

Nez Perce Tribe Harvest Monitoring Program -2007 Snake River Basin Spring and Summer Chinook Sampling Plan-

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Introduction

The Nez Perce Tribe will conduct fishery sampling and catch estimation for planned treaty fisheries targeting Snake River spring and summer Chinook in the 2007 run year. The Snake River Basin treaty fisheries are expected to be conducted consistent with Nez Perce Tribal Code and law, the Treaty of 1855, and the established U.S. v. Oregon harvest management framework. The primary objective of the Harvest Management Program (HMP) is to develop and implement a biologically sound harvest monitoring program through the collection of more precise treaty catch data for fishing areas on the reservation lands, ceded lands, and at all “usual and accustomed” areas of the Nez Perce Tribe. Harvest monitoring activities for the Tribe covers tribal treaty fishing activities in tributaries located in southeast Washington, northeast Oregon, and a majority of central Idaho. Within this area, the Tribe can access 50% of the hatchery fish available for harvest and have a greater proportional impact on wild/natural fish than those allowed for state fisheries because of our treaty reserved fishing right. The catch and harvest information generated from this sampling plan will be used to insure that proposed harvest is biologically and legally sound and that it occurs (i.e. take numbers, locations, dates and gear types) in the manner designed.

This sampling plan will be implemented using funding sources from the Lower Snake River Compensation Plan (LSRCP) and the Bonneville Power Administration (BPA), of which each respective contract establishes deliverables consistent to the fishing locations in Table 2. It is worth noting that the identified fisheries do not include *all* Nez Perce “usual and accustomed” fishing sites reserved to the NPT under the Treaty of 1855. This plan encompasses only those fisheries where level of fishing pressure, listing status, co-management priority, and/or contractual deliverables, necessitate rigorous harvest management. The results of this sampling plan will be evaluated post-season to determine the efficacy of the sampling strategies in producing precise harvest estimates. The three sampling methods as described below (creel survey, direct interview survey, and inseason interview survey) will be reviewed to see if harvest sampling data accurately characterizes the true number of Chinook salmon harvested in each specific tributary.

The development of a harvest management system for the Nez Perce Tribe addresses some of the management issues as identified in Section D.5 of the 2000 Northwest Power Planning Council’s (NPPC) Fish and Wildlife Program (FWP). Specifically, the NPT is incorporating management practices that include the following key objectives identified by the FWP: manage harvest to

ensure risk of imprecision and error in predicted run size does not threaten survival and recovery of naturally spawning populations; monitor in-river fisheries (escapement, catch, and expand monitoring programs to reduce critical uncertainties); manage for data integration and availability; and manage harvest consistent with the protection and recovery of the naturally spawning populations. Implementation of this sampling plan for spring and summer Chinook will provide critical adult information necessary for stock assessment and management.

The primary strategy for the FWP is to assure that subbasin plans are consistent with harvest management practices and increase opportunities for harvest—like those envisioned by the Nez Perce Tribe—wherever feasible. The Council’s program calls for subbasin plans to deal explicitly with harvest management plans, of which this sampling plan is considered one important subcomponent to Nez Perce Tribe harvest planning and implementation. It is expected that the harvest information derived from the implementation of this sampling plan will start to provide a baseline accounting of Nez Perce harvest in the Snake River Basin, of which corresponding information can be incorporated into harvest sections in subbasin plans. The successful implementation of this sampling plan will address specific harvest management issues of the FWP as it relates specifically to Snake River Basin spring and summer chinook management.

Sampling Design

The annual Snake River Spring and Summer Chinook Sampling Plan is designed to cover six geographic management areas that comprise the Nez Perce Tribe Snake River Basin (SRB) treaty management area. These management areas include the mainstem Snake River, Tucannon River, Clearwater River, Salmon River, Imnaha River, and the Grande Ronde subbasins. The fisheries occurring in these management areas have the potential to affect Snake River (SR) spring and summer Chinook salmon listed under the Endangered Species Act (ESA) in hatchery-influenced or natural production areas located in these respective subbasins. The basic consideration undertaken by the Harvest Monitoring Program in collecting harvest data has been to determine what statistical sampling design provides the best quantitative estimate of the tribal fishery characteristics. The information to collect and sampling area to cover will include the reservation and specific “usual and accustomed” fishing areas located in the above mentioned subbasins that are open to tribal fishing. A goal of the Nez Perce Tribe is to manage treaty harvest consistent with the conservation needs of the fish and recovery of naturally spawning populations.

The primary focus is on collecting catch information necessary to calculate tribal fishing effort, observed catch per hour (OCPH) or harvest per unit effort (HPUE), which is used to estimate total catch or harvest for a particular tributary. For the above fishery parameters, the harvest estimates will be stratified into week day and weekend fishing profiles. Inseason monitoring of the catch composition of hatchery (unlisted and listed) and wild/natural (unlisted and listed) fish (dependent upon existence and type of mark) will be conducted so that harvest guidelines and constraints can be determined and appropriate steps to modify or close each given fishery can be taken when necessary. Annual fishery proposals by the Nez Perce Tribe will generally include details of expected run size composition (hatchery and wild/natural fish), selected harvest rates for Snake River spring/summer Chinook stocks, location, timing, and a description of anticipated

total take limits (hatchery and wild/natural fish). The season structure and sampling strategies may change (e.g, increase or decrease sampling effort per tributary) as the original preseason Snake River Basin spring and summer Chinook forecast is updated.

Table 1. 2007 tributary season structure and sampling strategies.

| Tributary | Fishing Period | No. of Samplers | Sampling Method |
|---|-----------------------|------------------------|------------------------|
| North Fork Clearwater River/mainstem CR | 24 | 1 | Creel Survey |
| Clear Creek | 24 | 1 | Creel Survey |
| South Fork CR | 24 | 1 | Inseason Interview |
| Selway River | 24 | 0 | Inseason Interview |
| Lochsa River | 24 | 0 | Inseason Interview |
| Rapid River | 24 | 2 | Creel Survey |
| South Fork Salmon River | 24 | 2 | Inseason Interview |
| Sawtooth | 24 | 0 | Inseason Interview |
| Pahsimeroi | 24 | 0 | Inseason Interview |
| Mainstem Snake River | 24 | 0 | Inseason Interview |
| Tucannon River | 24 | 0 | Inseason Interview |
| Lookingglass Creek | 24 | 0 | Inseason Interview |
| Lostine River | 24 | 2 | Inseason Interview |
| Imnaha River | 24 | 2 | Inseason Interview |

The management timeframes for the above tributaries are summarized by respective subbasin in Table 2 below. The HMP will structure monitoring shifts for each tributary based on expected run timing, levels of harvestable fish, and tribal member fishing preference. The Nez Perce Tribe, in coordination with the other federal and state co-managers, expects to finalize Snake Basin run size predictions, broodstock needs, and harvest intents by late April. Below are the three components that constitute the sampling design for the anticipated 2006 Nez Perce spring and summer Chinook seasons.

1. Sampling Area

Sampling Strategies

The sampling design is customized to tributary listing status and attempts to fit the spatial and temporal characteristics of the drainages and tribal fishing activities to the extent practicable. The Nez Perce Tribe authorizes spring and summer Chinook treaty seasons that are considered “opened until closed,” and typically do not implement those seasons with timing closures (i.e.,

| Management Week | Date | Salmon River Subbasin | Mainstem Snake River | Clearwater River Subbasin | Tucannon River Subbasin | Imnaha River Subbasin | Grande Ronde River Subbasin |
|-----------------|-----------------|-----------------------|----------------------|---------------------------|-------------------------|-----------------------|-----------------------------|
| 1 | Apr 10 - Apr 16 | x | x | | | | |
| 2 | Apr 17 - Apr 23 | x | x | | | | |
| 3 | Apr 24 - Apr 30 | x | x | x | | | |
| 4 | May 1 - May 7 | x | x | x | | | |
| 5 | May 8 - May 14 | x | x | x | | | |
| 6 | May 15 - May 21 | x | x | x | | | |
| 7 | May 22 - May 28 | x | x | x | | | x |
| 8 | May 29 - Jun 4 | x | x | x | x | x | x |
| 9 | Jun 5 - Jun 11 | x | x | x | x | x | x |
| 10 | Jun 12 - Jun 18 | x | x | x | x | x | x |
| 11 | Jun 19 - Jun 25 | x | x | x | x | x | x |
| 12 | Jun 26 - Jul 2 | x | x | x | x | x | x |
| 13 | Jul 3 - Jul 9 | x | x | x | x | x | x |
| 14 | Jul 10 - Jul 16 | x | x | x | x | x | x |
| 15 | Jul 17 - Jul 23 | x | x | x | x | x | x |
| 16 | Jul 24 - Jul 30 | x | x | x | x | x | x |
| 17 | Jul 31 - Aug 6 | | x | x | x | x | |
| 18 | Aug 7 - Aug13 | | x | x | | | |
| 19 | Aug 14 - Aug 20 | | | | | | |

day light fishing only or weekends only). The HMP accounts for this in the sampling methodologies as

described in section 2 below.

Table 2. Annual Snake River Basin Spring and Summer Chinook sampling timeframe.

For tribal harvest monitoring purposes the HMP anticipates the following sampling strategies will be implemented to cover the 2006 treaty salmon fisheries.

Clearwater River Subbasin

North Fork Clearwater/ Clear Creek Fisheries

Depending upon actual level of adult run size and broodstock attainment, this system may be sampled by an on-site monitor for two week days and one weekend day for the North Fork Clearwater River. If run size is sufficient for a Clear Creek fishery, an on-site monitor will sample 2 week days and 1 weekend day. The samplers will collect information each management week according to the creel survey method to determine the overall treaty catch. The tributary harvest estimate will be conducted so that harvest guidelines and constraints can be determined and appropriate steps to modify or close the fishery can be taken when necessary.

Other Clearwater River Subbasin Fisheries

If staff level permits, a roving monitor will be included to collect harvest information for other Clearwater River tributary fisheries. The collection of harvest data for hatchery and wild/natural spring Chinook (dependent upon existence and type of mark) is developed to determine the overall treaty catch. The harvest estimates will be produced on a weekly to bi-weekly schedule. Inseason interview survey method will be used to determine if tribal harvest guidelines and constraints have been reached for South Fork Clearwater River system, Lochsa River, and

Selway River fisheries and when appropriate steps to modify or close a specific fishery will be authorized.

Salmon River Subbasin

Rapid River Fishery

The proposed sampling strategy includes 2 monitors to work 8 days on/6 days off for the duration of the fishing season. The samplers will collect information each fishing day according to the creel survey method to determine the overall treaty catch. Sampling effort will focus on catch composition (hatchery versus wild/natural fish) and whether or not it is a listed fish (dependent upon existence and type of mark) for the Rapid River fishery. The harvest estimate will be conducted so that harvest guidelines and constraints can be determined and appropriate steps to modify or close the fishery can be taken when necessary. The inseason harvest information will be evaluated on a weekly to bi-weekly basis so that the wild impact level is not exceeded.

South Fork Salmon River Fishery

The proposed sampling strategy includes 2 monitors to work 8 days on/6 days off for the duration of the fishing season. The collection of harvest data for hatchery and wild/natural summer chinook is developed to determine the overall treaty catch. Inseason monitoring of the catch composition (hatchery versus wild/natural fish) and whether or not it is a listed fish (dependent upon existence and type of mark) for South Fork Salmon River fishery will be conducted so that harvest guidelines and constraints can be determined and appropriate steps to modify or close the fishery can be taken when necessary. The inseason harvest information will be evaluated on a weekly to bi-weekly basis so that the wild/natural impact level is not exceeded.

Other Salmon River Subbasin Fisheries

Depending upon actual level of adult run size and broodstock attainment in other Salmon River Subbasin tributaries, sampling may occur using the inseason interview approach by samplers assigned to monitor Rapid River and South Fork Salmon River. The collection of harvest data for hatchery and wild/natural summer chinook is developed to determine the overall treaty catch. Inseason monitoring of the catch composition (hatchery versus wild/natural fish) and whether or not it is a listed fish (dependent upon existence and type of mark) for Johnson Creek, Sawtooth, and Pahsimeroi fisheries will be conducted so that harvest guidelines and constraints can be determined and appropriate steps to modify or close the fishery can be taken when necessary. The inseason harvest information will be evaluated on a weekly to bi-weekly basis so that the wild/natural impact level is not exceeded.

Imnaha River Subbasin

Imnaha River Fishery

The proposed sampling strategy for the Imnaha River includes 2 monitors to work 8 days on/6 days off for the duration of the fishing season. The collection of harvest data for hatchery and wild/natural spring Chinook (dependent upon existence and type of mark) is developed to determine the overall treaty catch. Inseason interview survey method will be used to determine if tribal harvest guidelines and constraints have been reached for the Imnaha River and when appropriate steps to modify or close the fishery are to be authorized. The inseason harvest information will be evaluated on a weekly to bi-weekly basis so that the overall impact level on listed fish is not exceeded.

Grande Ronde River Subbasin

Grande Ronde River Fishery

The proposed sampling strategy for the Grande Ronde River system includes 2 monitors to work 8 days on/6 days off for the duration of the fishing season at the Lostine River. The collection of harvest data for hatchery and wild/natural spring Chinook (dependent upon existence and type of mark) is developed to determine the overall treaty catch. Inseason interview survey method will be used to determine if tribal harvest guidelines and constraints have been reached for the Lostine River and when appropriate steps to modify or close the fishery are to be authorized. The inseason harvest information will be evaluated on a weekly to bi-weekly basis so that the overall impact level on listed fish is not exceeded.

Other Grande Ronde River Subbasin Fisheries

Depending upon actual level of adult run size and broodstock attainment in other Grande Ronde River Subbasin tributaries, sampling may occur using the inseason interview survey method by samplers assigned to monitor Lostine River. The collection of harvest data for hatchery and wild/natural summer chinook is developed to determine the overall treaty catch. Inseason monitoring of the catch composition (hatchery versus wild/natural fish) and whether or not it is a listed fish (dependent upon existence and type of mark) for the Catherine Creek, Upper Grande Ronde River, and Lookingglas Creek fisheries, will be conducted so that harvest guidelines and constraints can be determined and appropriate steps to modify or close the fishery can be taken when necessary. The inseason harvest information will be evaluated on a weekly to bi-weekly basis so that the wild/natural impact level is not exceeded.

Tucannon River Subbasin

Tucannon River Fishery

Depending upon actual level of adult run size and broodstock attainment, this system may be sampled by an on-site monitor operating on a shift of 8 days on/6 days off for the duration of the fishing season. The collection of harvest data for hatchery and wild/natural spring Chinook (dependent upon existence and type of mark) is developed to determine the overall treaty catch. Inseason interview survey method will be used to determine if tribal harvest guidelines and

constraints have been reached for the Tucannon River and when appropriate steps to modify or close the fishery are to be authorized. The inseason harvest information will be evaluated on a weekly to bi-weekly basis so that the overall impact level on listed fish is not exceeded.

2. Methods of Harvest Estimation and Statistical Analysis

The monitoring surveys were developed as a simple random design by stratification of week day versus weekend fishing time preference or by constant weekly survey times (for certain tributaries the monitors will sample each day of the work week). The Nez Perce treaty fisheries are open from the arrival of the fish to the time that seasons are closed due to reaching the tribal harvest allocation quota, reaching a specific take limit, or that the time of spawning nears, whichever comes first. Information to be collected in the proposed fisheries will include the following: 1) number of fishers, 2) time period engaged in fishing activity, 3) fisher catch per hour (FCPH) for fisher monitoring or harvest per unit effort (HPUE) for fisher interviews, 4) species, 5) number of hatchery or wild/natural chinook released, and 6) number of hatchery or wild/natural chinook harvested.

Creel Survey

Statistical analysis of creel catch data and the calculation of harvest expansions for each tributary and strata will give a measure of variance, which could then be used to calculate the level of uncertainty for each catch estimate. Calculating the standard deviation and 95% confidence interval for each tributary and strata will produce upper and lower values to weekly catch harvest estimate. Data will be collected for by direct observation on specific days selected randomly or systematically from a seven-day timeframe (Monday-Sunday). Typically, this seven-day timeframe is open continuously with no time closure restriction in effect. For those tributaries identified for this method, sampling data will be collated and entered into a spreadsheet by hour increments contained in a 24 hour (h) sampling period that represents the 24 hour fishing period. The monitors will survey an 8-h segment from a 24-h fishing period. Generally, the HMP will assign sampling shifts based upon an Excel-derived scheduling format which identifies sampling time strata (days and hours).

However, the Rapid River will use a systematic sampling strategy where the available sampling time will be equally divided into strata and selected uniformly each management week. An 8-h segment of time will be selected systematically from three time periods (See Table 3). The time periods have expected sampling day coverage time as follows:

Table 3. Daily sampling segments.

| Time Period | Expected Sampling % |
|--------------------|----------------------------|
| 1:00 am – 9:00 am | 33% |
| 9:00 am – 5:00 pm | 33% |
| 5:00 pm – 1:00 am | 33% |

There are a total of 21 8-h segments (6 weekend and 15 week time segments) in a standard sampling week. The actual sampling rates (# of 8-h segments/21 8-h segments) for each tributary that will use the creel survey sampling method may vary depending upon whether the random or systematic selection approach is employed. The final creel survey sampling schedule will be determined based upon the available number of samplers and expected Chinook salmon returns.

This revised sampling strategy still seeks to define what times of the fishing season (categorized into week and weekend strata) there is high and low fishing intensity.

From the sampling data, an expansion will be calculated by the following equation (Rishi Sharma, personal communication, November 2, 2006):

$$\hat{C}_E = \frac{C_o}{F_f} \times \left[\frac{H_T}{H_{OB}} \right] \quad (1)$$

Where, $C_o = \sum_{i=1}^n CPH_i$ or is the observed catch per hour (OCPH),

F_f = estimate of the number of fishers in area (s), and time (t) for any given hour,

$H(T)$ = Total number of hours the fishers are fishing, and

$H(Ob)$ = Observed sample hours when the fishery is taking place

Or expressed as,

$$\hat{C}_E = \frac{\sum_{i=1}^n CPH_i}{F_f T_f} \quad (2)$$

Where T_f = # of hours sampled/total number of hours open in the fishery for a particular strata

The variance of the creel estimate will be calculated by the following equation:

$$Var(\hat{C}_E) = Var(CPH) \times \left(\frac{1}{F_f} \right)^2 \left(\frac{1}{T_f} \right)^2 \quad (3)$$

Where,

$$\left(\frac{1}{F_f} \right) = \frac{\#ofF_o}{\#ofF_{Total}}$$

is the number of Fisherman observed/Number of total fisherman (an effort fraction),

$$\left(\frac{1}{T_f} \right) = \frac{H_{OB}}{H_T}$$

and T_f = (# of hours sampled/total number of hours open in the fishery for a particular strata).

The task is to estimate confidence intervals (CI), precision (indicator of data quality), and variance (indicator of monitoring effort) in catch for the SRB tributary fisheries that use data produced from the creel survey collection method.

- a. Weekly catch expansions.

Analysis Method

Comparison of the CI, precision, and variance values for weekly expansions are used to determine where majority of variability in the monitoring of catch occurs for this method. The following statistical measures for each respective fishery that uses the creel survey method will be calculated:

- b. The sample mean is sum of the catch observed in a specific area and time (observed catch per hour) over number of fishers (observed in area (s), and time (t) for any given hour) by the sampling fraction.
- c. The estimate of standard error (SE) of the sample mean is used to measure the level of precision for an estimate (assuming normality of the catch data). Our attempt is to produce a SE value that is equal to or less than 20% of the estimate, to ensure that the 95% confidence intervals surrounding the estimate is kept within a statistically desirable range.
- d. The range, sample variance (s^2), and sample standard deviation (SD), are measures of dispersion of data that describe sampling variation. These statistical procedures characterize the spread of sample measurements about the sample mean (used to express central tendency). The variability of the sample mean is denoted by $Var(\hat{C}_E)$ in the equation (no variance associated with the estimate of the number of fishers in specified area and time, the number of hours the fishery is open, and the proportion of the fishers sampled).

Inseason Interview Survey

This survey method will collect data by direct observation and through interviews for fisheries that require extensive travel and time to cover or for tributary fisheries that will not be assigned a sampler because of insufficient amount of funding (see Table 1 above). For tributaries identified for this method, data will be collected on-site on a daily basis for the duration of the fishery season and monitoring schedule (8 days on/6 days off). Tributaries not assigned an on-site sampler will rely on samplers operating within the same subbasin to interview fishers for catch data.

The monitors will survey an 8-h segment for each sampling week, to survey each 24-h fishing period. The sampling period is designed to directly observe the numbers of fishers in the area, and to interview the individual fishers for times in the fishing period that observed or interviewed fish data was not collected. This is to off-set the potential for not directly observing specific fishers between sampling periods and to collect harvest data that might have accrued during the time sampling was not conducted.

From the interview data, the calculation of HPUE will be based on the total-ratio estimator as described by the following steps:

Total-ratio estimator: $HPUE=h/e$,

$$\hat{R}_2 = \frac{\sum_{i=1}^n h_i}{\sum_{i=1}^n e_i}$$

$$\sum_{i=1}^n h_i = \text{sum fish harvested per fisher } (h_i) \text{ over all fishers interviewed } (n).$$

$$\sum_{i=1}^n e_i = \text{sum hours fished per fisher } (e_i) \text{ over all fishers interviewed } (n).$$

Catch is generated for the unsampled fishers using the equation below:

$$\hat{C}_{s,t} = \hat{R}_2 \times H_f \times \hat{N}_{s,t}$$

Where \hat{C} is the catch in area (S) over time (t),

R = the catch efficiency per fisher hour

H = the number of hours fishery was open in area S

N = the number of unsampled fishers in area (S) at time (t)

Variance for the catch is dependent on the variance of R_2 . So, if R_2 has mean (μ) and variance (σ^2) then,

$$Var(\hat{C}_{s,t}) = \sigma^2 \times H_f^2 \times N_{s,f}^2$$

μ = population mean

σ = variance of the population

The task is to estimate confidence intervals (CI), precision (indicator of data quality), and variance (indicator of monitoring effort) in catch for the SRB tributary fisheries that use data produced from the inseason interview collection method. The purpose is to determine the following fishery characteristic:

- e. Weekly catch expansions.

Analysis Method

Comparison of the CI, precision, and variance values for weekly expansions are used to determine where majority of variability in the monitoring of catch occurs for this method. The following statistical measures will be calculated for the harvest estimates produced from the inseason interview method:

- f. The sample mean is sum of the catch efficiency rate observed in a specific area and time (for the observed number of fishers) multiplied by the number of unsampled fishers for the number hours the fishery is opened.
- g. The estimate of standard error (SE) of the sample mean is used to measure the level of precision for an estimate (assuming normality of the catch data). Our attempt is to produce a SE value that is equal to or less than 20% of the estimate, to ensure that the 95% confidence intervals surrounding the estimate is kept within a statistically desirable range.
- h. The range, sample variance (s^2), and sample standard deviation (SD), are measures of dispersion of data that describe sampling variation. These statistical procedures characterize the spread of sample measurements about the sample mean (used to express central tendency). The variability of the sample mean is denoted by $Var(\hat{C}_{s,t})$ in the equation (variance for the catch is dependent on the variance of R multiplied by the number of hours the fishery is open and the number of unsampled fishers).

An assumption is that the majority of fishers will be contacted and a ratio estimate of total harvest over the duration of the fishing season can be produced. The differences in daily fishing effort acts as a self-weighting factor for harvest estimates produced by this method. The harvest information contributed by individual fisher that is used in the total-ratio estimator are weighted by the amount of fishing effort expended, and therefore is the appropriate estimator to use for calculation of total harvest when completed trip data is used.

Post-Season Interview Survey

If necessary the Harvest Division will institute a post-season interview survey method to derive a harvest estimate for areas where inseason interviews for certain fishing locations were not conducted or had incomplete harvest information. The post-season interview method will utilize fishing profiles (low, medium, and high) to estimate the level of harvest for a particular tributary. The fishing profiles will be developed using existing harvest data for that particular tributary (when incomplete information exists) or catch information that has been collected at other Snake River Basin tributary fisheries that the Harvest Division anticipates to have similar fishing characteristics (numbers of fishers, fishing effort, and fish escapement).

The harvest monitors will routinely conduct interviews with the tribal fishers and submit the data collection sheets for tabulation in the spreadsheet on a weekly basis. This can be facilitated through direct contact with tribal fishers by harvest monitors assigned to a specific tributary for inseason interview duties. The interview survey data will be documented on a weekly basis to avoid counting the same fish over in subsequent interviews with tribal fishers. From the sampling data an expansion will be calculated by the following equation (Rishi Sharma, personal communication, March 24, 2004):

$$\hat{C}_s = \frac{\sum C_{i,s}}{n} \times \hat{N}_s$$

or ,

$$\hat{C}_s = CPH \times \hat{N}_s$$

Where \hat{C} is the estimate of catch in area (S),

n = the number of fishers sampled by profile- high, medium, and low fishing profile,

C = the catch observed from fisher i sampled by fishing profile,

CPH = the average observed catch per fisher, and

N_s = estimate of the number of fishers by strata (s) – high, medium, and low fishing profile.

Mean catch per hour (CPH) expanded by fisher effort data (number of fishers in area sampled by high, medium, and low fishing profiles) will be used to derive weekday and weekend estimated catch. The expansion will produce a harvest estimate for that specific fishing location and season duration. The results generated from monitoring are to be used to evaluate the statistical effectiveness of the sampling design.

If $CPH \sim Normal(\mu(1), \sigma(1)^2)$, and there is no variance associated with N , then the variance of the catch estimate is:

$$Var(\hat{C}_s) = Var(CPH) X \left[\frac{1}{\left(\frac{n}{\hat{N}_s} \right)} \right]^2,$$

$$\sqrt{Var(\hat{C}_s)} = S.E.(\hat{C}_s), \text{ and}$$

$$95\% \text{ Confidence Interval} = \hat{C}_s \pm 1.96 (S.E.(\hat{C}_s)).$$

Analysis Method

Comparison of the CI, precision, and variance values for weekly expansions are used to determine where majority of variability in the monitoring of catch occurs for this method. The following statistical measures will be calculated for the harvest estimates produced from the inseason interview method:

- i. The sample mean is sum of the catch efficiency rate observed in a specific area and time (for the observed number of fishers) multiplied by the number of unsampled fishers for the number hours the fishery is opened.
- j. The estimate of standard error (SE) of the sample mean is used to measure the level of precision for an estimate (assuming normality of the catch data). Our attempt is to produce a SE value that is equal to or less than 20% of the estimate, to ensure that the 95% confidence intervals surrounding the estimate is kept within a statistically desirable range.
- k. The range, sample variance (s^2), and sample standard deviation (SD), are measures of dispersion of data that describe sampling variation. These statistical procedures characterize the spread of sample measurements about the sample mean (used to express central tendency). The variability of the sample mean is denoted by $Var(\hat{C}_s)$ in the equation.

An assumption is that the majority of fishers will be contacted and that the mean catch per fisher hour (CPH) value can be determined for the low, medium, and high fishing profiles. The differences in weekly fishing effort acts as a self-weighting factor for harvest estimates produced by this method. The harvest information contributed by individual fisher that is used in this harvest estimator are weighted by the amount of fishing effort expended, and therefore is the appropriate estimator to use for calculation of total harvest when collecting harvest information for specific tributaries where creel survey or inseason interview surveys were not conducted, or conducted to the limited extent.

Sampling Objective

The management objective of the sampling design is to estimate tribal catch or harvest with a coefficient of variation value of 0.3 for 95% of the sampling time. This CV value assures that we are adequately sampling the fishery. Certain critical ESA stocks of spring and summer chinook in the SRB may require higher sampling effort to obtain this value. The harvest of these critical stocks will be determined using the inseason interview as facilitated by on-site harvest monitors (as described above). The overall goal is to create a complementary harvest monitoring system that increases the precision and accuracy of annual tribal catch or harvest estimates and to allow the evaluation of sampling plan effectiveness.

3. Reporting

The NPT recognizes that significant interaction and cooperation with other tribal, state, and federal fish managers will need to occur in order fulfill co-management obligations for harvest management.

Inseason checks will be used to evaluate the number of spring and summer chinook returns over the Lower Granite Dam to each tributary of monitoring focus. As the actual numbers of spring and summer chinook increase or decrease from preseason projections, Nez Perce Tribe may increase or decrease harvest goals accordingly. This inseason monitoring is facilitated through the collection and sharing of fishery information by the respective fishery managers, which includes the following; fish returning and collected at hatchery facilities, harvest updates, and through updated run predictions based on the PIT tag detections at Lower Granite dam. Additionally, the NPT may modify this sampling plan inseason if chinook salmon runize projections to the SRB indicate that the spring and summer Chinook salmon distribution and abundance will differ significantly than anticipated. Modifications will be in the form of re-directing seasonal staff to areas of anticipated higher fish returns and fishing intensity, and not of utilizing different harvest estimation methods.

The Nez Perce Tribe Harvest Division will provide to the co-managers weekly harvest updates for the treaty fisheries covered under this sampling plan. A final report for the 2006 Nez Perce Tribe spring and summer chinook season will be provided to the co-managers.

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