



Nez Perce

TRIBAL EXECUTIVE COMMITTEE

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May 22, 2015

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**By Electronic mail ([paula.wilson@deq.idaho.gov](mailto:paula.wilson@deq.idaho.gov))**

Re: Docket No. 58-0102-1201 – Nez Perce Tribe Response to IDEQ Policy  
Recommendations concerning Human Health Criteria

Dear Ms. Wilson:

The Nez Perce Tribe (Tribe) appreciates the Idaho Department of Environmental Quality's (IDEQ) invitation to comment on the agency's policy recommendations for human health criteria that will be used to derive water quality standards. For the reasons below, as well as for the reasons set forth in the comments of the Columbia River Inter-Tribal Fish Commission submitted to IDEQ on these recommendations that the Tribe incorporates by reference, the Tribe urges the Idaho Department of Water Quality to protect the health of the Nez Perce Tribe by fully addressing our recommendations.

In May 2012, the Environmental Protection Agency (EPA) disapproved of Idaho's 167 new and revised human health water quality criteria for 88 pollutants, and the proposed use of a fish consumption rate of 17.5 grams/day (g/day). As part of this decision, EPA stated that it "is unable to ensure that the use of a fish consumption rate of 17.5 g/day in deriving statewide criteria is consistent with 40 CFR 131.11(a)," and that, they cannot ensure that the criteria derived "are based on a sound scientific rationale" and "protect Idaho's designated uses."<sup>1</sup> To remedy this flaw, EPA stated that "Idaho must evaluate local and regional fish consumption information to determine whether its statewide criteria are protective of designated uses," and advised that it "protect highly exposed populations, such as subsistence fishers, and to rely on

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<sup>1</sup> In EPA's letter they confirms that the disapproval does not apply to waters located in Indian Country: "This action applies only to water bodies in the State of Idaho, and does not apply to waters that are within Indian Country, as defined in 18 U.S.C. Section 1151. In addition, nothing in this letter shall constitute an approved or disapproved water quality standard applying to waters within Indian Country. The EPA, or authorized Indian Tribes, as appropriate, will retain responsibilities for WQS for waters within Indian Country."

local or regional fish consumption data in developing a fish consumption rate that is more representative of target populations.”

IDEQ has approached the development of human health criteria and the selection of a regulatory fish consumption rate as generally involving the use of three elements—science, policy, and risk management, with science providing basic information, policy driving application of this information, and risk management involving publicly weighing options and making a decision. This is how IDEQ has framed their process to develop and consider its policy recommendations as part of their water quality rulemaking process.

The Tribe has participated and monitored IDEQ’s water quality rulemaking process given that the outcome of this process can impact or affect the Tribe, its people, and its natural resources. Idaho’s water quality standards affect the rights, interests and resources of the Nez Perce Tribe. When the waters that support fish are allowed to be contaminated, the Tribe’s interests are affected and Tribal people are disproportionately exposed. The long-term solution to this problem is not adopting a position that keeps Tribal members and other from eating contaminated fish (i.e. avoiding risky behavior), it is keeping fish from being contaminated in the first place.

The Nez Perce Tribe has been involved in a quantitative fish consumption survey that consists of two components: a food frequency questionnaire (FFQ) and the National Cancer Institutes (NCI) method. The FFQ is designed to evaluate fish consumption over a broad period of time by asking respondents to recall how much fish she or he consumed within the last several months. In contrast the NCI method is a “24-hour recall method” designed to ask respondents what was consumed the previous day. An interim report has been provided to IDEQ previously. The survey data and calculation of Nez Perce fish consumption rates from the interim report helps provide key science information to this process. The Tribe’s final report will provide credible, statistically valid and defensible estimations of our fish consumption rates that are representative of our Tribal members and of fish resources available to Tribal members for harvest and consumption. This report will provide “best available data” and evidence that substantiates that Nez Perce fish consumption rates are significantly greater than what IDEQ had proposed in their application that EPA ultimately disapproved.

The Tribe has provided preliminary fish consumption values of Tribal members in its interim report. This report provides fish consumption rates for two groups of fish: Group 1 (All finfish and shellfish) and Group 2 (Near coastal, estuarine, freshwater and anadromous). This fish consumption survey will inform our knowledge and understanding about an important component of our tribal members’ health. The Tribe requires that anadromous fish be used in the calculation of fish consumption rates for Nez Perce tribal members. This information will be provided to the State of Idaho so that it – and in turn, EPA – can make the best decision about establishing statewide fish consumption rates that are protective of high fish consuming people like the Nez Perce Tribe.

### **Background on the Nez Perce**

Since time immemorial, the Tribe has occupied and used a territory encompassing more than 13 million acres in what are today north-central Idaho, southeast Washington, northeast Oregon, and

western Montana. The Tribe's aboriginal area is 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 Tribe's subsistence cycle involved traveling year to year, primarily to follow the salmon runs. The Tribe has historically and contemporarily fished for Chinook, Silver, Coho, and Sockeye varieties of salmon, lamprey, and several species of resident fish and some shellfish. The Tribe's economy and culture evolved around Northwest fish runs. This dependence on salmon and other anadromous species to meet dietary, spiritual, cultural, economic and basic subsistence needs is still a prevailing necessity of Nez Perce life.

In 1855, the United States entered into a treaty with the Tribe. Treaty of June 11, 1855 with the Nez Percés, 12 Stat. 957 (1859). In this treaty the Tribe explicitly reserved, and the United States secured, among other provisions, a permanent homeland as well as, in Article III, “the right to fish at all usual and accustomed places in common with citizens of the Territory; and of erecting temporary buildings for curing, together with the privilege of hunting, gathering roots and berries, and pasturing their horses and cattle upon open and unclaimed lands.” This treaty-reserved 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 Tribe today as it was in 1855 and before contact with non-Indians.

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 and lamprey on the Columbia River and its tributaries. The 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 species – anadromous and resident – for all streams, lakes and watersheds within its management authority. The Tribe is actively involved in these efforts to protect Nez Perce culture and treaty rights, restore species and conditions consistent with the treaty, and to protect the long-term productivity of its natural resources. The treaty right to harvest and eat fish is a federally-secured right. The Tribe expects the IDEQ, in consultation with the Environmental Protection Agency (EPA), to follow EPA policy as it relates to establishing standards for fish consumption rates in water quality standards.

### **Treaty Rights**

The Nez Perce Tribe's treaty-reserved fishing rights and fisheries in the Snake Basin continue to be critically important to the Tribe in maintaining and practicing its culture and ways of life. Implementation of treaty fisheries is consistent with the Nez Perce Tribe's legally enforceable treaty-reserved fishing rights and with the United States' treaty and trust obligations and responsibilities to the Nez Perce Tribe.

It is well-established that the 1855 “Stevens” Treaties provide Indian treaty fishermen the opportunity to take a fair share (or up to 50 percent of the harvestable surplus) of the fish passing through or destined to reach a tribes' usual and accustomed fishing places. Article III of the 1855 Treaty guarantees to the Tribe the right to fish at its “usual and accustomed places.”<sup>2</sup> It is

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<sup>2</sup> The official records of the 1855 Treaty negotiations prepared by the United States representatives document the assurances made by the United States to the Nez Perce with respect to these fisheries. Governor Stevens, addressing Nez Perce leader Looking Glass, stated: “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 cattle outside of the reservation on land not claimed by settlers, that he can catch fish at any of the fishing stations, that he can kill game and go to buffalo when he pleases, that he can get roots and berries on any of the lands not occupied by settlers.” U.S.

well established that Indian treaty fishing rights are “not a grant of rights to the Indians—but a grant of rights from them—a reservation of those not granted.” U.S. v. Winans, 198 U.S. 371, 380 (1905).

The “usual and accustomed” treaty fishing right held by Nez Perce Tribe and the Confederated Tribes and Bands of the Yakama Indian Nation, the Confederated Tribes of the Umatilla Indian Reservation and the Confederated Tribes of the Warm Springs Reservation of Oregon, under the 1855 Stevens treaties, is the basis of the case law in U.S. v. Oregon, and has well-established principles dating back to the U.S. Supreme Court decisions in U.S. v. Winans, 198 U.S. 371 (1905) and Seufert Bros.Co. v. U.S., 249 U.S. 194 (1919). As the courts in U.S. v. Oregon and U.S. v. Washington have held, these treaties secure to the Indians fishing pursuant to these 1855 treaties the right to take 50 percent of the harvestable fish destined to reach these tribes’ usual and accustomed fishing places.

The Tribe fully expects that the EPA will ensure water quality standards and human health criteria that are protective of designated uses and is based on a sound scientific rationale, prior to approval and adoption of such criteria and standards. Of particular importance to the Tribe is the need for the State to use regional and local fish consumption data and to set the cancer risk level that fully protects tribal fishing and treaty rights at the current level and in consideration of heritage rate consumption levels. In order to do so the EPA must focus on the substantive body of law concerning treaty rights such as that of the Nez Perce.

### **Heritage Rates and Suppression**

The Tribe, in cooperation with EPA, is completing our fish consumption survey to ascertain the type and amount of fish Nez Perce Tribal members consume. As part of this effort, the Tribe is also conducting a heritage rate study that will develop a range of fish consumption rates for the Tribe based on an evaluation of historical and recent literature. Preliminary information concerning this information is provided as Attachment A. The Tribe believes that the Nez Perce Tribal members are currently catching and consuming fish (resident and anadromous kind) below our historic baseline, and thus our consumption is suppressed.

EPA explains that fish consumption “suppression” occurs when a fish consumption rate (FCR) 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 FCR.” EPA goes on to describe that two circumstances can result in a suppression effect: (1) “it 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;” or (2) 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.”

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Department of Interior, Bureau of Indian Affairs. Certified Copy of the Original Minutes of the Official Proceedings at the Council in Walla Walla Valley, Which Culminated in the Stevens Treaty of 1855, at 42; see Sohappay v. Smith/United States v. Oregon, 302 F. Supp. 899, 906 and n.1 (D.Or. 1969).

Given EPA's guidance on evaluating suppression, as well as the Tribe's efforts through the fish consumption survey to ascertain current and heritage fish consumption rates, the Tribe expects that EPA will work with IDEQ to ensure that its findings particularly on suppression are adequately considered and incorporated into the State's Water Quality rule-making process. This will help address the issue of fish consumption rates that are artificially suppressed and IDEQ potentially setting "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 religious purposes." This is a very real and disturbing issue that has potentially long-term implications that the Tribe finds unacceptable. Such a "downward spiral" would have significant impacts to the Nez Perce treaty-reserved fishing right and ability to harvest and eat fish for "subsistence, traditional, cultural and religious" purposes.

Ultimately, the Tribe's goal is to rebuild Snake River fish to healthy, self-sustaining levels that will in turn support sustainable treaty fisheries. To relate this to WQS and fish consumption rate, the Tribe would like to have runs that support per capita fish consumption that is consistent with our historic baseline and per capita consumption. This is consistent with the point EPA expressed in their letter to Washington that a fish consumption rate should "represent tribal subsistence consumer's practices unsuppressed by fish availability or concerns about the safety of the fish available for them to consume."

### **IDEQ Policy Recommendations for Human Health Criteria**

It is clear that the State of Idaho is deliberately making a policy choice to place Tribal members at an unacceptable risk as a result of its policy recommendations on human health criteria:

- Idaho is employing a hybrid deterministic/PRA approach that is novel and hasn't been implemented in this manner before. Because this method can be complicated, additional detail on how it will be used and how it will protect the most vulnerable members of the target population needs to be supplied to the Tribe before it is implemented;
- Idaho is choosing to exclude market fish, a known contributor of contaminants to fish consumers (i.e., exposure pathway), and despite knowledge that Tribal members are known to consume those types of fish;
- Idaho is choosing to exclude anadromous fish, thereby discrediting a major contributor or source of contaminants (i.e., exposure pathway) to Nez Perce tribal members who consume large quantities of these fish;
- Idaho is choosing to only set risk under a  $10^{-6}$  incremental increase in cancer risk at mean consumption rate for high fish consuming groups, which may equate to protecting a smaller percentage of Tribal members than if the State were to set the risk level using the Group 2 fish consumption rate at the 95<sup>th</sup> percentile from the Nez Perce fish consumption survey; and
- Idaho is employing a RSC approach that is different from how other states in the Pacific Northwest have used it. It hasn't been implemented in this manner before, and doesn't appear to be a proven or demonstrated method at this time to protect Tribal member

health. In applying RSC the State of Idaho must address the complex life histories of all salmon species along with all other routes of exposure such as air, soil, and other marine fish and shellfish. An alternative approach to this complex calculation is to simply include salmon in the fish consumption rate such as the Tribe is advocating for.

In its entirety, the policy choices set forth—and the rationale or basis that the State of Idaho asserts support those decisions—do not protect the health of Nez Perce tribal members, do not seem based on “best available science,” and therefore does not protect the designated uses of Idaho waters.

The state has chosen a regulatory fish consumption rate that selectively and purposefully applies science in a way that could result in inadequate, weaker human health criteria and water quality standards. Such an outcome could benefit dischargers by allowing more discharge of contaminants and pollutants to enter into state waters, in cumulative fashion with other sources of contamination, which ultimately will find their way into fish, and into the Nez Perce who consume those fish, at levels above what might otherwise result if they choose a different policy path. By doing so, as a policy choice they are using available scientific information and data in a way that does not go far enough to protect a high fish consuming population like the Nez Perce. Thus, they have used their policy risk scale to weigh these options in a way that places the risk of their decisions on the Nez Perce people, rather than those that discharge contaminants and pollutants into these waters. Among the policy options available, the State is choosing the ones that place greater burden and risk on people most reliant upon—and who place the highest value on—the fishery resources.

### **Conclusion**

The Nez Perce must be treated as the target general population for purpose of establishing human health criteria and water quality standards under the Clean Water Act. The Nez Perce Tribe concludes that incorporating information on both the heritage rates and suppression for the Tribe in the State of Idaho’ fish consumption rate is necessary, given the Tribe’s culture and sovereignty, given the Tribe’s treaty-reserved rights which the EPA has an obligation to honor and protect, given EPA’s existing policy, and given the Tribe’s desire for a full evaluation of its historic, current, and vision for improved fish harvest and consumption in the future.

Salmon know no political boundaries, and our Tribal members exercise treaty-reserved fishing rights to fish in Oregon, Washington, and Idaho. We urge EPA to ensure that water quality standards are protective of tribal fish consumption levels and needs throughout the Northwest where its treaty rights apply (or where its usual and accustomed fishing areas are located). The Tribe will provide the results of this survey to IDEQ in 2015 and expects that this local data on Nez Perce fish consumption, which will necessarily include data implicating tribal consumption of anadromous species from waters in Idaho, will be fully considered in the State of Idaho’s promulgation of fish consumption rates to protect human health. Given the preliminary Group 2 fish consumption rate, the Tribe believes that Idaho’s policy recommendations that it will use to develop statewide criteria will not be protective of designated uses, and therefore will not protect its Tribal members.

The Tribe would find it unacceptable if the IDEQ uses artificially suppressed FCR for the Tribe. Such an outcome would perpetuate the “downward spiral” that EPA cautions against with respect to suppression of fish consumption.

In summary, the Tribe concludes that IDEQ’s policy recommendations do not remedy the key findings in EPA’s May 2012 disapproval of the state’s July 2006 water quality standards and should be reevaluated.

Thank you for considering the Tribe’s comments on IDEQ’s policy recommendations and related aspects.

Sincerely,

  
Anthony D. Johnson  
Chairman

## Nez Perce Tribe Response to IDEQ Policy Recommendations

Given that the Nez Perce treaty rights are of similar nature and character to some Washington Tribes (i.e., “Stevens “ Treaty rights that reserve off-reservation fishing at usual and accustomed fishing places), the Tribe requests EPA to apply the same position regarding “Tribal Treaty Rights” as it is doing in the Washington rulemaking process. There, EPA advanced the following treaty rights aspects to Washington Department of Ecology for their consideration,<sup>3</sup> as follows:

- (1) certain tribes hold a treaty-reserved right to take fish for subsistence, ceremonial, religious, and commercial purposes at usual and accustomed places, and these places cannot directly be protected by the tribes and responsibility falls to state and federal government to ensure their protection;
- (2) to harmonize treaty fishing rights with the CWA, EPA must interpret the state’s designated uses to include subsistence fishing;
- (3) the state must adopt criteria that will protect the tribal population exercising the subsistence fishing use as the target general population, not as a high consuming subpopulation of the state;
- (4) that the data used to determine FCR must reasonably represent tribal subsistence consumer’s practices unsuppressed by fish availability or concerns about the safety of the fish available for them to consume; and
- (5) cancer risk level selected must ensure a minimum level of protection for that tribal target population when consuming fish at unsuppressed levels.”

These five points are supported by EPA’s recent disapproval of Maine’s human health criteria.<sup>4</sup> In the Maine process, EPA took the position that Tribal consumers should be considered as part of the target population in state human health criteria, and their right to exercise their treaty-reserved rights must be adequately protected. EPA has indicated that they have the authority, and the duty to disapprove standards that do not protect tribal rights and provide for safe consumption of fish they depend upon:

*... if the State does submit a new or revised WQS that would **interfere** with the Tribes’ reserved fishing right, EPA has authority under the CWA to ensure that the Tribes’ fishing right is protected.*

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<sup>3</sup> For additional information see letter from Daniel D. Opalski, Director, EPA Office of Water and Watersheds, to Ms. Cheryl Niemi (Washington Department of Ecology) re: EPA’s comments on proposed revisions to Washington’s Human Health Criteria and new and revised implementation provisions, March 23, 2015.

<sup>4</sup> For additional information see letter from Hilary C. Tompkins, Solicitor Department of Interior to Avi S. Garbow, EPA Office of General Counsel re: Maine’s WQS and Tribal Fishing Rights of Maine, January 30 2015.

The Nez Perce Tribe supports EPA applying these positions to the Idaho water quality rulemaking process.

### **Heritage Rates and Suppression**

As IDEQ is aware, the Tribe, in cooperation with EPA, is currently doing a fish consumption survey to ascertain the type and amount of fish Nez Perce Tribal members consume. As part of this effort, the Tribe is also doing a heritage rate study that will develop a range of fish consumption rates for the Tribe based on an evaluation of historical and recent literature. Preliminary information concerning this information is provided as Attachment A.

EPA explains that fish consumption “suppression” occurs when a fish consumption rate (FCR) 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 FCR.” EPA goes on to describe that two circumstances can result in a suppression effect: (1) “it 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;” or (2) 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.”

Given EPA’s guidance on evaluating suppression, as well as the Tribe’s efforts through the fish consumption survey to ascertain current and heritage fish consumption rates, the Tribe expects that EPA will work with IDEQ to ensure that its findings particularly on suppression are adequately considered and incorporated into the State’s Water Quality rule-making process.

Ultimately, the Tribe’s goal is to rebuild Snake River fish to healthy, self-sustaining levels that will in turn support sustainable treaty fisheries. To relate this to WQS and fish consumption rate, the Tribe would like to have runs that support per capita fish consumption that is consistent with our historic baseline and per capita consumption. This is consistent with the point EPA expressed in their letter to Washington that the fish consumption rate should “represent tribal subsistence consumer’s practices unsuppressed by fish availability or concerns about the safety of the fish available for them to consume.”

The Tribe believes that the Nez Perce Tribal members are currently catching and consuming fish (resident and anadromous kind) below our historic baseline. Given EPA’s guidance on evaluating suppression, as well as the Tribe’s efforts through the fish consumption survey to ascertain current and heritage fish consumption rates, the Tribe expects that EPA will work with IDEQ to ensure that its findings particularly on suppression are adequately considered and incorporated into the State’s Water Quality rule-making process.

This will help address the issue of fish consumption rates that are artificially suppressed and IDEQ potentially setting “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 religious purposes.” This is a very real and disturbing issue that has potentially long-term implications that the Tribe finds unacceptable. Such a “downward spiral” would have significant impacts to the Nez Perce treaty-reserved fishing right and ability to harvest and eat fish for “subsistence, traditional, cultural and religious” purposes. An outcome like this would fail to protect Nez Perce Tribal members who arguably have been impacted the most by depleted fish runs. Moreover, under a suppressed FCR scenario, these Tribal members will be the ones who will have to face the prospect of dealing with serious health risks when they catch and eat fish under a “suppressed scheme” wherein water quality standards allow for increased pollution into state waters and elevated contaminants in fish.

Ultimately, the Tribe’s goal is to rebuild Snake River fish to healthy, self-sustaining levels that will in turn support sustainable treaty fisheries. To relate this to WQS and fish consumption rate, the Tribe would like to have runs that support per capita fish consumption that is consistent with our historic baseline of 300-646 pounds per capita consumption (or higher depending upon what results from final Nez Perce heritage rate report the Tribe and EPA are collaborating on).

IDEQ stated at their April 21, 2015 rulemaking session, that the state may evaluate angler and Tribal data on high fish consumers over time, and if fish consumption increases in the future, then the IDEQ may consider and address it at that time.

In its November 18, 2014 letter to IDEQ, EPA expressed that it “has been working with the Idaho Tribal Governments to document suppression as a part of the Idaho Tribal Fish Consumption Surveys,” and that the Agency is “hopeful that information once reviewed and approved by the Idaho Tribal Governments will be informative for Idaho DEQ in ongoing and future work efforts.” The EPA acknowledged that suppressed fish consumption affect Indian tribes, and are evaluating how to characterize fish suppression in fish consumption surveys.

### **IDEQ Policy Recommendations**

The following is the Nez Perce response to the ten policy recommendations. With respect to “Best Available Science” EPA took the position that the state “should use the best available science to derive its human health criteria and, in many instances, the EPA’s 2014 draft 304(a) recommended criteria represents that information.” Some of these recommended criteria are referenced and inform part of this response.

#### **1. Consumer/Non-consumers**

IDEQ Recommendation was to include consumers only given their exposure to contaminants in fish. Non-consumers would be excluded given that they do not eat fish and therefore the risk to them eating fish contaminated with pollutants would essentially be zero.

The Tribe supports including only people that consume fish (i.e., consumers) given their exposure to contaminants in fish. Every tribal member is entitled to exercise their treaty-reserved right to harvest and consume fish. The Tribe’s draft fish consumption survey report provides evidence that majority of the respondent’s consume local and marine fish in substantial quantities.

## **2. Everyone or High Consumers**

IDEQ Recommendation was to evaluate a range of exposure/risks in both the general population and higher fish consuming subpopulations. From their perspective, this would be consistent with EPA guidance. Related to above, there would be non-consumers that would be excluded for reasons stated, so it wouldn't involve all people from the general population.

In its policy issue paper on this subject, IDEQ expressed its concerns as to whether the CRITFC 1994 study was relevant and could be used in their rulemaking process. Of particular concern was that the CRITFC survey did not take into account the varying body weight among tribal members sampled—they assert that a fish consumption rate should be reported as grams of fish per kilogram of body weight per day (g/kg/day). Ultimately, IDEQ took the position that “more information is needed to paint an accurate picture of fish consumption in Idaho.” The State acknowledged that the fish consumption surveys that EPA and the State is doing will “provide a thorough and scientifically defensible view of the range of fish consumption rates in the state and better inform the choice of a rate that is protective of all fish consumers.”

IDEQ has stated that one advantage of using a fish consumption rate that is derived for a subpopulation is that they “would be able to show that high consumers are being protected at a set level,” however, the disadvantage that they see with this approach is that they may not be able to directly relate the FCR to the overall general population. IDEQ stated that the resulting consumption rate should be compared to the targeted populations in both the state and tribal surveys to determine if those fish consumers are adequately protected.

In its corresponding PowerPoint presentation on this issue, the State recommended the following: “to target high consumers, they must be well defined,” “definition should be based on fish consumption rate, not *a priori* on an ethnic, economic, or geographic characterization, and “there should be a comparison of how a targeted subpopulation (presumed high consumers) relate to the broader population so that risk can be described for all.”

The Tribe supports including people that are high consumers of fish. Every tribal member is entitled to exercise their treaty-reserved right to harvest and consume fish. The Tribe's interim fish consumption survey report provides evidence that majority of the respondents consume local and marine fish in substantial quantities. The Tribe should be treated as the “targeted population” for which WQS are being established for. The Nez Perce tribal members must not be defined as some subpopulation or statistic that could be represented as high consumers within a general population.

## **3. Deterministic or Probabilistic Approach**

IDEQ Recommendation was to use a probabilistic risk assessment (PRA) in addition to deterministic calculation to inform criteria selection. From IDEQ's perspective, this would provide better information on the range of risk in the population.

In its March 31, 2014 email submittal of its comments to IDEQ policy issue paper, EPA conveyed some major points and issues concerning the use of probabilistic risk assessment. EPA requested that IDEQ consider how it might describe uncertainty (i.e., lack of knowledge about something) versus variability (i.e., the range of values a parameter could assume) as it attempts to address ‘conservatism’ in the application of probabilistic risk assessment (PRA). EPA also requested that IDEQ verify the quality of the input distributions used for analysis and issues of correlation (example provided was that a FCR or DI might be correlated with body weight).

In its policy paper IDEQ explained that some parameters are represented by point estimates (BAFs, BCFs, RSC), while others could potentially use a distribution of values (BW, DI, FCR). This method could be a hybrid of PRA and deterministic methods, and could be used to characterize variability in fish consumption and distribution of risk to Idaho fish consumers. However, PRA is generally only appropriate when the parameters in question vary independently. This is not the case when fishing tribes, such as the Nez Perce, are among the exposed population. In such a case, Nez Perce tribal member exposure is characterized by parameters that do not vary independently; rather, tribal members consume fish at the highest rates and tend to live in the same place for their entire lives and, according to tribal exposure scenarios, have the highest drinking water intake rates.

Idaho is employing a hybrid deterministic/PRA approach that is novel and hasn’t been implemented, let alone proven, to protect human health. Additionally, EPA has questioned the use of assigning distributions to toxicity parameters because of limited data to develop distributions for those parameters. Because this method can be complicated, additional detail on how it will be used and how it will protect the most vulnerable members of the target population needs to be supplied to the Tribe before it is implemented. The Tribe notes that this approach is different from what the states of Oregon and Washington has used in their respective water quality rulemaking process.

#### **4. Include or exclude market fish**

IDEQ Recommendation is to use Idaho’s regulatory FCR on local fish only. The state doesn’t regulate market fish and this would be consistent with EPA’s treatment of marine fish in the national FCR. From IDEQ’s perspective, they can use the relative source contribution (RSC) to account for market fish. IDEQ may include rainbow trout given the production and marketing of those fish within the state. EPA clarified that their guidance also includes estuarine and near-coastal marine fish as local fish.

IDEQ framed this issue very succinctly in its policy discussion paper on this matter. IDEQ stated that “[w]ater quality criteria for human health protection are inversely proportional to the rate of fish consumption. Higher fish consumption rates mean lower water quality criteria if all other variables remain the same. Conversely, lower fish consumption results in higher criteria.” Later on in the document, they assert the following, “[i]f the fish consumption rate is based on all fish consumed, regardless of source, we are protecting the population at a known and acceptable risk level while knowing that there may be a significant portion of the exposure from outside sources that we do not regulate or monitor.”

In its June 23, 2014 to IDEQ concerning this policy issue, EPA that “304(a) water quality criteria, and accompanying risk assessment methodologies, reflect the longstanding interpretation that a designated use consistent with the goals of the Clean Water Act means that state and tribal waters should support safe consumption of fish and shell fish. EPA expects that a state’s human health criteria will be set to enable residents to safely consume from local waters the amount of fish they would normally consume from all fresh and estuarine waters.” And that EPA believes a fish consumption rate should “include the amount of represented by an estimate of fish consumed from local waters,” and that it would be appropriate to “include the consumption of market fish in the fish consumption rate used to develop protective human health criteria” in the State’s water quality standards.

Idaho is choosing to exclude market fish, a known contributor of contaminants to fish consumers, despite knowledge that Tribal members are known to consume those types of fish. The Tribe supported the use of Group 1 in its computation and analysis of fish consumption rate in its interim draft FFQ Report. This group includes market fish.

#### **5. Include or exclude anadromous fish**

IDEQ Recommendation is to exclude anadromous fish. While anadromous fish are caught in Idaho waters, as returning adults almost all of the contaminants they bear are not locally sourced, thus like market fish, their quality is not under the state’s control. However, it is noted that the IDEQ is considering something different for steelhead given their life cycle and time spent in Idaho waters.

In its September 5, 2014 to IDEQ concerning this policy issue, EPA explained that “the overall function of the water quality criteria is to support maintenance of appropriate water quality throughout the United States,” and that individuals “should be able to safely consume the amount of fish they wish to and utilize water resources from any location within the U.S.” Thus, it is their position that “consumption of freshwater and estuarine fish, regardless of source, should be used to develop” water quality criteria. With respect to salmon, EPA commented on a number of uncertainties relative to consumption of salmon and body burden, and given those uncertainties, EPA took the position that “salmon should be included in the fish consumption rate. EPA recommends fully including salmon in the FCR, versus using the method to reduce the relative source contribution (RSC) to address exposure to contaminants in salmon. Another rationale to include salmon is to “develop a cohesive regional perspective as [EPA] works with states and tribes to develop and/or update human health water quality criteria.” EPA noted that State of Oregon included salmon, and the State of Washington is considering the inclusion of salmon in its criteria.

Salmon know no political boundaries, and our Tribal members exercise treaty-reserved fishing rights to fish in Oregon, Washington, and Idaho. We urge EPA to ensure that water quality standards are protective of tribal fish consumption levels and needs throughout the Northwest—for protection of downstream water quality standards in the Columbia Watershed and for Nez Perce tribal members who catch and consume fish “usual and accustomed” fishing places in this area. Pollutants and contaminants that originate and are discharged in waters located within the State of Idaho, flow downstream, and ultimately makes its way into the Columbia River.

In the Tribe's August 22, 2014 letter on this policy issue, the Tribe's position was that "including anadromous fish in the State of Idaho' fish consumption rate recognizes the Tribe's culture and sovereignty, honors the Tribe's treaty-reserved rights which the State of Idaho has an obligation to protect, is based in sound science, and is consistent with the Tribe's desire for a regional fish consumption approach that includes anadromous fish which benefits all communities in the Pacific Northwest." This would be consistent with the EPA's perspective of having regional consistency of human health water quality criteria across the states of Oregon, Washington, and Idaho. It is important to emphasize here that the Nez Perce treaty territory encompasses areas in northeast Oregon, southeast Washington, and much of central Idaho. A regional cohesiveness would best achieve protective water quality criteria and standards for the Nez Perce Tribe, a high fish consuming population.

Idaho is choosing to exclude anadromous fish, thereby discrediting a major contributor or source of contaminants to Nez Perce tribal members who consume large quantities of these fish. To remedy the flaws in their WQS application, EPA expressed to Idaho that they must "rely on local or regional fish consumption data in developing a fish consumption rate that is more representative of target populations."

The Tribe supports inclusion of salmon as representative of the Nez Perce consumption of fish and would be consistent with its Treaty of 1855 with the United States and the treaty-reserved fishing rights that flow from that treaty.

## **6. Risk and Human Health Protection**

IDEQ's Recommendation is for setting criteria for non-carcinogens to achieve a  $10^{-6}$  incremental increase in cancer risk at mean consumption rate for high fish consuming groups (using angler or tribal data, whichever is greater), while making sure  $10^{-6}$  risk in overall population occurs at no less than the 95%tile. From IDEQ's perspective, it is appropriate to balance protectiveness for both consumers and general population. IDEQ will also address non-carcinogens.

In its January 20, 2015 letter to IDEQ concerning this policy issue, EPA discussed nine points of concern. A couple of notable responses were set forth in this letter. First, EPA clarified that relative to factors used in developing acceptable risk levels by IDEQ, its review will focus on whether the proposed water quality criteria protect applicable designated uses and are based on sound scientific rationale. With respect to the one-in-a-million risk, their review will conform to the enabling statute, the Clean Water Act, and its implementing regulations, that they do "not consider economic impacts or the technological feasibility of meeting the criteria in ambient water." Second, EPA discussed risk levels relative to whether or not risk in involuntary or voluntary and how risk can be used in setting water quality criteria. Governments are responsible to reduce risks and it is well documented that "tribes and other low-income, minority populations" have exposures to contaminants in fish and shellfish that exceed the levels at which the general population are exposed to. EPA also explained that tribal trust responsibilities and treaty rights are also important considerations. Third, EPA pointed out that IDEQ's focuses on the use of  $10^{-6}$  to  $10^{-5}$ , but their Human Health Methodology specifies that a  $10^{-7}$  could be used by States and Tribes.

Idaho's water quality standards affect the rights, interests and resources of the Nez Perce Tribe. When the waters that support fish are allowed to be contaminated, the Tribe's interests are affected and Tribal people are disproportionately exposed. The long-term solution to this problem is not adopting a position that keeps Tribal members and others from eating contaminated fish (i.e. avoiding risky behavior); it is keeping fish from being contaminated in the first place.

The Tribe remains very troubled with the State's interpretation of the consumption of fish as a "voluntary risk." Tribal members could no more choose to not consume fish than they could choose to not be Nez Perce. The Tribe agrees with the State's acknowledgment that humans are often exposed to multiple contaminants at a time or in succession, often through multiple avenues of exposure. Studies conducted in the Columbia River Basin have shown dozens of different contaminants in fish tissue (U.S. Environmental Protection Agency), and while some of the cumulative effects and their interactions are known, most of them are not well understood. Weakening the current cancer risk level criteria in light of this uncertainty will likely jeopardize the health of Tribal members and all Idahoans. In conclusion, lowering the cancer risk level will place a disproportionate burden on the health and welfare of Tribal communities and likely interfere with the Tribe's treaty-reserved fishing rights. The Tribe urges the State to retain the protective cancer risk rate of  $10^{-6}$  and turn your attention to establishing an accurate fish consumption rate to accompany it.

The Tribe is not a subpopulation, but rather a "targeted population" that requires a more stringent and protective risk level. The Tribe objects to the offered basis/rationale for IDEQ's choice, and believes this decision does not balance risks appropriately between the non-Indian low fish consumers and the Nez Perce tribal members who are high fish consumers. We are unable to determine that such a proposed approach to cancer risk level will provide health protections consistent with Nez Perce treaty reserved rights to harvest and eat fish.

Idaho is choosing to only set risk under a  $10^{-6}$  incremental increase in cancer risk at mean consumption rate for high fish consuming groups, which equates to protecting a smaller percentage of Tribal members than if the State decided to set the risk level at the 95<sup>th</sup> percentile.

The Tribe does not support the recommendation of achieving a  $10^{-6}$  incremental increase in cancer risk at the mean consumption rate for high consuming subpopulations (using Tribal data), while making sure that  $10^{-6}$  risk in the overall population occurs at no less than the 95<sup>th</sup> percentile. This appears to provide more protection for the general population, and thus, places greater risks on the Tribal population, such as the NPT.

## **7. Relative Source Contribution (RSC)**

IDEQ Recommendation is to adjust RSC values based on changes in FCR. This would be a new approach that hasn't been tried before. From IDEQ's perspective, the RSC will vary by contaminant and by exposure, through the following ways:

- Fish + Water > fish only

- High BAF > low BAF
- High FCR > low FCR

IDEQ will use EPA recommended RSC value of 0.2 and adjust it for marine fish (so it doesn't double count these fish—and will not use a value of 1.0). They are not looking at this on a contaminant-by-contaminant basis. An example was discussed regarding mercury (Hg) where fish consumption is the primary exposure pathway for humans. If eat a lot of fish then may elect to use a higher RSC value to account for exposure pathway (meaning that as RSC value gets closer to 1 then it is assumed that fish consumption is the only way mercury is getting into humans, and no other sources are at play).

EPA expressed concern about IDEQ's assumptions and generalizations concerning application of the RSC value. EPA stated that it may not be practical to account for range of BAFs across contaminants if it isn't done contaminant-by-contaminant. It was EPA's position that it should be looked at contaminant-by-contaminant. As noted above on Policy Issue #5, EPA recommends fully including salmon in the FCR, versus using the method to reduce the relative source contribution (RSC) to address exposure to contaminants in salmon.

In its policy discussion paper on this issue, the State explained that “[s]ince water quality criteria for human health only address exposure through drinking water and eating fish or shellfish,” the RSC correction factor “is used to ensure that total exposure from all sources does not exceed the reference dose for lifetime exposure.” Because the Idaho fish consumption survey will include data on all types of fish consumed, they think it might be possible to identify likely values of RSC by examining the amount of Idaho fish consumed to the overall fish consumption. Until they can do that, they recommended for use the default RSC “value of 0.20, and a value no greater than 0.80.”

The Tribe believes that the FCR must significantly increase if the State is to adequately protect those most dependent on a fish diet and lifestyle—and those most vulnerable to eating fish that are contaminated with pollutants. RSC is not the appropriate input parameter in the deriving the water quality standard for the Nez Perce, who depend significantly on salmon and other anadromous fish in their diet. The Tribe would find it unacceptable if the IDEQ uses artificially suppressed FCR for the Tribe (see our comments above under Heritage Rates and Suppression” for more detail on this aspect).

Idaho is employing a RSC approach that is different from how other states have used it. It hasn't been implemented, let alone proven, to protect human health. The Tribe supports having anadromous and other fish addressed through the fish consumption rate and not in the RSC.

## **8. Bioaccumulation Factors (BAF) versus Bio-concentration Factors (BCF)**

IDEQ's Recommendation was to move to the use of BAFs versus BCFs. This would be consistent with EPA's 2000 guidance. By doing so IDEQ would better account for increase in toxin concentration in food chain. IDEQ may need to look at trophic level information and compare to national values.

In its policy discussion paper on this issue, IDEQ acknowledges that “[d]ifferent fish consumption rates will have less impact for those chemicals with low BAFs. However, as BAFs increase, the overall impact on the exposure of humans to those chemicals from fish and shellfish consumption increases quickly. This would impact the overall risk to consuming fish and shellfish.” They further recognize that “[b]ioaccumulation of chemical constituents in fish is not identical across species or across chemicals.”

The Tribe supports the use of the BAF versus the BCF application for development of human health criteria.

## **9. Body Weight (BW) and Drinking Water Intake (DI)**

IDEQ’s Recommendation is to use a three step process to address BW: 1) use data from Idaho survey, 2) use data from DHW/BRFSS, and 3) use EPA 2011 exposure factors handbook. For deterministic calculation the BW will be the mean adult value. EPA expressed concern about how to account for children that have less body weight. IDEQ’s response was that this involves a lifetime exposure and they expect that children will be consuming less fish than adults.

As a default value, the Tribe supports the use of 70 kg for body weight, and/or the Tribe may also use BW data from its fish consumption survey (survey value has not been derived or shared with the Tribe yet). At this point the Tribe is not certain that the EPA 2011 exposure factors handbook that uses a value of 80 kg for body weight (this is also described draft 2014 304(a) recommendations) is appropriate.

IDEQ’s Recommendation for DI is to use EPA 2011 exposure factors handbook which the deterministic calculation value will be at the 90<sup>th</sup>tile, which is 2.4L/day. EPA appears to support a higher value as reflected in their draft 2014 304(a) recommendations, which indicates that 3.0L/day is more appropriate for use.

The Tribe supports use of 3.0L/day from EPA recommendation.

## **10. Protectiveness Criteria**

IDEQ Recommendation is that the criteria will not be allowed to become less protective going forward (stated “no backsliding”). From their perspective, the state expressed that it wants to assure that they will be improving human health into future. Given the Tribe's treaty-reserved right to take up to half of the fish that are destined to reach the Tribe's usual and accustomed fishing places, including those places in Idaho, the Tribe would be very concerned if Idaho adopts a weak cancer risk level that may effectively undermine or interfere with the Tribe's treaty-reserved fishing rights.

EPA explains in their 2000 Human Health Methodology document that “EPA expects that the standards will be set to enable residents to safely consume from local waters the amount of fish they would normally consume from all fresh and estuarine waters (including estuarine species harvested in near coastal waters).” According to the EPA this “is consistent with a principle that every State does its share to protect people who consume fish and shellfish that originate from

multiple jurisdictions”. The state of Idaho shares this obligation to protect all people that consume fish that are impacted by contaminants released by Idaho dischargers into the Columbia River watershed.

In its October 4, 2012 rulemaking session, IDEQ provided a PowerPoint presentation, titled “Water Quality Protection for Protection of Human Health,” and delivered by Don Essig (IDEQ) and others. In this presentation, IDEQ explained some aspects of establishing and using fish consumption rates (FCR). The agency stated that an ideal survey would: provide long-term estimates of consumption rates; account for seasonality; characterize consumption for general population as well as groups that consume at higher rates; and identify all sources of fish by species” (slide #33). IDEQ next explained how to choose a regulatory fish consumption rate, and to do so involves three elements—science, policy, and risk management. IDEQ stated that “[a]ll three are part of criteria development: science provides us basic information, policy tells us how to apply that information, and risk management is a matter of publicly weighing options and making a decision. (slide #35). This is the understanding that the Tribe has on how IDEQ developed and selected its policy recommendations as part of their water quality rulemaking process.

The Tribe is unable to determine whether or in what ways application of this protectiveness criteria is protective of high fish consumers. The survey data and calculation of Nez Perce fish consumption rates from the interim report helps provide key science information to this process. It provides the “best available data” and evidence that substantiates that Nez Perce fish consumption rates are significantly greater than what IDEQ had proposed in their application that EPA ultimately disapproved. The Tribe’s final report will provide credible, statistically valid and defensible estimations of our fish consumption rates that are representative of our Tribal members. Given the Tribe's treaty-reserved right to take up to half of the fish that are destined to reach the Tribe's usual and accustomed fishing places, including those places in Idaho, the Tribe would be very concerned if Idaho adopts a weak cancer risk level that may effectively undermine or interfere with the Tribe's treaty-reserved fishing rights.

As illustrated by IDEQ’s approach to try and achieve a  $10^{-6}$  incremental increase in cancer risk at the mean consumption rate for high consuming subpopulations (using Tribal data), this does little to protect a significant portion of our Tribal members who consume the highest amount of fish. The mean consumption rate would essentially protect our members at the 68<sup>th</sup>%tile –much lower than the 95<sup>th</sup>%tile that the Tribe would support.

Moreover, the Tribe does not understand how this fits with the anti-degradation provision of the CWA, or with EPA’s principle that each state does its “share to protect people who consume fish and shell fish from multiple jurisdictions.” Under this approach, the State doesn’t seem to intend to do its part to protect people within its area. But rather, it appears to point fingers at others and fault them for their contributions to contaminants, while at the same time washing their hands of any responsibility for impacting the health of high fish consuming population like the Nez Perce Tribe, by claiming they do not regulate or have responsibility for sources or routes of exposure that originate in other areas and jurisdictions. To compound this, the State asserts that eating fish is a voluntary risk that Nez Perce tribal members undertake by choice.

ATTACHMENT A

Preliminary review of Heritage Fish Consumption Rates from Idaho Tribal Heritage Fish Consumption Rate Reports for the Nez Perce Tribe (Rudolf 2014).							
Reference	Methodology	Tribes Evaluated	Species Evaluated	Rate in g/day	Rate Derivation	Includes (Note: +/-/U indicates whether the way in which a particular factor was addressed causes an increase, decrease, or unknown impact on the FCR)	
						Uses Besides Caloric Consumption Migratory Caloric Loss Factor <sup>1</sup> Accounting for inedible portion <sup>2</sup>	
Craig & Hacker 1940	Ethnographic Observation	Columbia Basin Tribes	Salmon, sturgeon, trout	454	Not presented	No (+)	
Swindell 1942	Ethnographic Observation	Columbia Basin Tribes, Celilo Region	Salmon	401	1611 lb salmon/year ÷ 5 people/family × 454 g salmon/lb salmon ÷ 365 days/year	No (+)	No (-)
Hewes 1947	Caloric Analysis	Columbia Basin Tribes	Salmon	454	2000 calories/day × 50% of diet as salmon × 1000 calories/lb salmon × lb salmon/454 g salmon	Yes (-)	No (-)
Griswold 1954	Ethnographic Observation	Columbia Basin Tribes, Celilo Region	Salmon	746	30 sacks salmon/year/family × 10 lb salmon/sack × family/5 people × 454 g salmon/lb salmon × year/365 days	No (+)	No (-)
Walker 1967	Evaluation of Craig & Hacker 1940 and Griswold 1954	Columbia Basin Tribes	Salmon	725	Griswold cited 40 sacks of salmon per family were obtained with 30 retained for family use and 10 used for other purposes. Average of 454 g/day (from Craig and Hacker, 1940) and 995 g/day (from Griswold 1954). The Griswold value was based on families obtaining 40 bags of salmon, 30 for consumption and 10 for trade. 995 g/day = 40 sacks salmon/year/family × 100 lb salmon/sack × family/5 people × 454 g salmon/lb salmon × year/365 days	Yes (+)	No (-)
Boldt 1974	Undocumented, (United States v. Washington, 384 F. Supp. 312)	Columbia Basin Tribes	Salmon	622	500 lb salmon/person/year × 454 g salmon/lb salmon × year/365 days	Unknown (U)	No (-)
Walker 1967	Ethnographic observation citing Spalding 1936	Nez Perce Tribe	Salmon	373 <sup>a</sup> 466 <sup>b</sup>	300 fish/peak day/fishing site × 10 peak days/year × 10 lb tissue/fish × 50 fishing sites ÷ 5000 total population (from Spalding 1936) a: assumes population of 5000 b: assumes population of 4000 (Hewes 1947)	Unknown (U)	No (-)
Hewes 1973	Caloric Analysis/Ethnographic Observation	Nez Perce Tribe	Salmon	373		No (+)	No (-)
Marshall 1977	Ethnographic Observation citing Walker	Nez Perce Tribe	Salmon	701	300 fish/peak day/fishing site × 10 peak days/year × 10 lb salmon/fish × 94 fishing sites × 454 g salmon/lb salmon ÷ 5000 total population	Unknown (U)	No (-)
Walker 1985	Ethnographic Observation, unpublished by cited by Schnitz 1985	Nez Perce Tribe	Salmon & Resident	1,244	Note: fishing sites increased from 50 to 94 based on Schwede 1966 Methodology not presented	Unknown (U)	Unknown (U)

Preliminary review of Heritage Fish Consumption Rates from Idaho Tribal Heritage Fish Consumption Rate Reports for the Nez Perce Tribe (Riddolf 2014).									
Reference	Methodology	Tribes Evaluated	Species Evaluated	Rate in g/day	Rate Derivation	Includes (Note: +/-U indicates whether the way in which a particular factor was addressed causes an increase, decrease, or unknown impact on the FCR)	Uses Besides Consumption	Migration Factor <sup>1</sup>	Accounting for inedible portion <sup>2</sup>
Schak 1986	Ethnographic Observation citing Hewes 1947 and 1973	Nez Perce Tribe	Salmon	804	300 lb salmon/year/person x 454 g salmon/lb salmon x year/365 days ÷ 0.58 caloric loss factor ÷ 0.8 edible fraction.	Unknown (U)		Yes (+)	Yes (+)
Hunn and Bruneau 1989	Ethnographic Observation, derived from: Craig and Hacker 1950; Hewes 1947 & 1973; Walker 1957	Nez Perce Tribe	Salmon, Steelhead, Lamprey	398	400 lb salmon/year/person x 454 g salmon/pound of salmon x year/365 days x 0.8 edible fraction Based on review of references cited in the methodology column, Hunn and Bruneau estimated the annual salmon harvest per person at 400 lb/year	Unknown (U)		No (-)	Yes (-)

<sup>1</sup> Includes a migration caloric loss factor (based on Hunn, 1981, citing Idler and Clemens, 1959) to adjust estimates based on caloric intake.

<sup>2</sup> Waste loss may be accounted for either in direct observation (i.e. the author is citing consumption of fish that had been prepared for consumption, as was done by Craig and Hacker and Swindell) or by adjusting the amount of fish harvested by a waste loss factor/loss factor (0.8, based on Hunn, 1981) to translate from amount consumed to amount harvested. For consumption rates derived using caloric analysis, waste loss is inherently accounted for, as calories consumed are converted into edible fish mass consumed.