maintaining objectivity throughout the entire process, from respondent recruitment and screening through the final question of the second interview. There was also instruction and an emphasis on careful and accurate key entry of interview responses into the correct fields in the CAPI tablets.

The final part of the training included mock interviews with the interviewers and trainers. The mock interviews required the use of the tablets, interviewing software, and fish models and photographs. Interviewers were required to complete a mock hour-long interview as well as a mock follow-up telephone interview before completion of their training.

After this initial day-long training session, interviewers were required to conduct practice interviews, either with family and friends or independently. After these practice interviews, we provided interviewers with “dummy” responses from the survey questionnaire on paper, asking them to enter the dummy data in test records on the CAPI system in order to familiarize themselves with the questionnaire as well as the tablet and data entry procedures. The dummy data was entered in May 2014.

In June 2014 the Project Manager at Pacific Market Research checked all dummy data entered against the master file, a key version of the dummy data. If discrepancies were found between the key and the data entry by any interviewer, that interviewer was notified and required to correct the errors. Any interviewers who made such errors were required to conduct additional data entry exercises prior to receiving authorization to “go live.”

All of the dummy data output was double-checked to make sure that the values entered in the CAPI system matched the values produced by the CAPI system. Concurrent with successful testing, the live interviews with tribal members began. The first live interview was completed on May 10, 2014 and the last live interview included in this draft interim report was completed on February 20, 2015.

5.13 Methods—Design Changes

As the survey progressed, a number of issues became evident. It was found that the contact information found in tribal enrollment records was not as accurate as had been hoped, requiring research to locate potential respondents. The time required for interviewers to travel to respondents’ homes and conduct interviews was also much greater than expected, and there was some difficulty in doing interviews at tribal members’ homes. Finally, the fraction of individuals agreeing to be interviewed was also lower than expected. All of these factors led to a lower-than-expected rate of interview acquisition and concerns about attaining an appropriate number of interviews.

To address these issues, several design changes were adopted partway through the interviewing period to increase the number of interviews completed and improve the chances of meeting the sample size goals for the NCI method. The first of these was to permit the interviewers to attend special events⁵ (e.g., tribal meetings and powwows) and recruit attendees for interviews during the event, drawing potential respondents only from the list of tribal members selected into the sample. As part of this design change, interviewers were permitted to draw respondents from any of the four sample waves of members.

As part of their activity at these events, the interviewers were also permitted to schedule interviews at a later time (after the special event). Thus, the special events provided an opportunity not only for on-site interviewing, but also to arrange additional interviews later on. After the special event, the recruitment criterion reverted to respondent recruitment only from the wave of members assigned to the specific calendar period. However, interviewers were also permitted to conduct interviews (from the sample list, any wave) of members whom they might encounter by chance.

The design change noted above was expected to, and did, greatly increase the acquisition of completed interviews. Any adult willing to be interviewed at a special event was likely part of

⁵ It is important to recognize that Nez Perce culture and traditional practices involved regular and time specific ceremonies. Today, these ‘special events’ identified here are a continuation of tribal customs and cultural practices, and provide an opportunity to maintain those traditional values and teachings.

the sample roster, as approximately 80% of the eligible adults in the Tribe were included in the sample.

The second change was increased coordination in scheduling of interviews. The interviewers' supervisor (from the contractor team) worked more closely with the interviewers to assist them in arranging interviews.

A third design change occurred after the EPA and the contractor team recommended and received approval by the Tribe to expand the interview team to include non-Nez Perce interviewers. Non-Nez Perce interviewers from the EPA and tribal organizations were permitted to assist the Nez Perce interview team. These individuals received the same training and instructions that the Nez Perce interview team received, though practice interviews did not include as many tribal members as used in the tribal interviewer training. Non-tribal interviewers visited the Tribe in December 2014 and March and April, 2015 and interviewed eligible members from the sample list. These non-Nez Perce members were permitted, again, to draw respondents from any wave of members.

5.14 Methods—Re-Interviews

A sample of members with completed FFQ interviews is being re-interviewed using a short list of questions related to fish consumption. Results comparing original interviews to re-interviews will be presented in the final report.

5.15 Methods—Response Rates

Response rates were calculated according to standard definitions of response rate (AAPOR, 2011). The following specific form of the response rate was calculated:

$$RR1 = I / [(I + P) + (R + NC + O) + U]$$

where:

I = The number of complete interviews

P = The number of partial interviews

R = The number of refusals and break-offs

NC = The number of eligible non-contacts

O = The number of other eligible non-respondents

U = The number of non-respondents with unknown eligibility

Respondents from all four sampling waves (quarters) were included in the calculations. As all four waves are still being used to obtain new interviews, the response rates will almost certainly increase. We considered a person a “responder” for the purpose of calculating overall survey response rates if the individual completed the initial screening questions that allowed us to determine whether the respondent was a fish consumer or a non-consumer. The equation for RR1, above, in our survey, is equivalent to dividing the number of responders in the survey by the total sample size—after subtracting from the sample size the number of tribal members

known to be ineligible for the survey. A few respondents who were fish consumers completed these initial screening questions (and qualified as “consumers”) but did not supply sufficient information from additional questions needed to determine their fish consumption rates. Thus, the count of ‘responders’ in one tabulation may be greater than the count of fish consumers in another tabulation, due to the exclusion of non-consumers and respondents with insufficient data.

5.16 Methods—Species Groups

The fish groupings for which FCRs are reported were decided upon by the Nez Perce Tribe. To inform this decision, the EPA provided the Tribe with background on the EPA’s approaches for selecting fish groupings for FCRs to develop AWQC.

The Nez Perce Tribe decided that from a water quality standard development perspective the appropriate grouping of fish to focus on in this report should include near coastal, estuarine, freshwater, and in particular, anadromous species (Group 2). Inclusion of anadromous species in the FCR used to develop AWQC is a policy option that EPA has made available to states and tribes. In Oregon, anadromous species are included in the FCR used for that State’s AWQC. Anadromous species are also currently included in the FCR used for Washington’s proposed AWQC. The Nez Perce Tribe wished to report on total fish consumption (Group 1).

Table 2. Species groups.

Species Group	Description	Species and Groups Included
Group 1	All finfish and shellfish	All group 2 species, marine finfish (cod, halibut, pollock, tuna, herring, sardines, mackerel, mahi mahi, orange roughy, red snapper, seabass, hamachi, kipper and shark) and other marine shellfish (lobster, crab and shrimp)
Group 2	Near coastal, estuarine, freshwater and anadromous	Any salmon, steelhead, any resident trout, lamprey, other freshwater finfish (sturgeon, whitefish, sucker, bass, bluegill, carp, catfish, crappie, sunfish, tilapia, walleye and yellow perch), freshwater shellfish (crayfish, clams and mussels), geoduck, razor clam, scallops, oysters, octopus and squid

5.17 Methods—Subpopulations

Group 1 (all fish) consumption rates were computed by subgroups defined by variables available from the enrollment file and the questionnaire. The enrollment file subgroups were based on gender, age, and whether or not the respondent was a documented fisher as determined from the Nez Perce Tribe fishers list. The questionnaire subgroups were based on whether the respondent lived on- or off-reservation, the number of persons resident in the respondent’s household, and the respondent’s education and income levels.

5.18 Methods—Statistical Analysis

5.18.1 Consumer/Non-Consumer Determination (Overall and per Species)

Our analysis included a determination of whether respondents were either fish consumers or fish non-consumers using screening questions in the CAPI (FFQ questions 3–6). These questions asked the respondent sequentially whether he or she consumed fish yesterday, last week, last month, or in the past year. Consumers of Group 2 species (near coast, estuarine, freshwater and anadromous species) were determined using the FFQ and whether the respondent reported consuming any of the applicable species over the prior year, including consumption at special events and gatherings.

5.18.2 Descriptive Statistics for Responder Cooperation and Reliability

At the end of the questionnaire, the interviewer was prompted to rate the respondent's cooperation on a four-point scale (very good, good, fair, poor) and the interviewer's judgment of the respondent's reliability on a four-point scale (highly reliable, generally reliable, questionable, unreliable). While these ratings are subjective, they may be helpful (though not definitive) in evaluating the quality of respondents' reports. The interviewers' ratings are reported in the results section.

5.18.3 Handling Missing Values

As with all surveys, the interviewers strove to obtain complete responses from all respondents and to avoid any missing values. However, in a survey of this size and complexity, missing values are unavoidable and we made a concerted effort to handle the missing values in an appropriate manner.

In this survey, the respondents usually had the option indicating “don't know or refused” to avoid responding to a specific question but then continuing on to the subsequent question. In those situations, missing values were dealt with in multiple ways depending on the type of variable or its importance. If a *non-consumption-related* response or variable was missing (e.g., respondent weight in pounds or household income), the respondent was simply excluded from any analysis involving that variable.

In contrast, if the missing variable *was* a consumption rate component, then a value was imputed. The consumption rate components that were imputed in the case of missingness were portion frequency (e.g., portions per day), the portion size based on portion models and, if the respondent reported consumption in two periods (e.g., higher/lower or in season/out of season), the length of the higher consumption period as a percentage of the year (see Section 5.11 on consumption rate calculations). The imputation procedure was based on the specific rate component missing and the corresponding species and was always derived from observed, similar responses without “missingness,” as described below.

In the sample, respondents reported consuming 6.2 species on average and 13% of respondents had at least one missing component among any species reported. In total, there were 2,323 species-specific consumption responses (across all species and respondents), of which 3.0% had

a missing component. This rate of missingness is quite mild, given the large number of combinations of respondents and species, but needed to be addressed due to the total number of respondents with some missingness.

The guiding principle to the imputation procedure was to impute only individual consumption rate components rather than the final consumption rate itself, which can vary many-fold between individuals. In general, the value imputed was a mean calculated from similar responses that had no missing values, where “similar” means that the species or species group was the same as for the given respondent’s record with a missing value. For example, if a respondent reported consuming Chinook salmon by describing consumption during higher and lower consumption periods, but did not provide the portion size for the lower-period rate, other responses for Chinook consumption during the lower consumption period, without missingness, would be selected for imputation. The mean portion size from those similar responses would then be calculated and used in place of the missing portion size. If there were less than five other similar records to use for imputing a missing value, related species were grouped to increase the sample size. All groupings used are fully specified in Appendix C.

Imputation of missing values was performed according to the following rules:

1. Both portion frequency and portion size are missing.

If a respondent provided neither how often he or she consumed a species nor in what portion size, both frequency and portion size were imputed to 0, which resulted in a consumption rate of 0 grams/day for that specific species.

2. Portion frequency is missing but portion size is not

If the respondent reported how much he or she consumed per portion but not the frequency, the frequency was imputed using the mean value computed using records from the same species and from the same period type, where period type was the whole year, higher consumption period, or lower consumption period. If fewer than 5 such records were available, similar species were grouped together to provide a larger sample size. Details on how species were grouped is described in Appendix C.

3. Portion size is missing but portion frequency is not

If the respondent reported how frequently he or she consumed but not how much, the portion size was imputed in an analogous way as Case 2 above, using similar records without missing values.

4. Higher consumption period length is missing

If the respondent provided consumption detail for higher and lower consumption periods but did not provide the length of the higher consumption period, this value was imputed using the mean calculated from similar responses for higher consumption periods. As for Cases 2 and 3 above, the imputation was species-specific unless the sample size was less than 5, in which case similar species were grouped. Appendix C describes this process in more detail.

Once a value was imputed for the missing consumption rate component, the consumption rate was calculated according to Section 5.11 as if the imputed value was the actual value provided by the respondent. Appendix C shows that the final mean and percentiles of consumption rates were similar under a range of possible imputed values, indicating that the impact of missingness and imputation on the final results was negligible.

There was one exception to the above rules on handling missing values. One respondent reported consuming Chinook, cod, and crab outside of special events and gatherings, and consuming salmon, steelhead, and sturgeon at special events and gatherings. However, for all species, this respondent did not provide a portion size or frequency. Instead of imputing all of these species as 0 g/day as the above rules prescribe, the rates were considered incalculable and the respondent was excluded for the analysis of consumption rates. The reason for treating this respondent differently is that the pattern of response strongly indicated that the respondent was a consumer of salmon (included in Group 2) because salmon was reported as a consumed species both at special events and gatherings and outside of them. As a rate of 0 for both Group 1 and Group 2 would be clearly incorrect in this case and there was no basis for imputation, it was deemed best to exclude the respondent.

5.18.4 Sampling Probabilities

The sampling probabilities (or sampling fraction) for each stratum were calculated as the number of the sampled tribal members in a stratum divided by the number of tribal members in the same stratum.

5.18.5 Non-Response Adjustments to Weights

Completed interviews with useable responses for consumption rate calculations (or with a determination that the respondents never consumed fish) were not available for all sampled tribal members. If it could be assumed that non-response to the survey was completely random—for example, not dependent on sampled members' gender, age or other characteristic—then the original sampling weights (based on strata only) could be used without leading to any bias. However, that assumption is often not valid and was not made here. The sampling weights were therefore adjusted for non-response using characteristics available from the enrollment file and fisher indicator list.

The non-response adjustment is used to adjust the probability of being sampled from the tribal population—the “sampling probability.” The sampling probability is a quantity used in creating appropriate statistical weights. It is adjusted by taking account of the probability of responding to the survey. That probability of survey response, in turn, is calculated in relation to demographics of the sampled tribal members. The goal is to adjust for potential bias due to differences among responders and non-responders and yield better (usually less biased) estimates of the population value of a statistic, such as a mean. A respondent's sampling weight W (used for statistical analysis) was calculated as the inverse of the product of: a) the sampling fraction in the respondent's stratum F_s , and b) the estimated probability P_R of being a respondent (“response probability”) for a tribal member with the respondent's specific characteristics (e.g., age, gender, etc.):

$$W = 1/(F_s * P_R)$$

Response probabilities (P_R) were calculated using logistic regression for survey response among sampled tribal members, using available population characteristics. Available population characteristics included age group, gender, ZIP code group (83540, 83536, 83501, Other), and fisher indicator.

Logistic regression models for response were selected using the Hosmer-Lemeshow goodness of fit statistic (Hosmer and Lemeshow, 2000). The selected models included all available population characteristics (as main effects) and the age group–ZIP code group interaction.

Replicate weights from bootstrap re-sampling (1,000 re-samples) were used to calculate the variance estimators (standard errors, confidence intervals, p-values). See the section on replicate weight calculations, below, for more detail.

5.18.6 Software and Software Modules

Calculations were carried out in R (R Core Team, 2015). versions 3.1.1–3.1.3. The weighted survey analyses were calculated using an R survey package for analysis of complex surveys. (Lumley, 2014 and Lumley, 2004).

5.18.7 Mean, Variance and Percentile Methods

Estimates of means, variances and percentiles were carried out using standard survey estimate methods implemented in the R survey package (Lumley, 2014 and Lumley, 2004). For the estimates of the percentiles, the package uses a method described in Francisco and Fuller’s 1986 (Iowa State University) technical report, *Estimation of the Distribution Function With a Complex Survey*. The survey package also enables inference (estimation of means, variances, percentiles, percentages) in specific subpopulations. When estimating quantities in sub-populations the methodology accounts for the uncertainty in the weights derived for a specific sub-population. The methodology is further described in Lumley, 2010.

5.18.8 Limited Percentiles for Small Sample Sizes

Some percentiles may be quite imprecise, due to the small sample size of respondents used for the percentile calculation. We have generally indicated such percentiles, using a rule of thumb borrowed from random sampling: we designated a percentile as potentially very imprecise if—treating the sample as a simple random sample—there would have been two or fewer respondents with a consumption rate equal to or greater than the noted percentile. Due to the statistical weighting used in the calculation of percentiles, it is possible that in a specific case there may actually be more than two respondents (in the sample used to calculate the percentile) with a rate at or exceeding the noted percentile value. Nevertheless, this approximate method does provide a helpful flag of caution attached to some percentiles.

5.18.9 Effect of Changes in Study Design

We assessed the impact of two study design changes on overall fish consumption. The first impact was that of interviews conducted at special events. All interviews conducted on September 25–27, 2014 and October 17–19, 2014 were considered as such interviews. The second impact was the impact of non-tribal interviewers compared to tribal interviewers.

We also assessed whether interviews conducted at home differed in fish consumption from interviews not conducted at home. Although this is not a design change, the comparison was of interest because it could have impacted the reported consumption. This result is presented in this section for convenience.

The impact of the design variables on fish consumption was calculated without and with an adjustment for respondent characteristics. The unadjusted analysis consisted of the calculation of means and medians of fish consumption in the two groups and the estimation of the difference of the two means. The latter was estimated from linear regression (with the same statistical weighting of respondent as in the calculation of means and percentiles). Linear regression was also used in the adjusted analysis and included respondent characteristics in addition to the tested design variable. The characteristics included ZIP code (83536, 83501 and others), age category (<30, 30–39, 40–49, 50–59 and 60+), gender, on/off reservation, fishing (questions 35 and 36) and the respondent's physical weight (as a continuous predictor). Including the respondent characteristics in the regression controls for differences in the fish consumption that may be due to the respondent's personal characteristics and not the tested design variables.

5.18.10 Confidence Intervals

Confidence intervals express the uncertainty of the estimated population means and percentiles of fish consumption. The confidence intervals in this draft interim report were calculated using the bootstrap replicate weight method (Lumley, 2010), which is a standard statistical methodology for calculating confidence intervals and that incorporates relevant sources of uncertainty. In this method 1,000 replicate weights (random perturbations of the adjusted sampling weights) are first calculated (see the section “Replicate Weight Calculations” for more detail). The replicated weights are then saved for use in all subsequent confidence interval calculations (see the section “Confidence Interval Calculations for a Specific Statistic” for more detail).

5.18.11 Replicate Weight Calculations

A total of 1,000 bootstrap replicates were utilized. In the calculations each replicate bootstrap accounted for two sources of uncertainty: the random sampling of members from the population in each stratum and the non-response model.

The sampling uncertainty was addressed by drawing 1,000 non-parametric bootstrap re-samples. Each non-parametric bootstrap resample consisted of a stratified random sample from the

original sample, sampling with replacement. Specifically, the strata were the strata used in drawing the random sample for the study (see Section 5.6) and the sample was the sample of the participants drawn for this study (see Section 5.6). Each random draw was selected from all sampled tribal members (both non-responders and responders) in each sample stratum. Logistically, the recorded information from the non-parametric bootstrap procedure was the number times (N_i) each respondent was drawn in each bootstrap resample i . Note that for observations not being drawn into a given re-sample, $N_i = 0$.

The uncertainty in the non-response model was addressed by drawing 1,000 parametric bootstrap sets of the response probabilities for the sampled tribal members. For each bootstrap set the response probabilities predicted by the logistic response model (described in section 5.18.5) were recalculated after the regression coefficients from the logistic model were replaced by a single random draw from the multivariate normal distribution with the mean equal to the original regression coefficients and the variance matrix equal to the variance matrix of the estimated regression coefficients. The response probabilities from bootstrap i will be denoted by P_{Ri} .

The two bootstraps (the non-parametric for the sampling uncertainty and the parametric for the non-response adjustment uncertainty) were carried out independently. Each set of non-parametric bootstrap sampling weights was paired with one set of the parametric bootstrap response probabilities (1,000 pairs). The non-response adjusted replicate weights were then calculated for all responders in the bootstrap resample. Replicate weights W_i (i denotes the bootstrap index) were calculated as the inverse of the product of (a) the sampling fraction per stratum (F_s) and (b) the parametric bootstrap response probabilities (P_{Ri}), and then multiplied by the number of bootstrap resamples for a given observation:

$$W_i = N_i / (F_s * P_{Ri})$$

The 1,000 sets of bootstrap replicate weights were saved and used for all confidence interval calculations.

5.18.12 Confidence Interval Calculations for a Specific Statistic

Calculations for specific statistics were carried out on the subset of responders that were relevant for that statistic (e.g., consumers of Group 2 fish species would be included for Group 2 calculations of the mean, median and other percentiles).

The statistic of interest (a mean, percentiles or a regression coefficient) were then calculated on the relevant subset of responders (e.g., Group 2 fish consumers) for each bootstrap realization. Issues with item-specific missing values in this step were automatically handled by the subset function in the R software (by excluding the observations with missing values and adjusting the weights to accommodate the actual number of observations used in the analysis). The 95% confidence interval limits for a statistic were calculated as the 2.5th and the 97.5th percentiles of the bootstrap distribution of the specific statistic across the 1,000 bootstrap realizations.

5.18.13 Large Consumption Values

We examined histograms (Figure 2) of total consumption and found one respondent with a value noticeably higher than the other respondents (1372 g/day). The respondent's weight and gender and the details of the species consumed were further examined and the consumption rate determined to be plausible. Accordingly, the respondent was retained in the analysis without modification.

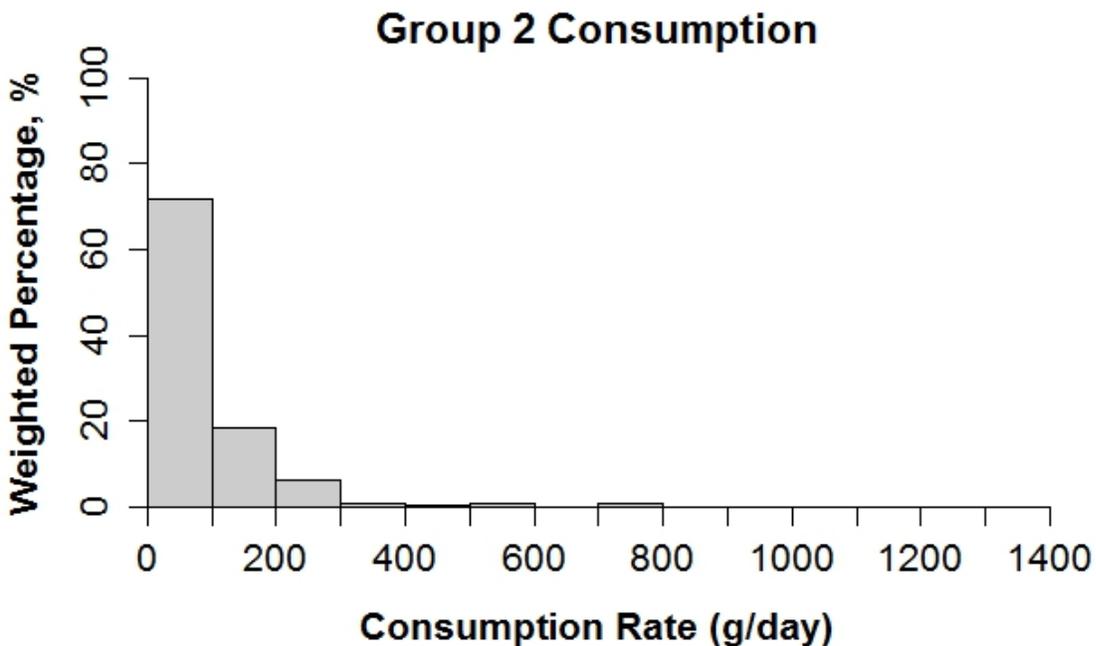
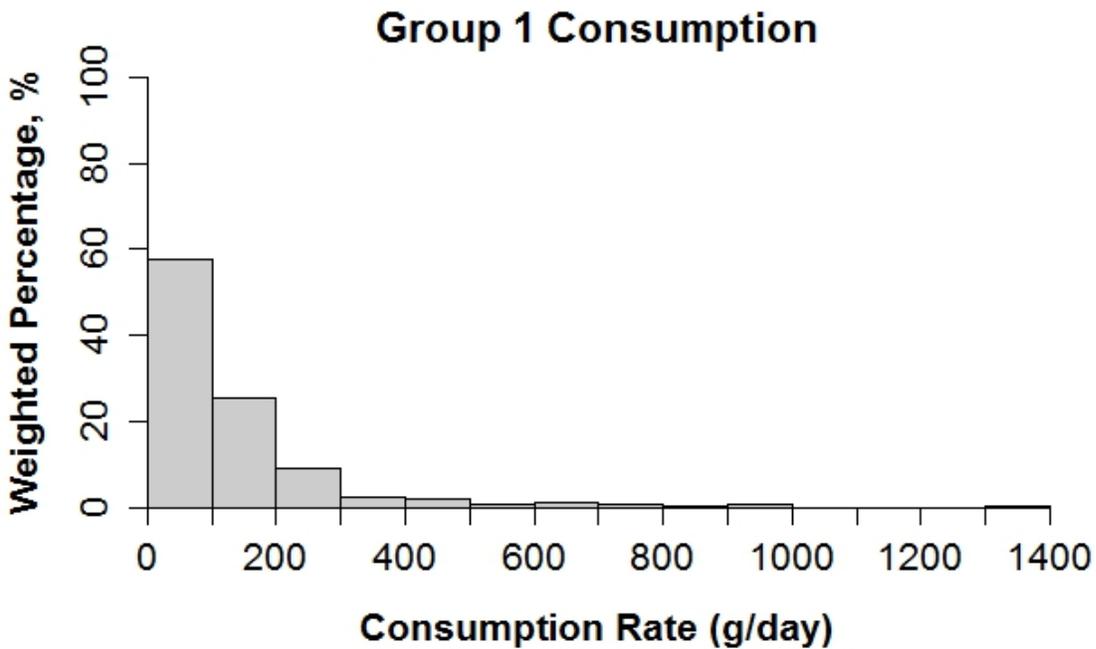


Figure 2. Histogram of total consumption rates. Group 1 includes all species. Group 2 includes near coastal, estuarine, freshwater, and anadromous species. The bin width is 100 g/day. The percentages (y-axis), corresponding to the frequency of consumers within each bin, are weighted to correspond to the percentage among consumers in the eligible population. The sum of all bars equals 100%.

6.0 Results

6.1 Response Rates

Of the 1250 Nez Perce tribal members originally sampled, 24 were found to be ineligible (e.g., lived out of area, were employed as Tribal interviewers involved in the survey, deceased, institutionalized or impaired) during the contact attempts by interviewers. For the purpose of overall response rate calculations, the remaining 1226 members were used as the denominator (using the RR1 standard—see AAPOR, 2011). Of these 1226 members, 384 members responded to the screening interview questions used to distinguish between consumers and non-consumers, for an overall response rate of 31% (Table 3). The number of responders corresponds to 24% of the original population size of 1574.

Table 3. Survey response rate.

	N or %
Responded to the screening interview*	384
Total sample size**	1226
Response rate (RR1)	31.3%

*Answered screening questions sufficiently to distinguish consumers and non-consumers;

**Excludes those known to be ineligible.

6.1.1 Factors Affecting Response Rates

The response rate did vary quite substantially by demographic characteristics of the selected sample. Tables 4 and 5 summarize the details. The response rate among males was somewhat higher than among females (34% vs. 28%), those on the fishers list (“documented fisher”)⁶ had a substantially higher response rate than non-fishers (42% versus 27%), and those in the most tribally populated ZIP code, 83540, had a substantially higher response rate than those in other ZIP codes (38% versus 18–22%).

Age was an important factor in determining response; among females and males, the youngest members of the selected sample had the lowest response rate (the age range of 18–29 had a response rate of 11% for females and 21% for males, versus 25–40% for other ages among females and 27–46% for other ages among males).

⁶ Fisher list was derived from Department of Fisheries Resources Management (DFRM) information on specific individual tribal members who were sampled during their fishing activity at a certain river/area. These are tribal members observed or interviewed as fishing at a certain area during a certain fishery season, and is not a comprehensive representation of all “fishers” of the Tribe. They serve as a “fisher indicator” for purpose of this survey. This will allow comparison their rates to other Tribal members who were not “documented” as fishers through the Tribe’s sampling program and monitoring activities.

Table 4. Response rates by sampling strata. Estimates are unweighted.

Group	No. in Eligible Pop.	Total No. Sampled	Screening Responses**		
			No.	% of Sample	% of Pop.
All	1574	1250	384	30.7%	24.4%
Sampling Strata					
Female Age 18-29	191	152	17	11.2%	8.9%
Age 30-39	145	115	29	25.2%	20.0%
Age 40-49	152	121	45	37.2%	29.6%
Age 50-59	153	122	35	28.7%	22.9%
Age 60 or older	175	139	55	39.6%	31.4%
Male Age 18-29	178	141	30	21.3%	16.9%
Age 30-39	160	127	50	39.4%	31.2%
Age 40-49	144	114	52	45.6%	36.1%
Age 50-59	130	103	40	38.8%	30.8%
Age 60 or older	146	116	31	26.7%	21.2%

*Ineligible members are *not* excluded; the response rates are thus somewhat under-estimated;

**Answered screening questions sufficiently to distinguish consumers and non-consumers.

Table 5. Response rates by demographic characteristics. Estimates are unweighted.

Group	No. in Eligible Pop.	Total No. Sampled*	Screening Responses**		
			No.	% of Sample	% of Pop.
All	1574	1250	384	30.7%	24.4%
Gender					
Male	758	601	203	33.8%	26.8%
Female	816	649	181	27.9%	22.2%
Documented Fisher***					
Yes	371	288	121	42.0%	32.6%
No	1203	962	263	27.3%	21.9%
Zip Code					
Lapwai – 83540	906	729	280	38.4%	30.9%
Kamiah – 83536	196	151	33	21.9%	16.8%
Lewiston – 83501	172	136	25	18.4%	14.5%
Other	300	234	46	19.7%	15.3%

*Ineligible members are *not* excluded; the response rates are thus somewhat under-estimated;

**Answered screening questions sufficiently to distinguish consumers and non-consumers;

***Refer to section 4.4 on Populations for a description of documented fishers. Some respondents who were not documented fishers did or do fisher.

6.2 Consumers, Non-Consumers and Frequency of Consumption

Non-consumption of fish was rare among the Nez Perce Tribe, as shown in Table 6. Only one non-consumer of fish was encountered among 384 respondents for whom fish consumption status could be determined. Fish consumption is almost universal, but most days of the week do not involve fish consumption (Table 6). The vast majority (87%) of tribal members eat fish once

per week or less often, while about 10% eat fish 1–2 times per week. However, this frequency information was determined during the relatively short screening interview and did not involve detailed probing of consumption patterns.

Of the 383 consumers who responded, 376 completed the first interview which collected detailed consumption information. One respondent did not provide enough information to calculate a rate, so the remaining 375 respondents were used as the primary sample for all subsequent rate and demographic calculations in this draft interim report.

Table 6. Frequency of fish consumption based on 384 responders to the screening questionnaire.

		<i>Unweighted %</i>	<i>No.</i>	<i>Weighted %</i>
Consumer*	Yes	99.7%	383	99.3%
	No	0.3%	1	0.7%
If consumer, how many days per week**	≤ 1	86.0%	257	87.1%
	1-2	11.0%	33	10.2%
	2-3	2.7%	8	2.5%
	3-4	0.0%	0	0.0%
	4-5	0.3%	1	0.2%
	5-6	0.0%	0	0.0%
	6-7	0.0%	0	0.0%

*376 of 383 (98%) of consumers completed the first interview; 375 had a calculable consumption rate based on the first interview and these consumers correspond to the primary sample analyzed in this draft interim report.

**299 consumers responded to this question;

6.2.1 Factors that Appear to Affect Response Rates

Available population characteristics for predicting response included age group, gender, ZIP code group (classified as 83540, 83536, 83501, Other) and the fisher indicator. The logistic regression models for response included all available population characteristics (as main effects) and the age group-ZIP group interaction.⁷ The “interaction” shows that the effect of age and zip group on response appeared to depend on age and zip group in combination, rather than on each acting independently.

⁷ The variables and interactions in the model were selected by the Hosmer-Lemeshow goodness of fit statistic.

6.3 Demographic Characteristics

The tribe is diverse in demographic composition. Table 7 shows that in addition to the expected diversity of gender and age, most of the respondents live in households with three or more persons, about a quarter of the population are fishers and the balance are non-fishers, and the almost all of the population has finished high school or obtained a GED, with a very strong representation of members who attended some college. The household income is also diverse but with the majority of Tribal member respondents falling into the range of \$15,000–\$45,000 per year annual household income.

Table 7. Demographic characteristics of consumers. Estimates are weighted.

		% or mean \pm SD	No. Responded
Gender*	Male	48.8%	375
	Female	51.2%	
Age*	18-29 years	21.7%	375
	30-39 years	19.4%	
	40-49 years	19.2%	
	50-59 years	18.7%	
	60 years or older	21.0%	
Weight, kgs		89.1 \pm 20.1	364
Weight, kgs (males only)		96.5 \pm 19.7	201
Weight, kgs (females only)		81.8 \pm 17.7	163
No. in household	1	8.1%	375
	2	18.7%	
	3-4	44.7%	
	5 or more	28.6%	
Documented fisher*	Yes	24.2%	375
	No	75.8%	
Live on reservation	Yes	82.8%	374
	No	17.2%	
Highest education	Less than High School	1.3%	372
	High school / GED	54.9%	
	Associates degree or higher	43.8%	

Annual household income	≤ \$15K	22.3%	337
	\$15K – \$45K	52.7%	
	>\$45K	25.0%	

*From the Tribal enrollment file or the Fishers List; other demographics were determined from the questionnaire. Refer to section 4.4 on Populations for a description of documented fishers. Some respondents who were not documented fishers did or do fish.

Due to the differential response rates across demographic factors, the first interviews analyzed for this draft interim report have a somewhat different demographic profile than the population or the sample. Appendix D includes a comparison of the members drawn into the sample and the sample members who became respondents and reported a non-zero consumption rate during the preceding year.

An Appendix D tabulation also shows that the respondents are somewhat younger than the population, there is a greater abundance of fishers among respondents than in the population, and there is an over-representation among respondents relative to the population and sample of the most urban ZIP code as compared to other ZIP codes. The survey weights are designed to account for these differences and produce estimates which are representative of the original population.

6.4 Results—FFQ Rates for Species and Groups of Species

Consumption rate statistics for the Nez Perce Tribe are shown in Table 8. The consumption distribution is skewed toward large values due to a number of consumers with high consumption rates. The mean of 125.4 grams per day among the 375 consumers with a calculable consumption rate is accompanied by a standard deviation of 148.9, larger than the mean, indicating skewness toward large values. In addition, the mean (125.4 g/day) is larger than the median (74.2 g/day), another indication of skewness.

The 90th percentile of consumption, 260.0 grams per day, is more than twice the mean and approximately three times the median, and the 95th percentile of consumption, 402.8 grams per day, is approximately triple the mean and over five times as large as the median. The maximum observed consumption rate was 1,371.9 grams per day, a large but plausible consumption rate.

The width of a confidence interval is a measure of the uncertainty in the specific value. Regardless of the width of the confidence interval, the estimated rate (statistically referred to as the “point estimate”) is a useful value and is methodologically superior to any other choice within the confidence interval as an estimate of the percentile, because it has been derived by an unbiased method. It is a fallacy to assume that the range of a confidence interval—from lower bound to upper bound—is a level field with all consumption rate values in it having equal merit for being the choice for the true, population value. As an unbiased methodologic practice the choice of the “point estimate,” for example, of 402.8 grams per day for the 95th percentile, is superior to any other choice within the interval as a consumption rate equaled or exceeded by the top 5% of consumers in the Tribe.

In Group 2 the mean consumption rate is somewhat lower at 86.6 grams per day, and the median is approximately half as large, 49.3 grams per day, once again with skewed values from tribal members with high consumption rates, weighting to a 90th percentile of 195.7 grams per day and a 95th percentile of 245.0 grams per day. The maximum Group 2 consumption rate of 1323.8 grams per day is, again, large, but plausible. The consumption rates are presented in a graphical format in Figures 2 and 3.

Table 8. Mean, median and selected percentiles of fish consumption rates (g/day); consumers only. Estimates are weighted.

Species	No. of Consumers	Mean	SD	Min	Percentiles											
					50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	99%	Max
Group 1	375	125.4	148.9	0.41	74.2	88.9	106.3	116.8	132.5	152.0	180.7	209.6	260.0	402.8	794.1	1371.9
(95% CI)		(108.1-150.0)			(66.5-98.0)	(72.9-108.9)	(83.3-122.5)	(101.2-137.4)	(111.4-157.0)	(131.5-188.3)	(150.3-221.9)	(180.3-252.6)	(223.2-318.1)	(287.0-606.1)	(501.6-874.6)	
Group 2	370	86.6	119.8	0.27	49.3	56.3	65.2	76.5	94.1	110.0	128.6	160.5	195.7	245.0	660.3	1323.8
(95% CI)		(73.5-103.9)			(38.3-59.5)	(47.6-70.2)	(53.0-82.7)	(63.3-99.2)	(74.0-113.5)	(89.3-132.1)	(109.0-167.0)	(128.6-179.7)	(167.3-225.7)	(216.1-382.3)	(358.5-775.0)	

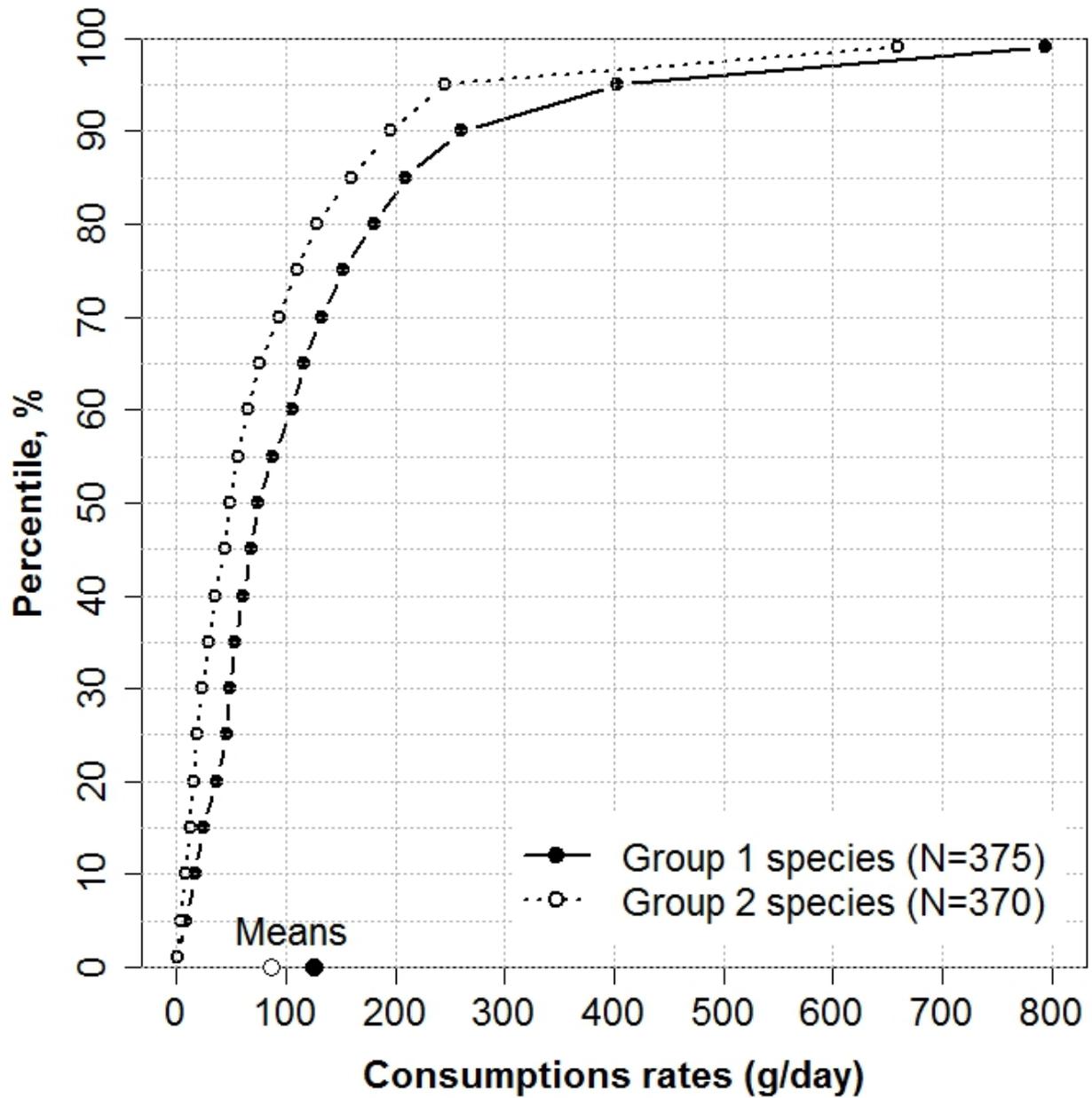


Figure 3. Estimated cumulative distribution of total consumption rates. Group 1 includes all species. Group 2 includes near coastal, estuarine, freshwater, and anadromous species. The percentiles are spaced every 5% on the vertical axis, with the 1st percentile and 99th percentiles also included. Estimates are weighted. The points are the original estimates and the lines (solid and dotted) are linear interpolations between those estimates. The mean consumption rates for both species groups are indicated with points on the horizontal axis.

6.5 Results—Consumption Rates by Demographic Groups

Consumption of fish at special events was small but not trivial. Of the total consumption by the Tribe, consumption at special events amounted to 9.7 g/day (counting all 365 days in the year—including days which do and days which do not have special events.) This rate of consumption is 7.8% percent of the total fish consumption by the Tribe.

Consumption rates did vary substantially across some of the demographic factors. The documented fishers (fisher indicator list) had a substantially higher consumption rate than the non-fishers (or those tribal members who were not documented as fishing recently through the Tribe’s sampling program and monitoring activities), as shown in Table 9. The mean of 160.0 g/day for fishers is 40% larger than the mean for non-fishers at 114.3 g/day. The medians and higher percentiles are also substantially different.

Males consumed substantially more than females (a mean of 152.8 g/day versus 99.3 g/day, respectively) which may be partly but probably not substantially due to differences in body weight.

Age had less of an impact on consumption rates, being relatively consistent (mean and median) across all age groups except the oldest age group (60 years or older). The youngest age group also had a somewhat lower mean and median and higher percentiles of consumption.

Those living on the reservation had a higher mean consumption than those not living on the reservation; higher percentiles of consumption were also larger for those living on the reservation.

Household size did not show a consistent relationship with consumption rates. Nor did education, with those completing high school (or GED) or less having about the same consumption rate as those who reported some college education. There was also no consistent pattern of consumption rates in relation to household income.

Table 9: Estimated distribution consumption rates (g/day) of consumers within demographic subgroups. All rates are for total consumption (group 1). Estimates are weighted.

Group	No. of Consumers*	Mean	SD	Percentiles		
				50%	90%	95%
Gender**						
Male	201	152.8	175.3	101.0	284.7	463.2
Female	174	99.3	112.9	59.5	239.7	319.7
Age**						
18-29 years	45	110.7	113.3	82.1	202.4	228.5
30-39 years	76	145.0	163.8	74.3	324.9	451.6
40-49 years	96	122.5	126.6	76.9	266.6	465.2
50-59 years	74	161.7	218.0	88.3	270.8	671.2
60 years or older	84	93.0	94.7	61.5	238.9	317.3
Documented Fisher**						
Yes	119	160.0	173.6	100.1	298.0	489.0
No	256	114.3	138.6	69.6	242.4	343.8
Live on reservation						

Yes	329	127.3	152.0	72.6	279.3	407.2
No	45	116.2	134.8	99.4	203.8	240.7
Number who live in household						
1	32	136.7	187.9	82.2	264.2	***510.1
2	70	128.3	146.4	65.5	277.0	453.3
3-4	168	113.5	138.9	72.3	223.9	318.9
5 or more	105	139.0	154.1	85.6	284.5	347.5
Highest education						
High school / GED or less	206	127.3	169.1	74.4	252.5	414.3
Associates degree or higher	166	124.2	119.3	74.2	266.8	398.7
Annual household income						
≤ \$15K	70	138.0	192.9	70.5	281.9	567.7
\$15K – \$45K	180	116.8	128.8	71.8	229.6	384.5
>\$45K	87	133.5	114.8	89.8	269.9	362.1

*Consumers with unknown or missing subgroup status were excluded for the analysis of that subgroup;

**From the enrollment list or fisher indicator list; other subgroups were determined from the questionnaire;

***Two or fewer expected respondents with rates equal to or greater than the reported percentile (approximately); interpret this percentile more cautiously.

6.6 Results—Consumption Rates from NCI Method

The NCI method will produce rates for all species combined and for any other species or species groups that have an adequate number of “double hits” (respondents with fish consumption on both of two 24-hour recall days for the given species or species group). Results from the NCI method will be provided in the final report.

6.7 Results—Compare FFQ to 24-Hour Rates

Under idealized, steady-state circumstances (unchanging fish consumption rates throughout the year) and perfect memory, the expected mean consumption rate would be equal when derived from the FFQ portion of the questionnaire (asking about consumption during the last year) and the 24-hour recall portion of the questionnaire. Those idealized, steady-state circumstances never happen in reality. Thus, the two mean rates can be expected to differ—due to changes in outer circumstances that affect FFQ and 24-hour responses, and also due to the role of chance in what a respondent ate “yesterday” when asked in the 24-hour recall.

The observed mean consumption rates (groups 1 and 2) for the Tribe differ between the FFQ responses and the 24-hour responses, as shown in Table 10. The differences in FCR means between the 24-hour recall and FFQ are statistically significant by a commonly used test ($p < 0.05$ using the bootstrap, groups 1 and 2; results not shown). The data from the 24-hour recall are a mixture of the 84 positive consumption rates and 291 values of zero (respondent did not consume fish ‘yesterday’), a type of statistical distribution that is more difficult to handle. An additional analysis of this type will be presented in the final report using results from the NCI method and a larger pool of interviews.

Table 10. Mean consumption rates of first interview consumers calculated from the first 24 hour recall and FFQ. Estimates are weighted.

	A. No. of Consumers	B. No. who Consumed Yesterday	% of Consumers (100xB/A)	Consumption	
				Mean	(95% CI)
Group 1 (all fish)					
24 hour recall, g	375	84	22.4%	80.7	(58.9-103.2)*
FFQ annual consumption, g/day	375	-		125.4	(108.1-150.0)
Group 2					
24 hour recall, g	370	64	11.9%	65.9	(47.3-87.1)*
FFQ annual consumption, g/day	370	-		86.6	(73.5-103.9)

Group 2 includes near coastal, estuarine, freshwater, or anadromous species;

*The confidence intervals for the 24 hour recalls were computed using bootstrap and are intended to provide a heuristic indication of uncertainty in the estimate of the mean.

6.8 Results—Changes in Consumption and Reasons

An estimated two-fifths of the Tribe have experienced a change in fish consumption over time, and among those who have experienced the change, 53% experienced increased consumption and 44% experienced a decrease. A large proportion of the Tribe (48%) have experienced a change in fishing access and, among those experiencing a change, less access to fishing (75%) far outweighed more access (21%).

Table 11. Estimated consumption and fishing access changes in the eligible consumer population.

Variable		%
Change in fish consumption over time	Yes	38.1%
	No	61.9%
If so, how has consumption changed	Increased	52.8%
	Decreased	43.6%
	Other	3.5%
Change in access to fish and fishing over time	Yes	48.3%
	No	51.7%
If so, how has access changed	More access	21.2%
	Less access	74.7%
	Other change	4.1%

6.9 Results—Effect of Changes in Study Design

The estimated mean and medians of fish consumption according to the design variables (special event, tribal interviewer and home interview) are shown in Table 12. The corresponding differences in means, unadjusted or adjusted for other respondent characteristics, are shown in Table 13.

The mean consumption for respondents interviewed at special events was 4.6 grams/day lower compared to respondents not interviewed at special events. This difference became even smaller (1.2 grams/day) once we adjusted for respondent characteristics. The mean consumption for respondents with tribal interviewers was 8.6 grams/day lower compared to respondents with non-tribal interviewers. This difference became larger (26.8 grams/day) once we adjusted for respondent characteristics using a multivariate linear regression model (Table 13). However, the adjusted difference was not statistically significant ($p=0.4$). Finally, the mean consumption for respondents interviewed at home was 18.4 grams/day lower compared to respondents interviewed elsewhere. This difference changed very little (17.5 grams/day) once we adjusted for respondent characteristics. Neither the unadjusted nor the adjusted differences were statistically significant. While there are small numeric effects of the design variables, they are not statistically significant and there is no need to adjust for them in presenting consumption rates for this population.

Table 12. Mean and median Group 1 (overall) FFQ consumption rates by groups according to design variables.

Group	N	mean	median
Not special event	316	126.2	78.9
Special event	67	121.6	59.8
Non-tribal interviewer	47	132.8	83.0
Tribal interviewer	336	124.2	73.8
Not home interview	317	128.2	75.1
Home interview	64	109.7	68.5

Table 13. Unadjusted and adjusted difference for the impact of design variables. Linear regression.

difference	Unadjusted			Adjusted for respondent characteristics*		
	<i>est.</i>	<i>SE</i>	<i>p</i>	<i>est.</i>	<i>SE</i>	<i>p</i>
Special event	-4.6	22.2	0.8	-1.2	27.1	1
Tribal interviewer	-8.6	32.7	0.8	-26.8	33.1	0.4
Home interview	-18.4	26.2	0.5	-17.5	24.9	0.5

*Adjusted for ZIP code (83536, 83501 and others), age category (<30, 30-39, 40-49, 50-59 and 60+), gender, on/off reservation, fishing (questions 35 and 36) and the respondent's physical weight (as a continuous predictor).

6.10 Results—Reliability and Cooperation of Respondents: Interviewer’s Assessment

Table 14 shows that the interviewers found only a very small fraction of respondents to be less than “highly reliable” or “generally reliable.” Similarly, the interviewers found only a small fraction of respondents to be less than “very good” or “good” in their cooperation.

Table 14. Descriptive summary of interviewers’ ratings of respondents’ cooperation and reliability during the first interview.

Variable		%	No.
Respondent’s cooperation	Very good	86.7	325
	Good	12.3	46
	Fair	1.1	4
	Poor	0.0	0
Respondent’s reliability	Highly reliable	81.9	307
	Generally reliable	18.1	68
	Questionable	0.0	0
	Unreliable	0.0	0

7.0 Discussion

7.1 Discussion—Overview

The fish consumption survey of the Nez Perce Tribe, based on a moderately low response rate (31%) to the survey—and one that has likely been addressed by use of survey weighting techniques—has a substantial fish consumption rate, with quite large consumption rates for a notable fraction of the population. As is shown in a later section of this discussion, the Tribe has a higher consumption rate than the Columbia River Inter-Tribal Fish Commission (CRITFC) pooled consumption rates among several tribes. The mean median and 90th and 95th percentiles of consumption for the Nez Perce tribe are larger than the pooled CRITFC tribes, the only other inland Pacific Northwest tribes with documented consumption rates that can be used for comparison with inland tribes. The Nez Perce Tribe's mean, median and 95th percentiles are higher than the corresponding CRITFC statistics. The Nez Perce rates are also higher than that of the Tulalip and Squaxin Island Tribes, but lower than that of the Suquamish Tribe. All of the aforementioned tribes have access to Puget Sound fisheries resources.

A contributing factor to the high fish consumption rates as compared to the CRITFC study may be the difference in abundance of anadromous fish, particularly, and other fish species, that were at low levels in the 1990s and have been increasing to higher levels in the past decade or more (based on yearly counts of fish passages at Lower Granite Dam from the website of the Fish Passage Center, www.fpc.org). The fish runs in recent years are larger, which would support more harvest opportunities, and, therefore, would be expected to support increased current consumption by Tribal members compared to the time of the CRITFC survey.

The Nez Perce Tribe has also experienced changes in fish consumption rates and fishing activities. Among those who experienced a change in access to fishing, many more experienced less access than more access compared to an earlier time.

The tribal members and staff and Nez Perce Tribal Executive Committee contributed very significantly to the execution of this survey. Through advertising, offering of incentives (at the Tribe's own expense), opening special events and powwows to interviewing opportunities, conducting mailings to tribal members, and other forms of information and advertising, the Nez Perce came forward to substantially reverse what was a very challenging and difficult slow start to the survey. Thus, in addition to the quantitative findings in this report, the role of the Tribe and its governing body and staff should be considered a critical component in the planning of future tribal surveys. In addition, the development of individual rapport and mutual trust between individuals from the contractor's staff and those from the tribal staff was a critical component of the survey. The Tribe is a separate and distinct nation, and collaboration with this unique nation is something that involves mutual learning, both from the survey and contractor's staff and the Tribe.

There were very few non-consumers of fish encountered in the survey. Only one respondent reported non-consumption of fish (based on respondents who adequately completed the relevant portions of the questionnaire).

7.2 Discussion—Comparison of FFQ Rates to NCI Rates

The estimated mean consumption rates (groups 1 and 2) differed substantially (and with statistical significance) between the FFQ-based rates and the rates based on the first 24-hour recall, with the FFQ mean rates being higher. The 24-recall analysis and comparison to the FFQ will be repeated once all interviews have been completed and using a more sophisticated methodology; the comparison between FFQ rates and 24-hour rates here is tentative. In addition, the final report will include consumption rates based on the NCI method, using data from both the first and second 24-hour recall interviews. The mean and percentiles of consumption rates based on the NCI method (and the two 24-hour recalls) will be compared to the rates based on the FFQ data.

7.3 Discussion— Comparison of This Survey’s Rates to Other Surveys’ Rates

Table 15 compares the Nez Perce rates from the current consumption survey (based on a Food Frequency Questionnaire) to other similarly targeted tribal surveys, and also presents results of a survey of the U.S. National Population. All of the tribal survey consumption rates (mean, median, and higher percentiles) are higher than that of the U.S. national population, usually by several-fold.

Table 15. Total fish consumption rates of adults in Pacific Northwest Tribes (with consumption rates available) and the U.S. general population. Consumers only.

Population	No. of	Mean	Percentiles		
	Respondents*		50 th	90 th	95 th
Nez Perce Tribe	375	125.4	74.2	260.0	402.8
Tulalip Tribes	73	82.2	44.5	193.4	267.6
Squaxin Island Tribe	117	83.7	44.5	205.8	280.2
Suquamish Tribe	92	213.9	132.1	489.0	796.9
Columbia River Tribes	464	63.2	40.5	130.0	194.0
USA/NCI	9,129	18.4	11.8	42.8	57.5

*Consumers only.

Data for populations outside of Idaho extracted from Polissar, et al, 2014.

7.4 Discussion—Strengths and Limitations

A major strength of the survey is that it utilized experts in every area needed to develop a credible survey. These areas of expertise included tribal culture, fisheries and fishing practices, survey design (including CAPI), survey administration, statistics, and government policy. In

addition to the core technical staff working on the project, the project consulted with and utilized outside experts.

A synergy was realized when all of these parties were brought together to collaborate. Throughout the survey and during the current report drafting phase, all of these individuals have been in constant and frequent communication. This close collaboration between the Tribe and the contractor's staff along with the EPA and tribal organizations, as well as all of the many individuals that were required to bring the survey to fruition, is another strength.

Another source of confidence in the survey is the use of carefully trained tribal interviewers. Tribal members are more inclined to trust and open up to fellow members of their tribe than they are to outside interviewers. In addition, one of the contractor's staff (not a tribal member) developed an exceptional rapport with tribal members, greatly increasing their effectiveness at coordinating survey implementation and allowing them to carry out interviews to increase the respondent count.

We also found that use of outside interviewers was effective and increased the total number of interviews, due to their activities being shepherded and supported by the Tribe. First contacts for interviews were usually made by tribal members.

Another strength of the survey was the use of the CAPI interview mode, which, as noted previously, greatly enhances survey accuracy and completeness. The interview results were usually available very shortly after the interview itself based on synchronizing the CAPI tablet online with the contractor's website.

An additional strength of the survey was the level of detail obtained on consumption by species. Approximately 45 individual species were named, and additional species could be reported by respondents and entered into the database using a text field. All such entries were used in preparing this draft interim report.

Yet another strength of the survey was the span of time during which the survey was carried out, covering multiple periods of fish runs and seasons. The representation of all seasons in the survey allowed an assessment of seasonal effect on FFQ consumption responses. While our analysis did not show that a seasonal adjustment was needed for this draft interim report, the topic will be revisited for the final report. While, ideally, a retrospective fish consumption rate covering the past year and drawn from the respondent's memory (i.e., the food frequency approach) should be fairly constant over time, in fact the consumption of the preceding year reported during interviews at the beginning of the survey year could be quite different than the consumption in the preceding year reported at the end of the survey year. Thus, spreading the surveys over almost a full calendar year covered a great deal of outside variation in access to harvesting of fish. Relative to extant fish consumption surveys in EPA Region 10, this is one of the first to collect FFQ information over a year⁸.

⁸ EPA Region 10 includes Alaska, Idaho, Oregon, Washington and Native American Tribes in these states.

A further strength of the survey was the use of a well-defined frame for drawing the sample. The Tribe had a complete roster of all members with some demographic information as well as some contact information, which provided a valuable frame for drawing the sample.

A limitation of the survey is that there were a number of cases with missing data that had to be imputed to be able to retain the respondent's other responses for inclusion in the survey. Usually the much less frequently consumed species had such missing values, though it was not exclusively the case. An analysis showing the sensitivity of estimated mean consumption, as well as the median and other percentiles showed quite a minor impact of the imputations. See Appendix C for the sensitivity analysis.

The response rate for the survey was less than expected. However, some of the non-response is due neither to refusal nor an inability to find respondents but, rather, to limitations on resources and time to adequately pursue finding and interviewing some respondents. Resources had to be diverted from interviewing to finding respondents, and this transfer of effort reduced the response rate due to limited contact with some potential respondents. The survey team experienced considerable difficulty in locating, and thus interviewing, Tribal members. They also experienced difficulty in arranging for and completing surveys within the home of the prospective respondent. Tribal members would at times schedule interviews in their homes but then decide not to do it or postpone the interview for another time and/or location—a postponement which did not always have a successful ending.

A counterbalancing strength to the moderately low response rate is that the weighting method used to estimate the population distribution of consumption rates would usually correct for a potential selection bias, to the extent that we were able to use variables characterizing selection bias and adjusting for it.

An additional fact, not necessarily a limitation, is that the target population was based on ZIP codes and distance to tribal centers. While it does make sense to exclude tribal members who live at a great distance from the reservation, there is no clear cutoff as to who should be included or excluded based on geographic considerations, especially considering that the data will be used in the effort to protect the health of tribal members and other residents in all of Idaho, especially those who have high levels of fish consumption.

7.5 Discussion—Characterizing Uncertainty

The confidence intervals for percentiles of consumption rates in the study describe the uncertainty in various FCR statistics. The width of these confidence intervals should be taken as advisory, without a specific cutoff of widths considered to be desirable or undesirable among the confidence intervals presented in this draft interim report. Again, the data are valuable and, as a practice, the estimated means and percentiles are the best choice to use for practical purposes as opposed to other values in the confidence interval. Based on methodologic principles used to avoid bias, the point estimate (the estimated value lying within the confidence interval) is the preferred estimate to use in practice and not other values in the confidence interval.

We cannot be sure that the statistical weighting we have used adequately corrects for selection bias. We also cannot be sure that our imputation method, applied to a limited number of cases, is the correct way, on average, to handle this missing information. However, the choice of the method is reasonable in that the impact of imputation was small, based on a sensitivity analysis.

7.6 Discussion—Next Steps, Lessons Learned

A very important lesson learned was the critical role of the tribal staff and Council, who played a significant role in increasing the number of interviews achieved. The Tribe was pivotal in assisting the contractors in developing a strategy and making refinements to obtain more completed interviews. The Tribe provided incentives to members—such as a raffle—to participate in the survey, organized mailings and periodic mass e-mails, and approved administrative leave for staff to participate in interviews. In addition, tribal staff provided assistance and oversight for on-site interviews (e.g., snacks, interview facilities, administrative support, calling and arranging interviews and free, attractive t-shirts for many interviewees). Without these measures the total number of interviews would have been less than the number achieved. The mailings and other publicity were reviewed by the contractors to ensure that the content would not introduce any bias into respondents' reporting of fish consumption.

Another important lesson was that the current survey fish consumption rates are not the rates of most importance to the Tribe. The heritage rates, which reflect consumption at a time before interference with the natural environment and decline of fish runs, are the tribal ideal. The heritage rates study being carried out in this project will be released in the future, and the heritage rates contained in that analysis are most relevant to tribal members, by their own account—heard in the many contacts of the survey team with tribal members and tribal staff.

The accrual of interviews continued during this report-writing period and ended on April 30th, shortly before the release of this interim draft report. This report is based on less than the full dataset. A subsequent report to be released in September 2015 will include data from all interviews through the end of the survey field work.

7.7 Discussion—Conclusions

The Nez Perce Tribe is a high fish-consuming population, relative to the general U.S. population and other Pacific Northwest tribes. The population of documented fishers within the Tribe has even higher fish consumption rates than the overall tribal population. There has been a substantial reported change in access to fish and fishing according to tribal respondents, and the largest change is a decrease in access to fishing for approximately three times as many members of the population as those with increased access.

A lesson learned from the survey activity is the importance of strong support from the tribal leadership and staff in order to achieve acceptance of the survey and higher response rates.

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9.0 Appendices

- Appendix A: Idaho Tribes Fish Consumption Survey
- Appendix B: Portion-to-Mass Conversion
- Appendix C: Additional Detail on Imputations
- Appendix D: Additional Detailed Tables
- Appendix E: Design of a Survey on Fish Consumption by the Nez Perce Tribe



9.1 Appendix A—Questionnaire⁹

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⁹ This paper version of the questionnaire was used from time to time as needed. The vast majority of interviews with the questionnaire embedded in a CAPI system (computer-assisted personal interviewing) on a tablet. See the main body of this report for a description of the CAPI system used in this survey.



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LIST OF ACRONYMS

CDC	Center for Disease Control and Prevention
FFQ	food frequency questionnaire
NCI	National Cancer Institute



(NOTE: The original Preface and Telephone Screen introductory narrative were repetitive of the main design document and, therefore, removed from this appendix.)



1.0 TELEPHONE SCREENING

1. “Hello, I’m calling on behalf of the (name of Tribe and department) .
May I please speak with (name of respondent) ?” (Enter contact information into Table A-1; refer to Table A-2 for response entry codes)

_____ Yes
_____ No

If YES and respondent is speaking or when the respondent comes to the telephone, continue to Question #2.

If NO, probe if he/she lives there, and if so, ask “**When is the best time to reach him/her?** (Record on log) “**Okay, thank you for your time. Good bye.**”

If NO, not living there, ask “**What is the best way to reach him/her?** (Record new number on log) “**Okay, thank you for your time. Good bye.**”

2. “Hello, my name is (your name) . Reintroduce Tribe if necessary. **We are conducting a survey to determine the fish consumption rates within our Tribe. The survey is endorsed and supported by the (name council / other) . Your information, plus the information of other Tribal members, will help us protect our environment and promote the health of our Tribal members and families. You are free to not answer any of the questions. Today’s survey takes about 5 minutes and we would like to include your input, if now is a good time?”**

_____ Yes
_____ No

If YES, “**thank you for agreeing to participate,**” check box below and continue to Question #3.

INTERVIEWER CHECK THIS BOX IF RESPONDENT AGREES TO PARTICIPATE IN THE TELEPHONE SCREENING.



If NO, ask **“When is a good time to call back?”** (Record on log) **“Okay, thank you for your time. Good bye.”**

3. **“I’d like to ask you about what you ate yesterday. Did you eat any fish yesterday? This includes ANY amount of fish, shellfish, or seafood eaten for breakfast, lunch, dinner, or snacks, by itself or within a dish such as soup.”** (Record on log)

Yes

No

Don’t know / Prefer not to answer

If YES, skip to Question #8.

If NO or other, continue to Question #4.

4. **“Did you eat any fish in the past week (or if not, in the past month)?”**

(Record on log)

Yes

No

Don’t know / Prefer not to answer

If YES, skip to Question #7.

If NO or other, continue to Question #5.

5. **“Did you eat any fish in the past year?”** (Record on log)

Yes

No

Don’t know / Prefer not to answer

If YES, skip to Question #7.

If NO or other, continue to Question #6.



6. **“Thank you. Just to be thorough, is it possible that during the past year you ate fish at a restaurant, a friend’s house or another place, or someone brought fish to you?”** (Record on log)

_____ Yes

_____ No

_____ Don’t know / Prefer not to answer

If YES, continue to Question #7.

If NO or other, skip to Question #9.

7. **“How many days did you eat fish in the past week (or month or year – depending on previous answers)?”** (This information will determine applicability of the NCI Method; Record on log as number per week, month, or year)

- 7a. **“Now considering your eating habits in general, on average how many days do you eat fish – this can be number of times each week, each month, or each year?”** (Record on log as number per week, month, or year)

8. **Thank you. We are also conducting survey interviews that have been endorsed by _____ (endorsing authority) _____. The information that you provide will remain strictly confidential and it will help to protect the health of our Tribe. We will conduct in-person interviews in a convenient location. Your participation is very important. If you do agree to participate, you may withdraw at any time and there would be no consequence for you. May we meet with you for the survey interview?**

(Record on log)

_____ Yes

_____ No

If YES, **“Great, thank you for your willingness to participate in this important survey. Let’s schedule a time and place. We have Tribal interviewers available to meet 7 days a week from 8:00 am until 7:00 pm; which day**



in the next two weeks is best for you?" If don't know, schedule a call-back time to set interview. Record on log, skip to #10.

If NO, **"I understand. This survey is very important. We don't have to do it immediately, we have several months to schedule it. I'd like to call you back at a later date. We want to make sure we represent the whole Tribe."**

If ACCEPT or SOFT REFUSAL, schedule re-call and skip to #10.

If HARD REFUSAL, **"Okay, thank you for your time today. Good bye."**

9. **"Can you please tell me the main reasons why you haven't eaten fish?"**
Allow respondent to answer question unaided, then state **"now I will list some other reasons people do not eat fish; please let know if any of these apply to you."** List the following items (of those not already noted by the respondent). Check left and right columns, then continue to #10:

Contamination:

A. "Do you not eat fish because of fish advisories?"

Yes
 No

Answered unaided
 Answered by prompt

B. "Do you not eat fish because of pollution?"

Yes
 No

Answered unaided
 Answered by prompt

C. "Do you not eat fish because of other environmental concerns (for example, eating fish is not sustainable)?"

Yes
 No

Answered unaided
 Answered by prompt

Fish Availability:

D. "Do you not eat fish because there is not enough fish available to catch?"

Yes
 No

Answered unaided
 Answered by prompt



E. “Do you not eat fish because it is hard to find fresh fish and seafood”

Yes

Answered unaided

No

Answered by prompt

Access to Fishing:

F. “Do you not eat fish because of limited access to fishing areas?”

Yes

Answered unaided

No

Answered by prompt

G. “Do you not eat fish because you used to have access to a boat or fishing gear, but don’t anymore?”

Yes

Answered unaided

No

Answered by prompt

Other Reasons:

H. “Do you not eat fish because you do not like fish or you prefer other foods?”

Yes

Answered unaided

No

Answered by prompt

I. “Do you not eat fish because you are too busy to catch and/or prepare fish?”

Yes

Answered unaided

No

Answered by prompt

J. “Do you not eat fish because you do not know how to prepare fish?”

Yes

Answered unaided

No

Answered by prompt

K. “Do you not eat fish because you cannot afford it?”

Yes

Answered unaided

No

Answered by prompt



L. “Do you not eat fish because of allergies or other health concerns?”

_____ Yes

_____ No

_____ Answered unaided

_____ Answered by prompt

M. “Do you not eat fish because you are a vegetarian or vegan?”

_____ Yes

_____ No

_____ Answered unaided

_____ Answered by prompt

N. “Do you not eat fish because you observe religious customs?”

_____ Yes

_____ No

_____ Answered unaided

_____ Answered by prompt

Table A-1. Telephone Screening Contact Log

Respondent Name:					Respondent ID #:			
Respondent Telephone Number <i>(strike-out incorrect numbers, record new):</i>								
Scheduled Call-Back Time for Telephone Screen <i>(if necessary to re-schedule):</i>								
When Called					Who Contacted		Results (of call & questions)	
Attempt	Date	Day	Time	Circle	Caller Name	Caller ID	Codes	Notes
1				AM PM				
2				AM PM				
3				AM PM				
4				AM PM				
5				AM PM				
6				AM PM				
7				AM PM				
8				AM PM				
9				AM PM				

When Called					Who Contacted		Results		
Attempt	Date	Day	Time	AM/PM	Caller Name	Caller ID	Code	Notes	
10				AM PM					
11				AM PM					
12				AM PM					
13				AM PM					
14				AM PM					
15				AM PM					
Reported eating fish <u>yesterday</u> (circle):					YES	/	NO	/	No Answer
Reported eating fish during past <u>week</u> (circle):					YES	/	NO	/	No Answer / Not Applicable
Reported eating fish during past <u>month</u> (circle):					YES	/	NO	/	No Answer / Not Applicable
Reported eating fish during past <u>year</u> (circle):					YES	/	NO	/	No Answer / Not Applicable
Number of <u>days ate fish</u> (enter number, circle unit):					_____	in past	Week	/	Month / Year
Number of <u>days generally eat fish</u> (enter number, circle unit):					_____	times per	Week	/	Month / Year
Schedule in-person interview? (circle, enter):					YES	/	NO	(If NO, enter call-back time at top of form)	
Date: _____ (mm/dd/yyyy)					Day: _____	Time: _____	am / pm	Location: _____	

Table A-2. Disposition Codes for Respondent Contact

01	Completed interview
02	Mid-termination
03	Hard Refusal
04	Invalid number: out of service, disconnected, fast busy
05	No answer
06	Busy signal
07	Answering machine
08	Appointment set
09	Language barrier: non-English
10	Impairment: hearing, mental health, other
11	Deceased respondent
12	Institutionalized
13	Other (Please Specify)
14	Soft Refusal
15	Email attempt
16	Enrollment office lookup
17	Acquaintance / family lookup
18	Online lookup
19	Household visit

Note: Interviewers will be trained on how to respond to telephone inquiries (leaving a message, handling refusals, calling back, etc.)

10. Finally, for the survey, we need to note the general location where you live. The zip code we have listed for your residence is (zip code from enrollment); is that correct? (Check)

Yes
 No

If NO, “Can you please provide your correct RESIDENCE zip code (or if you don’t know the zip code, community name)? _____¹⁰”

Final zip code of residence: _____

This concludes the interview. Thank you very much for your cooperation. We really appreciate your time today. That is all. Good bye.”

¹⁰ **NOTE:** Individuals may have a different zip code for mail versus residence; be sure to inquire about residence. Prior to an in-person interview, the supervisor will need to check that the corrected zip code (or community name) supplied by the respondent is included in the list of eligible zip codes. If the reported residence zip code is not eligible, but the enrollment zip code used to locate the respondent is eligible, then a call-back may be made to clarify the location of the current residence address. An interview can still be scheduled pending the final determination. The final residence zip code for the respondent should be noted here.

2.0 INTERVIEW INTRODUCTION

Basic information about the interview (e.g., location) will be recorded by the interviewer prior to the in-person interview. The interviewer will then provide a brief introduction to the respondent about the project. Words to be spoken by the interviewer are identified in bold. Answers are written, checked, and/or circled, as indicated.

2.1 Administrative Information

General administrative information will be completed by the interviewer at the time of the interview, but prior to questioning the respondent.

2.1.1 Interviewer Identification

1. Interviewer Name _____
2. Interviewer ID: _____

2.1.2 Respondent Identification

3. Respondent ID: _____

2.1.3 Interview Date, Time, and Location

4. Date: _____ / _____ / _____ (mm/dd/yyyy)
5. Day (of the week): _____
6. Start time: _____ AM / PM (*circle*)
7. City, State: _____
8. Location/Venue (check):

<input type="checkbox"/> Home	<input type="checkbox"/> Central Location
<input type="checkbox"/> Tribal Office	<input type="checkbox"/> Other (coffee shop, etc.)

2.2 Introduction to Interview

To begin the in-person interview, the interviewer will introduce the purpose of the survey and provide a brief overview of its structure.

“Hello, my name is _____, and we’re conducting a survey on behalf of the _____. We appreciate your willingness to participate in our fish consumption survey. The survey is endorsed by the _____.

The information you provide as part of this survey will help us understand the rates of fish consumption, how fish is prepared, and the species or types of fish regularly eaten by members of the _____ Tribe. Your information, plus the information of other Tribal members, will help us protect our environment and promote the health of our Tribal members and families.

We do not intend to collect ANY culturally-sensitive information during this interview. The information that you provide during this interview is confidential. Your responses to the questions will be combined with those of others so that your answers cannot be identified. In the meantime, if you have any questions, here is an information and contact sheet for you to keep. ([Provide Information Sheet](#))

This interview will take about an hour. The questionnaire has 3 parts. In the first part, I will ask you to tell me how much fish you ate yesterday. The second part focuses on the past 12 months: the types of fish you ate, how often you ate it, where you got it, and how it was prepared, as well as fishing activities and special events. Finally, in the third part, I will ask you for some general information about yourself.

Your participation in this study is voluntary and you may withdraw at any time without any consequence to you. If at any time during the interview, you do not know an answer or do not feel comfortable answering a question, we can skip to the next question. You are free to not answer any of the questions. May we start the interview now?”

INTERVIEWER CHECK THIS BOX IF RESPONDENT AGREES TO PARTICIPATE IN THE IN-PERSON INTERVIEW.

3.0 24-HOUR DIETARY RECALL

The first part of the in-person interview is a 24-hour dietary recall. Words to be spoken by the interviewer are identified in bold. Each question will be asked in numeric order. Photographic and portion model displays will be available for use during questioning.

3.1 Fish Consumption

9. **“The first questions are about your fish consumption yesterday. Please consider what you ate yesterday. I am going to ask you about EACH time you ate. That would include meals, snacks, eating at home, eating at a friend’s or relative’s house or a purchase somewhere. It includes eating fish anywhere or at any time and in any amount. Did you eat any fish yesterday?”**

_____ Yes

_____ No

_____ Don’t know / Prefer not to answer

If YES, continue to next Question #9a

If NO or other, skip to next Section (4.0).

- 9a. **“Please think about the first time you ate yesterday Please enter a description (name, time, or number) for the first occasion where you ate fish yesterday (which includes finfish, shellfish, and seafood). Consider all meals and snacks, including fish within dishes such as soups. Include fish bought from a store, from a restaurant, or caught by you or someone else.”** (Enter description or occasion number in Table A-3)

10. **“What type of fish did you eat?”** (Refer to species display, if needed, enter species type in Table A-3; see Table A-4 for list of species).

- 10a. **“How much of the (species type mentioned) did you eat?** (See quantity displays according to species type; enter portion size according to Table A-3a).

- 10b. **“How was the (species type mentioned) prepared or cooked?”** (Unprompted, check box in Table A-3).

10c. **“Where did the (species type mentioned) come from? Was it from a market or store? Was it from a restaurant? Or was it caught by you or someone else (this includes Tribal distributions)?**

10d. **“Was it from Idaho waters or outside of Idaho?”** (Check box in Table A-3).

10e. **“Did you eat this species prepared in any other way or did you eat any other species of fish for (eating occasion mentioned) ?”**

Repeat Question #9a for first/second/third species type or preparation method mentioned for that eating occasion and complete Table A-3.

_____ Yes

_____ No

If YES, repeat Question #10b above.

If NO, continue to next Question #11.

11. **“Please think about the NEXT time you ate yesterday; when was that (name the eating occasion)? Did you eat fish? (Check)**

_____ Yes

_____ No

_____ Did not eat fish rest of day

If YES, repeat Question #9a above for up to 6 eating occasions.

If NO, repeat Question #11 for all eating occasions yesterday.

If “Did not eat fish rest of day,” skip ahead to next section, Question #12.

Table A-3. 24-Hr Recall: Types, Quantities, Methods, and Sources of Fish Eaten Yesterday

Occasion # & Description ¹	Species Type ²	Portion Size / Quantity <i>See Displays (enter display #)</i>	Preparation / Cooking Method <i>Check box</i>	Source <i>Check box</i>
1	Species 1:	Salmon sections #s _____ Trout (thin) fillets: _____ Lamprey sections: _____ Jerky packages: _____ Soup bowls: _____ cups Shellfish (organisms): _____	<input type="checkbox"/> Fried / Sauteed <input type="checkbox"/> Stew, Soup <input type="checkbox"/> Baked / Roasted <input type="checkbox"/> Canned, Pickled <input type="checkbox"/> Broiled / Grilled <input type="checkbox"/> Microwaved <input type="checkbox"/> Poached / Boiled <input type="checkbox"/> Raw / Uncooked <input type="checkbox"/> Dried, Smoked, Salted <input type="checkbox"/> Other, Unknown <input type="checkbox"/> Casserole, Mixed Dish	<input type="checkbox"/> Market / Store <input type="checkbox"/> Restaurant <input type="checkbox"/> Caught ----- <input type="checkbox"/> In Idaho <input type="checkbox"/> Outside of Idaho
	Species 2:	Salmon sections #s _____ Trout (thin) fillets: _____ Lamprey sections: _____ Jerky packages: _____ Soup bowls: _____ cups Shellfish (organisms): _____	<input type="checkbox"/> Fried / Sauteed <input type="checkbox"/> Stew, Soup <input type="checkbox"/> Baked / Roasted <input type="checkbox"/> Canned, Pickled <input type="checkbox"/> Broiled / Grilled <input type="checkbox"/> Microwaved <input type="checkbox"/> Poached / Boiled <input type="checkbox"/> Raw / Uncooked <input type="checkbox"/> Dried, Smoked, Salted <input type="checkbox"/> Other, Unknown <input type="checkbox"/> Casserole, Mixed Dish	<input type="checkbox"/> Market / Store <input type="checkbox"/> Restaurant <input type="checkbox"/> Caught ----- <input type="checkbox"/> In Idaho <input type="checkbox"/> Outside of Idaho
	Species 3:	Salmon sections #s _____ Trout (thin) fillets: _____ Lamprey sections: _____ Jerky packages: _____ Soup bowls: _____ cups Shellfish (organisms): _____	<input type="checkbox"/> Fried / Sauteed <input type="checkbox"/> Stew, Soup <input type="checkbox"/> Baked / Roasted <input type="checkbox"/> Canned, Pickled <input type="checkbox"/> Broiled / Grilled <input type="checkbox"/> Microwaved <input type="checkbox"/> Poached / Boiled <input type="checkbox"/> Raw / Uncooked <input type="checkbox"/> Dried, Smoked, Salted <input type="checkbox"/> Other, Unknown <input type="checkbox"/> Casserole, Mixed Dish	<input type="checkbox"/> Market / Store <input type="checkbox"/> Restaurant <input type="checkbox"/> Caught ----- <input type="checkbox"/> In Idaho <input type="checkbox"/> Outside of Idaho
2	Species 1:	Salmon sections #s _____ Trout (thin) fillets: _____ Lamprey sections: _____ Jerky packages: _____ Soup bowls: _____ cups Shellfish (organisms): _____	<input type="checkbox"/> Fried / Sauteed <input type="checkbox"/> Stew, Soup <input type="checkbox"/> Baked / Roasted <input type="checkbox"/> Canned, Pickled <input type="checkbox"/> Broiled / Grilled <input type="checkbox"/> Microwaved <input type="checkbox"/> Poached / Boiled <input type="checkbox"/> Raw / Uncooked <input type="checkbox"/> Dried, Smoked, Salted <input type="checkbox"/> Other, Unknown <input type="checkbox"/> Casserole, Mixed Dish	<input type="checkbox"/> Market / Store <input type="checkbox"/> Restaurant <input type="checkbox"/> Caught ----- <input type="checkbox"/> In Idaho <input type="checkbox"/> Outside of Idaho
	Species 2:	Salmon sections #s _____ Trout (thin) fillets: _____ Lamprey sections: _____	<input type="checkbox"/> Fried / Sauteed <input type="checkbox"/> Stew, Soup <input type="checkbox"/> Baked / Roasted <input type="checkbox"/> Canned, Pickled <input type="checkbox"/> Broiled / Grilled <input type="checkbox"/> Microwaved	<input type="checkbox"/> Market / Store <input type="checkbox"/> Restaurant <input type="checkbox"/> Caught

			Jerky packages: _____ Soup bowls: _____ cups Shellfish (organisms): _____	<input type="checkbox"/> Poached / Boiled <input type="checkbox"/> Raw / Uncooked <input type="checkbox"/> Dried, Smoked, Salted <input type="checkbox"/> Other, Unknown <input type="checkbox"/> Casserole, Mixed Dish	----- <input type="checkbox"/> In Idaho <input type="checkbox"/> Outside of Idaho
		Species 3:	Salmon sections #s _____ Trout (thin) fillets: _____ Lamprey sections: _____ Jerky packages: _____ Soup bowls: _____ cups Shellfish (organisms): _____	<input type="checkbox"/> Fried / Sauteed <input type="checkbox"/> Stew, Soup <input type="checkbox"/> Baked / Roasted <input type="checkbox"/> Canned, Pickled <input type="checkbox"/> Broiled / Grilled <input type="checkbox"/> Microwaved <input type="checkbox"/> Poached / Boiled <input type="checkbox"/> Raw / Uncooked <input type="checkbox"/> Dried, Smoked, Salted <input type="checkbox"/> Other, Unknown <input type="checkbox"/> Casserole, Mixed Dish	<input type="checkbox"/> Market / Store <input type="checkbox"/> Restaurant <input type="checkbox"/> Caught ----- <input type="checkbox"/> In Idaho <input type="checkbox"/> Outside of Idaho
3		Species 1:	Salmon sections #s _____ Trout (thin) fillets: _____ Lamprey sections: _____ Jerky packages: _____ Soup bowls: _____ cups Shellfish (organisms): _____	<input type="checkbox"/> Fried / Sauteed <input type="checkbox"/> Stew, Soup <input type="checkbox"/> Baked / Roasted <input type="checkbox"/> Canned, Pickled <input type="checkbox"/> Broiled / Grilled <input type="checkbox"/> Microwaved <input type="checkbox"/> Poached / Boiled <input type="checkbox"/> Raw / Uncooked <input type="checkbox"/> Dried, Smoked, Salted <input type="checkbox"/> Other, Unknown <input type="checkbox"/> Casserole, Mixed Dish	<input type="checkbox"/> Market / Store <input type="checkbox"/> Restaurant <input type="checkbox"/> Caught ----- <input type="checkbox"/> In Idaho <input type="checkbox"/> Outside of Idaho
		Species 2:	Salmon sections #s _____ Trout (thin) fillets: _____ Lamprey sections: _____ Jerky packages: _____ Soup bowls: _____ cups Shellfish (organisms): _____	<input type="checkbox"/> Fried / Sauteed <input type="checkbox"/> Stew, Soup <input type="checkbox"/> Baked / Roasted <input type="checkbox"/> Canned, Pickled <input type="checkbox"/> Broiled / Grilled <input type="checkbox"/> Microwaved <input type="checkbox"/> Poached / Boiled <input type="checkbox"/> Raw / Uncooked <input type="checkbox"/> Dried, Smoked, Salted <input type="checkbox"/> Other, Unknown <input type="checkbox"/> Casserole, Mixed Dish	<input type="checkbox"/> Market / Store <input type="checkbox"/> Restaurant <input type="checkbox"/> Caught ----- <input type="checkbox"/> In Idaho <input type="checkbox"/> Outside of Idaho
		Species 3:	Salmon sections #s _____ Trout (thin) fillets: _____ Lamprey sections: _____ Jerky packages: _____ Soup bowls: _____ cups Shellfish (organisms): _____	<input type="checkbox"/> Fried / Sauteed <input type="checkbox"/> Stew, Soup <input type="checkbox"/> Baked / Roasted <input type="checkbox"/> Canned, Pickled <input type="checkbox"/> Broiled / Grilled <input type="checkbox"/> Microwaved <input type="checkbox"/> Poached / Boiled <input type="checkbox"/> Raw / Uncooked <input type="checkbox"/> Dried, Smoked, Salted <input type="checkbox"/> Other, Unknown <input type="checkbox"/> Casserole, Mixed Dish	<input type="checkbox"/> Market / Store <input type="checkbox"/> Restaurant <input type="checkbox"/> Caught ----- <input type="checkbox"/> In Idaho <input type="checkbox"/> Outside of Idaho
4		Species 1:	Salmon sections #s _____ Trout (thin) fillets: _____ Lamprey sections: _____ Jerky packages: _____ Soup bowls: _____ cups Shellfish (organisms): _____	<input type="checkbox"/> Fried / Sauteed <input type="checkbox"/> Stew, Soup <input type="checkbox"/> Baked / Roasted <input type="checkbox"/> Canned, Pickled <input type="checkbox"/> Broiled / Grilled <input type="checkbox"/> Microwaved <input type="checkbox"/> Poached / Boiled <input type="checkbox"/> Raw / Uncooked <input type="checkbox"/> Dried, Smoked, Salted <input type="checkbox"/> Other, Unknown <input type="checkbox"/> Casserole, Mixed Dish	<input type="checkbox"/> Market / Store <input type="checkbox"/> Restaurant <input type="checkbox"/> Caught ----- <input type="checkbox"/> In Idaho <input type="checkbox"/> Outside of Idaho

		Species 2:	Salmon sections #s _____ Trout (thin) fillets: _____ Lamprey sections: _____ Jerky packages: _____ Soup bowls: _____ cups Shellfish (organisms): _____	<input type="checkbox"/> Fried / Sauteed <input type="checkbox"/> Baked / Roasted <input type="checkbox"/> Broiled / Grilled <input type="checkbox"/> Poached / Boiled <input type="checkbox"/> Dried, Smoked, Salted <input type="checkbox"/> Casserole, Mixed Dish	<input type="checkbox"/> Stew, Soup <input type="checkbox"/> Canned, Pickled <input type="checkbox"/> Microwaved <input type="checkbox"/> Raw / Uncooked <input type="checkbox"/> Other, Unknown	<input type="checkbox"/> Market / Store <input type="checkbox"/> Restaurant <input type="checkbox"/> Caught ----- <input type="checkbox"/> In Idaho <input type="checkbox"/> Outside of Idaho
		Species 3:	Salmon sections #s _____ Trout (thin) fillets: _____ Lamprey sections: _____ Jerky packages: _____ Soup bowls: _____ cups Shellfish (organisms): _____	<input type="checkbox"/> Fried / Sauteed <input type="checkbox"/> Baked / Roasted <input type="checkbox"/> Broiled / Grilled <input type="checkbox"/> Poached / Boiled <input type="checkbox"/> Dried, Smoked, Salted <input type="checkbox"/> Casserole, Mixed Dish	<input type="checkbox"/> Stew, Soup <input type="checkbox"/> Canned, Pickled <input type="checkbox"/> Microwaved <input type="checkbox"/> Raw / Uncooked <input type="checkbox"/> Other, Unknown	<input type="checkbox"/> Market / Store <input type="checkbox"/> Restaurant <input type="checkbox"/> Caught ----- <input type="checkbox"/> In Idaho <input type="checkbox"/> Outside of Idaho
5		Species 1:	Salmon sections #s _____ Trout (thin) fillets: _____ Lamprey sections: _____ Jerky packages: _____ Soup bowls: _____ cups Shellfish (organisms): _____	<input type="checkbox"/> Fried / Sauteed <input type="checkbox"/> Baked / Roasted <input type="checkbox"/> Broiled / Grilled <input type="checkbox"/> Poached / Boiled <input type="checkbox"/> Dried, Smoked, Salted <input type="checkbox"/> Casserole, Mixed Dish	<input type="checkbox"/> Stew, Soup <input type="checkbox"/> Canned, Pickled <input type="checkbox"/> Microwaved <input type="checkbox"/> Raw / Uncooked <input type="checkbox"/> Other, Unknown	<input type="checkbox"/> Market / Store <input type="checkbox"/> Restaurant <input type="checkbox"/> Caught ----- <input type="checkbox"/> In Idaho <input type="checkbox"/> Outside of Idaho
		Species 2:	Salmon sections #s _____ Trout (thin) fillets: _____ Lamprey sections: _____ Jerky packages: _____ Soup bowls: _____ cups Shellfish (organisms): _____	<input type="checkbox"/> Fried / Sauteed <input type="checkbox"/> Baked / Roasted <input type="checkbox"/> Broiled / Grilled <input type="checkbox"/> Poached / Boiled <input type="checkbox"/> Dried, Smoked, Salted <input type="checkbox"/> Casserole, Mixed Dish	<input type="checkbox"/> Stew, Soup <input type="checkbox"/> Canned, Pickled <input type="checkbox"/> Microwaved <input type="checkbox"/> Raw / Uncooked <input type="checkbox"/> Other, Unknown	<input type="checkbox"/> Market / Store <input type="checkbox"/> Restaurant <input type="checkbox"/> Caught ----- <input type="checkbox"/> In Idaho <input type="checkbox"/> Outside of Idaho
		Species 3:	Salmon sections #s _____ Trout (thin) fillets: _____ Lamprey sections: _____ Jerky packages: _____ Soup bowls: _____ cups Shellfish (organisms): _____	<input type="checkbox"/> Fried / Sauteed <input type="checkbox"/> Baked / Roasted <input type="checkbox"/> Broiled / Grilled <input type="checkbox"/> Poached / Boiled <input type="checkbox"/> Dried, Smoked, Salted <input type="checkbox"/> Casserole, Mixed Dish	<input type="checkbox"/> Stew, Soup <input type="checkbox"/> Canned, Pickled <input type="checkbox"/> Microwaved <input type="checkbox"/> Raw / Uncooked <input type="checkbox"/> Other, Unknown	<input type="checkbox"/> Market / Store <input type="checkbox"/> Restaurant <input type="checkbox"/> Caught ----- <input type="checkbox"/> In Idaho <input type="checkbox"/> Outside of Idaho
6		Species 1:	Salmon sections #s _____ Trout (thin) fillets: _____ Lamprey sections: _____	<input type="checkbox"/> Fried / Sauteed <input type="checkbox"/> Baked / Roasted <input type="checkbox"/> Broiled / Grilled	<input type="checkbox"/> Stew, Soup <input type="checkbox"/> Canned, Pickled <input type="checkbox"/> Microwaved	<input type="checkbox"/> Market / Store <input type="checkbox"/> Restaurant <input type="checkbox"/> Caught

		Jerky packages: _____ Soup bowls: _____ cups Shellfish (organisms): _____	<input type="checkbox"/> Poached / Boiled <input type="checkbox"/> Dried, Smoked, Salted <input type="checkbox"/> Casserole, Mixed Dish	<input type="checkbox"/> Raw / Uncooked <input type="checkbox"/> Other, Unknown	----- <input type="checkbox"/> In Idaho <input type="checkbox"/> Outside of Idaho
	Species 2:	Salmon sections #s _____ Trout (thin) fillets: _____ Lamprey sections: _____ Jerky packages: _____ Soup bowls: _____ cups Shellfish (organisms): _____	<input type="checkbox"/> Fried / Sauteed <input type="checkbox"/> Baked / Roasted <input type="checkbox"/> Broiled / Grilled <input type="checkbox"/> Poached / Boiled <input type="checkbox"/> Dried, Smoked, Salted <input type="checkbox"/> Casserole, Mixed Dish	<input type="checkbox"/> Stew, Soup <input type="checkbox"/> Canned, Pickled <input type="checkbox"/> Microwaved <input type="checkbox"/> Raw / Uncooked <input type="checkbox"/> Other, Unknown	<input type="checkbox"/> Market / Store <input type="checkbox"/> Restaurant <input type="checkbox"/> Caught ----- <input type="checkbox"/> In Idaho <input type="checkbox"/> Outside of Idaho
	Species 3:	Salmon sections #s _____ Trout (thin) fillets: _____ Lamprey sections: _____ Jerky packages: _____ Soup bowls: _____ cups Shellfish (organisms): _____	<input type="checkbox"/> Fried / Sauteed <input type="checkbox"/> Baked / Roasted <input type="checkbox"/> Broiled / Grilled <input type="checkbox"/> Poached / Boiled <input type="checkbox"/> Dried, Smoked, Salted <input type="checkbox"/> Casserole, Mixed Dish	<input type="checkbox"/> Stew, Soup <input type="checkbox"/> Canned, Pickled <input type="checkbox"/> Microwaved <input type="checkbox"/> Raw / Uncooked <input type="checkbox"/> Other, Unknown	<input type="checkbox"/> Market / Store <input type="checkbox"/> Restaurant <input type="checkbox"/> Caught ----- <input type="checkbox"/> In Idaho <input type="checkbox"/> Outside of Idaho

1. "Description" refers to a distinct fish-eating occasion defined by the respondent (breakfast, lunch, dinner, snack, or a time or number).
2. See Table A-4 for species list; will be coded later as anadromous, freshwater resident, or marine fish and shellfish.

Table A-3a. Portion Size Model Displays: Description and Use

Display Type ¹	Display Numbers ²	Display Description	What Display Represents	How Respondents Report Portion Size	Associated Mass of Real Fish
Salmon	S1 to S9	Large rubber salmon fillet, cut into 24 servings	Cooked salmon and other fish species with thick fillets	Identify multiples and/or fractions for sections 1 to 24 in 0.25 increments	Serving sections range from 1.5 oz. (42 g) to 6.8 oz. (192 g) of uncooked fish
Trout	T1 to T9	Small plastic trout fillet, single serving	Cooked trout and other fish species with thin fillets	Identify multiples and/or fractions of the fillet in 0.25 increments	One fillet is 3.0 oz. (85 g) of baked fish, or 4.0 oz. (113 g) of uncooked fish
Lamprey	L1 to L9	Gray PVC pipe, 2" diameter, 14" long, notched every 2" for 7 servings	Cooked adult lamprey (eel)	Identify multiples and/or fractions of the 2" servings in 0.25 increments	Each 2" serving is calculated to be 4.0 ounces (113 grams) of uncooked fish
Jerky	J1 to J9	Package of real "salmon candy" (dried fish pieces)	Dried pieces of salmon and other fish species	Identify multiples and/or fractions of the package in 0.25 increments	Packages range from 2.4 oz. (68 g) to 3.0 oz. (84 g) of dried fish, or 5.6 oz. (159 g) to 6.5 oz. (187 g) raw fish
Bowls	B1 to B9 (each is set of 5)	Empty plastic bowls (¼, ½, 1, 1½, and 2 cups) of different colors	Containers to hold fish soup, composite dishes	Identify multiples and/or fractions of a cup in 0.25 increments	1 cup of fish soup is estimated to include 0.25 cup of cooked fish (2 oz. or 57 g) or 2.5 oz. (72 g) raw fish
Crayfish	C1 to C9	Color photograph (laminated) of whole crayfish	Cooked crayfish	Identify number of organisms	1 crayfish contains 0.26 oz. (7.2 g) of uncooked edible meat
Mussels	M1 to M9	Color photograph (laminated) of plate with 6 half-shell mussels	Cooked mussels and other bivalve shellfish	Identify number of organisms	1 mussel contains 0.4 oz. (10 g) of uncooked edible tissue
Shrimp	S1 to S9	Color photograph (laminated) of plate with 6 shrimp	Cooked shrimp	Identify number of organisms	1 shrimp contains 1.6 oz. (44 g) of uncooked edible tissue
Other	N/A	Can or jar of fish (no display provided)	Fish (tuna, salmon) in a can or jar	Identify multiples and/or fractions of cans or jars in 0.25 increments	Standard tuna can is 5 oz. (142 g); mason jar is 8 oz (227 g)

Notes

1. A total of nine identical copies of each model display type will be available for use during interviews (five for NPT and four for SBT).

Respondent ID: _____

2. Display numbers are written in permanent marker on every model display, as well as contact information for Kristin Callahan, RIDOLFI, 206-436-2774, in the event there are questions or need for replacements.

" = inches

g = grams

oz. = ounces

3.2 Other Dietary Information

“Now I will ask you general questions about your diet.”

12. **“Was the amount of fish you ate yesterday more, less, or about the same as usual?”** (Check)

_____ More than usual

_____ Less than usual

_____ About the same as usual

13. **“Are you currently on any kind of diet, either to lose weight or for some other reason?”** (Check)

_____ Yes

_____ No

_____ Prefer not to answer

4.0 FOOD FREQUENCY QUESTIONNAIRE

The second part of the in-person interview is a food frequency questionnaire (FFQ) based on the past year (12 months), and includes questions on dietary patterns and related activities that may affect fish consumption.

4.1 Fish Consumption

“Thank you for the information about fish you may have eaten yesterday. The next questions are about your fish consumption (and activities involving fish) over the past year.”

4.1.1 Species, Frequency, Quantities

14. **“Did you eat fish in the past 12 months? That includes finfish, shellfish, and seafood. Consider all meals and snacks, including fish within dishes such as soups. Include fish bought from a store, from a restaurant, or caught by you or someone else. Did you eat fish in the past 12 months?”** (Check)

_____ Yes

_____ No

If YES, continue to Question #15.

If NO, ask **“Please consider ANY amount of fish you may have eaten in the past year.”** If still NO, terminate interview (skip to Section 5.2, Interview End).

15. **“Please tell me which types of fish you ate in the past 12 months (including the fillet and any parts). For each fish type you say you have eaten, I will ask you how often you ate it and how much you usually ate. You will be able to respond according to two periods: when the fish is in-season and the rest of the year. Remember to consider breakfast, lunch, dinner, and snacks, and include fillets, stews, and other dishes. Do NOT include special events, such as feasts and ceremonies; I will ask about that later.”**

Substitute each species name listed in Table A-4 for each of the questions below, and complete the table accordingly. Be prepared to show species photographs, if necessary, and portion size displays. Ask all questions for each species one-by-one, and record frequency according

to “in season” and the rest of the year and record portion sizes according to Table A-3a.

16. **“In the past 12 months, did you eat (Species X) ?”**

If YES, check box in Table A-4 and continue to Question #17.

If NO, repeat question for next species on list.

17. **“Did you eat about the same amount of (Species X) throughout the year or did you eat more during certain periods and less during other periods of the year?”**

If SAME, ask Questions #18-19 and complete Table A-4 for one period; enter length of period as 12 months. If contradiction occurs (e.g., reports only 3 months), ask **“what about the rest of the year?”** (and consider as NOT SAME below).

If NOT SAME, skip to Question #20 and complete Table A-4 for both high and low fish-eating periods.

18. **“In the past 12 months, how often did you eat (Species X) in any form (e.g. cooked or smoked fillets, dried, or soups)?”** Enter value and check the units (number of portions per day, per week, per month, or per year).

19. **Please tell me what your typical portion size was when you ate (Species X). You may only choose ONE type of measurement, either enter the section numbers or one of the measurements below.”** Refer to portion displays.

REPEAT Question #16 for each species type listed on Table A-4.

20. **“In the past 12 months, how often did you eat (Species X) in any form (e.g. cooked or smoked fillets, dried, or soups) when it was in season?”** Enter value and check the units (number of portions per day, per week, per month, or per year).

21. **Please tell me what your typical portion size was when you ate (Species X) when it was in season. You may only choose ONE type of measurement, either enter the section numbers or one of the measurements below.”** Refer to portion displays.

22. **“Recognizing that past years may be different, how long was (Species X) in season (total in weeks or months)?”** Enter value in weeks or months.
23. **“In the past 12 months, how often did you eat (Species X) in any form (e.g. cooked or smoked fillets, dried, or soups) during the rest of the year ?”**
Enter value and check the units (number of portions per day, per week, per month, or per year).
24. **Please tell me what your typical portion size was when you ate (Species X) during the rest of the year. You may only choose ONE type of measurement, either enter the section numbers or one of the measurements below”** Refer to portion displays.
25. REPEAT Question #16 for each species type listed on Table A-4.
26. **“Are there any other fish or shellfish species that you ate in the past 12 months that we have not mentioned here?”**
REPEAT this question and Question #17 (series of questions).

Table A-4. FFQ: Types, Frequency, and Quantity of Species Eaten in Past 12 Months

Fish Species ¹	Check if eaten	Consumption When Fish are In Season ² Or Same Consumption Year Round				Consumption Rest of the Year (Blank if Same Consumption Year Round)											
		Number of Portions	Portions per day, week, month, or year (circle)			Typical Portion Size (& display #) ³	Length of period (weeks or months)	Number of Portions	Portions per day, week, month, or year (circle)			Typical Portion Size (& display #) ³	Length of period (auto-calculated)				
SALMON AND STEELHEAD																	
Chinook (King) Salmon			Day	Wk.	Mo.	Yr.		Wk.	Mo.		Day	Wk.	Mo.	Yr.		Wk.	Mo.
Coho (Silver) Salmon			Day	Wk.	Mo.	Yr.		Wk.	Mo.		Day	Wk.	Mo.	Yr.		Wk.	Mo.
Sockeye (Red) Salmon			Day	Wk.	Mo.	Yr.		Wk.	Mo.		Day	Wk.	Mo.	Yr.		Wk.	Mo.
Kokanee (resident form of sockeye)			Day	Wk.	Mo.	Yr.		Wk.	Mo.		Day	Wk.	Mo.	Yr.		Wk.	Mo.
Steelhead (migratory form of rainbow trout)			Day	Wk.	Mo.	Yr.		Wk.	Mo.		Day	Wk.	Mo.	Yr.		Wk.	Mo.
Other salmon species (specify, e.g., Chum, Pink, Atlantic salmon)			Day	Wk.	Mo.	Yr.		Wk.	Mo.		Day	Wk.	Mo.	Yr.		Wk.	Mo.
All salmon and steelhead / species not identified			Day	Wk.	Mo.	Yr.		Wk.	Mo.		Day	Wk.	Mo.	Yr.		Wk.	Mo.
RESIDENT TROUT																	
Rainbow Trout			Day	Wk.	Mo.	Yr.		Wk.	Mo.		Day	Wk.	Mo.	Yr.		Wk.	Mo.
Cutthroat Trout			Day	Wk.	Mo.	Yr.		Wk.	Mo.		Day	Wk.	Mo.	Yr.		Wk.	Mo.
Cutbow Trout (hybrid of Rainbow and Cutthroat Trout)			Day	Wk.	Mo.	Yr.		Wk.	Mo.		Day	Wk.	Mo.	Yr.		Wk.	Mo.
Bull Trout (Dolly Varden)			Day	Wk.	Mo.	Yr.		Wk.	Mo.		Day	Wk.	Mo.	Yr.		Wk.	Mo.
Brook Trout			Day	Wk.	Mo.	Yr.		Wk.	Mo.		Day	Wk.	Mo.	Yr.		Wk.	Mo.
Lake Trout			Day	Wk.	Mo.	Yr.		Wk.	Mo.		Day	Wk.	Mo.	Yr.		Wk.	Mo.
Brown Trout			Day	Wk.	Mo.	Yr.		Wk.	Mo.		Day	Wk.	Mo.	Yr.		Wk.	Mo.
Other trout species (specify)			Day	Wk.	Mo.	Yr.		Wk.	Mo.		Day	Wk.	Mo.	Yr.		Wk.	Mo.
All resident trout / species not identified			Day	Wk.	Mo.	Yr.		Wk.	Mo.		Day	Wk.	Mo.	Yr.		Wk.	Mo.
Fish Species¹	Check	Consumption When Fish are In Season²				Consumption Rest of the Year											

	if eaten	Or Same Consumption Year Round				(Blank if Same Consumption Year Round)											
		Number of Portions	Portions per day, week, month, or year (circle)			Typical Portion Size (& display #) ³	Length of period (weeks or months)	Number of Portions	Portions per day, week, month, or year (circle)			Typical Portion Size (& display #) ³	Length of period (auto-calculated)				
OTHER FRESHWATER FISH AND SHELLFISH																	
Sturgeon			Day	Wk.	Mo.	Yr.		Wk.	Mo.		Day	Wk.	Mo.	Yr.		Wk.	Mo.
Lamprey			Day	Wk.	Mo.	Yr.		Wk.	Mo.		Day	Wk.	Mo.	Yr.		Wk.	Mo.
Whitefish			Day	Wk.	Mo.	Yr.		Wk.	Mo.		Day	Wk.	Mo.	Yr.		Wk.	Mo.
Sucker			Day	Wk.	Mo.	Yr.		Wk.	Mo.		Day	Wk.	Mo.	Yr.		Wk.	Mo.
Burbot			Day	Wk.	Mo.	Yr.		Wk.	Mo.		Day	Wk.	Mo.	Yr.		Wk.	Mo.
Northern Pike/minnow (Squawfish)			Day	Wk.	Mo.	Yr.		Wk.	Mo.		Day	Wk.	Mo.	Yr.		Wk.	Mo.
Bass			Day	Wk.	Mo.	Yr.		Wk.	Mo.		Day	Wk.	Mo.	Yr.		Wk.	Mo.
Bluegill			Day	Wk.	Mo.	Yr.		Wk.	Mo.		Day	Wk.	Mo.	Yr.		Wk.	Mo.
Carp			Day	Wk.	Mo.	Yr.		Wk.	Mo.		Day	Wk.	Mo.	Yr.		Wk.	Mo.
Catfish			Day	Wk.	Mo.	Yr.		Wk.	Mo.		Day	Wk.	Mo.	Yr.		Wk.	Mo.
Crappie			Day	Wk.	Mo.	Yr.		Wk.	Mo.		Day	Wk.	Mo.	Yr.		Wk.	Mo.
Sunfish			Day	Wk.	Mo.	Yr.		Wk.	Mo.		Day	Wk.	Mo.	Yr.		Wk.	Mo.
Tilapia			Day	Wk.	Mo.	Yr.		Wk.	Mo.		Day	Wk.	Mo.	Yr.		Wk.	Mo.
Walleye			Day	Wk.	Mo.	Yr.		Wk.	Mo.		Day	Wk.	Mo.	Yr.		Wk.	Mo.
Yellow Perch			Day	Wk.	Mo.	Yr.		Wk.	Mo.		Day	Wk.	Mo.	Yr.		Wk.	Mo.
Other freshwater finfish (specify)			Day	Wk.	Mo.	Yr.		Wk.	Mo.		Day	Wk.	Mo.	Yr.		Wk.	Mo.
Crayfish			Day	Wk.	Mo.	Yr.		Wk.	Mo.		Day	Wk.	Mo.	Yr.		Wk.	Mo.
Freshwater Clams or Mussels			Day	Wk.	Mo.	Yr.		Wk.	Mo.		Day	Wk.	Mo.	Yr.		Wk.	Mo.
Unspecified freshwater fish			Day	Wk.	Mo.	Yr.		Wk.	Mo.		Day	Wk.	Mo.	Yr.		Wk.	Mo.

Fish Species ¹	Check if eaten	Consumption When Fish are In Season ² Or Same Consumption Year Round				Consumption Rest of the Year (Blank if Same Consumption Year Round)											
		Number of Portions	Portions per day, week, month, or year (circle)			Typical Portion Size (& display #) ³	Length of period (weeks or months)	Number of Portions	Portions per day, week, month, or year (circle)			Typical Portion Size (& display #) ³	Length of period (auto-calculated)				
SEAFOOD / MARINE FISH AND SHELLFISH																	
Cod			Day	Wk.	Mo.	Yr.		Wk.	Mo.		Day	Wk.	Mo.	Yr.		Wk.	Mo.
Halibut			Day	Wk.	Mo.	Yr.		Wk.	Mo.		Day	Wk.	Mo.	Yr.		Wk.	Mo.
Pollock			Day	Wk.	Mo.	Yr.		Wk.	Mo.		Day	Wk.	Mo.	Yr.		Wk.	Mo.
Tuna			Day	Wk.	Mo.	Yr.		Wk.	Mo.		Day	Wk.	Mo.	Yr.		Wk.	Mo.
Lobster			Day	Wk.	Mo.	Yr.		Wk.	Mo.		Day	Wk.	Mo.	Yr.		Wk.	Mo.
Crab			Day	Wk.	Mo.	Yr.		Wk.	Mo.		Day	Wk.	Mo.	Yr.		Wk.	Mo.
Marine Clams or Mussels			Day	Wk.	Mo.	Yr.		Wk.	Mo.		Day	Wk.	Mo.	Yr.		Wk.	Mo.
Shrimp			Day	Wk.	Mo.	Yr.		Wk.	Mo.		Day	Wk.	Mo.	Yr.		Wk.	Mo.
Other marine fish or shellfish (Specify)			Day	Wk.	Mo.	Yr.		Wk.	Mo.		Day	Wk.	Mo.	Yr.		Wk.	Mo.
Other marine fish or shellfish (Specify)			Day	Wk.	Mo.	Yr.		Wk.	Mo.		Day	Wk.	Mo.	Yr.		Wk.	Mo.
Other marine fish or shellfish (Specify)			Day	Wk.	Mo.	Yr.		Wk.	Mo.		Day	Wk.	Mo.	Yr.		Wk.	Mo.
UNSPECIFIED FISH OR SHELLFISH SPECIES			Day	Wk.	Mo.	Yr.		Wk.	Mo.		Day	Wk.	Mo.	Yr.		Wk.	Mo.

Notes

1. Species are listed and grouped according to the most commonly eaten types of fish and shellfish.
2. Fish consumption "in season" is based on respondents perception or experience related to harvest and assumed higher consumption (compared to the rest of the year); biological seasons (e.g., fish runs) will be evaluated during data analysis and do not have to correspond to the duration of seasons noted by the respondent.
3. See 24-hour dietary recall (Table A-3) for examples of portion size data to enter according to species type (e.g., salmon, trout, lamprey, shellfish) or preparation method (jerky, bowls of soup). A description of the portion displays is provided in Table A-3a above.

4.1.2 Parts of Fish Consumed, Preparation Methods, and Sources

The next questions are about the parts of fish you eat, methods of preparation, and sources (where acquired) according to species groups. Those groups are 1) salmon and steelhead, 2) trout species, 3) sturgeon, and 4) suckers and whitefish." Complete Table A-5 for the following questions.

27. "When you eat a fish fillet, what percent of the time do you eat the following species of fish with skin?"

ASK question for 1) salmon and steelhead, 2) trout, 3) sturgeon, and 4) suckers and whitefish. Record answers in percent (including zero) or leave blank if that species type is not consumed at all. Complete Table A-5.

28. "When you eat (species group) , what percent of the time do you eat the eggs and what percent of the time do you eat other organs (including head and bones)?"

ASK question for 1) salmon and steelhead, 2) trout, 3) sturgeon, and 4) suckers and whitefish. Record answers in percent (including zero) or select "Not Applicable" if that species type is not consumed at all. Complete Table A-5.

29. "Thinking about how the fish that you eat is prepared, what percent of the time that you eat (species group) is it: baked or broiled? smoked? dried? in a soup? or other method (specify)? Your answers should total 100%."

ASK question for 1) salmon and steelhead, 2) trout, 3) sturgeon, and 4) suckers and whitefish. Complete Table A-5.

30. "Thinking about where the fish comes from that you eat, what percent of the time do you get (species type) from the following sources? Your answers should total 100%."

- Bought from a store (grocery or market)?
- From a restaurant?
- Caught by you or someone else in Idaho waters, including Tribal distributions?
- Caught by you or someone else outside of Idaho waters, including Tribal distributions?

ASK question for 1) salmon and steelhead, 2) trout, 3) sturgeon, and 4) suckers and whitefish. Complete Table A-5.

Table A-5. FFQ: Fish Parts Eaten, Preparation Methods, and Sources

Species Group:	Salmon and Steelhead	Trout	Sturgeon	Suckers and Whitefish
Percent of Time Typically Eat:				
Skin				
Eggs				
Head, bone, and/or organs				
Percent of Time Typically Prepare (total 100%):				
Baked or broiled				
Smoked				
Dried				
In a soup				
Other:				
Don't know				
Percent of Time Typically Obtained (total 100%):				
Bought from a store (grocery or market)				
From a restaurant				
Caught by you or someone else (in Idaho waters)				
Caught by you or someone else (outside of Idaho)				
Other:				
Don't know				

4.2 Special Events and Gatherings

“I will now ask questions related to your fish consumption during special events and gatherings, including ceremonies or other community events.” Complete Table A-6 for the following questions.

31. **“In the past 12 months, how many special events and gatherings did you attend (either per week, month or year)?”** (Enter number and circle one unit)

_____ Events per Week / Month / Year

If zero, skip to next section (4.3), Question #35.

32. **“Did you eat fish in any form (e.g. cooked or smoked fillets, dried, or soups) at these special events and gatherings, such as 1) salmon and steelhead, 2) trout, 3) sturgeon, 4) suckers or whitefish?”** (Circle answer in Table A-6)

_____ Yes

_____ No

_____ Don't know / Prefer not to answer

If YES continue to next question

If NO or other, skip to next section (4.3), Question #35.

33. **“What was your typical portion size for the following species at the special events and gatherings? You may only choose ONE type of measurement, either enter the section numbers or one of the measurements below.”**

ASK question for 1) salmon and steelhead, 2) trout, 3) sturgeon, and 4) suckers and whitefish. Complete Table A-6. (See portion models.)

34. **“At what percent of the special events and gatherings did you eat (species group)?”**

ASK question for 1) salmon and steelhead, 2) trout, 3) sturgeon, and 4) suckers and whitefish. Complete Table A-6.

Table A-6. FFQ: Fish Consumption at Gatherings

Species Group	Consumed (circle)	Typical Portion Size <i>(enter sections, fillets, packages, cups– see Table A-4a for model list)</i>	Percent of time eat fish at gatherings
Salmon and Steelhead	YES NO		%
Trout	YES NO		%
Sturgeon	YES NO		%
Suckers and Whitefish	YES NO		%

4.3 Fishing Activities

“I am now going to ask you some questions about fishing.”

35. **“Over the past 12 months, did you take part in any fishing-related activities?”** (Check)

- _____ Yes
- _____ No
- _____ Prefer not to answer

If YES, continue to next question.

35a. If NO, ask **“Why not”**? (Check and skip to next section)

If prefer not to answer, skip to next section.

- _____ Fish advisories
- _____ Pollution
- _____ Other environmental concerns
- _____ Not enough fish available to catch
- _____ Limited access to fishing areas
- _____ Used to access to boat/fishing gear, not anymore
- _____ Too far from fishing areas
- _____ Too busy, no time
- _____ No longer custom, prefer other activities

- _____ Prefer other foods
- _____ Don't know how to fish
- _____ Prefer not to answer
- _____ Other _____

36. **“Now I’m going to ask you the approximate number of times you went fishing (for fish and shellfish) each month. How many times did you go fishing during each of the following months?”** (List and enter value for each)

- _____ Times in January
- _____ Times in February
- _____ Times in March
- _____ Times in April
- _____ Times in May
- _____ Times in June
- _____ Times in July
- _____ Times in August
- _____ Times in September
- _____ Times in October
- _____ Times in November
- _____ Times in December

37. **“What percent of the fish that you harvest do you keep for you and your household, what percent do you give/distribute to others outside your household, and what percent do you sell (your answers should total 100%)?”** (Enter)

- _____ Percent Keep
- _____ Percent Give to others
- _____ Percent Sell

100% Total

38. **“Do you own or have access to fishing gear?”** (Check)

- _____ Yes
- _____ No
- _____ Prefer not to answer

39. **“Do you own or have access to a boat?”** (Check)

- Yes
- No
- Prefer not to answer

4.4 Changes in Fish Consumption

“I am now going to ask you questions about changes in fish consumption and availability. Some of these may be open-ended questions. We do not intend to collect ANY culturally-sensitive information.”

40. **“Has there been a change over time in your fish consumption?”** (Check)

- Yes
- No
- Don't know / Prefer not to answer

If YES, continue to next question.

If NO or other, skip to Question #41.

40a. **“How has it changed most recently?”** (Check)

- Increased consumption
- Decreased consumption
- Other change (e.g., available species) _____
-

40b. **“When did it change?”**

- Within past 5 years
- In the 2000s (or 5 to 15 years ago)
- In the 1990s (or 15 to 25 years ago)
- In the 1980s (or 25 to 35 years ago)
- In the 1970s (or 35-45 years ago)
- In the 1960s or earlier (more than 45 years ago)

40c. **“Why did it change?”** (Multiple choice options may be developed in Pilot Test)

41. **“In the past, how important was fish to your Tribe’s heritage and culture?”**

- Very important
- Somewhat important
- Not important
- Don’t know / Prefer not to answer

41a. **“Currently, how important is fish to your Tribe’s heritage and culture?”**

- Very important
- Somewhat important
- Not important
- Don’t know / Prefer not to answer /

42. **“Has there been a change in access to fish and fishing (for you or others) over time?”** (Check)

- Yes
- No
- Don’t know / Prefer not to answer /

If YES, continue to next question.
If NO or other, skip to Question #43.

42a. **“How has it changed?”** (Check)

- More access to fishing
- Less access to fishing
- Other change _____

42b. **"When did it change?"**

- _____ Within past 5 years
- _____ In the 2000s (or 5 to 15 years ago)
- _____ In the 1990s (or 15 to 25 years ago)
- _____ In the 1980s (or 25 to 35 years ago)
- _____ In the 1970s (or 35-45 years ago)
- _____ In the 1960s or earlier (more than 45 years ago)

42c. **"Why did it change?"** (Multiple choice options may be developed in Pilot Test)

43. **"Has there been a change in how often you fish (for you or others)?"**
(Check)

- _____ Yes
- _____ No
- _____ Don't know / Prefer not to answer

If YES, continue to next question.
If NO or other, skip to Question #44.

43a. **"How has it changed most recently?"** (Check)

- _____ Increased frequency
- _____ Decreased frequency
- _____ Other change _____

43b. **"When did it change?"**

- _____ Within past 5 years
- _____ In the 2000s (or 5 to 15 years ago)

- _____ In the 1990s (or 15 to 25 years ago)
- _____ In the 1980s (or 25 to 35 years ago)
- _____ In the 1970s (or 35-45 years ago)
- _____ In the 1960s or earlier (more than 45 years ago)

43c. **“Why did it change?”** (Multiple choice options may be developed in Pilot Test)

44. **“Has there been a change in the way you prepare or use fish?”** (Check)

- _____ Yes
- _____ No
- _____ Don't know / Prefer not to answer /

If YES, continue to next question.
If NO or other, skip to Question #45.

44a. **“How has it changed most recently?”**

- _____ Different cooking method
- _____ Different use
- _____ Don't know / Prefer not to answer /

44b. **“When did it change?”**

- _____ Within past 5 years
- _____ In the 2000s (or 5 to 15 years ago)
- _____ In the 1990s (or 15 to 25 years ago)
- _____ In the 1980s (or 25 to 35 years ago)
- _____ In the 1970s (or 35-45 years ago)
- _____ In the 1960s or earlier (more than 45 years ago)

44c. **“Why did it change?”** (Multiple choice options may be developed in Pilot Test)

45. **“Compared to your fish consumption now, how much/how frequently would you like to consume fish in the future?”** (Check)

- Increase consumption
- Decrease consumption
- Maintain same consumption
- Don't know / Prefer not to answer

If INCREASED, continue to next question.
If DECREASED or other, skip to next section.

46. **“If you prefer to eat more fish or seafood than you're currently eating, what would have to occur for you to eat that amount in the future?”**

5.0 GENERAL INFORMATION

The third and final part of the in-person interview involves collecting general information from the respondent and recording final administrative data.

5.1 Respondent Information

Respondents will be asked demographic questions as well as (for female respondents) questions related to breastfeeding history.

5.1.1 Demographic Information

“This is the final part of the interview. I have a few general questions and then we will be done. These include reporting your height and weight, which will help us to calculate and check fish consumption rates, and reporting education and income ranges, which will help us determine fish consumption rates for various population groups.” (Check or enter – if respondent prefers not to say, enter 999)

47. Gender (check):

_____ Male

_____ Female

48. **“What is your age?”** _____ (years)

49. **“What is your height?”** _____ feet _____ inches

50. **“How much do you weigh?”** _____ pounds

51. **“How many people live in your household, including yourself?”** _____

52. **“Do you live on your Tribe’s Reservation?”** (Check)

_____ Yes

_____ No

_____ Prefer not to answer

53. **“What is the highest level of education that you’ve completed?”** (Check)

- Elementary School
- Middle School
- High School / GED
- Associates Degree
- Bachelor's Degree
- Master's Degree
- Doctorate
- Prefer not to answer

54. **“What is your approximate household income per year?”** (List all options below, except “prefer not to say” and check)

- \$15,000 or less
- More than \$15,000 up to \$25,000
- More than \$25,000 up to \$35,000
- More than \$35,000 up to \$45,000
- More than \$45,000 up to \$55,000
- More than \$55,000 up to \$65,000
- More than \$65,000
- Prefer not to answer

5.1.2 Breastfeeding History

The following questions are for female respondents only; if male, skip to next section.

55. **“Have you ever given birth?”** (Check)

- Yes
- No
- Prefer not to answer

If YES, continue to next question.
Otherwise, skip to next section.

56. "When did you most recently give birth? _____ / _____ (MM, YYYY)

57. "Was this baby ever breastfed or fed breast milk? (Check)

- Yes
- No
- Prefer not to answer

If YES, continue to next question.
Otherwise, skip to next section.

58. "If the youngest child is no longer breastfeeding, at what age did you stop feeding breast milk to this child?" (Provide in months or check other option)

- Stopped at _____ (months old)
- Still breastfeeding
- Prefer not to answer
- Not applicable (not biological mother, etc.)

5.2 Interview End

Upon completing the interview, the interviewer will offer appreciation and complete the remaining administrative information, including signing a form verifying participation.

"This concludes the interview. If any of your answers included culturally-sensitive information, please tell me.

- Yes, included culturally sensitive information
- No culturally sensitive information included
- Don't know / Prefer not to answer

If YES, this questionnaire will be reviewed by a Tribal official and culturally sensitive information may be edited or redacted prior to further analysis and review.

Thank you SO very much for your time and cooperation today. Your participation will contribute significantly to the overall success of this survey and help protect the health of our Tribe. It would also benefit the survey if you could participate in a second, follow-up interview over the phone in the next one to four weeks. This second interview will be much shorter and should only take about 15 minutes."

59. "Is it okay if I contact you again for a follow-up call?"

_____ Yes

_____ No

59a. If YES, "what is the best phone number to reach you?" _____

59b. If YES, "**Thank you. I am going to leave photographs of the portion display models with you so that you will have them for reference when I call.**" Leave actual-size photographs of models with the respondent.

59c. If NO, remind respondent of the importance of this study and ask again.

60. "**Thank you again for your time today, that is all.**" Complete information below.

Record interview end time and calculate interview length.

61. End time: _____ AM / PM (circle)

62. Length of interview: _____ (hours and/or minutes)

63. Was the interview conducted in private or were others present? (Check)

_____ In private

_____ Others were present

5.3 Post-Interview

Following the interview, the interviewer will assess and record the respondent's level of participation and the interviewer will acknowledge that he/she recorded the information truthfully and to the best of his/her ability by signing the following guarantee of authenticity.

5.3.1 Interview Quality

64. Respondents cooperation: (Check)

_____ Very good

_____ Good

_____ Fair

_____ Poor

65. Respondent's reliability: (Check)

_____ Highly reliable

_____ Generally reliable

_____ Questionable

_____ Unreliable

Notes / Reasons for opinions:

66. Note any topics or specific questions that appeared confusing or particularly challenging for the respondent to answer.

5.3.2 Interviewer Guarantee of Authenticity

67.I, _____ (printed name of interviewer)
hereby affirm that the answers recorded on this questionnaire reflect a
complete and accurate accounting of my interview with the respondent.

Signature of Interviewer

Date

6.0 SECOND 24-HOUR DIETARY RECALL

Based on the results of the first interview, which includes a 24-hour dietary recall, food frequency questionnaire, and general demographic information, a subset of individuals will be selected as “high” fish consumers for participation in a second 24-hour dietary recall by telephone. Words to be spoken by the interviewer are identified in bold. Questions will be asked in numeric order.

6.1 Administrative Information

Since this telephone interview will be conducted at a later date, general administrative information will be completed similar to the first interview (prior to questioning the respondent).

6.1.1 Interviewer Identification

1. Interviewer Name _____
2. Interviewer ID: _____

6.1.2 Respondent Identification

3. Respondent ID: _____
4. Phone number: _____

6.1.3 Interview Date, Time, and Location

5. Date: _____ / _____ / _____ (MM/DD/YYYY)
6. Day (of the week): _____
7. Start time: _____ AM / PM (circle)
8. City, State: _____

6.2 Introduction

“Hello, my name is _____, and I am calling on behalf of the _____ Tribe. We appreciate your continued willingness to participate in our fish consumption survey.

The information you provide during this follow-up interview, as well as your previous answers, plus the information of other Tribal members, will help us understand the rates of fish consumption, how fish is prepared, and the species or types of fish regularly eaten by members of the _____ Tribe.

The information that you provide during this interview is confidential. Your responses to the questions will be combined with those of others so that your answers cannot be identified. If you have any questions, please refer to the information sheet I gave you previously.

This follow-up survey is much shorter and should only take about 15 minutes. I will ask you to tell me how much fish you ate in the last 24 hours. Please refer to the photographs I left with you previously. If you do not know an answer or do not feel comfortable answering, we can skip that question. You are free to not answer any of the questions. May we start the interview now?”

INTERVIEWER CHECK THIS BOX IF RESPONDENT AGREES TO PARTICIPATE IN THE FOLLOW-UP TELEPHONE INTERVIEW.

6.3 Fish Consumption

9. “The first questions are about your fish consumption yesterday. Please consider what you ate yesterday. I am going to ask you about EACH time you ate. That would include meals, snacks, eating at home, eating at a friend’s or relative’s house or a purchase somewhere. It includes eating fish anywhere or at any time and in any amount. Did you eat any fish yesterday?”

_____ Yes

_____ No

_____ Don’t know / Prefer not to answer

If YES, continue to next Question #9a

If NO or Other, skip to next Section (6.5), Question #14.

9a. **“Please think about the first time you ate yesterday Please enter a description (name, time, or number) for the first occasion where you ate fish yesterday (which includes finfish, shellfish, and seafood). Consider all meals and snacks, including fish within dishes such as soups. Include fish bought from a store, from a restaurant, or caught by you or someone else.”** (Enter description or occasion number in Table A-7)

10. **“What type of fish did you eat?”** (Refer to species display, if needed, enter species type in Table A-7; see Table A-4 above for list of species).

10a. **“How much of the (species type mentioned) did you eat?** (See quantity displays according to species type; enter portion size according to Table A-7a).

10b. **“How was the (species type mentioned) prepared or cooked?** (Unprompted, check box in Table A-7).

10c. **“Where did the (species type mentioned) come from? Was it from a market or store? Was it from a restaurant? Or was it caught by you or someone else (this includes Tribal distributions)?**

10d. **“Was it from Idaho waters or outside of Idaho?”** (Check box in Table A-7).

10e. **“Did you eat this species prepared in any other way or did you eat any other species of fish for (eating occasion mentioned) ?”**

11. **“Please think about the NEXT time you ate yesterday; when was that (name the eating occasion)? Did you eat fish? (Check)**

_____ Yes

_____ No

_____ Did not eat fish rest of day

If YES, repeat Question #10 above for up to 6 eating occasions.

If NO, repeat Question #11 for all eating occasions yesterday.

If “Did not eat fish rest of day,” skip ahead to next section, Question #12

Table A-7. 24-Hr Recall: Types, Quantities, Methods, and Sources of Fish Eaten Yesterday

Occasion # & Description ¹	Species Type ²	Portion Size / Quantity <i>See Displays (enter display #)</i>	Preparation / Cooking Method <i>Check box</i>	Source <i>Check box</i>
1	Species 1:	Salmon sections #s _____ Trout (thin) fillets: _____ Lamprey sections: _____ Jerky packages: _____ Soup bowls: _____ cups Shellfish (organisms): _____	<input type="checkbox"/> Fried / Sauteed <input type="checkbox"/> Stew, Soup <input type="checkbox"/> Baked / Roasted <input type="checkbox"/> Canned, Pickled <input type="checkbox"/> Broiled / Grilled <input type="checkbox"/> Microwaved <input type="checkbox"/> Poached / Boiled <input type="checkbox"/> Raw / Uncooked <input type="checkbox"/> Dried, Smoked, Salted <input type="checkbox"/> Other, Unknown <input type="checkbox"/> Casserole, Mixed Dish	<input type="checkbox"/> Market / Store <input type="checkbox"/> Restaurant <input type="checkbox"/> Caught ----- <input type="checkbox"/> In Idaho <input type="checkbox"/> Outside of Idaho
	Species 2:	Salmon sections #s _____ Trout (thin) fillets: _____ Lamprey sections: _____ Jerky packages: _____ Soup bowls: _____ cups Shellfish (organisms): _____	<input type="checkbox"/> Fried / Sauteed <input type="checkbox"/> Stew, Soup <input type="checkbox"/> Baked / Roasted <input type="checkbox"/> Canned, Pickled <input type="checkbox"/> Broiled / Grilled <input type="checkbox"/> Microwaved <input type="checkbox"/> Poached / Boiled <input type="checkbox"/> Raw / Uncooked <input type="checkbox"/> Dried, Smoked, Salted <input type="checkbox"/> Other, Unknown <input type="checkbox"/> Casserole, Mixed Dish	<input type="checkbox"/> Market / Store <input type="checkbox"/> Restaurant <input type="checkbox"/> Caught ----- <input type="checkbox"/> In Idaho <input type="checkbox"/> Outside of Idaho
	Species 3:	Salmon sections #s _____ Trout (thin) fillets: _____ Lamprey sections: _____ Jerky packages: _____ Soup bowls: _____ cups Shellfish (organisms): _____	<input type="checkbox"/> Fried / Sauteed <input type="checkbox"/> Stew, Soup <input type="checkbox"/> Baked / Roasted <input type="checkbox"/> Canned, Pickled <input type="checkbox"/> Broiled / Grilled <input type="checkbox"/> Microwaved <input type="checkbox"/> Poached / Boiled <input type="checkbox"/> Raw / Uncooked <input type="checkbox"/> Dried, Smoked, Salted <input type="checkbox"/> Other, Unknown <input type="checkbox"/> Casserole, Mixed Dish	<input type="checkbox"/> Market / Store <input type="checkbox"/> Restaurant <input type="checkbox"/> Caught ----- <input type="checkbox"/> In Idaho <input type="checkbox"/> Outside of Idaho
2	Species 1:	Salmon sections #s _____ Trout (thin) fillets: _____ Lamprey sections: _____ Jerky packages: _____ Soup bowls: _____ cups Shellfish (organisms): _____	<input type="checkbox"/> Fried / Sauteed <input type="checkbox"/> Stew, Soup <input type="checkbox"/> Baked / Roasted <input type="checkbox"/> Canned, Pickled <input type="checkbox"/> Broiled / Grilled <input type="checkbox"/> Microwaved <input type="checkbox"/> Poached / Boiled <input type="checkbox"/> Raw / Uncooked <input type="checkbox"/> Dried, Smoked, Salted <input type="checkbox"/> Other, Unknown <input type="checkbox"/> Casserole, Mixed Dish	<input type="checkbox"/> Market / Store <input type="checkbox"/> Restaurant <input type="checkbox"/> Caught ----- <input type="checkbox"/> In Idaho <input type="checkbox"/> Outside of Idaho
	Species 2:	Salmon sections #s _____ Trout (thin) fillets: _____ Lamprey sections: _____ Jerky packages: _____	<input type="checkbox"/> Fried / Sauteed <input type="checkbox"/> Stew, Soup <input type="checkbox"/> Baked / Roasted <input type="checkbox"/> Canned, Pickled <input type="checkbox"/> Broiled / Grilled <input type="checkbox"/> Microwaved <input type="checkbox"/> Poached / Boiled <input type="checkbox"/> Raw / Uncooked	<input type="checkbox"/> Market / Store <input type="checkbox"/> Restaurant <input type="checkbox"/> Caught -----

			Soup bowls: _____ cups Shellfish (organisms): _____	<input type="checkbox"/> Dried, Smoked, Salted <input type="checkbox"/> Casserole, Mixed Dish	<input type="checkbox"/> Other, Unknown	<input type="checkbox"/> In Idaho <input type="checkbox"/> Outside of Idaho
		Species 3:	Salmon sections #s _____ Trout (thin) fillets: _____ Lamprey sections: _____ Jerky packages: _____ Soup bowls: _____ cups Shellfish (organisms): _____	<input type="checkbox"/> Fried / Sauteed <input type="checkbox"/> Baked / Roasted <input type="checkbox"/> Broiled / Grilled <input type="checkbox"/> Poached / Boiled <input type="checkbox"/> Dried, Smoked, Salted <input type="checkbox"/> Casserole, Mixed Dish	<input type="checkbox"/> Stew, Soup <input type="checkbox"/> Canned, Pickled <input type="checkbox"/> Microwaved <input type="checkbox"/> Raw / Uncooked <input type="checkbox"/> Other, Unknown	<input type="checkbox"/> Market / Store <input type="checkbox"/> Restaurant <input type="checkbox"/> Caught ----- <input type="checkbox"/> In Idaho <input type="checkbox"/> Outside of Idaho
3		Species 1:	Salmon sections #s _____ Trout (thin) fillets: _____ Lamprey sections: _____ Jerky packages: _____ Soup bowls: _____ cups Shellfish (organisms): _____	<input type="checkbox"/> Fried / Sauteed <input type="checkbox"/> Baked / Roasted <input type="checkbox"/> Broiled / Grilled <input type="checkbox"/> Poached / Boiled <input type="checkbox"/> Dried, Smoked, Salted <input type="checkbox"/> Casserole, Mixed Dish	<input type="checkbox"/> Stew, Soup <input type="checkbox"/> Canned, Pickled <input type="checkbox"/> Microwaved <input type="checkbox"/> Raw / Uncooked <input type="checkbox"/> Other, Unknown	<input type="checkbox"/> Market / Store <input type="checkbox"/> Restaurant <input type="checkbox"/> Caught ----- <input type="checkbox"/> In Idaho <input type="checkbox"/> Outside of Idaho
		Species 2:	Salmon sections #s _____ Trout (thin) fillets: _____ Lamprey sections: _____ Jerky packages: _____ Soup bowls: _____ cups Shellfish (organisms): _____	<input type="checkbox"/> Fried / Sauteed <input type="checkbox"/> Baked / Roasted <input type="checkbox"/> Broiled / Grilled <input type="checkbox"/> Poached / Boiled <input type="checkbox"/> Dried, Smoked, Salted <input type="checkbox"/> Casserole, Mixed Dish	<input type="checkbox"/> Stew, Soup <input type="checkbox"/> Canned, Pickled <input type="checkbox"/> Microwaved <input type="checkbox"/> Raw / Uncooked <input type="checkbox"/> Other, Unknown	<input type="checkbox"/> Market / Store <input type="checkbox"/> Restaurant <input type="checkbox"/> Caught ----- <input type="checkbox"/> In Idaho <input type="checkbox"/> Outside of Idaho
		Species 3:	Salmon sections #s _____ Trout (thin) fillets: _____ Lamprey sections: _____ Jerky packages: _____ Soup bowls: _____ cups Shellfish (organisms): _____	<input type="checkbox"/> Fried / Sauteed <input type="checkbox"/> Baked / Roasted <input type="checkbox"/> Broiled / Grilled <input type="checkbox"/> Poached / Boiled <input type="checkbox"/> Dried, Smoked, Salted <input type="checkbox"/> Casserole, Mixed Dish	<input type="checkbox"/> Stew, Soup <input type="checkbox"/> Canned, Pickled <input type="checkbox"/> Microwaved <input type="checkbox"/> Raw / Uncooked <input type="checkbox"/> Other, Unknown	<input type="checkbox"/> Market / Store <input type="checkbox"/> Restaurant <input type="checkbox"/> Caught ----- <input type="checkbox"/> In Idaho <input type="checkbox"/> Outside of Idaho
4		Species 1:	Salmon sections #s _____ Trout (thin) fillets: _____ Lamprey sections: _____ Jerky packages: _____ Soup bowls: _____ cups Shellfish (organisms): _____	<input type="checkbox"/> Fried / Sauteed <input type="checkbox"/> Baked / Roasted <input type="checkbox"/> Broiled / Grilled <input type="checkbox"/> Poached / Boiled <input type="checkbox"/> Dried, Smoked, Salted <input type="checkbox"/> Casserole, Mixed Dish	<input type="checkbox"/> Stew, Soup <input type="checkbox"/> Canned, Pickled <input type="checkbox"/> Microwaved <input type="checkbox"/> Raw / Uncooked <input type="checkbox"/> Other, Unknown	<input type="checkbox"/> Market / Store <input type="checkbox"/> Restaurant <input type="checkbox"/> Caught ----- <input type="checkbox"/> In Idaho <input type="checkbox"/> Outside of Idaho
		Species 2:	Salmon sections #s _____	<input type="checkbox"/> Fried / Sauteed	<input type="checkbox"/> Stew, Soup	<input type="checkbox"/> Market / Store

			Trout (thin) fillets: _____ Lamprey sections: _____ Jerky packages: _____ Soup bowls: _____ cups Shellfish (organisms): _____	<input type="checkbox"/> Baked / Roasted <input type="checkbox"/> Broiled / Grilled <input type="checkbox"/> Poached / Boiled <input type="checkbox"/> Dried, Smoked, Salted <input type="checkbox"/> Casserole, Mixed Dish	<input type="checkbox"/> Canned, Pickled <input type="checkbox"/> Microwaved <input type="checkbox"/> Raw / Uncooked <input type="checkbox"/> Other, Unknown	<input type="checkbox"/> Restaurant <input type="checkbox"/> Caught ----- <input type="checkbox"/> In Idaho <input type="checkbox"/> Outside of Idaho
		Species 3:	Salmon sections #s _____ Trout (thin) fillets: _____ Lamprey sections: _____ Jerky packages: _____ Soup bowls: _____ cups Shellfish (organisms): _____	<input type="checkbox"/> Fried / Sauteed <input type="checkbox"/> Baked / Roasted <input type="checkbox"/> Broiled / Grilled <input type="checkbox"/> Poached / Boiled <input type="checkbox"/> Dried, Smoked, Salted <input type="checkbox"/> Casserole, Mixed Dish	<input type="checkbox"/> Stew, Soup <input type="checkbox"/> Canned, Pickled <input type="checkbox"/> Microwaved <input type="checkbox"/> Raw / Uncooked <input type="checkbox"/> Other, Unknown	<input type="checkbox"/> Market / Store <input type="checkbox"/> Restaurant <input type="checkbox"/> Caught ----- <input type="checkbox"/> In Idaho <input type="checkbox"/> Outside of Idaho
5		Species 1:	Salmon sections #s _____ Trout (thin) fillets: _____ Lamprey sections: _____ Jerky packages: _____ Soup bowls: _____ cups Shellfish (organisms): _____	<input type="checkbox"/> Fried / Sauteed <input type="checkbox"/> Baked / Roasted <input type="checkbox"/> Broiled / Grilled <input type="checkbox"/> Poached / Boiled <input type="checkbox"/> Dried, Smoked, Salted <input type="checkbox"/> Casserole, Mixed Dish	<input type="checkbox"/> Stew, Soup <input type="checkbox"/> Canned, Pickled <input type="checkbox"/> Microwaved <input type="checkbox"/> Raw / Uncooked <input type="checkbox"/> Other, Unknown	<input type="checkbox"/> Market / Store <input type="checkbox"/> Restaurant <input type="checkbox"/> Caught ----- <input type="checkbox"/> In Idaho <input type="checkbox"/> Outside of Idaho
		Species 2:	Salmon sections #s _____ Trout (thin) fillets: _____ Lamprey sections: _____ Jerky packages: _____ Soup bowls: _____ cups Shellfish (organisms): _____	<input type="checkbox"/> Fried / Sauteed <input type="checkbox"/> Baked / Roasted <input type="checkbox"/> Broiled / Grilled <input type="checkbox"/> Poached / Boiled <input type="checkbox"/> Dried, Smoked, Salted <input type="checkbox"/> Casserole, Mixed Dish	<input type="checkbox"/> Stew, Soup <input type="checkbox"/> Canned, Pickled <input type="checkbox"/> Microwaved <input type="checkbox"/> Raw / Uncooked <input type="checkbox"/> Other, Unknown	<input type="checkbox"/> Market / Store <input type="checkbox"/> Restaurant <input type="checkbox"/> Caught ----- <input type="checkbox"/> In Idaho <input type="checkbox"/> Outside of Idaho
		Species 3:	Salmon sections #s _____ Trout (thin) fillets: _____ Lamprey sections: _____ Jerky packages: _____ Soup bowls: _____ cups Shellfish (organisms): _____	<input type="checkbox"/> Fried / Sauteed <input type="checkbox"/> Baked / Roasted <input type="checkbox"/> Broiled / Grilled <input type="checkbox"/> Poached / Boiled <input type="checkbox"/> Dried, Smoked, Salted <input type="checkbox"/> Casserole, Mixed Dish	<input type="checkbox"/> Stew, Soup <input type="checkbox"/> Canned, Pickled <input type="checkbox"/> Microwaved <input type="checkbox"/> Raw / Uncooked <input type="checkbox"/> Other, Unknown	<input type="checkbox"/> Market / Store <input type="checkbox"/> Restaurant <input type="checkbox"/> Caught ----- <input type="checkbox"/> In Idaho <input type="checkbox"/> Outside of Idaho
6		Species 1:	Salmon sections #s _____ Trout (thin) fillets: _____ Lamprey sections: _____ Jerky packages: _____	<input type="checkbox"/> Fried / Sauteed <input type="checkbox"/> Baked / Roasted <input type="checkbox"/> Broiled / Grilled <input type="checkbox"/> Poached / Boiled	<input type="checkbox"/> Stew, Soup <input type="checkbox"/> Canned, Pickled <input type="checkbox"/> Microwaved <input type="checkbox"/> Raw / Uncooked	<input type="checkbox"/> Market / Store <input type="checkbox"/> Restaurant <input type="checkbox"/> Caught -----

Respondent ID: _____

		Soup bowls: _____ cups Shellfish (organisms): _____	<input type="checkbox"/> Dried, Smoked, Salted <input type="checkbox"/> Casserole, Mixed Dish	<input type="checkbox"/> Other, Unknown	<input type="checkbox"/> In Idaho <input type="checkbox"/> Outside of Idaho
	Species 2:	Salmon sections #s _____ Trout (thin) fillets: _____ Lamprey sections: _____ Jerky packages: _____ Soup bowls: _____ cups Shellfish (organisms): _____	<input type="checkbox"/> Fried / Sauteed <input type="checkbox"/> Baked / Roasted <input type="checkbox"/> Broiled / Grilled <input type="checkbox"/> Poached / Boiled <input type="checkbox"/> Dried, Smoked, Salted <input type="checkbox"/> Casserole, Mixed Dish	<input type="checkbox"/> Stew, Soup <input type="checkbox"/> Canned, Pickled <input type="checkbox"/> Microwaved <input type="checkbox"/> Raw / Uncooked <input type="checkbox"/> Other, Unknown	<input type="checkbox"/> Market / Store <input type="checkbox"/> Restaurant <input type="checkbox"/> Caught ----- <input type="checkbox"/> In Idaho <input type="checkbox"/> Outside of Idaho
	Species 3:	Salmon sections #s _____ Trout (thin) fillets: _____ Lamprey sections: _____ Jerky packages: _____ Soup bowls: _____ cups Shellfish (organisms): _____	<input type="checkbox"/> Fried / Sauteed <input type="checkbox"/> Baked / Roasted <input type="checkbox"/> Broiled / Grilled <input type="checkbox"/> Poached / Boiled <input type="checkbox"/> Dried, Smoked, Salted <input type="checkbox"/> Casserole, Mixed Dish	<input type="checkbox"/> Stew, Soup <input type="checkbox"/> Canned, Pickled <input type="checkbox"/> Microwaved <input type="checkbox"/> Raw / Uncooked <input type="checkbox"/> Other, Unknown	<input type="checkbox"/> Market / Store <input type="checkbox"/> Restaurant <input type="checkbox"/> Caught ----- <input type="checkbox"/> In Idaho <input type="checkbox"/> Outside of Idaho

1. "Description" refers to a distinct fish-eating occasion defined by the respondent (breakfast, lunch, dinner, snack, or a time or number).
2. See Table A-4 for species list; will be coded later as anadromous, freshwater resident, or marine fish and shellfish.

Table A-7a. Portion Size Model Displays: Description and Use

Display Type ¹	Display Numbers ²	Display Description	What Display Represents	How Respondents Report Portion Size	Associated Mass of Real Fish
Salmon	S1 to S9	Large rubber salmon fillet, cut into 24 servings	Cooked salmon and other fish species with thick fillets	Identify multiples and/or fractions for sections 1 to 24 in 0.25 increments	Serving sections range from 1.5 oz. (42 g) to 6.8 oz. (192 g) of uncooked fish
Trout	T1 to T9	Small plastic trout fillet, single serving	Cooked trout and other fish species with thin fillets	Identify multiples and/or fractions of the fillet in 0.25 increments	One fillet is 3.0 oz. (85 g) of baked fish, or 4.0 oz. (113 g) of uncooked fish
Lamprey	L1 to L9	Gray PVC pipe, 2" diameter, 14" long, notched every 2" for 7 servings	Cooked adult lamprey (eel)	Identify multiples and/or fractions of the 2" servings in 0.25 increments	Each 2" serving is calculated to be 4.0 ounces (113 grams) of uncooked fish
Jerky	J1 to J9	Package of real "salmon candy" (dried fish pieces)	Dried pieces of salmon and other fish species	Identify multiples and/or fractions of the package in 0.25 increments	Packages range from 2.4 oz. (68 g) to 3.0 oz. (84 g) of dried fish, or 5.6 oz. (159 g) to 6.5 oz. (187 g) raw fish
Bowls	B1 to B9 (each is set of 5)	Empty plastic bowls (¼, ½, 1, 1½, and 2 cups) of different colors	Containers to hold fish soup, composite dishes	Identify multiples and/or fractions of a cup in 0.25 increments	1 cup of fish soup is estimated to include 0.25 cup of cooked fish (2 oz. or 57 g) or 2.5 oz. (72 g) raw fish
Crayfish	C1 to C9	Color photograph (laminated) of whole crayfish	Cooked crayfish	Identify number of organisms	1 crayfish contains 0.26 oz. (7.2 g) of uncooked edible meat
Mussels	M1 to M9	Color photograph (laminated) of plate with 6 half-shell mussels	Cooked mussels and other bivalve shellfish	Identify number of organisms	1 mussel contains 0.4 oz. (10 g) of uncooked edible tissue
Shrimp	S1 to S9	Color photograph (laminated) of plate with 6 shrimp	Cooked shrimp	Identify number of organisms	1 shrimp contains 1.6 oz. (44 g) of uncooked edible tissue
Other	N/A	Can or jar of fish (no display provided)	Fish (tuna, salmon) in a can or jar	Identify multiples and/or fractions of cans or jars in 0.25 increments	Standard tuna can is 5 oz. (142 g); mason jar is 8 oz (227 g)

Notes

1. A total of nine identical copies of each model display type will be available for use during interviews (five for NPT and four for SBT).

2. Display numbers are written in permanent marker on every model display, as well as contact information for Kristin Callahan, RIDOLFI, 206-436-2774, in the event there are questions or need for replacements.

" = inches

g = grams

oz. = ounces

6.4 Other Dietary Information

“Now I will ask you general questions about your diet.”

12. **“Was the amount of fish you ate yesterday more, less, or about the same as usual?”** (Check)

_____ More than usual

_____ Less than usual

_____ About the same as usual

13. **“Are you currently on any kind of diet, either to lose weight or for some other reason?”** (Check)

_____ Yes

_____ No

_____ Prefer not to answer

“This concludes the interview. Thank you SO very much for your time and cooperation today. Your participation will contribute significantly to the overall success of this survey and help protect the health of our Tribe. We will be calling a few people back just as a quality control measure. Thanks again for your time; that is all.”

6.5 Post-Interview

Following the interview, the interviewer will record the telephone interview end time and length and acknowledge that he/she recorded the information truthfully and to the best of his/her ability by signing the following guarantee of authenticity.

Respondent ID: _____

Record interview end time and calculate interview length.

14. End time: _____ AM / PM (circle)

15. Length of interview: _____ (hours and/or minutes)

16. I, _____ (printed name of interviewer)
hereby affirm that the answers recorded on this questionnaire reflect a
complete and accurate accounting of my interview with the respondent.

Signature of Interviewer

Date

6.6 Appendix B—Portion-to-Mass Conversion

Appendix B Fish Consumption Survey Portion Model Displays and Mass Calculations

For dietary assessments where food items are not weighed, portion sizes must be used (with frequency of consumption) to calculate consumption rates (Wrieden, et al., 2003). The U.S. Department of Agriculture (USDA), in partnership with the Centers for Disease Control and Prevention (CDC), uses 3-D food models for in-person interviews and 2-D photographs for follow-up telephone interviews to collect dietary information as part of the National Health and Nutrition Examination Survey (NHANES) (USDA, 2013). A similar approach has been successfully used for Tribal fish consumption surveys in California where University of California Davis researchers use 3-D fish fillet models of varying pre-determined masses to estimate Tribal fish consumption rates (Shilling, 2014). The USDA recommends that models represent foods “as consumed” as much as possible (for most accurate reporting); i.e., familiar in appearance and preparation method (Moshfegh, 2014). Broadly, the models used in this survey can be grouped into three types: life size depictions of fish portions (e.g. fillets), depictions of numbers of organisms consumed per serving (e.g. shellfish), or volumes of tissue or composite dishes consumed (e.g. bowls for fish meat or soup containing fish). The U.S. Environmental Protection Agency (USEPA) recommends reporting the portions in uncooked weights, however, since contaminant concentrations are measured in raw fish tissue (Kissinger, 2014). Recognizing that fish is eaten in various forms, bowls may be used as a measuring guide for fish stews and other composite dishes; although a standard recipe must be determined in advance to equate the bowl quantity to fish mass. Some respondents to this survey also reported consumption of fish tissue in volumetric terms. For example, consumption of crab meat might be reported in terms of cups of crab meat consumed. Once respondents are familiar with the models, photographs of the models can be given to respondents for the follow-up telephone interviews (CDC, 2010).

The list of common species used during the interviews to determine fish consumption is provided in Table B-1 below. The fish model displays used to determine portion sizes consumed of those species are described in Table B-2, followed by photographs and a discussion of the models and the mass calculations. There were nine to 11 copies of each display type, depending on the number of interviewers and whether replacements were necessary during the survey. The model displays, which represent common species and preparation methods, included the following:

1. Large cooked salmon fillet replica, cut into servings
2. Small cooked trout fillet replica, single serving
3. PVC pipe to represent lamprey
4. Fish jerky pieces (real, packaged) to represent dried fish
5. Measuring bowls for soups and composite dishes
6. Photographs of shellfish, including mussels, crayfish, and shrimp

Table B-1. Survey Species List

SALMON AND STEELHEAD
Chinook (King) Salmon

Coho (Silver) Salmon
Sockeye (Red) Salmon
Kokanee (resident form of sockeye)
Steelhead (migratory form of rainbow trout)
Other salmon species (specify, e.g., Chum, Pink, Atlantic salmon)
RESIDENT TROUT
Rainbow Trout
Cutthroat Trout
Cutbow Trout (hybrid of Rainbow and Cutthroat Trout)
Bull Trout (Dolly Varden)
Brook Trout
Lake Trout
Brown Trout
Other trout species (specify)
OTHER FRESHWATER FISH AND SHELLFISH
Sturgeon
Lamprey
Whitefish
Sucker
Burbot
Northern Pikeminnow (Squawfish)
Bass
Bluegill
Carp
Catfish
Crappie
Sunfish
Tilapia
Walleye
Yellow Perch
Other freshwater finfish (specify)
Crayfish
Freshwater Clams or Mussels
SEAFOOD / MARINE FISH AND SHELLFISH
Cod
Halibut
Pollock
Tuna
Lobster
Crab
Marine Clams or Mussels
Shrimp
Other marine fish or shellfish (specify)

Table B-2. Description of Portion Size Model Displays

Display Type¹	Display Numbers²	Display Description	What Display Represents	How Respondents Report Portion	Associated Mass of Uncooked Fish
Salmon	S1 to S9	Large rubber salmon fillet, cut into 24 servings	Cooked salmon and other fish species with thick fillets	Identify multiples and/or fractions for sections 1 to 24 in 0.25 increments	Servings range from 1.5 oz. (42 g) to 6.8 oz. (192 g) uncooked fish
Trout	T1 to T9	Small plastic trout fillet, single serving	Cooked trout and other fish species with thin fillets	Identify multiples and/or fractions of the fillet in 0.25 increments	One fillet is 3.0 oz. (85 g) of baked fish, or 4.0 oz. (113 g) of uncooked fish
Lamprey	L1 to L10	Gray 14" PVC pipe, 2" diameter notched every 2" for 7 servings	Cooked adult lamprey (eel)	Identify multiples and/or fractions of the 2" servings in 0.25 increments	Each 2" serving is calculated to be 4.0 oz. (or 113 g) of uncooked fish
Jerky	J1 to J11	Package of real "salmon candy" (dried fish pieces)	Dried pieces of salmon and other fish species; also crab or similar-shape tissue	Identify multiples and/or fractions of the package in 0.25 increments	Packages range from 2.4 oz. (68 g) to 3.0 oz. (84 g) of dried fish, or 5.6 oz. (159 g) to 6.5 oz. (187 g) uncooked fish
Bowls	B1 to B9 (each is set of 5)	Empty plastic bowls (¼, ½, 1, 1½, and 2 cups) of different colors	Containers to hold fish soup, composite dishes	Identify multiples and/or fractions of a cup in 0.25 increments	1 cup of fish soup includes 0.25 cup of cooked fish (2 oz. or 57 g) or 2.5 oz. (72 g) uncooked fish; If not soup, 1 cup of fish (8 oz or 227 g) or 10.7 oz (302.4 g) uncooked fish
Crayfish	C1 to C10	Color laminated photograph of whole crayfish	Cooked crayfish	Identify number of organisms	1 crayfish contains 0.26 oz. (7.2 g) of uncooked edible tissue
Mussels	M1 to M10	Color laminated photograph of plate with 6 half-shell mussels	Cooked mussels and other bivalve shellfish	Identify number of organisms	1 mussel contains 0.4 oz. (10 g) of uncooked edible tissue
Shrimp	Sh1 to Sh10	Color laminated photograph of plate with 6 shrimp	Cooked shrimp	Identify number of organisms	1 shrimp contains 1.6 oz. (44 g) of uncooked edible tissue

Notes: " = inches, g = grams, oz. = ounces

B.1 Salmon Fillet Model Display

A 3-D replica of a Chinook salmon fillet was obtained from a local Seattle artist (Figure B-1). The fillet (with skin and tail) was made of a flexible and durable urethane rubber, which was poured into a latex mold built based on a fresh (brined) ocean-caught Chinook salmon fillet. The rubber model was painted the color of cooked salmon muscle (fillet) and other tissues (skin and tail). The rubber model weighed 6.8 pounds; the fillet part of the model, which was used to report portion sizes (without skin or tail), had a total length of 29 inches, a width ranging from 3 inches (at the tail end) to 7.5 inches (in the middle), and a depth up to approximately 1 inch.

The salmon replica was used as a model display to indicate portion sizes of all species of baked or smoked salmon, including Chinook, coho, and sockeye salmon, and also other large fish with thick fillets, such as sturgeon or halibut, assuming the respondents could associate the model cross-species. The fillet was cut into 24 servings, each of which was labeled with a number (1 through 24). During the interviews, respondents indicated which serving pieces represented their average portion size, and the interviewers recorded those numbers for each species type (translated to mass during data analysis). The display number (S1 to S9) of the specific model used during the interview was also recorded.

Figure B-1. Salmon Fillet Replica (24 Servings)



To equate fish model servings to mass of fresh fish, a Chinook salmon of comparable size was obtained from the Pike's Place Market in Seattle, Washington. Professional staff at the fish market filleted and skinned an ocean-caught Chinook salmon and cut it into servings as equal to the model servings as possible. The whole raw fish (with skin, but no tail) weighed approximately 7 pounds; 6.8 pounds without the skin. Each serving was later weighed (in ounces and grams) on a scale (precision of +/- 2 grams), both uncooked and cooked (after oven-baking for 30 minutes). There was an average 12% loss of mass from the light baking process. Due to the amorphousness of fresh fish (and, therefore, the model), servings nearest the head and tail were found to have less mass (about half) than those in the middle of the fillet. Uncooked fish mass of each of the 24 servings of fresh fish (representing the 24 servings of the portion model) is presented in Table A.

B.2 Trout-Like Fillet Model Display

A 3-D replica of a baked tilapia fillet from Barnard, Ltd. (made of flexible plastic resin, latex- and lead-free, 3.5 x 5-inches, and weighing 2.6 ounces), was used as a model display to indicate portion sizes of baked or smoked trout and other fish species with lighter-colored tissue and thinner fillets as compared to salmon (Figure B-2). The trout-like replica represented a 3-ounce (or 85-gram) fillet of baked fish, and was versatile enough to represent a variety of freshwater and marine species. Respondents reported fractions (0.25, 0.5, and 0.75) and/or multiples (1, 2, 3, etc.) of the fillet to indicate their portion size, and interviewers recorded that number (translated into total mass during data analysis). The display number (T1 through T9) of the specific model used during the interview was also recorded.

Figure B-2. Trout-Like Fillet Replica (Single Serving)



Based on the replica representing a 3-ounce baked fish fillet, and assuming a 25% moisture loss during the baking process (see Attachment 1; USEPA, 2014), Table B presents various portion sizes converted into uncooked fish mass (based on fractions or multiples of 1). One serving (one whole trout fillet) that is 3 ounces (85 grams) baked equates to 4 ounces (113 grams) uncooked.¹¹ Additional multiples and/or fractions reported by respondents were calculated during data analysis.

B.3. Lamprey (PVC Pipe) Display

Lamprey (eel) is a unique anadromous species type consumed by Tribal members. As recommended by Tribal Representatives, a 14-inch long, 2-inch diameter gray PVC pipe was used as a model display to indicate portion sizes of lamprey (Figure B-3). The length was an approximate average size of an adult lamprey post-migration, preparing to spawn up-river (Kostow, 2002). The PVC pipe had section marks notched every 2 inches to indicate servings. Each 2-inch serving was labeled with a number (1 through 7). Respondents reported fractions

¹¹ Values shown in ounces and grams reflect the direct mass conversions from cooked to uncooked weights (according to the equation in Attachment 1).

(0.25, 0.5, or 0.75) and/or multiples (1, 2, 3, etc.) of a serving to represent their average portion size, and the interviewers recorded that number (translated into total mass during data analysis). The display number (L1 to L10) of the specific pipe used during the interview was also recorded.

Figure B-3. PVC “Lamprey” Pipe (7 Servings)



Assuming a density as least as great as other fresh (raw) fish muscle, approximately 1.1 g/cm³ (UNFAO, 2014a), and a calculated volume of a cylinder section (102.9 cm³), the mass of each 2-inch serving was estimated to be 4.0 ounces (113 grams). Table B presents portion sizes as fractions and multiples of one (1) serving. Additional multiples and/or fractions of these servings reported by respondents were calculated during data analysis.

B.4. Jerky / Dried Fish Display

In cases where respondents reported eating any species of fish (salmonid or other) in a dried form, real fish jerky (known as “salmon candy”), protected in a sealed package, was used to indicate portion sizes (Figure B-4). Respondents reported fractions (0.25, 0.5, or 0.75) and/or multiples (1, 2, 3, etc.) of the approximately 3-ounce (85-gram) package of dried salmon to indicate their portion size, and the interviewers recorded that number (translated into total mass during data analysis). The display number (J1 to J11) of the specific package used during the interview was also recorded.

In this case, recording the specific display number was particularly important because, although the label stated that there were 3 ounces (85 grams) in every package, the true mass was found to vary between packages (and was generally less). Two extra packages were purchased and opened, and the contents were weighed (in ounces and grams) on a scale (precision of +/- 2 grams). The dried salmon within each of these packages was measured at 2.6 ounces (72 grams), and the package alone weighed 0.2 ounces (5.7 grams). Without opening the display packages to be used during the survey (to maintain the integrity of the contents), each whole package was weighed and, subtracting the weight of the bag (0.2 ounces), total mass of dried fish was calculated. That mass, without a moisture loss conversion, was used for reporting fresh tissue such as crab.

Figure B-4. Package of Real Jerky/Dried Fish (“Salmon Candy”)

To represent dried fish, assuming a 57% moisture loss during the desiccation process (Attachment 1; USEPA, 2014), Table C presents the mass of salmon jerky measured in each display package converted to uncooked mass (based on fractions or multiples of 1). One serving (one whole package of display J1) that was 2.5 ounces (70 grams) dried, for example, converted to 5.8 ounces (163 grams) uncooked. Fractions and/or multiples of one serving (one package) were calculated based upon one (1) serving of the particular display package during data analysis.

B.5. Soup Bowl Display

For fish soups and composite dishes, portion sizes were determined using empty hard-plastic bowls of different quantities (and colors) within a ¼-cup (red), ½-cup (yellow), 1-cup (purple), 1½-cup (blue), or 2-cup (green) bowl (Figure B-5). Respondents reported the fractions (0.25 or 0.5 cup) or multiples (1, 1.5, 2 cups, etc.) of one cup to indicate their portion size, and the interviewers recorded that number (translated into mass of fish during data analysis). The display number (B1 to B9) of the measuring bowl set used during the interview was also recorded.

Figure B-5. Measuring Bowls for Fish Soups

As suggested by Tribal representatives (Holt, et al., 2014), it was estimated that 1 cup of soup contained approximately 0.25 cup (or 2 ounces or 57 grams) of cooked fish (i.e., soup was 25% fish). Based on the assumption that a one (1)-cup serving of soup contained 2 ounces (57 grams) of cooked fish, and assuming a moisture loss of 21% from cooking in soup (“wet cooked in moist heat”), Table B presents the mass of uncooked fish according to number of cups (servings) of soup (based on fractions or multiples of 1) (Attachment 1; USEPA, 2014). Additional multiples and/or fractions that were reported by respondents were calculated during data analysis. Note that the measuring bowls were intended to represent soups, stews, chowders, or other composite dishes such as casseroles, applying the same general assumption of 1 cup composite dish: 0.25 cup cooked fish ratio. As has been noted, some respondents reported consumption of fish or shellfish tissue in volumetric terms. When the bowls were used to describe fish volume rather than soup, it was assumed that one cup corresponded to 8 ounces (227 g) of cooked fish and 10.7 ounces (302.4 g) of uncooked fish, assuming a 25% moisture loss, as from canning or a dry heat method (Table B-4).

B.6. Shellfish Photograph Displays

For shellfish, portion sizes were determined using laminated color photograph displays (photo-displays), printed to 100% scale (actual size). There was a photo-display of a single, whole crayfish (tail tucked under); a photo-display of mussels (six half shells on a plate) to represent marine and freshwater bivalves (clams and mussels); and a photo-display of shrimp (six on a plate), as shown on Figures B-6 through B-8, respectively. Respondents reported numbers of organisms (e.g., number of crayfish, mussels, or shrimp) to indicate their portion size, and the interviewers recorded that number (translated into mass of shellfish during data analysis). The photo-display number (C1 to C10 for crayfish; M1 to M10 for mussels; or SH1 to SH10 for shrimp) of the specific photo-display used during the interview was also recorded.

Figure B-6 illustrates a native crayfish, *Pacifastacus leniusculus*, the most widely distributed species in the Pacific Northwest (Johnsen and Taugbøl, 2010; Larson and Olden, 2011), which was obtained from the Columbia River watershed and purchased at the Pikes Place Market in Seattle, Washington. Weight of the whole uncooked organism was measured at 1.3 ounces (36 grams). The primary edible tissue of crayfish is the tail (abdominal muscle), the percent (to whole body) of which depends on size and maturity. The edible portion of *P. leniusculus* has

been estimated to be 15 to 25% of total body weight (Lee and Wickins, 1992, as cited in Harlioğlu, 1996). Assuming that an average 20% of body mass is edible tissue, the mass consumed per single organism (of a size organism shown in the figure) is 0.26 ounces (7.2 grams), as shown in **Table B**. Total numbers of crayfish reported by respondents as the portion size consumed were recorded and the associated mass was calculated during data analysis.

Figure B-6. Crayfish Photo-Display



Figure B-7 illustrates a common intertidal zone bivalve, *Mytilus edulis* or Blue Mussel, which is found on the Pacific coast of the U.S. and is domestically farmed (NOAA, 2014). Freshwater mussels are in a different subclass of bivalves than the marine species, but are superficially similar in appearance. The figure is intended to represent all types of marine and freshwater bivalves that may be consumed by participants. The shell (half) is included with cooked mussel meat in the photograph to display a familiar preparation method, but it is the edible soft tissue that is of interest. Soft tissue can be nearly 50% of total live (wet) weight when the organism is in best condition (UNFAO, 2014b). One study reported that organisms investing energy in shell growth may actually limit soft tissue growth (Gimin et al., 2004). For this study, average tissue weights, which vary by species, age, gender, density, season, food availability, and other environmental conditions, were used for portion size calculations.

Multiple sources of information were investigated to determine the average mass of soft tissue consumed per bivalve organism. The mean wet weight of edible soft tissue of a single mussel consumed by California Indians was reported (in an archeological study) as 1.065 grams, but with no supporting documentation (Heizer and Whipple, 1971). A more recent study of *Mytilus edulis* in Québec, Canada, collected 4,224 juvenile mussels and measured an average soft tissue dry weight (ash free) of 0.037 grams (Alunno-Bruscia et al., 2001), which equates to 0.42 grams wet weight (likely a juvenile that is too small to be edible). Finally, a reference documenting the life history of mussels suggested that average large adult mussel soft tissue weighs 1 g dry weight (Newell and Moran, 1989), which (assuming 10% solids) equates to 10 g. This value was used to represent the mass of a single bivalve organisms, as shown in **Table B**. Total numbers of

mussels or clams reported by respondents as the portion size consumed were recorded, and the associated mass was calculated during data analysis.

Figure B-7. Mussels Photo-Display



Figure B-8 illustrates a large shrimp, likely *Pandalus borealis*, northern prawn or pink shrimp. Large males commonly reach 170 millimeters (mm) (6.69 inches), which (when including head) approximates the organism sizes in the photograph. Based on a total length to weight conversion cited by the U.S. Fish and Wildlife Service (Nichols, 1982 as cited in Bielsa, et al., 1983), a length of 170 mm equates to 44 grams (1.6 ounces). This value was used to represent the mass of a single shrimp organism, based upon fractions and multiples of 1, as shown in Table B. Total numbers of shrimp reported by respondents as the portion size consumed were recorded, and the associated mass was calculated during data analysis.

Figure B-8. Shrimp Photo-Display**B.7. Fish in Cans or Jars**

For fish reported as eaten from cans or jars, the following assumptions were made: 1 standard can of tuna (or other commercially canned fish) contains 5 ounces of cooked fish and 1 standard Mason jar of salmon (or other fish, home-canned) contains 8 ounces of cooked fish. Based on a moisture loss of 25% during the canning process (Attachment 1; USEPA, 2014), a single can or jar equates to 6.7 ounces (189 grams) and 10.7 ounces (302 grams) of uncooked fish, respectively. Table B-3 presents the uncooked fish mass associated with fractions and multiples of 1 can or 1 jar, respectively, of cooked fish.

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COOKING LOSS FACTORS

Similar to the Idaho Tribal Fish Consumption Survey, NHANES participants report the amount of fish consumed “as prepared,” which is converted to a raw wet weight in grams. Since the process of cooking changes the moisture content of fish, a weight conversion based on the estimated moisture loss due to cooking is required to calculate the grams of raw fish consumed (USEPA, 2014). Adjustment factors for cooking loss used by NHANES, and reported by EPA, are provided in Table B-4 (with values in bold associated with key preparation methods presented in this study; notes in italics have been added by the authors).

The following equation is used to convert cooked mass to uncooked (raw) mass:

$$\text{Weight of raw fish} = \frac{\text{Weight of cooked fish}}{1 - (\% \text{ Moisture Loss}/100)}$$

Table B-4. Estimated Fish Moisture Loss Due to Cooking

Cooking / Preparation Method	Percent moisture loss
Dried (<i>e.g., jerky</i>)	57
Kippered	46
Smoked, (other than salmon)	36
Salted	33
Canned	25
Cooked, dry heat (<i>e.g., baked</i>)	25
Restructured	25
Cooked, moist heat (<i>e.g., soup</i>)	21
Smoked salmon	17
Pickled	16
Fried	12
Raw	0

Source: USEPA, 2014

Figure B.9. Species Identification Photographs

(See supplemental PDF file.)

Figure B-9 shows the species identification photographs used by the interviewers to facilitate the administration of the questionnaire.

Portion-to-Mass Calculations

More specific details of the portion-to-mass conversion procedure are described below, including the specific factors used for each portion model, how write-in species were handled, how can and jar portion sizes were determined, how shellfish portion sizes were determined, and special-case exceptions to the overall procedure.

6.6.1 Portion-to-Mass Conversion Tables

The portion-to-mass conversion factors for each model are shown in Tables A (salmon fillet sections), B (trout, soup bowl, lamprey, shellfish, can and jar models), and C (jerky models). Two different conversion factors were determined for bowls, depending on whether the respondent likely intended the bowl to refer to the total volume of a composite dish of which fish was only one component or whether the bowl referred to the actual volume of fish. The most common example of the latter would be canned tuna, as used, for example, in a tuna fish sandwich. The bowl conversions are described in detail in section 6.6.3 of this appendix.

Lastly, two conversion factors were used for each jerky model, with and without adjustment for moisture loss due to drying. The moisture-loss-adjusted conversion was used for most species. However, for certain species (noted in Table C) it was assumed that the respondent utilized the jerky model to describe consumption due to the visual appearance of the model rather than to imply it was consumed in a dried form. In those cases, the conversion without moisture loss adjustment was used.

Table A. Portion-to-mass conversions for the salmon replica with fillet divided into sections.

Fillet Section Number	Portion-to-Mass (grams)	Fillet Section Number	Portion-to-Mass (grams)
1	50	13	192
2	80	14	180
3	92	15	178
4	112	16	162
5	124	17	170
6	132	18	138
7	176	19	124
8	190	20	110
9	174	21	88
10	170	22	88
11	178	23	66
12	176	24	42

Table B. Portion-to-mass conversions for other models.

Model	Unit	Portion-to-Mass (grams)*
Trout replica	1 fillet	113.4
Measuring bowls (for soup, stew, etc.)**	1 cup	72.2
Measuring bowls (for fish volume)**	1 cup	302.4
Lamprey	1 serving	113.2
Crayfish	1 organism	7.2
Mussel	1 organism	10.0
Shrimp	1 organism	44.0
Can	1 5 oz can***	302.4
Jar	1 8 oz jar***	189.0

*Values rounded to 1 decimal digit for display although 4 decimal digits were used for calculations to avoid accumulating rounding errors;

**The 72.2 grams conversion factor was used when the respondent described consumption using the measuring bowl and either 1) specified the preparation as soup or stew (24 hour recall only) or 2) the species being described was clams, mussels or lamprey (FFQ only); this factor assumed only a portion of the volume was fish; otherwise, the 302.4 grams factor was used, which assumed the entire volume was fish (see section 6.6.3 of this appendix);

***The conversion factor was adjusted proportionally if a non-standard size was specified (i.e., not 5 oz. or 8 oz.) as described in the *Portion-to-mass conversions for cans and jars* section below.

Table C. Portion-to-mass conversions for jerky, depending on the jerky model and species.

Jerky Model	Portion-to-Mass (grams)*	
	With Moisture Loss Adjustment (Species Group A)	Without Moisture Loss Adjustment (Species Group B)
J1	163.5	70.3
J2	172.8	74.3
J3	168.1	72.3
J4	163.5	70.3
J5	163.5	70.3
J6	158.8	68.3
J7	168.1	72.3
J8	163.5	70.3
J9	186.7	80.3
J10	196.0	84.3
J11	191.4	82.3

Group A contains all salmon, steelhead, freshwater finfish, cod, halibut, pollock, and other marine finfish not in group B;

Group B contains all freshwater and marine shellfish, tuna and sardines;

See Table B-4 for moisture loss adjustment factors;

*Values rounded to 1 decimal digit for display although 4 decimal digits were used for calculations to avoid accumulating rounding errors.

6.6.2 Write-In Species Corrections and Mapping

In CAPI, several general species categories allowed the respondent to describe consumption of specific but unlisted species, such as pink salmon or oysters. These species categories include other salmon, other trout, other freshwater finfish, other marine fish or shellfish, and other fish or shellfish. In each case the interviewer was able to write in the name of the specific species.

Because these write-in fields allowed unrestricted free text, there were occasional spelling variations and instances where a listed species (e.g., tuna) was written in or a write-in species belonged in a more specific species category. For example, marine clams or mussels would be a more specific category for a write-in of butter clams rather than “other marine fish and shellfish.” All write-in text instances were examined manually to correct for spelling variation and remap to a more specific CAPI species category when needed. These changes, which were made in consultation with Ridolfi staff, facilitated species-specific portion-to-mass conversions and species grouping for reporting.

6.6.3 Portion-to-Mass Conversions for Soup Bowls

The soup bowls were originally intended to be used only for specifying soups, stews, or other composite dishes where the fish was only a component of the total volume; however, during the course of interviewing it was found that respondents more often used this model to describe the volume of fish they consumed, not including other non-fish components. This was particularly common for tuna, crab and lobster meat and small shrimp, the latter being difficult to count individually, as would be required to utilize the shrimp model. In contrast, clams or mussels were most often consumed and described as soups.

Whether the respondent intended the soup bowl to refer to A) the total volume of a composite dish or B) only to the volume of fish contained in the dish was not recorded by the interviewer. However, through discussions with the interviewer supervisor (who performed and observed a number of interviews) and some of the interviewers who performed a large number of interviews, it was determined which species were most commonly described as type A or type B. The type A species (fish was a component of soup or stew) were determined to be freshwater clams or mussels, marine clams or mussels and lamprey. All other species were type B.

When performing the mass conversions for the FFQ interviews, where a preparation method was not recorded, type A species described using bowls were converted using 72.2 grams per 1 cup bowl (see Figure B-5 of this appendix). Type B species were converted using 302.4 grams per 1 cup bowl. This conversion assumed a 25% moisture loss, the same factor assumed for canned fish or fish cooked with a dry heat (Table B-4).

However, when performing the mass conversions for the 24 hour recall, the 72.2 grams per 1 cup bowl conversion (type A) was used only when the preparation was noted as soup or stew, regardless of species. The 302.4 grams per 1 cup bowl conversion (type B) was used for all other preparations, including casserole or mixed dish (a single category). This preparation was most often used to refer to the final form of the dish rather than how the respondent described the portion size. For example, a tuna fish sandwich or shrimp salad would be described as a mixed dish, but the soup bowl model was used to describe the amount of tuna or shrimp included instead of the total volume of the final dish. This is the only aspect of the portion-to-mass conversions which differed between the 24 hour recall and FFQ.

6.6.4 Portion-to-Mass Conversions for Cans and Jars

When respondents provided portion sizes in terms of cans or jars, the interviewer had a text field in which to capture specific descriptions. Unless otherwise specified, cans were assumed to be 5-oz. and jars 8-oz. In consultation with Ridolfi, an algorithm was developed which utilizes the species and text description field to determine the most appropriate portion-to-mass conversion. The steps of the algorithm are as follows:

1. If an unambiguous container size could be determined from the text field (e.g., 6 oz., 1 qt., 1 cup), this size was used for the conversion.
2. Otherwise, if the text field contained the string “can” and did not contain “jar” (which would create an ambiguity), then 5 oz. was assumed.
3. If the text field contained the string “jar” but not “can,” then 8 oz. was assumed.
4. Finally, if a size could not be determined by steps 1–3, a default was assumed based on the species. For all freshwater species, cod, halibut, and pollock, 8 oz. was assumed. For the remaining marine species, 5 oz. was assumed.

6.6.5 Portion-to-Mass Conversions for Number of Shellfish

When reporting consumption of shellfish, the respondent had the option of specifying the number of organisms. There were three portion models for this purpose: crayfish, mussels, and shrimp, each with different portion-to-mass conversion factors. In November 2014 a field was

added to CAPI to allow the interviewer to record which model was used. Due to restrictions in CAPI, this was implemented as a text field and the interviewer was instructed to use “C” for crayfish, “M” for mussels, and “S” for shrimp. However, the text field also allowed other text, and an algorithm was developed in consultation with Ridolfi staff to examine the model text field and the species field to determine the most appropriate model for mass conversion. The procedure used is:

1. For any clams or mussels species, “mussels” was chosen regardless of the shellfish model recorded.
2. For other species, if a valid shellfish model code (C, M, S) could be determined from the text field, that model was chosen.
3. If a valid shellfish model could not be determined, Table X was used to choose the likely model used:

Table X. Choice of shellfish model *when not specified by the interviewer.*

Species in CAPI	Chosen Shellfish Model
Crayfish, lobster, crab	Crayfish
Freshwater clams or mussels, marine clams or mussels, oysters, scallops	Mussels
Shrimp, prawns, squid, octopus	Shrimp

6.6.6 Exceptions to the Portion-to-Mass Conversion Procedure

Two records that did not follow the expected protocol were manually modified to perform the mass conversion. These are described below:

1. One respondent reported shark consumption in a higher consumption period and a lower consumption period. The respondent reported consuming shark once per year in the higher period and 0 times per year in the lower period, but did not provide the duration of the higher period. This was manually converted into once per year as a single period instead of a higher and lower period. The standard portion-to-mass conversion procedure was then applied to the modified record.
2. One respondent reported consuming alligator as 2 soup bowls per year. This response was excluded because the alligator is neither a finfish nor a shellfish.

6.7 Appendix C—Additional Detail on Imputations

6.7.1 Grouping of Species for Imputation of Uncommon Responses

As described in Section 5.18.3 of the main body of this report, when a component needed to calculate a species-specific consumption rate (portion frequency, portion size or higher consumption period percentage of the year) was missing, similar non-missing responses were used to estimate a mean value for imputation. To be considered similar, a response needed to be for the same species and have the same period type (the types were: whole year, higher consumption period or lower consumption period). This rule was used when the number of similar responses was at least 5. When the number was less than 5, species were grouped to expand the number of similar responses on a case-by-case basis, as described in Table X. In general, the choice of groupings was restrictive and based on consultation with Ridolfi staff. When high-consumption period percentage was being imputed, the grouping was less restrictive than for size and frequency because the number of available responses was smaller and because the majority of responses were in the range of 8%–33% (1–4 months) across all species. As the sensitivity analysis in the next section shows, the final results are similar under a wide range of imputed values, so the precise value used for the imputation is not critical.

Table X. Species groupings used to impute missing values for uncommon species (less than 5 non-missing responses).

Species in CAPI	Missing Field	No. Imputed	Species group used for Imputation
Other salmon*	Portion frequency	1	Other salmon,* Kokanee, Sockeye, which are less commonly consumed salmon species
Other salmon*	Higher period percentage	1	Other salmon,* Kokanee, Sockeye, which are less commonly consumed salmon species
All salmon or unspecified	Higher period percentage	5	All salmon and steelhead species/groups
All trout or unspecified	Higher period percentage	1	All resident trout species/groups
Freshwater clams or mussels	Higher period percentage	1	All freshwater or marine shellfish species
Lobster	Higher period percentage	4	All freshwater or marine shellfish species

*Other salmon is a species category in CAPI that allowed for a specific salmon species not listed to be written in, most commonly pink or Atlantic salmon.

6.7.2 Sensitivity Analysis on Imputations

The impact of imputing missing values in calculating consumption rates was explored by recomputing rates under two extreme approaches: imputing 0 for all missing values, which would systematically underestimate consumption, and imputing twice the mean value (based on the same species), which in many cases would overestimate consumption. Consumption rates based on alternative imputations for Group 1 and Group 2 are shown in Tables 12AA and 12AB, respectively. There was usually little or no difference in the final estimates compared to the

imputation approach used in the report (imputing the mean value from the same species), with the *largest* differences being 1.6%. Most differences were much smaller, often 0. As neither zero for all missing values nor twice the mean for all missing values are particularly plausible, while the true but unknown values are most likely between those two extremes, these results show that imputation of missing values had a negligible impact on the final consumption rates presented in this report.

Table 12AA. Sensitivity analysis of imputation method on the Group 1 consumption rates. Estimates are weighted.

	Imputation Method		
	Zero*	Mean** (used in report)	High***
No. of consumers	375	375	375
Mean	124.4	125.4	125.9
SD	149.1	148.9	148.9
Min	0.4	0.4	0.4
50 th percentile	73.9	74.2	75.0
90 th percentile	260.0	260.0	260.0
95 th percentile	402.8	402.8	402.8
99 th percentile	794.1	794.1	794.1
Max	1371.9	1371.9	1371.9

*All missing values were assigned the value 0;

**All missing values were assigned the mean value from the same species;

***All missing values were assigned twice the mean value from the same species.

Table 12AB. Sensitivity analysis of imputation method on the Group 2 consumption rates. Estimates are weighted.

	Imputation Method		
	Zero*	Mean** (used in report)	High***
No. of consumers	370	370	370
Mean	85.7	86.6	87.1
SD	119.9	119.8	119.7
Min	0.0	0.3	0.3
50 th percentile	48.8	49.3	50.1
90 th percentile	195.7	195.7	195.7
95 th percentile	245.0	245.0	245.0
99 th percentile	660.3	660.3	660.3
Max	1323.8	1323.8	1323.8

*All missing values were assigned the value 0;

**All missing values were assigned the mean value from the same species;

***All missing values were assigned twice the mean value from the same species.

6.8 Appendix D—Additional Detailed Tables

The tables in this appendix supplement tables already included in the body of the report.

Table 4A. Demographics of the eligible population, selected sample and first interview consumers with known consumption rates. Estimates are unweighted.

Variable		Eligible Population (N=1574)		Sample (N=1250)		First interview Consumer* (N=375)	
		%	N	%	N	%	N
Gender	Male	48.2%	758	48.1%	601	53.6%	201
	Female	51.8%	816	51.9%	649	46.4%	174
Age	18-29 years	23.4%	369	23.4%	293	12.0%	45
	30-39 years	19.4%	305	19.4%	242	20.3%	76
	40-49 years	18.8%	296	18.8%	235	25.6%	96
	50-59 years	18.0%	283	18.0%	225	19.7%	74
	60 years or older	20.4%	321	20.4%	255	22.4%	84
Documented fisher	Yes	23.6%	371	23.0%	288	31.7%	119
	No	76.4%	1203	77.0%	962	68.3%	256
Zip code	83540	57.6%	906	58.3%	729	73.6%	276
	83536	12.4%	196	12.1%	151	8.5%	32
	83501	10.9%	172	10.9%	136	6.1%	23
	Other	19.1%	300	18.7%	234	11.7%	44

*Includes those who completed the first interview and have a calculable non-zero consumption rate.

Table 5A. Demographics of the first interview consumers with known consumption rates. Estimates are unweighted.

		% or mean \pm SD	No. Responded
Gender*	Male	53.6% (201)	375
	Female	46.4% (174)	
Age*	18-29 years	12.0% (45)	375
	30-39 years	20.3% (76)	
	40-49 years	25.6% (96)	
	50-59 years	19.7% (74)	
	60 years or older	22.4% (84)	
Weight, kgs		89.6 \pm 19.6	364
No. in household	1	8.5% (32)	375
	2	18.7% (70)	
	3-4	44.8% (168)	
	5 or more	28.0% (105)	
Documented fisher*	Yes	31.7% (119)	375
	No	68.3% (256)	
Live on reservation	Yes	88.0% (329)	374
	No	12.0% (45)	
Highest education	Less than High School	1.9% (7)	372
	High school / GED	53.5% (199)	
	Some college	44.6% (166)	
Annual household income	\leq \$15K	20.8% (70)	337
	\$15K – \$45K	53.4% (180)	
	>\$45K	25.8% (87)	

*From the enrollment list or fisher indicator list; other demographics were determined from the questionnaire.

Table 11A.1: Estimated distribution consumption rates (g/day) of consumers within demographic subgroups. All rates are for total consumption (group 1). Estimates are weighted. Mean, SD, median ('50%') and percentiles.

Group	No. of Consumers*	Mean	SD	Percentiles									
				50%	55%	60%	65%	70%	75%	80%	85%	90%	95%
Gender**													
Male	201	152.8	175.3	101.0	114.5	131.4	148.6	163.7	188.0	204.0	226.7	284.7	463.2
Female	174	99.3	112.9	59.5	69.0	73.9	91.0	108.3	121.3	135.9	156.9	239.7	319.7
Age**													
18-29 years	45	110.7	113.3	82.1	99.3	108.2	108.9	111.1	122.6	142.7	162.0	202.4	228.5
30-39 years	76	145.0	163.8	74.3	97.3	129.2	139.3	159.0	167.1	192.0	243.3	324.9	451.6
40-49 years	96	122.5	126.6	76.9	82.9	93.7	105.8	122.7	138.6	156.5	200.9	266.6	465.2
50-59 years	74	161.7	218.0	88.3	105.8	136.2	150.0	180.7	191.5	216.3	245.7	270.8	671.2
60 years or older	84	93.0	94.7	61.5	70.9	74.0	90.0	112.5	126.1	138.3	161.9	238.9	317.3
Documented Fisher**													
Yes	119	160.0	173.6	100.1	118.1	127.8	157.0	179.9	201.9	228.5	244.4	298.0	489.0
No	256	114.3	138.6	69.6	76.1	91.2	108.5	122.5	137.4	156.3	192.5	242.4	343.8
Live on reservation													
Yes	329	127.3	152.0	72.6	81.9	98.3	122.7	136.3	156.0	189.8	224.2	279.3	407.2
No	45	116.2	134.8	99.4	106.6	108.8	109.0	109.6	120.7	124.1	175.4	203.8	240.7
Number who live in household													
1	32	136.7	187.9	82.2	95.6	110.1	113.9	131.7	136.3	146.6	215.0	264.2	***510.1
2	70	128.3	146.4	65.5	86.4	102.9	136.7	173.5	184.0	210.9	250.1	277.0	453.8
3-4	168	113.5	138.9	72.3	78.9	89.8	108.5	110.0	123.4	146.1	175.5	223.9	318.9
5 or more	105	139.0	154.1	85.6	106.2	128.8	136.9	156.0	167.6	197.2	214.4	284.5	347.5
Highest education													
High school / GED or less	206	127.3	169.1	74.4	88.8	105.9	109.2	122.1	135.4	157.4	202.8	252.5	414.3
Associates degree or higher	166	124.2	119.3	74.2	88.7	109.9	133.2	150.4	179.2	194.6	221.4	266.8	398.7
Annual household income													
≤ \$15K	70	138.0	192.9	70.5	83.5	99.8	109.0	132.0	143.8	176.7	213.7	281.9	567.7
\$15K – \$45K	180	116.8	128.8	71.8	82.5	94.7	109.3	121.1	137.3	157.1	205.3	229.6	384.5
>\$45K	87	133.5	114.8	89.8	120.3	133.1	148.2	161.0	178.9	198.9	223.9	269.9	362.1

*Consumers with unknown or missing subgroup status were excluded for the analysis of that subgroup;

**From the enrollment list or fisher indicator list; other subgroups were determined from the questionnaire;

***Two or fewer expected respondents with rates equal or greater than the reported percentile (approximately); interpret this percentile more cautiously.



6.9 Appendix E—Design of a Survey on Fish Consumption by the Nez Perce Tribe

DESIGN OF A SURVEY ON FISH CONSUMPTION BY THE NEZ PERCE TRIBE

Prepared for
The Nez Perce Tribe
The U.S. Environmental Protection Agency
SRA International, Inc.

Prepared by
The Mountain-Whisper-Light Statistics and RIDOLFI Inc.

February 2014



Design of a Survey
on Fish Consumption
by the Nez Perce Tribe

Prepared for
The Nez Perce Tribe
The U.S. Environmental Protection Agency
SRA International, Inc.

Prepared by
The Mountain-Whisper-Light Statistics and RIDOLFI Inc.

February 2014



EXECUTIVE SUMMARY

Survey Purpose and Approach

The Tribal Governments in the State of Idaho are collaborating with the U.S. Environmental Protection Agency (EPA) Region 10, the State of Idaho, and other stakeholders to develop methods for gathering data on fish consumption rates (FCRs), which includes all freshwater and marine finfish and shellfish. A survey is being designed to obtain data necessary for determining fish consumption rates for the Tribes in Idaho, exploring both current and heritage rates. An additional objective of the survey is to determine how current fish consumption rates might increase if fisheries resources are improved. This information will be useful for developing water quality standards that are protective of the current and future health of the Tribes and of other Idaho residents. Water quality is of great importance to the Native American Tribes in Idaho, since a substantial portion of their diet is derived from aquatic sources, and water and aquatic resources play an important cultural and spiritual role for them. It has been documented elsewhere in the Pacific Northwest (e.g., Puget Sound and the Columbia River) that Tribes consume far more fish and shellfish than the general U.S. population. In addition, reported historic fish consumption rates are very high. EPA is therefore interested in investigating FCRs for Idaho Tribes to support development of Tribal ambient water quality criteria (AWQC) to protect high fish consuming populations.

Development of the survey design involved informational visits to the Idaho Tribes, including an open exchange of interests, concerns, and ideas; collection of relevant information on culture, history, fisheries, environment, and Tribal objectives; investigation of statistical methods and issues; development of an appropriate statistical methodology for the current fish consumption survey and an approach for documentation of heritage rates; preparation of a multi-part survey questionnaire, including screening, two 24-hour dietary recalls, and food frequency questionnaire; calculations to support a statistically valid design; and coordination with involved agencies, tribes, consortia, and consultants. This report describes the proposed survey design for the Nez Perce Tribe (NPT).

Current Survey and Historic Assessment

There are three eras of importance for a fish consumption study: the past, present, and future. Over an extended period of time, the Tribes have experienced environmental and social changes that have reduced fish abundance, access to fish, safety of fish consumption, and fish consumption



itself. The Tribes are seeking to increase fish availability, fish safety (i.e., free from contamination), and fish consumption in the future. Thus, current consumption rates do not reflect the Tribe's past nor its future goals. Assessing consumption through a current, cross-sectional survey will provide relatively precise information about current consumption only. For the overall goals of this survey project, the current consumption rates should not be considered in isolation. Assessing past consumption through an assessment of historical materials and, potentially, interviews with some older individuals whose history reaches back a long lifetime may be highly informative, but rates so derived are likely not as precise because they involve longer-term recall and unknown quality and completeness of past documentation.

Since the results of the survey may be used for water quality regulation, it is intended that rates and ancillary materials will support that use. The strength of the current rates is the methodology and the ability to compare them to contemporary rates for other populations. The strength of the historical rates is their relevance to the goals of the Tribe, which is to restore fish consumption to past, higher levels. Future rates may be projected based on anticipated increases in fish populations resulting from planned or ongoing habitat restoration and supplementation efforts, and associated increases in fish consumption.

The draft survey design includes a description of the Nez Perce Tribe's story about suppression, based primarily on existing literature and supplemented with input directly from the Tribes. Historical fish harvest and fish consumption by Tribal members is presented, as well as causes of decline in the fish populations, and goals for the future. Additional research and discussion with Tribal representatives and experts will take place to implement the survey design. During the survey implementation phase, a more in-depth study of suppression will take place and its implications for future fish consumption will be considered.

Suppression Effects and Their Implications

According to the National Environmental Justice Advisory Council (NEJAC), a "suppression effect" occurs when a fish consumption rate for a given population, group, or tribe reflects a current level of consumption that is artificially diminished from an appropriate baseline level of consumption for that population, group, or tribe. The baseline level of consumption is suppressed, and cannot be characterized via a survey of current consumption.



There are circumstances in which suppression effects have implications for an environmental justice policy that seeks to sustain healthy aquatic ecosystems and to protect the health and safety of people consuming fish, shellfish, aquatic plants, and wildlife for subsistence, traditional, cultural, or spiritual purposes. First, a suppression effect may arise when an aquatic environment and the fish it supports have become contaminated to the point that humans refrain from consuming fish caught from particular waters. Were the fish not contaminated, these people would consume fish at more robust baseline levels. Second, a suppression effect may arise when fish upon which humans rely are no longer available in historical quantities (and kinds), such that humans are unable to catch and consume as much fish as they had or would. Such depleted fisheries may result from a variety of affronts, including an aquatic environment that is contaminated, altered (due, among other things, to the presence of dams), overdrawn, and/or overfished. Were the fish not depleted, these people would consume fish at more robust baseline levels. Third, a suppression effect may occur from loss of access to fisheries resources and changes in social structure such that individuals no longer harvest fish to the same extent as before, or do not harvest at all.

When environmental agencies employ a FCR that does not capture fully the consumption that is suppressed – under any scenario in which suppression effects occur – they may set in motion a sort of downward spiral whereby the resulting environmental standards permit further and further contamination or depletion of the fish and so diminished health and safety of people consuming fish, shellfish, aquatic plants, and wildlife for subsistence, traditional, cultural, or spiritual purposes. This survey is intended to develop the most precise FCRs possible while taking into consideration historical rates as they relate to restored future rates. An approach is presented for determining the Tribe's heritage rates based on a critical evaluation of existing historical literature.

Survey Design and Questionnaire

The target population for the current survey is adult (18+) enrolled Nez Perce Tribal members, a population which will be geographically defined (e.g., by zip codes within the reservation and within a reasonable travel distance of the reservation). Sampling will occur with the use of stratification; strata will be defined by the combination of age, gender, and frequency of consumption (determined through an initial phone screening process). Potential respondents will be selected randomly from each stratum and this screening list will include 3



to 5 times as many individuals as the ultimate effective sample size,¹² which was statistically derived to achieve acceptably precise rates and support the use of modern survey methodology based on 24-hour dietary recall interviews. The proposed sample size is expected, conservatively, to provide an estimated mean consumption rate (all species combined, calculated from responses to the food frequency questionnaire) that has 95% probability of falling within 25% of the population mean, and to provide an estimated 95th percentile of consumption that has 95% probability of falling within 40% of the population 95th percentile of consumption. The sample size is also likely to provide an acceptable number of respondents with fish consumption on both days of the 24-hour dietary recall interview, enabling use of the methodology for analyzing the recall data.¹³

Trained Tribal representatives will conduct in-person interviews. Each individual surveyed will complete a food frequency questionnaire and a 24-hour dietary recall interview focused on fish consumption behavior. A subsample of individuals will subsequently be contacted by phone for a second 24-hour recall interview after several days. The food frequency questionnaire will ascertain species-specific frequency of consumption, typical quantities consumed by fish-eating period, sources of fish consumed, and preparation methods. Portion size characterization will be facilitated through use of models. Species identification will be facilitated by use of photographs. Hard copy and electronic data will be handled under strict confidentiality and quality assurance/quality control protocols.

In addition to the approach presented for critically reviewing existing literature to determine the Tribe's heritage rates and future aspirations for consumption, the survey questionnaire will include qualitative questions related to changes in fish consumption over time. The survey questionnaire presented to respondents during the in-person interviews will include questions related to changes in fish consumption and fishing activities compared to the past, reasons for changed fish consumption, and future consumption goals. These inquiries will provide additional lines of evidence regarding heritage rates.

¹² See subsections "FFQ Sample Size" and "24-Hour Dietary Recall Sample size" for details on sample size methodology.

¹³ The "NCI method", described later, will be used to analyze the 24-hour dietary recall data. The NCI method may be used only if there is a sufficient number of respondents with fish consumption on both days of the 24-hour recall interviews.



Survey Data Analysis and Reporting

In addition to data collection activities, the draft survey design includes a description of methods for data management, confidentiality, analysis, and reporting. The results of the suppression study for each Tribe (including fish consumption rates and supporting materials) will be presented in a final report along with the results of the current consumption survey. Reported fish consumption rates from the implementation of the current consumption survey will include the mean (average) and various percentiles of consumption up to the 95th percentile—and beyond, if warranted. The precision (margin-of-error) for certain rates (e.g., mean, median, 90th and 95th percentiles) will also be presented. Rates based on the food frequency questionnaire will be presented for population sub-groups defined by age, gender, and other characteristics in grams per day (and for some analyses, in grams per kilogram of body weight per day). Rates for fish species groups (e.g., anadromous, resident freshwater, and marine species) will also be presented. Data from the 24-hour recalls will be used (and assessed by the ‘NCI method’ where possible) to provide rates for all species combined and, if supported by the data, for population sub-groups and for some species groups. The report of findings will include a description of the survey operations performed and statistical analyses, results of both the current survey and heritage rate study, a discussion of the data, including a comparison of the fish consumption rates derived from both the FFQ and the 24-hr recall surveys, and supporting materials.



**NOTE: SECTION NUMBERS BELOW MAY DIFFER FROM
THE ORIGINAL DOCUMENT AND THE TABLE OF CONTENTS**

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Appendix A. Survey Questionnaire



LIST OF ABBREVIATIONS AND ACRONYMS

AWQC	ambient water quality criteria
CDC	Center for Disease Control and Prevention
CV	Curriculum vitae
CWA	Clean Water Act
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FCR	fish consumption rate
FFQ	food frequency questionnaire
FOIA	Freedom of Information Act
HSRRO	Human Subjects Research Review Official
ICC	Indian Claims Commission
IRB	Institutional Review Board
NCI	National Cancer Institute
NEJAC	National Environmental Justice Advisory Council
NHANES	National Health and Nutrition Examination Survey
NPDES	National Pollutant Discharge Elimination System
NPT	Nez Perce Tribe
NPTEC	Nez Perce Tribal Executive Committee
PHI	Protected Health Information
PI	Principal Investigator
PII	Personally Identifiable Information
SFTP	Secure File Transfer Protocol
USDA	U.S. Department of Agriculture

LIST OF UNITS

g/day	grams per day
g/kg-day	grams per kilogram of body weight per day



1.0 INTRODUCTION AND BACKGROUND

The Tribal Governments in the State of Idaho are collaborating with the U.S. Environmental Protection Agency (EPA) Region 10, the State of Idaho, and other stakeholders to develop methods for gathering data on fish consumption rates (FCRs) in Idaho. This effort is underway to support development of water quality standards. This survey has been designed to obtain data necessary for determining fish consumption rates for the Nez Perce Tribe (NPT). The survey is focused on both current and heritage rates. This information will be useful in developing water quality standards that are protective of the health of Tribal members as well as of other residents of Idaho.

6.10 Survey Background and Purpose

Water quality is of great importance to the Native American Tribes in Idaho, since a substantial portion of their diet is derived from aquatic sources, and water and aquatic resources play an important cultural and spiritual role for them. EPA Region 10 is conducting fact finding to assist Tribal governments in Idaho to identify fish consumption rates¹⁴ that are appropriate for use in setting Tribal ambient water quality criteria (AWQC) to protect human health. Idaho Tribal FCRs may also be of use to the State of Idaho as Idaho AWQC undergo revision.

The numeric value for a particular AWQC is inversely dependent on the FCR used to derive it. As the FCR increases, the AWQC becomes lower, or more stringent (and, therefore, more protective of human health). This is particularly true for bioaccumulative chemicals (i.e., chemicals that dissolve in fat and increase in concentration at higher levels of the food chain).

It has been documented elsewhere in the Pacific Northwest (e.g., Puget Sound and the Columbia River) that tribes consume far more fish and shellfish than the general U.S. population. EPA is thus interested in investigating FCRs for Idaho Tribes to support development of AWQC to protect high Tribal fish consuming populations.¹⁵

¹⁴ A fish consumption rate (FCR) is the amount of fish and shellfish (by weight) that is consumed by a person on a daily or annual basis.

¹⁵ EPA is also interested in protecting the health of other high fish consuming populations (e.g., recreational anglers or ethnic minorities). The State of Idaho is currently preparing a survey to determine FCRs for recreational anglers.



EPA has a national goal, established by the Clean Water Act (CWA), to protect water quality so that fish and shellfish thrive and can be safely eaten by humans. AWQC serve as an important tool in these efforts. AWQC are used by the CWA National Pollutant Discharge Elimination System (NPDES) to establish permits for allowable levels of contaminant discharge to the Nation's waters as well as other water quality management tools to reduce toxics and protect human health. Protection of tribal health is an important consideration for these regulatory efforts.

The purpose of this report is to provide a survey design for collecting Tribal fish consumption information for the Nez Perce Tribe. The information resulting from implementation of the survey can be used to set AWQC for Tribal waters. This survey effort will help Tribes build capacity for measuring FCRs, inform tribal fisheries management, and document the importance of fish in tribal culture and lifeways. The survey results may also be useful for the State of Idaho in its decision-making process for development of water quality standards.

6.11 Procedures Used to Develop Design Document

The development of this survey design included informative visits with the five Idaho Tribes on their reservations, including an open exchange of interests, concerns, and ideas; collection and review of relevant information on culture, history, fisheries, environment, and Tribal objectives; investigation of statistical methods and development of an appropriate approach for the fish consumption survey; drafting a multi-part survey questionnaire, including questions on past, current, and future consumption patterns; calculations to support a statistically valid design for each of the Tribal surveys; and coordination with involved agencies, tribes, consortia, and consultants.

The Tribal visits helped the survey team develop a working relationship with each of the Tribes and provided critical information for the survey design. The type of information gathered included the Tribes' objectives for the survey; the type of data compiled in their tribal registers (to be used for sample selection); existence of and content of historical records on fisheries resources; issues on language, travel and communication; planning for tribal hosting of and publicity around the surveys; issues of confidentiality of Tribal data and future survey records; and discussion of tribal capabilities for carrying out duties during the implementation phase.



Historical reports, past questionnaires, guidance documents, literature articles, and study methodologies were reviewed. Specific topics of interest relevant to this work included fish species, preparation methods, ceremonial uses, and suppressed consumption. As available, ethnographic information for each Tribe was reviewed. A list of additional resources related to this effort are provided in Section 7 of this report.

Design development included the evaluation of appropriate methodologies for a fish consumption survey; defining the population of interest; drafting a questionnaire based on survey objectives; performing calculations to support a statistically valid design for each of the Tribal surveys; incorporating methods to account for the effect of suppressed consumption; and specifying key elements of the survey operation.

The State of Idaho is also planning to implement fish consumption surveys. Coordination with the State of Idaho survey involved periodic conference calls with the survey design teams, agencies, Tribes and consultants to discuss technical topics related to the survey design. For example, methods of accessing survey participants, sampling frames, sharing of questionnaires and documentation from past surveys, defining consumers and non-consumers, species lists, and identification of survey components were discussed and may promote comparison of the final results from multiple surveys.

6.12 Survey Objectives for the Nez Perce Tribe

The Nez Perce Tribe has treaty reserved fishing rights within the Columbia Basin and Snake River basins. In the Snake Basin, the Nez Perce Tribe has quite possibly the largest number of tributary salmon and steelhead fisheries which can often occur year-round across the states of Washington, Oregon and Idaho. The Nez Perce Tribe has usual and accustomed fishing places throughout 13 million+ acres that have been found to be exclusively used and occupied by the Tribe (including the major portions of the Snake, Tucannon, Imnaha, Grande Ronde, Salmon and Clearwater Rivers and their drainages); the mainstem Columbia River; and other locations in the Columbia/Snake Basin.

The Nez Perce Tribe's primary objective for the fish consumption survey is to support development of more stringent water quality standards that are protective of tribal members' consumption of fish. The Tribe's culture is and always has been intimately tied to fish, which is a staple of their diet and an integral part of their society; poor water quality impedes fish survival and can affect both the quantity and availability of fish that can be harvested and safely



consumed by tribal members. The NPT has a vision of restoring fish species native to the Nez Perce Treaty Territory. To accomplish this vision, the Tribe has engaged in managing the resident and anadromous fish species in the streams, lakes, and watersheds within their management authority in an effort to rebuild habitat and restore opportunities for fish harvest. Their goal is that fish will be found in all available habitats and will provide fishing opportunities for present and future generations. An objective of the Tribe is that results of this survey and the resulting water quality standards should support the Tribe's expectation of an enhanced fishery and should be adequately protective of fish consumption by the Tribe in the future.

6.13 Role of Current Survey and Historic Assessment

There are three eras of importance for a fish consumption study: the past, present, and the future. Considering the past, over an extended period of time the NPT has experienced environmental and social changes that have reduced fish abundance, access to fish, safety of fish consumption, and fish consumption itself. The Tribe is seeking to increase fish availability, fish safety (i.e., free from contamination), and fish consumption in the future. Thus, current consumption does not reflect the Tribe's past nor its goals. Assessing consumption through a current, cross-sectional survey will provide relatively precise information about current consumption only. For the overall goals of this survey, the current consumption rates should not be considered in isolation. Assessing past consumption through an assessment of historical materials and, potentially, interviews with some older individuals whose history reaches back a long lifetime may be highly informative, but rates so derived are likely not as precise because they involve longer-term recall and unknown quality and completeness of past documentation.

The rates and supporting materials generated by this study will be used in water quality regulation. The strength of the current rates is that they are derived via a technically defensible methodology and that these rates can be compared to those of other populations. The strength of the heritage rates is their relevance to the goals of the Tribe. Future rates may be projected based on anticipated increases in fish populations resulting from planned or ongoing habitat restoration and supplementation efforts, and associated increases in fish consumption.



7.0 TRIBAL PERSPECTIVE ON SUPPRESSION

This section describes the Nez Perce Tribe's perspective on suppression, based primarily on existing literature and supplemented with input directly from the Tribe. Historical fish harvest and fish consumption by Tribal members is presented, followed by causes of decline in the fish populations, and vision for the future. Additional research and Tribal input will be required during the survey implementation phase to account for suppression and the implications for future fish consumption.

7.1 **Suppression Effects and Their Implications**

According to the National Environmental Justice Advisory Council (NEJAC, 2002), a “suppression effect” occurs when a fish consumption rate for a given population, group, or tribe reflects a current level of consumption that is artificially diminished from an appropriate baseline level of consumption for that population, group, or tribe. The more robust baseline level of consumption is suppressed, inasmuch as it does not get captured by the current FCR.

There are circumstances in which suppression effects have implications for an environmental justice policy that seeks to sustain healthy aquatic ecosystems and to protect the health and safety of people consuming fish, shellfish, aquatic plants, and wildlife for subsistence, traditional, cultural, or spiritual purposes. First, a suppression effect may arise when an aquatic environment and the fish it supports have become contaminated to the point that humans refrain from consuming fish caught from particular waters. Were the fish not contaminated, these people would consume fish at more robust baseline levels. Second, a suppression effect may arise when fish upon which humans rely are no longer available in historical quantities (and kinds), such that humans are unable to catch and consume as much fish as they had or would. Such depleted fisheries may result from a variety of affronts, including an aquatic environment that is contaminated, altered (due, among other things, to the presence of dams), overdrawn, and/or overfished. Were the fish not depleted, these people would consume fish at more robust baseline levels. Third, a suppression effect may occur from loss of access to fisheries resources and changes in social structure such that individuals no longer harvest fish to the same extent as before, or do not harvest at all.

The implications for environmental justice policy will depend in part upon which of these scenarios accounts for the suppression effect observed. They will also depend upon how the more robust “baseline” level is defined – an exercise that



itself raises important environmental justice issues. This question of an appropriate “baseline” will in turn be related to the particular group affected. In some cases, for example, a tribe will be able to cite a historical “point of reference” that would describe an appropriate baseline in terms of environmental quality, geographic delineation, and treaty rights. In each case, there may be important questions of history, culture, and aspiration to be considered in determining an appropriate baseline; that is to say, an appropriate baseline might mean examination of what people had consumed as well as aspiration for what people would consume were there “fair access for all to a full range of resources,” (NEJAC, 2002) or were the conditions fulfilled for full exercise of treaty- and trust-protected rights and purposes.

When environmental agencies employ a suppressed FCR – under any scenario in which suppression effects occur – they may set in motion a downward spiral where inappropriately lax environmental standards permit further and further contamination or depletion of the fish and so diminish health and safety of people consuming fish, shellfish, aquatic plants, and wildlife for subsistence, traditional, cultural, or spiritual purposes. This survey is intended to develop the most precise FCRs as possible while taking into consideration heritage rates as they relate to aspired future rates. An approach is presented for determining the Tribe’s heritage rates based on a critical evaluation of existing historical literature. Results of the heritage rate study will be presented with supporting materials in the final survey results report.

7.2 Historical Fish Harvest and Consumption

The Nez Perce are a large Northwest tribe with a culture tied closely to fish. Since time immemorial, the Tribe occupied a territory covering more than 13 million acres that included what is today north central Idaho, southeastern Washington, and northeastern Oregon. The Nez Perce subsistence cycle involved traveling year to year on the same well-traveled routes through the canyons of the Snake, Tucannon, Clearwater, Grande Ronde, Imnaha and Salmon Rivers, primarily to follow the salmon runs. In addition to those rivers and their tributaries, the Nez Perce historically took part in the fishing and trading that occurred between several of the region’s tribes at Celilo Falls on the Columbia River, among other locations of the Columbia Basin.

The Tribe has always fished. Their economy and culture evolved around Northwest fish runs. Their persistence can be attributed in large part to the abundance of fish, which has served as a primary food source, trade item and cultural resource for thousands of years. Settlement by others in the last 150



years has disrupted people of the Tribe and the natural resources (NPT, 2005). The degree to which the Tribe is culturally coupled to fish was recognized in treaties signed between the Tribe and the United States Government. The same treaties that confined the Tribe to a fraction of their former territory also guaranteed their access to fishery resources. Article III of the Treaty of 1855 guarantees to the Tribe:

“The exclusive right of taking fish in all the streams running through or bordering said reservation ... as also the right of taking fish at all usual and accustomed places in common with citizens of the Territory.” Treaty with the Nez Perces, 12 Stat. 957 (1859).

The 1855 Treaty Council at Walla Walla and the Treaty negotiations reflect the Tribe's inherent tribal sovereignty and its “aboriginal title” to land. At the Treaty Council, the United States sought to clear title to lands; the Nez Perce sought to reserve and maintain a homeland (“Reservation”) and reserve its aboriginal rights and way of life. The Nez Perce would not have signed this treaty without first receiving assurances that these rights, including the right to fish, would be protected into the future. Additional treaties between the two sovereigns have been made, but the reserved fishing right has remained unchanged since 1855.

In its 1855 Treaty, the Nez Perce reserved a significant portion of their aboriginal land (about 8 million acres). And, this Nez Perce homeland contained, as the United States recognized, many of the best fisheries:

Gov. Stevens said: “Here (showing a draft on a large scale) is a map of the Reservation. There is the Snake River. There is the Clear Water river. Here is the Salmon river. Here is the Grande Ronde river. There is the Palouse river. There is the El-pow-wow-wee. This is a large Reservation. The best fisheries on the Snake River are on it...”.

Moreover, in addition to this homeland, Nez Perce leaders insisted on reserving off-reservation hunting, fishing, gathering, and pasturing rights. The minutes of the treaty negotiations reflect Governor Stevens' repeated assurances, on behalf of the United States, that the treaty would reserve these off-reservation rights to the Nez Perce Tribe:

You will be allowed to pasture your animals on land not claimed or occupied by settlers, white men. You will be allowed to go on the roads, to take your things to market, your horses and cattle. You will be allowed to go to the



usual and accustomed fishing places and fish in common with the whites, and to get roots and berries and to kill game on land not occupied by the whites; all this outside the Reservation:"

Gov. Stevens said: "I will ask of Looking Glass whether he has been told of our council. Looking Glass knows that in this reservation settlers cannot go, that he can graze his cattle outside of the reservation on lands not claimed by settlers, that he can catch fish at any of the fishing stations, that he can kill game and can go to Buffalo when he pleases, that he can get roots and berries on any of the lands not occupied by settlers..."

Fish, as a staple of the Nez Perce diet, have always been an integral part of the Nez Perce society. Principal to the Nez Perce diet were the anadromous fish species that inhabit the rivers of the inland northwest. This is corroborated by other existing information such as those from federal court proceedings.

For example, in its 1967 decision concerning the Nez Perce Tribe, the Indian Claims Commission (ICC) made comprehensive findings based on detailed anthropological evidence from both the United States and the Nez Perce Tribe, of the Tribe's area of "exclusive use and occupancy" and "aboriginal ownership". The ICC determined that the Nez Perce had "exclusive use" and occupancy of 13,204,000 acres of land and "that salmon fishing was one of the major sources of subsistence since the main rivers through the area, which include the Snake, the Clearwater, the Salmon, and their branches, were well supplied with this fish in aboriginal times." It also concluded that their seasonal "cycle consists of specific times of the year for fishing for salmon, digging camas and other roots, hunting the game"; this "economic cycle can generally be summarized as ten months salmon fishing and two months berry picking, with hunting most of the year."¹⁶

During the time that the treaty was negotiated, the salmon resource reserved by the Nez Perce came from "...river systems that were biologically functional and

¹⁶ The ICC was created by Congress in 1946 to hear claims by Indian tribes for, among other things, compensation for the taking of aboriginal lands by the United States without fair payment. Compensable aboriginal title was required to be based on "actual and exclusive use and occupancy 'for a long time' prior to the cession, transfer, or loss of the property." It provided historical information regarding Nez Perce village sites, uses of natural resources, and range and extent of natural resource use.



fully productive..." (Meyer Resources, Inc., 1999). The decline of salmon productivity since the mid-1800's to present, does not alter, change, or abrogate the Nez Perce treaty right to take fish. This right to take fish represents an inherent right that the Nez Perce have held since time immemorial. The fishing right is as important to the Nez Perce today as it was before contact with non-Indians.

The Nez Perce governed where fishing occurred, how many fish were to be harvested, who could participate, how to use the resource, and ways to honor and perpetuate the resource. They developed ways to harvest large amounts of fish. These were documented as proven methods to catch the substantial numbers of salmon and steelhead (as well as other species of fish). The complex, elaborate, and efficient Nez Perce fishing techniques described below document the extent of their reliance on this valuable resource and the importance of fish to its society and cultural identity.

Whenever possible, the Nez Perce historically and contemporarily have regularly fished for the following species: Chinook, Silver, Coho, and Sockeye varieties of salmon; Dolly Varden, Cut Throat, Brook, Lake, and Rainbow varieties of trout; several species of suckers, white fish, sturgeon, squaw fish, lampreys, and some shellfish (freshwater clams). In order to harvest these fish species, the Nez Perce developed a number of fishing techniques and methods: weirs and traps; dipping platforms (either natural or man-made); fish walls and dams; canoes; spears; hook and line; gaffs; and variety of nets (dipnets, set nets and throw nets).

The expansive territory of the Nez Perce people was rich in rivers and streams abundant in fish life. Bands fished from the Snake, Salmon, Clearwater, Imnaha, Grand Ronde, Selway, Tucannon, Rapid River and many other rivers within and outside its homeland and territory. As with other tribes, the Nez Perce did not limit their fishing to salmon. Research has been conducted by a number of people in an effort to determine how many fish were historically harvested by the Nez Perce. There are a number of methods to estimate amount of fish harvested and consumed by the Nez Perce (commonly expressed in numbers of fish harvested and annual per capita consumption). Anthropologist Deward Walker, Jr. estimated that each Nez Perce consumed over 500 pounds of fish each year (CCRH, 2013).

Others (as cited in Scholz et al., 1985) have estimated an annual per capita fish consumption for the Nez Perce Tribe of 1,000 pounds per year. This range of



rates is equivalent to fish consumption rates of about 620 to about 1,240 grams per day. These values are represented as “pounds per capita”. While estimates, this illustrates the general magnitude of harvest that occurred.

In addition to salmon and steelhead, the Tribe has traditionally harvested Snake River white sturgeon for subsistence purposes. Tribal elders confirm the historical presence of white sturgeon throughout the Snake River, mainstem Salmon River, the Clearwater River from its mouth to above Orofino, Idaho, as well as seasonal migrations into the Grande Ronde River (Elmer Crow, Nez Perce Tribe Department of Fisheries Resources Management, Personal Communication, 2014). In addition to being an important food source, white sturgeon served many purposes in the culture of the Tribe. White sturgeon blood was used to make glue; the hides were used for bow cases and quivers, and for water proofing footwear. However, subsistence fishing has been severely limited as a result of low white sturgeon numbers between Hells Canyon and Lower Granite dams (all as cited in NPT, 2005).

The traditional way of life for the Nez Perce (e.g. gathering, harvesting, ceremonies, and traditions) depends on continuance of the circle of life for all native species (plants and animals). To the Nez Perce the rights reserved under the Treaty of 1855 must be protected such that the enjoyment of these rights resembles that envisioned by the treaty signers and Nez Perce leaders.

7.3 Causes of Decline in Fish Populations

Nez Perce tribal elders believe that one of the greatest tragedies of this century is the loss of traditional fishing sites and Chinook salmon runs on the Columbia River and its tributaries. They believe the circle of life has been broken and ask us to consider what the consequences of breaking that circle may mean for future generations. In many ways the loss of the salmon mirrors the plight of the Nez Perce people. The elders remind us that the fates of humans and salmon are linked (Landeem and Pinkham, 1999). This dependence on fish to meet dietary, spiritual, and basic subsistence needs is still a prevailing necessity of Nez Perce life. To this day, the right to a “fair share” of the salmon harvest by the Nez Perce Tribe does not occur because of the impacts to these fish by non-Indian activities and development in the Columbia and Snake basins.

The Nez Perce lived in the heart of salmon country – along the Salmon, Snake, Grande Ronde, Imnaha, Clearwater and Tucannon rivers; which historically were major salmon and steelhead producers. The Nez Perce have lived through and experienced the extirpation of entire populations of fish by blocking and



altering of thousands of miles of rivers and streams as result of dams. The Hells Canyon, Oxbow and Brownlee on the Snake River, Wallowa Lake Dam on the Wallowa River, Dworshak Dam on the North Fork Clearwater, the eight major dams on the Columbia and Snake rivers, and the many other smaller projects, have individually and collectively impacted fish, and thus the Nez Perce ability to fish for them.

The environment and water that support fish has been altered due to human development and enterprise over the past century and a half. This human progress has come at a cost to the fish species and “salmon people.” Current productivity of salmon- producing streams is much lower than it was historically. Many of the fish species either face extinction or are in seriously depressed conditions. As a result, tribal harvest in the present day is only a very small fraction of what the Nez Perce harvested in the mid- 1800's. Although hard to quantify, it is probable that until recently harvest has been less than 1% of historic harvest levels prior to 1855.

Causes contributing to salmon and steelhead decline encompass a variety of human activities and anthropogenic and natural phenomena. These include the following: commercial, recreational and subsistence fishing; freshwater and estuarine habitat alteration due to urbanizing, farming, logging, and ranching; dams built and operated for electricity generation and flood control; water withdrawals for agricultural, municipal, or commercial needs; stream and river channel alterations; hatchery production; predation by marine mammals, birds, and other fish species; competition with other fish species; diseases and parasites; and reduction in annual nutrient distribution from spawned-out salmon to the local ecosystem. These activities continue to affect fish.

Salmon and steelhead runs in the Snake Basin are not as abundant or productive as they were historically. Snake River Chinook salmon (spring, summer and fall runs, and sockeye) and steelhead are listed under the Endangered Species Act (ESA). Coho and Chinook salmon were extirpated in the Clearwater River subbasin in the 1990s, and steelhead were at very depressed levels.

Snake River spring/summer Chinook salmon were historically found spawning in the Snake River tributaries of the Clearwater, Salmon, Weiser, Payette, and Boise Rivers. A review of run size for Snake River of spring/summer Chinook salmon is provided by Matthews and Waples (1991). Their summary of research on run size reports historic runs in the Snake River probably exceeded one million fish

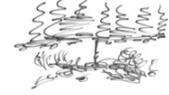


annually in the late 1800s. By the mid-1900s, the abundance of adult spring and summer Chinook salmon had greatly declined to near 100,000 adults per year in the 1950s. Since the 1960s, counts of spring and summer Chinook salmon adults have declined considerably at the lower Snake River dams (IDFG, 2013).

The construction of hydroelectric dams on the main stem Snake and Columbia Rivers blocked access to nearly half of the historic spawning habitat and reduced survival of juveniles and adults migrating to and from the ocean. Additional effects from hydroelectric dams and water storage projects have resulted in altered hydrographs and water temperature regimes affecting run timing of juveniles and adults. Diversions in spawning and rearing streams have caused direct mortality, loss of habitat and migration barriers. Land management activities have resulted in degraded habitat with the loss of riparian cover, sedimentation and artificial barriers to passage. The addition of hatchery programs to mitigate for lost habitat and survival of fish have introduced genetic concerns about effects to wild stocks. Declining water quality from increasing development in and along river and tributary streams can affect fish populations. Introductions of non-native fish in some waters can increase predation and competition with juvenile fish (IDFG, 2013).

Salmon runs in the Clearwater River Subbasin were virtually eliminated by the construction of hydroelectric dams (Mathews and Waples, 1991). In 1910, the Harpster Dam, constructed on the lower South Fork Clearwater River, prevented all fishes from returning upstream of Harpster, ID, and eliminated access to over 95% of the watershed and its high quality spawning grounds (Schoning, 1940). In 1927, the Washington Water Power Diversion Dam constructed just above the mouth of the Clearwater River eliminated all upriver salmon runs (Parkhurst, 1950; USFWS, 1962). A crude fish ladder was built on the lower Clearwater River dam, which allowed steelhead passage during higher flow periods, but proved almost impassible during lower flows when salmon arrived (Parkhurst, 1950). The ladder was not modified for a period of 12 to 14 years; eliminating all late returning fish, like coho and fall Chinook salmon (all as cited in Everett et al, 2006).

The cumulative loss of anadromous fish to the Nez Perce Tribe as a result of these two dams was substantial (Cramer et al., 1993). The Harpster Dam was removed in 1963 and the lower Clearwater River dam was removed in 1972, making available most of the salmon production areas in the drainage. However in 1971, Dworshak Dam was built just upstream of the mouth of the North Fork Clearwater River. Dworshak Dam lacks fish passage, resulting in the permanent loss of productive salmonid spawning aggregates and high quality habitat. The



lower Clearwater River temperature regime continues to be altered by Dworshak Dam, resulting in warmer water in the winter and cooler water in the summer (Arnsberg et al., 1992, Arnsberg and Statler, 1995; all as cited in Everett et al., 2006).

Currently, a majority of the fisheries that occur in the Snake River basin are supported by hatchery programs. All of the anadromous fish hatcheries in the Snake River basin are mitigation hatcheries for the development of hydroelectric dams. All of the returns from these hatcheries pass through or return to the Nez Perce Tribe's usual and accustomed fishing places.

7.4 Vision for the Future

The Nez Perce Tribe has a vision of restoring all fish species native to the Nez Perce Treaty Territory. To that end, the Tribe has engaged in management of all fish species- both resident and anadromous - for all streams, lakes and watersheds within their management authority. The Tribe is involved in these efforts to protect implementation of treaty rights, to restore species and conditions consistent with the treaty, and to protect the long-term productivity of their natural resources.

Today, maintaining a healthy 13-plus million acre watershed and improving survival of salmon and steelhead under the auspices of the 1855 Treaty, rests with the Tribe's Department of Fisheries Resources Management program and policy direction from the Nez Perce Tribal Executive Committee (NPTEC), the governing body of the Nez Perce Tribe. Native fish within the Nez Perce Country depend on healthy habitats, healthy watersheds, and healthy ecosystems. Sound fisheries and habitat management actions will be implemented to improve survival, production, recovery and restoration of all populations of native anadromous and resident fish species and their habitats throughout the Nez Perce Tribe's usual and accustomed fishing places. It is the Tribe's desire that all species and populations of anadromous and resident fish and their habitats will be healthy and harvestable throughout the Nez Perce Tribe's usual and accustomed fishing places.

As described in the Department's Strategic Management Plan (NPT, 2013), Tribal member use of and access to all treaty rights and resources guaranteed under the Treaty of 1855 guide's the department's restoration program and actions:

- All native anadromous fish and resident fish have had long-standing cultural significance to the Nimiipúu, including: subsistence value,



ceremonial and spiritual value, medicinal value, economic or commercial value, and intrinsic value.

- Native fish populations thrive best under natural or normative conditions to which they are best adapted.
- Natural ecosystems have been and will continue to be increasingly stressed and altered by human activities and population levels.
- When historic natural conditions are not achievable, altered ecosystems should function adequately enough to maintain harvest opportunities.
- The entire life cycle of a species must be successfully carried out (from egg through adulthood) for that species or population to persist.
- Failure to serve a species' needs, at any life history stage, can lead to extirpation of populations.
- Federal governmental agencies have treaty trust responsibilities; their actions must recognize the treaties as federal commitments and their actions must be taken in support of a tribe's ability to exercise rights guaranteed in the treaties.

The following goals seek to secure the integrity of populations and habitat features essential to anadromous and resident fish:

- Achieve and maintain fish abundance in tributary-specific areas at levels sufficient to support: 1) population persistence, 2) harvest, and 3) ecological processes.
- Achieve and maintain diverse and productive ecosystems with species composition and productivity consistent with historic conditions.
- Achieve and maintain adult spawner distribution consistent with historically utilized tributaries (includes within and across tributary spatial scales).
- Achieve and maintain fish population genetic diversity at levels adequate for population persistence and consistent with historic conditions.
- Ridge top to ridge top watershed protection and restoration for rearing and spawning habitats and protection of water quality.
- Supplementation approach "putting fish in the rivers" with hatchery tool.
- Protection and providing flows, water quality and passage for upstream and downstream migrants.
- Participate in Pacific Salmon Treaty and US v Oregon for ocean and in-river harvest management.



- Allow an abundance of spawners to protect the resource for future generations.
- Monitor our activities and the runs to determine how things are faring.
- Harvest opportunities currently available will be protected and enhanced.

The Nez Perce Tribe continues to protect and enhance abundance of fish through natural production and artificial production in the form of hatcheries. Hatcheries for salmon and steelhead in the Columbia Basin were developed as a necessary mitigation tool to compensate for the fishery losses that resulted from the impacts of increased human settlement that began soon after ratification of the Treaty of 1855.

Accordingly, hatcheries represent a promise to those who have always depended on the salmon for culture, sustenance, and livelihood to replace the fish that are and were diminished as a result of human development of salmon habitats. In the Snake River Basin, all but one of the hatcheries (Kooskia), were built specifically to mitigate for the impacts of the development and operation of hydroelectric dams (Dworshak, Brownlee, Hells Canyon, Oxbow, Lower Granite, Little Goose, Lower Monumental, Ice Harbor, McNary, John Day, The Dalles, and Bonneville dams). These hatchery programs play a very important role in meeting congressionally mandated mitigation obligations and treaty trust responsibility to protect and maintain tribal treaty reserved fisheries.

The Department has been a leader in implementing supplementation programs and hatchery reform. Tribal goals for supplementation programs are: increased abundance (both total and natural origin) and spatial structure; maintenance of culturally and economically important tribal salmon fisheries; contribution to non-Indian fisheries; and restored ecosystem processes and health.

The Fisheries program has over 150 employees and operates on a budget derived from more than 50 contracts. There are 7 divisions within the program: Administration, Conservation Enforcement, Harvest, Production, Research, Resident Fish and Watershed. The Fisheries program works throughout the ceded lands and has offices in Powell, Red River, Grangeville, Orofino, McCall, Sweetwater, Lapwai and Joseph, OR. Tribal staff coordinate and interact with State, Federal and Tribal agencies and committees and private entities in assessing and implementing fish recovery and restoration plans and actions.

The Department has engaged in a significant body of work throughout its U&A areas –implementing more restoration actions within the Snake River basin than



perhaps any other single entity or agency. The aquatic habitat is subject to a diverse array of natural and anthropogenic influences and impacts and given the synergistic effect of watershed health on aquatic habitat quality, the Department employs a “ridge-top to ridge-top” approach to restoration.

The Department adopted abundance-based reference points (thresholds) for certain anadromous fish to assist in development of long-term management strategies and to guide the implementation of short-term management actions to achieve both broad and population-specific salmon rebuilding goals. Adult salmon abundance (or escapement) objectives are our primary measure for quantifying goals and are generally defined as the number of adults and jacks in each population that return to their river of origin.

These identified abundance thresholds serve as useful decision criteria that trigger specific actions (e.g. harvest rates or initiation and other management actions). Populations at very depressed to critically low levels require “more aggressive actions and demand a more rapid population response than populations fluctuating at higher, less risky levels of abundance.” Reference abundances or population designations specified in this section include the designated escapement objective, and the ecological escapement objective for four focal species, spring/summer Chinook, steelhead, and fall Chinook (see Table below). The following are descriptions for each threshold type.

- Viable abundance thresholds are considered the size at which a population maintains essential genetic diversity, and at which there is negligible risk of long-term extinction given contemporary levels of environmental variability. They are the minimum abundance for a healthy population.
- Sustainable Escapement Objectives describe the numbers of returning adults that would annually sustain substantial spawning as well as harvest for tribal and non-tribal fisheries. It is assumed that escapement sizes reflecting these values would also encompass healthy tribal and non-tribal fisheries downriver.
- Ecological Escapement Objectives refer to the escapement level at which sustainable spawning abundance is maximized within a population, the full utilization of available spawning and rearing habitat is promoted, and the ecosystem-level processes (e.g., nutrient redistribution) for



multiple species are fostered. Historical salmon and steelhead escapement to the Columbia and Snake river basins was 8-16 million and 500,000 - 2 million, respectively (NPPC, 1986; CBFWA, 1990; Chapman, 1986; Fulton, 1968). According to tribal knowledge, escapement at those historic levels to tributary-specific areas resulted in “fish so thick you could walk across their backs.”

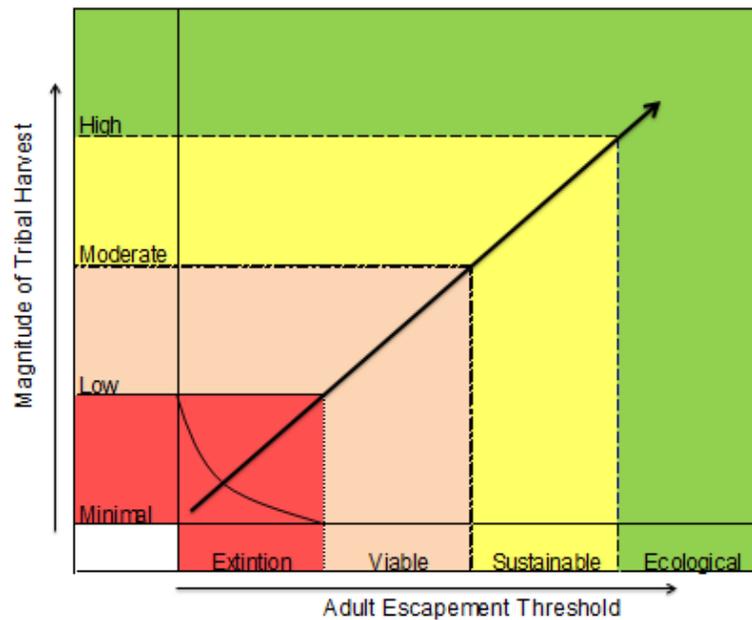
The following table depicts these abundance thresholds for certain fish species.

Table 2-1. Abundance Thresholds for Certain Snake River Anadromous Fish

Species	# Major Population Group	# Population(s)	Viable Abundance	Sustainable Harvest Goal	Ecological Escapement Goal
Spring/Summer Chinook	7	41	31,500	215,900	669,000
Fall Chinook	1	1	3,000	39,110	86,300
Steelhead	6	25	25,500	330,200	602,000

The Nez Perce Tribe intends to increase and expand the level of harvest or fishing areas for salmon and steelhead at all Nez Perce usual and accustomed places, including those in the Snake Basin, in a way that balances conservation needs of the fish with the right to take fish. This can be achieved through a biologically-sound harvest management philosophy and harvest rate schedules keyed to the status and trends in abundance and productivity of fish resources. Generally, abundance-based tribal harvest strategies can be designed to account for annual variation in total fish run size and run composition. This is illustrated in the Figure below.

Figure 2-1. Abundance-Based Tribal Harvest Goals



As returns increase, the Nez Perce Tribe expects to increase the relative magnitude of tribal harvest and fishing effort and fish consumption.

When restoration efforts result in sustainable returns, the Tribe anticipates that Tribal harvest will increase and fish consumption rates will rise when fish populations attain “sustainable abundance” and “ecological abundance” levels of adult escapement. Ultimately, the goal is to achieve a harvest consistent with pre-Treaty harvest levels. Simply put, the Tribe’s goal is to rebuild the Snake River fishery to healthy, self-sustaining levels that will in turn support sustainable treaty fisheries.

7.5 Estimating Heritage Fish Consumption Rates

Based on discussions with Tribal representatives and other experts on the issues of suppression and heritage fish consumption rates, the survey design team recommends that, as part of the survey implementation phase, heritage fish consumption rates be estimated for each of the individual Tribes. The design team believes that current survey respondents may provide useful information and context regarding heritage consumption rates, but that the approach to estimating heritage rates should be primarily based on a comprehensive review and evaluation of literature that is relevant to heritage rates, including historical accounts and modern studies of heritage consumption rates.



For Tribes that harvest fish from the Columbia River basin, there is a significant volume of literature to form the basis for quantitative estimates of fish consumption rates, or ranges of rates. Information includes ethnographic studies, personal interviews, historical harvest records, archaeological and ecological information, and nutritional and dietary information.

During project implementation, the survey team will compile and evaluate relevant available information regarding heritage consumption rates specific to the NPT. The development of estimates of heritage rates should include a thorough discussion of the types of information available regarding consumption, a discussion of the methodologies used to develop the estimates, and a discussion of factors affecting the uncertainty associated with the estimates. Finally, the implementation team should develop a quantitative estimate of a heritage fish consumption rate or range of rates for the Tribe.

One aspect of the quantitative assessment will be a compilation and analysis of historic and heritage information across the region (primarily for the Idaho Tribes). The purpose of this compilation and analysis will be, to the extent possible, to reduce the uncertainty associated with individual heritage rates or update the rate calculations by a statistical methodology that uses data for multiple Tribes, locations, and times. An analysis which shows consistency in relationships among these variables will support the individual heritage rates. Further, it may be possible to estimate a range of rates for the Tribe based on a joint (multivariate) analysis of heritage, including tabular and graphical displays and numeric estimates of a plausible range.



8.0 SURVEY DESIGN: TARGET POPULATION

This section describes the survey design approach as it relates to the target sample population and sampling frame, including phasing in of multiple surveys.

8.1 Target Population to be Sampled

The target population for the survey is enrolled adult members of the NPT, age 18 and over. The population to be sampled in this survey can be tentatively defined as enrolled adults (age 18+) who live within a specified geographic area around the NPT Reservation, e.g., a distance reflecting up to a reasonable drive time, such as 1-2 hours. While a distance cut-off may appear arbitrary for a population definition, some kind of practical cut-off is needed, since some tribal members may reside at great distances from the reservation. Distance will be defined by zip code or location of residence in relation to a central site for interviewing. The site or sites will be identified in cooperation with the Tribes. Due to the expected high correlation of diets and the substantial time per interview, the survey will be limited to enrolled tribal members and will not include non-tribal spouses or other non-tribal adults. The residential location of all members will be checked with the Tribes just prior to the sample selection. The specific tribal members in the population to be sampled will be identified from the Tribal enrollment roster in cooperation with the Tribal authorities.

Among the adult population, there will be a sub-population of non-consumers of fish, and these people would be detected in an initial telephone screening (described in Section 4.4.1). For the non-consumers, defined as those who have not eaten fish in the last year, the screening will determine the reasons for non-consumption, such as taste (dislike of fish), concern about advisories or pollution, or other reasons. No further information will be collected for non-consumers (some demographic information will be available from the tribal enrolment roster), and the main focus of the effort on the fish consumption survey will be confined to fish consumers only.

An exclusion from the sample, if they should be selected in the sampling process, is persons living in an institutional setting (e.g., nursing homes). The reason for the exclusion is that in this special population, expected to be small, a totally different questionnaire and data collection method would be needed. Secondly, an institutionalized person is usually not free to make decisions about their fish consumption, and it is not clear to what extent that consumption represents the tribal way of life.



Another exclusion is the tribal sub-population of children and young adults (age <18 years). This demographic group has been excluded at this time to avoid a potential insufficient sample size in an effort to shorten an already detailed and lengthy interview process for each adult interviewed and collectively ensure an adequate number of adult interviews within the resources available.

8.2 Phasing-in of the Survey

The design team recommends that the survey implementation be carried out in phases, with one or two Tribes selected initially to start. It is likely that a great deal will be learned about what works well and what does not work during the early part of the survey. While the survey design is certainly intended to provide an excellent framework for all of the Tribes, it is inevitable that important working points will be learned as the implementation team proceeds, collaborating with these unique populations. Thus, the survey might start with one or two Tribes and then proceed to a second and a third, etc., at short intervals. Alternatively, the survey may start with one Tribe but then proceed with the other Idaho Tribes with a modest delay after that. This is a decision that is best made closer to initiation of the survey. The survey team will communicate with tribal fishery staff to determine the several seasons of fishing and fish consumption. The survey will be scheduled to overlap significant seasonal periods.

8.3 Sampling the Population

The enrollment roster of the NPT will be the sampling frame and basis for sample selection. The roster is expected to be reasonably complete and up to date, since tribal membership includes benefits that motivate enrollment. The enrollment roster is expected to include age, birth date, gender, address (including zip code) and other fields.

The population to be sampled will be limited to specified zip codes or other location indicators. As noted earlier, the locations will be selected in order to accommodate a reasonable amount of travel time for members to attend a central site for interviewing. It may be possible for some interviews to be conducted closer to or at a respondent's home when there are issues of health and ability to travel.

The Nez Perce Tribe has supplied the data on their adult population counts by zip code of residence. The design team will use the data to fill in Table 3-1 for the NPT. The table will help the design team and the Tribes to decide on the geographic area from which survey participants will be selected.



Table 3-1. Number of adult Tribal members by distance from Tribal reference point defined by zip code of residence

Distance (miles)	No. of members	Zip codes included
<5	N	11111, 22222, 33333, etc.
5 to <10	N	44444, 55555, etc.
....
40 to <50	N	88888, 99999, etc.
Etc.		

8.3.1 Sample Stratification

The eligible adult population (defined by age 18+ and an eligible zip code of residence) will be sampled using stratification. "Strata" are simply population groups defined by some characteristic. For example, six strata might be defined by age and gender to include young adults, the middle aged, and Tribal elders, classified separately by each of the two genders. One use of stratification is to insure that the sample will represent the population faithfully. For example, if six strata (not necessarily age-related) cover the whole population and have about one-sixth of the population each, then one-sixth of the sample can be drawn from each stratum.

An ideal stratifying factor for this survey would be defined by an *a priori* indication of level and frequency of fish consumption. High-level consumers are needed since there is particular interest in the higher percentiles of fish consumption, which the high consumers would tend to define. Secondly, as explained later, frequent consumers (who also tend to be high-level consumers) are needed for the survey's planned use of a particular method (National Cancer Institute or NCI method) to estimate the fish consumption distribution from two or more 24-hour dietary recall interviews. In the use of the methodology to analyze the 24-hour recall interview data, it is important to have enough respondents with two days of fish consumption. Currently, age, gender, and location (defined by zip code) are the only candidates in the roster for the NPT that might define higher vs. lower level consumers. Fish consumption rates in relation to age show mixed results for the Native American surveys in the Pacific Northwest. Thus, the phone screening process (Section 4.4.1) is needed to identify frequent consumers who may, then, have a higher probability of consuming fish on the second of the two days of 24-hour dietary recall. The second interview will occur within a time window (yet to be specified) probably of one to four weeks after the initial interview. The time window will be selected



to yield an independent eating occasion but not so long that seasonal effects (e.g., associated with fish availability) will influence fish consumption.

Strata will be defined by the combination of age, gender, and frequency of consumption, with frequency determined from the phone screening process. The age-by-gender composition of the NPT has already been provided by the Tribe. The age group breakdown will be helpful in forming initial strata, which will then be sub-divided by at least two frequency categories, such as consumption of fish 'two or more times/week' vs. 'less than twice per week.' Again, these strata will both insure that the population can be well represented by the sample selected, and in addition, allow over-sampling of the high-frequency strata. An oversimplified stratification is shown in the table below.

Table 3-2. Hypothetical strata based on three stratifying factors: age, gender and frequency of fish consumption

Stratum	Gender	Age group	Consumption frequency
A	Male	18-44	< 2x per week
B	Male	18-44	≥ 2x per week
C	Male	45+	< 2x per week
D	Male	45+	≥ 2x per week
E	Female	18-44	< 2x per week
F	Female	18-44	≥ 2x per week
G	Female	45+	< 2x per week
H	Female	45+	≥ 2x per week

8.3.2 Sample Selection

Once the strata are defined in terms of age, gender and frequency of consumption, potential respondents for screening will be selected randomly from each age-gender stratum (combining the frequency strata). If there are appropriate non-disclosure agreements and adequate security and confidentiality procedures in place, and if the NPT agrees, a copy of the enrollment file with fields needed for sample selection can be transferred to the implementation team and then deleted (including derived files) after there is no further need for the file or after a mutually agreed period has expired.

If the NPT does not wish to "loan" the enrollment file for sample selection purposes, an alternate procedure of sample selection can be used. In order to

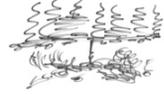


preserve the confidentiality of Tribal members listed in the electronic enrollment file, the enrollment office will be asked to take the following steps.

1. Apply any member exclusions (such as non-eligible zip codes and persons less than 18 years of age) and save a copy of the resulting file.
2. Add a field defining age and gender for each person. These strata labels will appear for each person in the file.
3. Sort the file in random order. Almost any random sort software can be used here.
4. Starting with the randomly sorted file from the previous step, add a field with a new sequential survey identification number ("surveyID"), which should be a sequential number, e.g., 1, 2, 3, The correspondence between this unique survey ID number and the Tribes' unique ID number will allow communication between the survey implementation team and the enrollment office, as needed. Due to the random sort prior to this step, the assigned survey ID number will be non-informative about any member characteristics—a helpful step in preserving confidentiality.
5. Save a file which contains only the new survey ID number, and selected demographic data (e.g., gender, age in grouped categories). Transfer this file to the implementation team.
6. The implementation team will select the sample from the file provided by the Tribe and return the file of the selected sample to the Tribe. The implementation team will work with the Tribe to generate a list of the sample suitable for phone screening (including names and contact information).

The implementation team will select the specified respondent count for screening from each stratum by random selection. This process should be carried out under the supervision of the statistician working with the implementation team. See the section on sample size for the specified sample count for the NPT.

The random selection process will generate a list of potential respondents for the screening step. This screening list will include 3 to 5 times as many individuals as the ultimate effective sample size, since a number of individuals may need to be screened to identify each frequent consumer. The screening list will be divided into 4 to 5 sections corresponding to waves of screening. Within each section,



the age-by-gender composition of the list will be similar to the composition of the Tribe.

By screening in several waves, the implementation team can examine initial results to better understand the population as well as determine what screening methods will yield a higher percentage of frequent consumers from the first or early waves. This allows the team to refine a sampling plan so that resources are allocated most effectively. For the 24-hour recall component of the interviews, it is especially important to obtain a large enough number of people who consume fish on both recalls. The implementation team will need to focus the selection effort on identifying people who are likely to meet this condition in order to provide the best chance of obtaining data suitable for use with the NCI method. After the initial full interview, frequent consumers can be given a higher probability of selection for the additional second 24-hour recall interview. All initially interviewed respondents (supplying food frequency interview and an initial 24-hour dietary recall report) will have a positive probability of selection for the second 24-hour recall. However, frequent consumers will be assigned a higher probability of selection. While all respondents supplying an initial 24-hour dietary recall will have some probability of selection for the second 24-hour recall, not all of them will be selected. Nevertheless, all of those selected for the second 24-hour-recall will be selected on a probability basis from the first recall and not by a categorical selection that absolutely excludes some first-recall respondents.

A list of respondents to be interviewed in person (in waves, corresponding to the sections of the screening list) will be generated by the screening process. The initial screening list will be turned over to Tribal members hired to help with the survey, and they will carry out the screening process under the direction of the implementation team.



9.0 SURVEY DESIGN: DATA COLLECTION

This section describes the survey design approach as it relates to the survey method, measurement method, sample size, and questionnaire development.

9.1 Survey Methods

Based on our experience, in-person interviews are superior to many other survey research modes for many reasons; however, for most studies, in-person interviews are cost prohibitive and a compromise must be achieved between “best practices” and budget constraints. In-person interviews allow the respondent to see survey aids (in the case of this study, photographs and models) and to establish a face-to-face connection with the interviewer. In addition, respondents generally tolerate longer in-person interviews than telephone or other interview modes (Doyle, 2005).

9.1.1 Selection of In-Person Interviews vs. Other Methods

Based on a review of the literature and decades of experience, we have identified several possible modes for this study. Below is an examination of various modes but, in a summary, we recommend in-person interviews for this survey. They are a superior solution for this project due to their inherent cultural advantages and the expected length of the interview for this survey.

Although mail surveys are generally less expensive than other modes (in-person, telephone, online), they suffer from poor response rates. Without a staff member prompting the potential respondent to complete the interview, it is very easy for recipients to discard the questionnaire without opening it. Further, self-administered mail questionnaires are rife with opportunities for respondents to provide incorrect, improper, or no answers to questions that they do not understand or do not care to answer. A telephone interview, an in-person interview, and online interview can all be structured in a way to alert the respondent when they've failed to answer a question or gone outside the choice parameters—a mail questionnaire cannot do that. Based on our research, mail questionnaires are insufficient for high-quality data collection, especially for long interviews. (The anticipated length of this interview is approximately one hour.) Finally, mail surveys exclude members of the target population who are not literate.

Telephone studies are a popular mode of survey research, allowing for centralized management of the sample frame, the interviewers, and project administration. Telephone surveys, when programmed with computer-assisted



telephone interviewing software, can include complex skip patterns and other calculations which are less feasible with mail surveys and in-person interviews. Telephone studies allow convenient monitoring and supervision of the interviewing staff, ensuring consistent administration of the questionnaire. However, telephone studies lend themselves to social desirability bias, the notion that a respondent seeks to provide answers which will increase the likelihood that the interviewer “likes” the respondent (Maguire, 2009). Further, telephone studies are limited to respondents with telephones, obviously; it is difficult to ensure 100% coverage within the sampling frame if it is based on the telephone alone.

The telephone approach also has another disadvantage for dietary surveys. With a telephone interview it is more challenging to use visual aids for identifying species and quantifying portions. While materials might be mailed or emailed in advance of the interview, that is another level of complexity for the survey and the respondent, and it may be difficult to have the proper conjunction of present materials and the specified interview appointment. Further, the planned interview goes into some detail on a number of topics and the hour or hour-plus duration of a phone interview may lose cooperation and accuracy of reporting.

9.1.2 Use of Photographs and Portion Size Models

There are different ways to measure respondent food consumption, including administering questions verbally, with or without visual aids. The use of aids such as photographs and portion size models is a well-accepted measurement device when collecting respondent-reported data. This is consistent with other, large-scale, ongoing survey research projects, such as the National Health and Nutrition Examination Survey (NHANES), which uses portion size models for its initial in-person 24-hour dietary recall. The portion model representation will include composite dishes, such as stews, chowders and other mixtures.

In order to ensure the most accurate self-reported data about past food consumption, we strongly recommend the use of either photographs, portion size models, or a combination of both for this survey. Although photographs lack the tactile and 3-dimensional visual appeal of portion size models, they have been shown to be equally as effective (providing accurate measurement) as portion size models (Thompson and Subar, 2013). During the pilot test, portion models should be used to verify their efficacy.

The design team is collecting displays to use as species and portion-size choices for use in the interviews. See Section 4.4.6 for more information about



development of these portion size models and other visual displays that will be useful tools for respondents to indicate fish consumption types and quantities during survey implementation.

9.1.3 Use of Tribal Interviewers

This project represents an important step in the evaluation of fish consumption among native populations in Idaho. To encourage participation from respondents, professional interviewers will administer the questionnaire to each respondent. The interviewing staff will be selected, hired, and trained from among NPT members. Tribal representatives reported that Tribal interviewers are necessary to gain and maintain respondent trust. Further, Tribal interviewers are familiar with the local area.

Complementary goals during the survey include decreasing respondent burden and increasing respondent comfort. We expect that an interviewer who shares heritage with the respondent can more easily identify and adhere to cultural norms and sensitivities. The interviewer may be more attuned to the respondent's background, living situation, and local conventions and events. In short, we expect greater affinity between respondents and interviewers who are from the same Tribe than between respondents and interviewers who are not Tribal members. Additionally, this study covers a broad geography in rural Idaho. In addition to our efforts to match interviewers to anticipated socio-demographic characteristics of respondents, by using local Tribal interviewers, study and travel costs may be reduced.

9.2 Measurement Method

The survey will use two methods to measure current fish consumption. The first method will be based a food frequency questionnaire (FFQ) which ascertains species-specific frequency of consumption and typical quantities eaten per eating occasion. The questionnaire will also allow these quantities to vary by 'season' with up to two periods per species. A 'season', as the term is used here, is one or more periods when the respondent reports consuming fish at a rate different than that of other periods during the year. Some species may be consumed by a particular respondent year-round at about the same rate, and that respondent would have one season (over one year) for that species. Consumption on ceremonial occasions and other special events will be covered by separate questions. See the questionnaire section of this document for the questions and wording of the FFQ (Appendix A).



The principle behind the FFQ is as follows. Briefly, a respondent's frequency of occasions of consumption of fish (per day, week, or month) multiplied by the typical quantity eaten per occasion will give the total quantity eaten per day, week, or month. This quantity is easily converted to total annual consumption, which, divided by 365 days, will yield an average quantity of the given fish species eaten per day. A straightforward extension of this basic method, described later, can include seasonal variation and consumption at special events.

The strength of the FFQ is that average frequency and quantities of fish consumption are reported directly by the respondent. The weakness of the FFQ is that the respondent is relying on memory and must internally average their varying frequencies and varying quantities of consumption to come up with 'typical' values.

The second method is based on the respondent's recall of fish consumption during two or more specified 24-hour periods. Each period is the day before an in-person or telephone contact. The second (and later) interviews will be matched on the weekday vs. weekend occurrence of the initial 24-hour recall interview for a given respondent. The reason for this day-matching is to hold other variables relatively constant so that the variation between days of consumption is random variation in consumption *per se* and is not influenced by other weekly cycles of eating. For example, the difference between weekday and weekend fish consumption may be a fixed average difference and not simply random variation. (With a substantially larger sample size than will be used in this survey, the NCI method, by using certain information collected about each eating occasion, could accommodate a mixture of weekday and weekend fish consumption per respondent.)

The second step in working with the 24-hour recall surveys is use of the 'NCI method' to analyze the data collected (Tooze, et al., 2006). The NCI method uses some assumptions and statistical models to generate a fish consumption distribution¹⁷ that is consistent with the observed data in the two 24-hour dietary recalls.

¹⁷ By 'distribution' in this report we are referring to values of the mean, median, and higher percentiles of the population's fish consumption rates. 'Distribution' has a more technical definition in the statistical literature.



A strength of the NCI method is that the respondent is having to remember only items and quantities consumed on the previous day. A weakness of the NCI method is that some strong (but reasonable) assumptions are needed to generate the distribution of average daily intake for a population. An additional weakness of the NCI method in the context of a fish consumption study is that it may be able to supply consumption estimates only for all fish species combined and for one or two frequently consumed species. For the less frequently consumed species there may be too few consumption 'hits' on the sampled recall days to support a meaningful analysis. The design team recommends that the questions on the 24-hour recall be constructed to support estimates of frequency of consumption for a) all species combined, b) anadromous species, c) freshwater resident species, and d) marine species. The ability to make the consumption estimates for each of the individual species groups a, b, c, and d using the NCI method depends on having an adequate number of respondents who report eating from the species group on both of the two 24-hour recall interviews. However, even if the NCI method cannot be used, the FFQ will be designed to allow calculation of the consumption rate distribution for each of the major species, for all species combined, and for various groups of species.

The FFQ and the 24-hour questionnaires that will be used to support the fish consumption estimates can be viewed in Appendix A of this document.

9.3 Sample Size

Multiple sample sizes are considered here, corresponding to the following survey components:

- Initial telephone screening operation to identify non-consumers and high consumers
- Food frequency questionnaire (FFQ)
- 24-hour recalls (1st and 2nd recall days)

Some strata (or groups) of respondents will be sampled at a higher rate than others. For example, when characteristics of more frequent consumers or high consumers of fish are identified, a stratum of these tribal members will be sampled at a higher rate than members not in this stratum. Currently, the design team recommends that the high or frequent consumers be identified by the initial telephone screen. If one-quarter of the consumer population consists of high consumers, they may be sampled at four times the rate as the lower-level consumers, resulting in more than 50% of the sample consisting of high



consumers. In the statistical analysis following data collection, each sampled high consumer would carry one-quarter of the weight compared to a low-end consumer in order to represent the entire population in an unbiased way. However, despite their quarter-weight, the extra sampling of high-end consumers will provide greater precision in estimation of the higher percentiles of fish consumption—percentiles of great importance in water quality regulation. Also, the over-sampling of high consumers will provide a better basis for carrying out the NCI method of analyzing the 24-hour recall data.¹⁸

For each sampling operation considered, the driving factor in selection of a sample size is the trade-off between precision of an estimate—which improves with increasing sample size—and the mounting cost of a survey as sample size increases

9.3.1 Screening of Participants

An initial telephone screening call will be carried out to identify any non-consumers of fish and note reasons for non-consumption (described in more detail in Section 4.4.1). Non-consumers will not receive a personal interview.

9.3.2 FFQ Sample Size

Prior to presenting notes on sample size for this survey, a caveat is that the final sample size will depend on results from the survey pilot testing and telephone screening as well a critical dependence on resources available to this project to carry out the surveys for the Idaho Tribes.

The desired effective sample size for the FFQ will be approximately 140 fish-consuming individuals. The “effective” sample size is smaller than the number of individuals sampled, because high consumers will be over-sampled in proportion to their numbers in the population. The effective sample size here takes into account the statistical weight given to each individual. A speculative guess is that 25% of consumers¹⁹ in the Tribe will be high consumers and if the high

¹⁸ One of the assumptions of the NCI method is that the within-person variance of the logarithm of the quantity consumed on a day with fish consumption is constant across all levels of consumption. If the assumption is true, there is no disadvantage to over-sampling high consumers. It may be possible to check this assumption if there is a sufficient number of respondents with two days of consumption.

¹⁹ The Columbia River Inter-Tribal Fish Commission survey results (CRIFC, 1994) reported that 38% of adult fish consumers had two or more fish meals per week



consumers are sampled at a fourfold rate compared to the low-consuming balance of the consuming population, then approximately 245 individual respondents will be included in the sample. The 245 individuals would include approximately 105 low consumers and 140 high consumers. The 140 high consumers would each have one-quarter statistical weight, yielding an effective sample size of 35 high consumers. (The full 140 high consumer respondents would be included in the analysis, but four high consumers carry the same statistical weight as one low consumer, thus the effective sample size of $140/4 = 35$ for high consumers.) The 105 low consumers plus the effective sample size of 35 high consumers yields a total effective sample size of 140.

Based on some preliminary simulation analyses, 140 completed FFQ questionnaires from randomly selected Tribal members would yield a mean consumption rate with a 95% probability of falling within $\pm 25\%$ of the true population value.²⁰ This is a conservative estimate of precision (i.e., precision would likely be better), because the effective sample size of $n = 140$ stems from a much larger sample size of individuals, due to over-sampling of high-consumers. Under the same conservative assumptions, the 90th and 95th

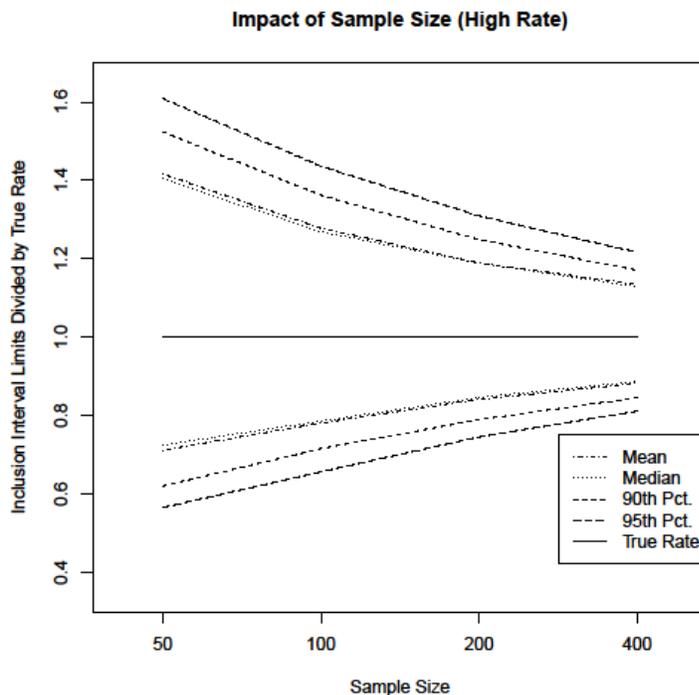
(Table 8). Given that some respondents may have consumed two or more of their weekly fish meals on a single day, the value of 25% of respondents consuming fish on two or more days per week (i.e., high consumers) may be a reasonable value to assume for this work.

²⁰ The simulations were samples of size $n = 100, 200$ and higher from hypothetical surveys of populations with a lognormal distribution of fish consumption rates for consumers only. Different populations were considered to have mean consumption rates varying from low to medium to high (mean \pm SD of 19 ± 21 g/day, 82 ± 128 g/day and 214 ± 273 g/day, respectively). For each population and sample size 10,000 simulated 'surveys' of the given sample size were drawn and the sample mean, median and 90th and 95th percentiles were calculated. From the simulation distribution of a descriptive statistic, such as the mean, the 2.5th and 97.5th percentiles of the descriptive statistic were calculated. This range, though not a confidence interval, shows estimated limits within which 95% of survey results for the specific statistic would be expected to fall for the given population and sample size. Across the low, medium and high fish consumption populations the maximum percentage difference of the limits from the true mean was 25% for a sample size of 140 (using linear interpolation between sample sizes of $n = 100$ and 200). For the 95th percentile of consumption the corresponding maximum percentage deviation from the true 95th percentile was 39%.



percentiles will have 95% probability of falling within about 40% of the true population value. Figure 4-1 shows the relationship between sample size and precision. It is apparent from the diagram that achieving high precision for the higher percentiles requires quite large sample sizes.

In order to yield approximately 140 high consumers and based on 25% high consumers and 30% refusals or no contact, the screening list will need to include approximately 800 individuals.²¹ The proportion of the population who are high consumers and the survey non-participation rate are speculative. For that reason, a phased start to the survey, as described in Section 3.2, is important with the implementation team learning from each wave of screening and then adjusting methods for the next wave.



²¹ Approximately 200 high consumers would need to have contact attempts in order to yield 140 net high consumers after a 30% loss rate. If 25% of Tribal members are high consumers, 800 Tribal members (of any consumption rate) would need to be contacted to find the 200 net high consumers. The low consumers can be selected from the remaining 600 Tribal members—the balance of the 800 who are not high consumers.



Figure 4-1. Precision of mean and selected percentile estimates vs. sample size

The upper and lower bounds for each estimate are expressed as a ratio to the true value. In 95% of surveys drawn from a population with a lognormal distribution of consumption rates, the estimated value of the statistic is expected to fall between the bounds corresponding to the survey's sample size (bounds are approximate from simulation).

9.3.3 24-Hour Dietary Recall Sample Size

All of the expected 245 individual respondents will complete the first 24-hour dietary recall assessment. All of these 245 respondents will have the possibility of selection for the 2nd 24-hour recall interview, but the probability of selection will increase with increasing (grouped) quantity and frequency of consumption as determined from the FFQ. The goal is to adjust the net number sampled on day 2 of the recall to yield at least 50 respondents with fish consumption on both days of the 24-hour recall.²²

The implementation team will need to: a) choose a cut-off that defines frequent consumers in terms of the frequency of consumption (and possibly the quantity eaten on day 1 of the recall), and b) determine selection probabilities for day 2 of the 24-hour recall in order to have at least an expected 50 individuals with fish consumption on both days 1 and 2 of the 24-hour dietary recall. The key parameters in this calculation will be an estimated survey non-participation rate (refusal, no contact, etc.) projected to the day 2 attempted contact, the percentages of day 1 recall respondents who consume at various frequencies, and the day 1 quantity of fish consumed.

As a side note, it is possible that the number of sampled individuals with two recall days of fish consumption will not be sufficient to yield a meaningful estimate of the fish consumption distribution using the NCI method. In that case, the data from multiple Tribes may be pooled and used with the NCI method, introducing the Tribe as a categorical covariate or as the person-specific fish

²² The minimum number of respondents—50—who consume fish on both days of the 24-hour recall has been suggested by Dr. Kevin Dodd, one of the developers of the NCI method. This minimum sample size is based on the precision of a variance estimate. To put the $n = 50$ in perspective, standard deviations (SD) based on 25, 50, or 75 degrees of freedom for samples drawn from a normal distribution would have 95% confidence limits that differ from the estimated SD by no more than 39%, 25% or 19%, respectively. Thus, $n = 50$ has an associated 25% level of precision, which is fair (not excellent) precision.



consumption rate for the species group being evaluated. That procedure will yield a distribution for each Tribe. However, some assumptions about commonality among the Tribes of certain statistics of the distributions will need to be tested and noted.

9.4 Questionnaire Development

A survey questionnaire, provided in Appendix A, was developed to help determine the fish consumption rate of the NPT. The purpose of the questionnaire is to ask Tribal members about their dietary patterns and activities related to fish consumption in the past 24 hours as well as in the preceding 12 months to determine current fish consumption rates. This will be accomplished by conducting two 24-hour dietary recall interviews (the second of which will be administered after a week, but within four weeks after the first recall interview) and a food frequency questionnaire, as discussed above. The second 24-hour recall will be administered to a randomly selected sample of the first-interview respondents, weighted toward those determined to consume fish more frequently, based on the first interview. Data will be collected regarding fish species consumed, frequency of consumption, and portion size, with additional information gathered about parts eaten, preparation methods, and special events. Data will also be collected regarding changes in fish consumption patterns from the past and expectations for future consumption to develop a more accurate FCR that is not restricted by current-day suppression factors.

The questionnaire is written such that the trained interviewer can clearly follow the line of questioning, read each question verbatim, and record (in written form, by check box or circling) the information given by each respondent in the space provided in a consistent manner. Words to be spoken by the interviewer are identified in bold text on the questionnaire, and each question will be asked in numeric order. Written information will only be recorded on the questionnaire form by the interviewer. Entry codes, species displays, and portion displays will be used during the interviews.

Past fish consumption surveys were reviewed, in addition to recent survey questionnaires developed by the Center for Disease Control and Prevention (CDC), for guidance in selecting wording for the current questionnaire. These resources are listed in Section 7. The questionnaire will be pre-tested (during a pilot survey) and revised as necessary prior to implementation. The questionnaire is organized according to the following sections, which are discussed in more detail below:



1. Telephone Screening
2. Interview Introduction
3. 24-Hour Dietary Recall
4. Food Frequency Questionnaire
5. General Information
6. Second 24-Hour Dietary Recall

9.4.1 Telephone Screening

Potential respondents will first be contacted by telephone. The initial phone contact will provide an opportunity to screen for fish consumers versus non-fish consumers and to discern why fish is not being eaten by the non-consumers. For those who do eat fish, an in-person interview will be scheduled with the respondent for a later date, if they are willing. The selection (or non-selection) of a tribal member reached through a screening call will be based on the survey's progress in filling in the required sample counts for each population stratum.

Each respondent will have his or her own Telephone Screening Contact Log. The Telephone Screening Contact Log will be maintained separate from the interview forms, as the contact log will provide the only documentation linking the respondent's name with the respondent's randomly assigned identification number. Subsequent interview forms will only include the respondent identification number to maintain confidentiality of the respondent.

This section of the questionnaire provides statements for the caller (interviewer) to make over the telephone and a log to record every contact attempt. If multiple attempts are made, the interviewer placing the call may vary (and may be different from the person who ultimately conducts the interview). The Telephone Screening Contact Log will include the date, day of the week, and time of the call, name and identification number of the interviewer making the call, results of the call according to the entry codes provided, and whether or not the respondent consumes fish. If an in-person interview is scheduled over the telephone, the date and location of the interview will be recorded on the contact log.

9.4.2 Interview Introduction

The primary in-person interview will begin by documenting basic identifying information about the interview (who, when, where) and introducing the



respondent to the project and the purpose of the interview. Administrative information will be recorded before (or as) the interview begins and will include the interviewer's name and assigned identification number, the respondent's assigned identification number (no name), and the date, day, start time, and location (city, state, and venue) of the interview. After the administrative information is recorded, the interviewer will read the introductory narrative to the respondent to formally begin the interview. The respondent will be reminded that their information will remain confidential. The primary in-person interview includes three parts, the 24-hour dietary recall, the FFQ, and general information. A second 24-hour dietary recall survey will be conducted for a subset of respondents by telephone.

9.4.3 24-Hour Dietary Recall

Following the introduction, a 24-hour dietary recall questionnaire will be administered to collect information on fish dietary patterns during the previous day. The objective of this component of the survey is to estimate total intake of fish that was consumed during the 24-hour period prior to the interview from midnight to midnight. The interviewer will read the questions in numeric order and complete the table, entering and circling answers as provided by the respondent.

The primary series of questions relate to the types of fish eaten over the past 24 hours, the quantity, preparation method, and source of the fish eaten. Once the interviewer has verified whether the respondent ate fish during the previous 24 hours, the interviewer will inquire about fish eaten during each occasion over those 24 hours, including species type (to be coded later), portion size (quantity), preparation method, and source of each fish meal or snack consumed by the respondent. Species and portion displays will be used.

A representative selection of respondents, weighted toward those identified as being high fish consumers, will be contacted for a second (separate) 24-hour dietary recall survey by telephone after a week, but within four weeks after the first interview. The second 24-hour dietary recall questionnaire will mimic the first, repeating the same inquiries as administered during the primary 24-hour dietary recall interview. The method of identifying species and sizing portions on the second 24-hour interview (by phone) is still being determined, but it is likely that it will use either displays left with the respondent at the initial interview or else delivered to the respondent.



9.4.4 Food Frequency Questionnaire

Following the 24-hour dietary recall, an FFQ will be administered to collect information on fish dietary patterns and associated activities over the past year. The objective of this component of the survey is to estimate total intake of fish that was consumed over the previous 12 months as well as to gather information about fishing activities and other factors that may affect consumption. The interviewer will read the questions in numeric order and complete the table in the questionnaire.

The first series of questions relate to the species, frequency, and quantities of fish eaten. If consumption varies with high and low-eating periods, questions will be asked for each period. Once the interviewer has verified whether the respondent ate fish during the previous 12 months, the interviewer will inquire about which type of species were eaten, the number of portions or frequency that each type was eaten, and typical portion sizes. Species and portion displays will be used.

Information will be gathered regarding parts of fish consumed, methods of preparation, and sources of fish consumed over the past 12 months. Information will also be gathered about activities associated with fish consumption, including special events, such as feasts and ceremonies, as well as fishing activities. Finally, several questions will attempt to gather more qualitative data on changes in fish consumption compared to the past and about intentions for fish-consumption in the future.

9.4.5 General Information

General information will be collected at the end of the primary in-person interview. Demographic information will be recorded, including the respondent's gender, date of birth, age, height, weight, residence on or off reservation, education level, and household income. These items are being collected to provide sub-groups for rate-reporting, to support calculations of rates in other formats (e.g., g/kg-day), or to attempt to identify characteristics of high vs. low consumers of fish. After the demographic information is recorded, the interviewer will ask female respondents about their breastfeeding history (linkage to child health).

The interviewer will conclude the interview by reading the statements of appreciation, inquiring about future contact. At that point, the interviewer will record the end time (and calculated length) of the interview. Following the interview, the interviewer will record their opinion of the respondent's level of



participation (cooperation and reliability) and acknowledge that they recorded the information truthfully and to the best of their ability by signing an attestation of authenticity.

9.4.6 Photographs and Portion Models

Portion models and graphics (photographs or other representations) will be used during the 24-hour recall and food frequency questionnaires and will be comparable to the U.S. Department of Agriculture (USDA) portion size booklet (and accompanying measuring implements) that is used by NHANES for national dietary surveys. These models will provide a visual display of quantities of fish consumed during each meal. These models will be reviewed and tested by the implementation team prior to survey interviews, and they will be evaluated for usefulness and appropriateness by the Tribes (and modified, if needed) during pilot testing of the questionnaire. The portion displays have not been fully evaluated by the survey team yet, but following are some general considerations in the selection and use of the final portion displays.

There may be a need to calibrate the portion displays to physical weights of the species represented and for each specific portion size shown in the display. Any portion displays should show the portions as actual (100%) size. If possible, the display should be shown to the respondent at a distance similar to the distance between a person and their meal, without being intrusive of personal space. This could usually be accomplished by handing the display to the respondent and asking them to indicate the particular portion mark within the display that corresponds to their consumption in response to a question.

All portion displays will have a specific code attached to them, and a separate table (to be used during data analysis) will show the volume and/or weight-per-species corresponding to each portion mark in the display. To maintain efficiency of the interview, the respondent will answer questions in terms of simple portion marks or codes on each display, saving the interviewer a table look-up for the species-specific weight of the noted portion.

Dishes such as stews, chowders, casseroles, and special composite dishes unique to the NPT will have their own portion models to indicate serving sizes. For example, measuring bowls will be used for respondents to identify portions of liquid dishes (with a fish ingredient list pre-determined). The survey team will identify the tribal-specific dishes (only those which include fish as a component) and obtain approximate recipes for conversion of visual portion sizes to weight of fish by species. Other composite dishes that are reported will be handled



using standard recipes (such as that compiled by the EPA) to convert respondent-reported quantities consumed to weight of fish consumed.

9.4.7 In-House Testing and Revisions of Questionnaire

In order to create the most effective questionnaire, the research design team identified the information of interest and crafted an initial design that was modeled after other questionnaires from recent, similar studies. Survey research experts from Pacific Market Research reviewed the questionnaire, along with statistical and subject matter experts.

Prior to widespread implementation, the questionnaire will be administered and tested among team members for content and length. After passage of that test, the questionnaire will be administered to a small subset of the target population. Following this “pilot test,” sample respondents will be interviewed about their experience with the questionnaire, including:

- Was your overall impression of your interview experience positive or negative, and why?
- Which questions were challenging? If any were challenging, what might make them easier?
- Keeping in mind that the study topic is fish consumption, are there any questions that ought to have been asked but weren't?
- Are there any questions which seemed unnecessary?

Each step of the process allows for questionnaire revisions as appropriate. Significant revisions and/or additions to the questionnaire deserve further testing.

9.4.8 Pilot Testing of Questionnaire and Field Operations

The pilot test will cover most of the survey procedures, including screening, invitation and first contact, interview using the questionnaires (FFQ and 24-hour recall), field review and key entry. The persons selected for the pilot test will exercise all dimensions of the questionnaire. It is likely that 15-20 persons, at least, will be needed for an adequate pilot test.

Questionnaires may be revised continuously while the pilot test is underway, but substantial revisions may require additional pilot interviews to test new questions or new wording and formats. The following characteristics of pilot test respondents (who will not be eligible for inclusion in subsequent sample selection) will be covered.



- Age: elders and younger members
- Gender: males and females
- Lifestyle: modern and traditional
- Fishing: fishers and non-fishers
- Source of fish: primarily eat at home vs. eat out frequently
- Income: low-income and high-income
- Food preparation: respondents who do and do not usually prepare food for the household

A pilot test respondent may cover more than one dimension. For example, elder fishers may contribute to understanding the questionnaire performance on both elders and fishers. However, other combinations of characteristics with an elder and with a fisher should also be tested. Additional pilot test participants may be added until the various dimensions have been fully covered. During the pilot test it is important to interview different types of respondents so that all iterations of the questionnaire can be addressed. The pilot test should include the anticipated final questionnaire as well as other tools related to it, such as portion size models and photographs.

9.5 IRB Approval

In order to meet accepted standards of protection for survey respondents, we will seek Institutional Review Board (IRB) approval of the survey design. We have identified Quorum Review IRB, a commercial IRB service, as a vendor for this purpose. The process consists of preparing a set of documents (see list below), working with the IRB for pre-review of the application, revising the application based on the pre-review, and then submitting the revised application for full review.

The following list provides an example of the documents needed for the IRB application; many forms and examples are available on the Quorum Review IRB website, at <http://www.quorumreview.com/forms/>.

- Submission forms, which include administrative details about the study, study locations, and study team.
- Study Protocol, including discussion of the purpose and benefits of the study, potential risks to the respondents, description of the study methods,



selection criteria for respondents, and procedures to protect confidentiality.

- Curriculum vitae (CV) and other credentials of the Principal Investigator (PI). Only one PI is needed for the IRB application if that PI will be responsible for the protection of human subjects.
- Survey documents, including survey forms, consent forms, and any other written material which will be provided to respondents.

The goal of pre-review with the IRB prior to full submission is to improve the quality and completeness of the submission. Quorum Review provides a pre-review service for this purpose. The expected timeline for IRB approval is about 1 week from submission of all documents, depending on whether the pre-review identifies any issues. Since this survey is purely behavioral and risk to the study participants is minimal, we expect that it will qualify for expedited review.

9.6 EPA Human Subjects Review

In addition to IRB review and approval, the survey will need review and approval from the EPA Human Subjects Research Review Official (HSRRO). The process consists of submitting an application and supporting documents to the HSRRO. The IRB review and approval is one input to the HSRRO review process. The HSRRO has final authority for review of human subjects research supported by the EPA. The following documents are needed for submission to the HSRRO; additional documents may also be requested:

- Application memorandum using a template provided by the HSRRO, which includes a brief discussion of the value of the research, any risk to the subjects from the research, and the approach for subject selection and informed consent.
- Documents submitted to the IRB, including the study design and survey documents such as consent forms, survey forms, and recruitment material.
- Documents received from the IRB, such as review comments and letters of approval or exemption.

The HSRRO review process takes place after IRB approval and prior to commencement of the survey.



The EPA provides educational resources for investigators to clarify human subjects research policies, such as the online tutorial “Human Subjects Research at the Environmental Protection Agency: Ethical Standards and Regulatory Requirements” at http://www.epa.gov/osa/phre/phre_course/index.htm. The survey team will pursue and manage the human subjects approval process with EPA.



10.0 SURVEY OPERATIONS

This section describes the field operations, including interviewing and contacting participants, as well as pilot testing and key entry of the questionnaire.

10.1 Interviewing

This section describes the selection and training of individuals who will administer the survey interviews; procedures for conducting the interviews; scheduling, monitoring, and recording interviews; and proper handling of the questionnaires.

10.1.1 Interviewer Selection

Interviewing positions will be filled in collaboration with the Tribal authorities with agreement on selection by both parties. Once hired, the interviewers will report to the survey team. Ideally, the Tribes will recruit or propose two to three individuals for each interviewer position. Additionally, the survey team hopes that the NPT will promote participation in this study, both for respondents and interviewers. For those who apply for the interviewing position, a survey team staff member will explain the job duties; those whose qualifications appear promising will be invited to complete various skills and aptitude tests that cover:

- Education
 - High school diploma or GED
 - 9th grade reading level
 - Reading sample survey script: silently and aloud
 - Comprehension and clarity
- Clerical skills
 - Legible hand-writing
 - Spelling
 - Grammar
- Employment availability: part-time work for 9-12 months
- Transportation
- 18+ years old
- Courtesy and professionalism
- Ability to think “on one's feet” and to adapt to changing conditions
- Good communication skills
- Reliability



- Ability to follow directions, as it is important that surveys be administered using a common, scripted approach to maximize objectivity and to enhance comparability of answers.

10.1.2 Interviewer Training

Interviewers will be trained to follow “best practices” when it comes to in-person interviews. This classroom component of the training is expected to last approximately 4-8 hours. It will begin with an overview of survey research, including a brief history of its utility and the importance of its role. The training will include general and specific interviewing techniques and skills. In addition to an explanation of the origin of this survey, interviewers will receive survey-related materials and information about the critical nature of the project. As part of the training, the survey staff will themselves need some instruction in practices that are acceptable to or unacceptable to Tribal respondents. These important cultural points will be included in the training.

Interviewers will be exposed to general survey research principles related to interviewing. Objective data collection will be emphasized, as will the need to listen closely to what the respondent says and record it accurately. Interviewers will learn how to probe, clarify and check open-ended answers to ensure that they've elicited and captured all relevant information from the respondent. Most importantly, interviewers will participate in a lengthy and in-depth mock interview session during which the interviewer works directly with a supervisor or another co-worker to try out the questionnaire and what they've learned. The supervisor will provide the interviewer with challenging but realistic answers to the questions.

Special attention will be devoted to cultural aspects which might prove challenging during verbatim administration of the questionnaire. For example, if a respondent does not understand a question, a typical interviewing technique is to repeat the question and to answer the respondent's inquiries with, “I can't interpret the question for you. It is whatever the question means to you.” If the pilot test uncovers survey items which are unclear, additional probes and prompts will be developed in order to minimize interviewer interpretations while in the field.

10.1.3 Procedure Manual and Training for Interviewers and Supervisors

All interviewers and supervisors will undergo a comprehensive training prior to beginning work on this project. The training will include basic and advanced



topics necessary to successfully conduct in-person survey research. Below is an example agenda for the training sessions which would be required for all interviewing staff.

- Introduction of survey staff and implementation team
- Project background
- Overview of survey research
- Confidentiality requirements
 - Dealing with Personally Identifiable Information (PII)
 - What to do if you know the respondent
- Exploration of question types
 - Close-ended items
 - Numeric items
 - Scale items
 - Open-ended items
- Importance of precision and accuracy when recording answers
- Objective research: non-bias by interviewer
- Techniques to probe and clarify
- Building rapport with respondents
 - Being courteous and respectful
 - Addressing challenging respondents
 - Older
 - Hard-of-hearing
 - Angry
- Review of questionnaire
- Quality control measures
 - Self-monitoring
 - Supervisor/data entry controls
 - Call-backs and verification
 - Statistical tests
- Productivity targets
- Logistics related to appointments, survey administration, etc.
 - Reimbursement for expenses
 - Contact information for all staff



10.1.4 Scheduling and Monitoring Interviewers and Activities

The process for assigning in-person interviews will be administered by the survey team's scheduler, who, initially, will be an employee of Pacific Market Research—one of the three firms which will be carrying out the survey implementation work. The scheduler will work closely with the interviewers to ensure that the in-person interviews are scheduled only during hours when the interviewers are available. Over time, some or all of the scheduling responsibility might be transferred to the interviewers with continued monitoring by the survey staff. Based on the estimated interview length, we anticipate that it will be possible for an interviewer to complete two interviews per day. This is expected to be the target quota for the interviewers, given the length of the interviews and activities associated with each interview. This depends on many factors, including the distance that the interviewer must travel, road conditions, and whether the respondents show up when agreed. We recommend setting a target of at least one half of all interviews being conducted at a central location on each reservation.

Consideration will be extended for respondents with mobility problems, ensuring that their responses are gathered even if they are homebound. Accounting for respondent availability and interviewer workload, interviews will be scheduled seven days a week starting as early as 8:00 a.m. with no interview beginning later than 8:00 p.m. To the extent possible, a primary goal is to minimize respondent burden; one way to do this is to offer an assortment of times and convenient locations for the interviews.

Any issues of calendar sensitivity (such as avoiding or minimizing interviews on Sundays or special occasions) will be addressed in conjunction with the Tribes prior to the commencement of interviewing. The survey implementation team will work with the Tribes to jointly design an initial approach to respondents that is consistent with the Tribes' way of carrying out activities and is also consistent with accepted scientific survey practice.

10.1.5 Recording Interviewer Responses

Interviewers will record interview answers on the hardcopy questionnaire. They will also record start date, the start time, the completion date, and the end time. Writing will be tidy and easily readable. Stray marks or mistakes will be corrected as necessary prior to handing off the completed questionnaire for data entry.

During data entry, the entry staff will review the questionnaires as they enter them. If the supervisor or the data entry personnel observe missing data or other



problematic aspects with the questionnaire, it will be referred to the original interviewer for review and correction as appropriate.

10.1.6 Integrity and Handling of Questionnaire Hardcopy

The completed questionnaires will be protected by interviewers until the questionnaires have been delivered to the data entry staff or a secure holding area. Questionnaires must not be left out where non-survey staff might gain access to them. Instead the questionnaires should be kept with the interviewer, within his/her physical control, or in a locked area prior to handing off to data entry.

10.2 Contact with Respondents

Respondents will first be contacted by mail and/or Tribal newsletter to introduce the project in general. Respondents will then be contacted by telephone, followed by a selection of those respondents who are willing to participate in the in-person interview(s).

10.2.1 Initial Contact by Mail and Telephone

Initial contact with respondents will be by letter or postcard, alerting respondents that the survey is forthcoming and that their opinions are important. Follow-up contact will occur via telephone (up to 15 call attempts before assigning a record as deceased or otherwise ineligible). During the telephone call, respondents will be screened for fish consumers versus non-fish consumers, and an attempt will be made to schedule an appointment for an in-person interview with fish consumers.

The implementer will coordinate with individual Tribes to identify motivating factors such as incentives or other valuable rewards for prospective respondents. EPA funds cannot be used for remuneration but we strongly recommend providing a token of gratitude in order to establish good will and boost the response rate. Without incentives there is danger of survey failure due to a low response rate. If the main motivation for the respondents in this project is a sense of altruism, it is all the more important that the interviewers are extremely assertive and persuasive in convincing prospective respondents to participate. In order for the survey to be successful, the Tribal leadership will need to play a central role in informing the Tribe about the survey and promoting cooperation with the survey.

When contacting respondents by telephone, some individuals are expected to refuse to participate. The initial counterpoint to a respondent refusal is to explain



the importance of the respondent's opinions and experiences in the study, sharing with him/her how the results will benefit the Tribes and community. If he/she still refuses, the interviewer will put the number back in the system, allowing several days to pass before attempting the number again. Call-back conversion attempts are often handled by "conversion experts," different from the original interviewer, which may be applied as necessary. Interviewers will use standard survey research practices to try to convert initial refusals to cooperative participants.

10.2.2 In-Person Interviews

Data collection will take place either in the respondent's home or in a central, public location. Part of the goal of the research is to promote a feeling of confidence and good will among the prospective respondents in order to conduct as many completed interviews as possible. To this end, we recommend conducting the interview in a location where the respondent feels comfortable and safe. The interviewer will either meet the respondent in a mutually agreed location or go to the respondent's home. Background materials relevant to the survey will also be provided to the respondent in advance.

At each interview's conclusion, the interviewer will graciously thank the respondent for his/her time, reiterate the importance of the study results, and quickly review the questionnaire so that the interviewer may administer follow-up questions for any items which have missing information. To the extent possible, interviewers will record interview feedback from respondents. This includes praise and complaints from respondents. Feedback will be provided to the scheduler or the supervisor at the end of each day. Interviewers are required to provide the outcome or disposition of each interview attempt as soon as possible after the attempt or at the conclusion of each day, whichever comes first. The disposition will be recorded in a master database so that the result is available for immediate and later analysis.

10.2.3 Follow-up Call and Re-Interview

For quality control purposes, we recommend a follow-up call to every respondent. The follow-up call or verification call is intended to provide a double-check of the interview. Some respondents who receive a follow-up call will merely be asked whether they participated in the survey. But a sub-sample of the entire group will be asked to validate their data. By asking some of the same questions again, the researchers can test the reproducibility of the data. The questions will be selected to represent major sections of the questionnaire and will avoid questions with complex or long lead-in development.



10.3 Tribal Collaboration in Field Operations

It is recommended that a primary technical contact for survey operations be identified by the Tribes. This contact person will be responsible for collaborating with the survey implementation team, providing access to the Tribal facilities for conducting interviews, assisting with the logistics of contacting and following-up with survey participants, and keeping the Tribal leadership and membership informed of the status of the survey.

To create and roll out a successful survey, it is critical to obtain Tribal support initially, particularly Tribal leadership, and to develop and maintain the relationship and support throughout the project. From the implementation team this requires familiarity with quantitative survey research as well as cultural sensitivity. The implementation team must be available to the Tribal representatives to address any outstanding survey issues. Two-way communication is crucial.

10.4 Key Entry of Questionnaire, Validity Checks, and Storage

Data collection will be conducted with hard copies of the questionnaire. After the data have been recorded on the questionnaire, information will be keypunched or entered onto digital media. This provides an extra level of redundancy as well as, and more importantly, an automated method of organizing and eventually analyzing the data.

Many data entry software packages are available and they allow quick, efficient, reliable and secure data entry. Some of these include: SPSS Data Collection Data Entry, Voxco Interviewer Suite/Command Center, EpiData Software, SurveyAnalytics iPad Survey Tool, snap Surveys, Confirmit and even Excel. Pricing varies depending on the vendor and the type of solution, from many thousands of dollars to a nominal (or even no) fee for open source applications. Each software package has its benefits and drawbacks, but for this project we recommend SPSS Data Collection. For security purposes, sample files and data files shall be encrypted.

Best practices demand that data entry is verified. This can be accomplished by spot-checking randomly selected data points in every n^{th} interview or entering all responses for every n^{th} interview twice. The most reliable way to check the accuracy of the data entry is to perform 100% verification. This means that *all* data points for every interview are entered twice. We strongly recommend 100% verification.



To effect reliable data verification, two or more parties will be involved in the process. An initial keypunch operator enters the data for one interview; it is verified (re-entered) by a different keypunch operator. Each record or line of data related to the questionnaire is checked against its respective original record. If discrepancies are found, a supervisor or other staff member will review both of the electronic records and the hard copy of the questionnaire to determine which data entry point is correct.

Error rates will be tracked among survey responses in general and also by cross-tabulating responses by various demographic or other information, and looking for anomalies or statistically significant differences.

10.4.1 Field Validity Checks and Re-interview

Of the many places where an error can be introduced into the data, the collection point is among the first. A typical way to test for interviewer errors is to re-contact some respondents and re-ask several questions. Due to the additional burden on respondents during this follow-up process, it's unrealistic to administer the entire interview again; instead a subset of questions may be asked to validate the data recorded by the interviewer. Not all respondents will be re-contacted. In the event that significant differences are found (between the originally recorded answers and the validation answers), the interview for that respondent will either be discarded or a new interviewer will be sent to administer the full questionnaire again. Each interviewer's work will be evaluated for consistency and accuracy. Selected questions will be re-asked of a selected sub sample.

10.4.2 Handling Missing Values

Missing survey data, whether because of survey design problems, interviewer error, respondent misunderstanding or simply refusal to answer questions, can be problematic for any project. Ideally there will be no missing data. In the event that a record is missing some of its data—and it is due to respondent-caused factors—there are several acceptable steps for adjusting the data to accommodate missing values. By using data analysis software we can impute new values where once the data were missing. That is, based on the values in other, similar cases, data can be pushed into the records which had missing data. The replacement data might be based on copying a value from a random case, mean substitution, regression, or multiple imputation. Generally, the most robust method is with multiple imputation; we recommend using multiple imputation for this project. This will be implemented during analysis.



10.4.3 Naming and storage of electronic files

Data files will be stored and named according to the specifications of the selected data entry software. Generally the file name suffix should be a concise but descriptive annotation of the file's contents and the date of last revision. For example, a data file created in Excel which holds information about the NPT should be named *fish_consumption_NPT_2014_04_23.xls*, where "fish_consumption" describes the study, "NPT" identifies the Tribe and "2014_04_23" is the date that the file was last modified. In most cases the file extension will depend on the data entry software. Some systems do not allow long file names. In this case, the file name will be shortened to convey as much information as possible without exceeding file-naming rules for the respective operating system.

10.4.4 Back-up and Transfer Protocols

Data back-ups shall be completed on a basic grandfather-father-son rotation schedule. Backups will be completed daily, weekly, and monthly. Media for daily back-ups are rotated daily, weekly back-ups are rotated weekly, and monthly back-ups are rotated monthly. For example, a back-up is completed each day. After the initial back-up, additional back-ups will be incremental (i.e., backing up only the files which have changed since the previous back-up).

The transfer of files which contain Personally Identifiable Information (PII) or Protected Health Information (PHI) shall be conducted via secure messaging or via a Secure File Transfer Protocol (SFTP) site. Sensitive data must not be transmitted via "regular" e-mail or other unsecured means.

10.5 Sensitive Information

During the administration of this survey, the Tribe will provide information about their membership. Some of this information is considered "sensitive information" and must be protected from disclosure. Sensitive information includes PII and PHI. Various laws and regulations affect the handling of PII and PHI.

10.6 Confidentiality and Data Management

Tribal Committees and the Tribal Office of Legal Council will be included in discussions and plans to maintain the confidentiality of the data during the survey operation. All survey staff will be required to sign a Proprietary Information Agreement and a Non-Disclosure form prior to gaining access to private or sensitive information and certainly before beginning work on the data collection. The agreement will include confidentiality during the interviews and confidentiality of the survey results.



10.6.1 Confidentiality of Hardcopy and Electronic Files

Hardcopy questionnaires, with data on them, whether completed or not, must be stored in a secure location if they include PHI or PII. A secure location is an area that cannot be easily breached by the public or by non-authorized personnel. An example of a secure location is within a safe, a locked filing drawer or sometimes a locked office. However, a locked office is often insufficient as custodial staff or other workers might have access to the area.

Data files which contain PII or PHI shall be stored on secure password-protected devices. In this case a password-protected device is an electronic medium which requires a unique username (not shared among users) and a strong password in order to access the file. The strong password should include a combination of alphanumeric characters, with uppercase and lowercase letters and numbers. The file should be encrypted using at least AES 256-bit security.

10.6.2 Communicating Confidentiality to Participants

Respondents will be informed in advance and again at the beginning of the interview that their survey responses will remain confidential and that all research results will be reported in an aggregate manner. No individually-identifiable data or answers will be shared with anybody outside of the survey staff. The respondents will be assured that they can safely and honestly answer the questions, since they will remain anonymous after completion of the interview. Respondents will be advised that a Freedom of Information Act (FOIA) request might nullify the study sponsor's promise of confidentiality. However, the usefulness of the data, on an individual level is dubious: a FOIA request is unlikely to affect divulgence of individual information.

The EPA and the NPT have yet to agree on and sign confidentiality agreements; communication to the respondents will be specified (and reviewed by the Tribes) after such agreements are in place. The survey will not proceed on administering any interviews with tribal members until confidentiality agreements are in place between the NPT and EPA and the survey has received both IRB and EPA Human Subjects approval.



11.0 ANALYSIS, REPORTING, CLOSE-OUT OF STUDY

This section discusses the methods for analyzing data collected from the FFQ and 24-hour dietary recall surveys, as well as final reporting and completion of the study.

11.1 Analysis of FFQ results

The data collected from the FFQ will enable a fish consumption rate (g/day) to be determined for each sampled individual. For an individual, the rate can be determined for each species or species group (anadromous, resident freshwater, and marine). Briefly, an annual amount consumed arising from consumption in a particular season can be calculated per species from the typical portion size (grams) consumed for that species multiplied by the frequency of consumption, then multiplied by the duration of the season (or period). The sum of this total seasonal quantity for the two seasons yields an annual quantity. Secondly, the amount consumed (grams) in ceremonial or special events can be calculated from the typical consumption amount at those events multiplied by the number of such events attended per year by the individual. This can be added to the total amount for two seasons to yield a total consumption for a year. Division by 365.24 days (taking into account leap years) will yield a daily amount in grams per day for the given species. The daily consumption rate for a species group can be calculated for an individual by summing the daily rates for the individual species included in the group. Some selected analyses can be carried out to express consumption rates in grams per kilogram of body weight per day (g/kg-day),²³ since some consumption studies report rates in these units.

The computation of means, medians and other percentiles will need to take into account the stratification and weighting used in the sampling, as well as any correlation among respondents' data introduced by the occurrence of two sampled adults in the same household.

Quantities reported for the NPT should be accompanied by appropriate indications of uncertainty and, where applicable, an estimate of variation across individuals. All means reported for fish consumption rates or for other variables should be accompanied by standard deviations along with a notation of the weighted and unweighted sample size underlying the calculation. Other

²³ Body weight data will be collected with general demographic information during the in-person interviews



estimated quantities (aside from means), such as percentiles of the fish consumption distribution, should be reported with standard errors and, for rates that are likely to be considered for setting water quality standards or other regulatory actions, the estimate should be accompanied by 95% confidence intervals. Again, for percentiles and other quantitative estimates, the underlying weighted and unweighted sample size should be noted.

There are several methods available for computing percentiles of an empirical distribution. See Hyndman and Fan (1996), for a discussion of the different methods. The design team recommends the calculation of type 7 percentiles, as noted in the Hyndman article.

A number of other quantities and responses are collected in relation to the FFQ. These quantities will consist of continuous variables (such as age) and categorical variables (such as gender or education). The continuous variables can be summarized by means (and medians if there are highly skewed distributions), standard deviations, minimum and maximum values and, if appropriate, standard errors. Categorical variables can be summarized by percentages per category. The total sample size underlying each set of summary statistics for variables should also be shown.

Confidence intervals (95% level) for the various statistics can be calculated by several methods. The choice of method depends heavily on the distribution of the values used to calculate the statistics and on the sample size. For the larger sample sizes (e.g., over 100), the nonparametric Bootstrap will usually work well for the mean, median and percentiles near the median, but other methods may be needed for the higher percentiles. (The Bootstrap method will need to be adapted to the particular weighting and stratification scheme used for the NPT.) Experiments with the Bootstrap for 95% confidence intervals for various percentiles or the mean from random samples from a lognormal distribution show less than 95% coverage for sample sizes of the magnitude discussed in this report. For the 90th and 95th percentiles (and possibly other nearby percentiles), non-parametric confidence intervals can be based on the ranking method described by Hollander and Wolfe (1999).

Alternatively, if the distribution appears close to the lognormal or another distribution that can be specified in closed form, the parametric bootstrap can be used. For example, a lognormal distribution can be fitted to the data (taking account of weighting) and the bootstrap algorithm can be applied to calculate percentiles for samples drawn from the fitted distribution, again taking account



of weighting and stratification. In fitting a distribution to the data, another method that may be useful is to fit a broken-stick spline to the Q-Q plot (using normal distribution quantiles). The parametric bootstrap can then be carried out with the fitted distribution.

11.2 Analysis of 24-hour Recalls

The 24-hour recall data will be analyzed using the “NCI method.” An example of analysis of fish consumption data using the NCI method, along with a heuristic description of the method can be found in Polissar, et al., 2012. Dr. Kevin Dodd of the NCI, one of the developers of the method, has offered to assist in implementation of the method for the Idaho Tribes. The implementation team statistician will be in touch with Dr. Dodd to carry out this work. Helpful references for this method can be found in Tooze, et al., 2006; Dodd, et al., 2006; and Kipnis, et al., 2009. An excellent series of webinars, including a talk and materials by Dr. Janet Tooze on the NCI method, are available at <http://riskfactor.cancer.gov/measurementerror/>. The SAS software for the method is available from Dr. Dodd at NCI and it will need to be adapted to this specific survey methodology. Confidence intervals are not provided by the methodology, but they may be computed by some potentially computationally extensive methods.

As noted previously, there may not be a sufficient sample size of respondents with two fish consumption days from the two 24-hour recall interviews to support the NCI method for the NPT considered alone. In that case it may be possible to estimate fish consumption rates for the NPT by pooling data with other Tribes (for this purpose alone) and then using a covariate or covariates to generate a unique NPT distribution of consumption rates. The covariate might be either a tribal indicator variable or else the respondent-specific consumption rate from the food frequency questionnaire.

11.3 Reporting of Results

The results of this survey are likely to be used for years ahead, if not decades, therefore a very complete report should be prepared. Some of the tribal fish consumption surveys in the Pacific Northwest continue to be used for environmental regulation more than 20 years after their completion. This survey will likely also have that long-term utility.

In addition to the report describing the methods and results of the survey, the implementation team may also prepare a short procedural history of the survey, including lessons learned and changes in design made during the survey



operation. Such a report will help users of the results to understand the context of data collection more thoroughly.

The suggested format for the report on suppression and quantitative rates is the commonly used sequence of:

- Executive summary
- Introduction (including background and motivation)
- Methods (including methods for survey design, survey operations and statistical methods for data analysis—for both the suppression study and the current consumption survey)
- Results (extensive tables and displays along with textual commentary) on the suppression study and the current consumption survey
- Discussion (including main findings, comparison of the rates from the FFQ and the NCI method, strengths, weaknesses, remaining uncertainty, potential applications of the results in water quality regulation and conclusions)
- References
- Appendices (including more detailed tables than presented in the body of the report, technical notes, and other supporting material)
- Acknowledgments (thanking, in particular, tribal council, tribal respondents and tribal staff)

The suppression study will fit into this framework as well, as part and parcel of the report. There have been many studies of historic rates and suppression in the past, but their isolation from a report on current rates may have denied them the attention they deserve. The primary quantitative results from the suppression study are likely to be mean (average) consumption per day with a plausible range bracketing the mean. To the extent possible, the rates will be categorized by broad species groups.

The methods section of the report can include plain-language description of methods, but highly technical material should be placed in the appendices. This should be a report whose main body is very readable by Tribal leaders and managers, environmental scientists, political leaders, regulatory staff, and by anyone with previous exposure to the topic.



The main results such as the mean, median, and percentiles of fish consumption for all species combined and for various species groups can be presented in tabular and graphical format in the main body of the report. The various rates can be presented for age, gender, income and educational attainment groups, but more detailed tables (e.g., with more percentiles, more sub-divided groups, and with confidence intervals) can be presented in the appendices. The implementation team should keep in touch with the team conducting the surveys for the State of Idaho and attempt to include tables in the report that have comparable species and demographic groups as the main tables of the State surveys.

The State of Idaho will be surveying anglers (in addition to their survey of the general population) and the NPT's report can also report on Tribal anglers who are sampled within the survey process. The anglers may be defined by, for example, having fished at least a certain number of times during a defined period (using questions included in the in-person interview). The extent of results reported for anglers will depend on the number of anglers encountered.

11.4 Peer Review

The design team recommends that a technical peer review panel be convened. The topic of fish consumption rates is controversial, and there are always opportunities for mistakes in a survey as large and complex as this one. The panel may consist of an environmental scientist familiar with issues in fisheries and fish consumption, a PhD-level statistician familiar with surveys, a scientist familiar with reconstruction of heritage consumption rates, and a support or reference person who is familiar with the use of FCRs for environmental regulation.

11.5 Archiving, Ownership, Sharing of Data

The EPA management staff for this project will be communicating with the Idaho Tribes, with this design team, and with other EPA staff to develop a globally satisfactory policy for confidentiality and ownership of, access to, and potential sharing of the data developed from this survey. The design team has provided input on this process and various issues related to this topic. The formal agreement on ownership of current and future access to the survey electronic and hardcopy data will be an agreement between EPA and the Tribes, it is anticipated. A survey team representative(s) may also be a signer – in the role of one implementing parts of the agreement. The survey team will request to review and comment on any proposed agreements to ensure that there is



compatibility between the agreements and survey operations, planned data analysis, and final reporting.

Undoubtedly the results of this survey will be a precious resource for the Tribe and others, documenting the status of fish consumption and factors affecting it both historically and at this time. Future aspirations for fish consumption are also covered.

Given the present and future importance of the survey results, it will be important to archive the material carefully. The quantitative data should be saved in electronic system and text files, accompanied by data dictionaries, including the name of each variable (field), its definition and meaning, file position and width, and codes used with a definition of each code. At least two copies of the files should be kept on external media and the two or more sets of files should be maintained in widely separate locations to avoid common loss in case of a disaster. At least annually (signaled by a tickler file) a copy should be made of each set of files (and verified) to avoid loss through physical deterioration of media. As storage modes change over time (e.g., the past transition from tape to disc), the storage mode of the survey files should be kept up to date.

12.0 DESIGN TEAM, ACKNOWLEDGEMENTS, AND RESOURCES

The survey design team coordinated with the Idaho Tribes, EPA, and the State of Idaho to develop this survey design. Various resources were compiled and reviewed as much as possible to support design development.

12.1 Names and affiliation

The survey design was conducted as a collaboration between The Mountain-Whisper-Light Statistics (TMWL) and RIDOLFI Inc., with support from Pacific Market Research (PMR), and consisted of the following key team members:

- Dr. Nayak Polissar of TMWL
- Dr. Derek Stanford of TMWL
- Callie Ridolfi of RIDOLFI Inc.
- William Beckley of RIDOLFI Inc.
- Kristin Callahan of RIDOLFI Inc.
- Anthony Salisbury of PMR

12.2 Acknowledgements

The survey design team would like to thank the following Tribal representatives for their support and input during the design phase:

- Silas Whitman, Nez Perce Tribal Executive Committee (NPTEC) Chairman
- Joel Moffett, NPTEC Vice-Chairman
- McCoy Oatman, NPTEC Treasurer
- Anthony Johnson, NPTEC Secretary
- Daniel Kane, NPTEC Asst. Sec./Treasurer
- Leotis McCormack, NPTEC Chaplain
- Samuel Penney, NPTEC Member
- Albert Barros, NPTEC Member
- Brooklyn Baptiste, NPTEC Member
- Julie Kane, Managing Attorney, Office of Legal Counsel
- Michael Lopez, Staff Attorney, Office of Legal Counsel
- David Cummings, Staff Attorney, Office of Legal Counsel
- Carla Timentwa, Enrollment and Chair of General Council
- James Holt, Director of Water Resources Division
- Ken Clark, Water Quality Program Coordinator



- Joseph Oatman, Deputy Program Manager, Department of Fisheries Resource Management
- Patrick Baird, Tribal Historic Preservation Officer, Cultural Resources
- Nakia Williamson, Tribal Ethnographer, Cultural Resources

12.3 Resources

A list of resources pertinent to developing and implementing a FCR survey is presented below, including agency guidance documents, existing surveys and methodology reports, and traditional lifeways and suppression studies. These resources, in addition to the references cited within this design report (Section 8), will provide additional guidance, background information, and research to support implementation of the survey.

12.3.1 Guidance, Regulations, and Other Agency Reports

Idaho Department of Health and Welfare (IDHW). 2013. *Eat Fish, Be Smart, Choose Wisely, A guide to Safe Fish Consumption for Fish Caught in Idaho Waters*. Bureau of Community and Environmental Health.

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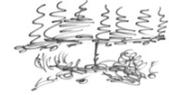
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APPENDIX A
Survey Questionnaire

(under separate cover)