

“The heartbeat of our people”: How blueback sockeye salmon influences tribal well-being

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Introduction

There is a current trend to include human well-being indicators for natural resource management (NRM) decisions in order for a more comprehensive approach to the social-ecological system (Millennium EA, 2005). The World Health Organization defines “well-being” as, “a context- and situation-dependent state, comprising basic material for a good life, freedom and choice, health, good social relations, and security” (Millennium EA, 2005). Natural resource management decisions are often made primarily based on economic or ecological data (Campbell and Vainio-Mattila, 2003). While this can be an effective way to make some natural resources decisions, it is not the most holistic consideration of human health in social-ecological systems, especially in tribal contexts where communities are deeply intertwined with natural resources. The tribal perspective views the importance of natural resources beyond just the ecological and material benefits (Donatuto *et al.*, 2011). Natural resources enhance various non-economic values of tribal communities such as culture, spirituality, and social relationships (Donatuto *et al.*, 2011). Due to the importance of these non-material aspects of human well-being, these values need to be included for tribal natural resource management decisions.

In response to some of these concerns, there is growing use of the concept of ecosystem services, or the notion of natural capital, as a way to link management decisions to human well-being (Millennium EA, 2005). These initiatives, however, have also relied on material (financial, income, or other) or ecological measures. They are not very advanced at considering other aspects of HWB, such as culture (Kai Chan *et al.* 2006). While some have expressed the need to take culture into account with natural resources management, few have actually put it into practice (Chiesura and Groot 2002). This problem is further exacerbated by the fact that few natural resource managers understand the cultural aspects imbedded in tribal NRM.

Specifically in reference to tribal cultural values, the majority of work has been completed outside of natural resource management. For example, in the field of anthropology, research on tribal cultural values often takes a more ethnographic approach (e.g., Jones 2005, Deur 2009) and these values are not looked at as way to enhance natural resource management. Some work looks at how culture can cause tension among natural resource managers (e.g. Cronin 2007) and how different cultures can result in different management practices. Others examine its adaptive capacity and resiliency within a system (Castleden 2009).

In the past few years, there has been a focus on developing frameworks to describe more holistic indicators/metrics for HWB associated with NRM. These frameworks attempt to take traditionally observational data and build indicators useful to evaluate and select appropriate natural resource management strategies. Biedenweg *et al.*, for example, identify seven domains of HWB: Psychological, Social, Cultural, Spiritual, Economic, Governance, and Physical (Fig. 1). Biedenweg *et al.* focus on attributes that describe potential domains within which indicators would fall. While this has not been applied to a tribal context, it encompasses the full notion of well-being rather than just physical health. Specifically related to tribal contexts, there have been some advances in New Zealand with the Maori indigenous population to create a stream cultural health index that incorporates the Maori worldview and values of streams in natural resources management (Townsend *et al.* 2004). Native American values have also been used to measure community risk by considering various aspects of health, cultural, economic, mental and ecological risk assessments (Harris and Harper 2000). For example, in the Swinomish Indian Tribal Community in Washington State, the definition of tribal health was developed in a culturally relevant manner to include food security, ceremonial youth, knowledge transmission, and community cohesion, each having three health components associated with them (Dontatuto

et al. 2011). This work is one of the most comprehensive approaches to looking at tribal health as related to natural resources. Although there have been these efforts, it is not yet clear how widely applicable these frameworks and indicator sets are.

This manuscript presents the results of a case study in the Quinault Indian Nation where we tested a method traditional to anthropology, and described by Donatuto *et al.* and Townsend *et al.*, to gather HWB potential metrics through key informant interviews. We specifically focused on values associated with salmon as this is a resource of great importance to the tribes and Pacific Northwest. We then coded the interviews to test whether the broad domains of attributes and indicators were relevant to any or all of the three frameworks described above.

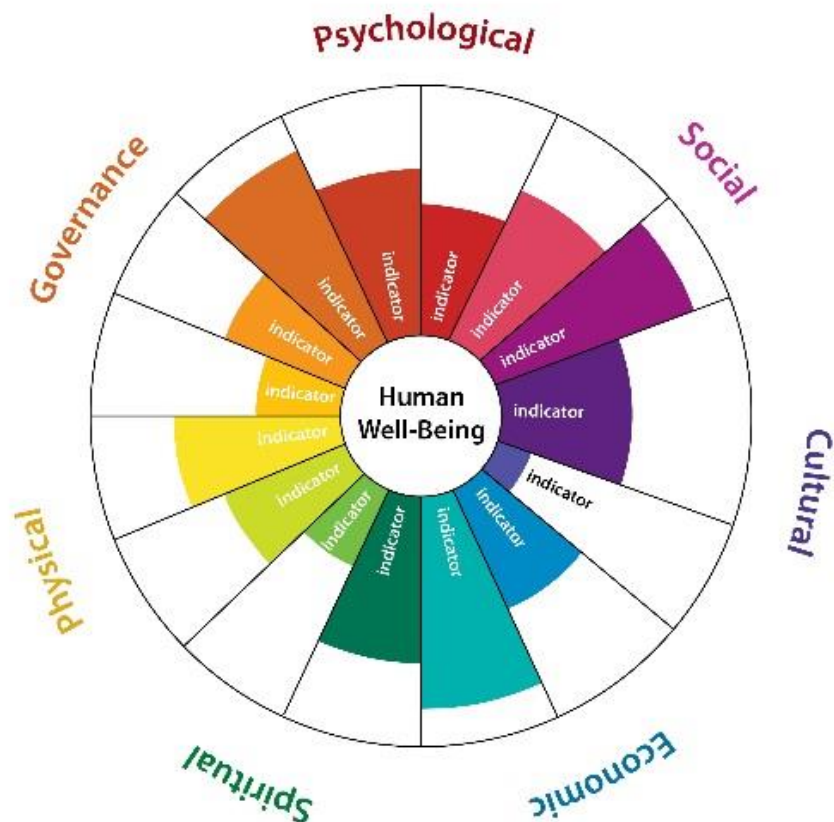


Figure 1. Human Well-Being Framework adapted from Biedenweg *et al.* 2013 (in review).

Background of the Quinault Indian Nation

Even though each tribe is its own entity, there are certain similarities that call for conclusions to be drawn from one tribe to another. A large number of tribes believe that their lives are rooted in the land: “Although tribal cultures are distinct, an emphasis on unity and connection with the land is integral to their traditional and modern way of life.” (Cronin, 2007a: 521) Many of the tribes of the Pacific Northwest incorporate salmon into their culture.

The Quinault Indian Nation (QIN) the largest of 6 reservations on the Olympic Peninsula in Washington state. The QIN is made up of multiples tribes, descendants of the Hoh, Quileute, Chinook, Cowlitz, and Chehalis have joined the QIN (Storm and Capoeman 1990). In 1887, the Dawes Act allowed the President of the United States to survey the land of the Indians and redistribute it to individuals rather than a tribe as a whole. Due to the Act, and the subsequent amount allotted per family, the QIN lost 64,000 acres of land which was almost a third of the reservation (Storm and Capoeman 1990). In 1945 the case of *the Quinault Tribe v. United States* the court determined that 15,000 acres of land was improperly excluded from the QIN. Currently the reservation encompasses almost 200,000 acres of land with pockets owned by the forest service and the national park service (James 2002).

The Quinault River is a 68.8 mile river which headwaters start at the Anderson Glacier, located on Mt. Anderson in Olympic National Park. The Quinault River flows into Lake Quinault and then drains out into the Pacific Ocean near Taholah (Storm and Capoeman 1990). The blueback salmon (*Oncorhynchus nerka*) is a type of sockeye but smaller than most, weighing only 2-4 Kg. The blueback returns to the Quinault River late winter/early spring to spawn in Lake Quinault (Storm and Capoeman 1990).

Salmon is tied to QIN culture and well-being. There is overwhelming support within the literature that salmon plays a very important part in tribal culture in the Pacific Northwest. For example, Rickert (2007: 219) states

“It is impossible to work in the environmental field in the Pacific Northwest without knowing something of salmon: their epic journeys from river to sea and back; the legendary runs of the nineteenth century, before the arrival of dynamite, fish wheels, dams, and hatcheries; the near- symbiotic relationship between the Northwest Indian tribes and the fish that were the backbone of their diet and culture”.

Colombi (2005: 576) also has the same argument that salmon is integral in tribal culture,

“Since time immemorial the Nez Perce revered anadromous fish and healthy watersheds as a paramount symbol to their cultural and religious identity. This several- millennia-old relationship was built upon three main elements: salmon as food, salmon as an object of trade, and salmon represented as a necessary component of traditional religious expression”.

To the QIN, the Quinault River is important because it is the only place where the blueback runs. Along with elk, deer, sea lions, shellfish, and a variety of plants, the salmon was a primary source of food for the QIN people. Historically, they fished with weirs or dip nets depending on the location along the river. Because of the high oil and fat content of the blueback the QIN would allow the majority of the salmon to travel up to Lake Quinault to spawn. This made it easier for the salmon to be smoked and preserved for the winter. The QIN would also prepare salmon for immediate consumption such as roasting it on a stick over a fire. These preparation techniques are still popular today (James 2002).

Historical estimates of blueback run into the millions but they have drastically declined. In 2007 the National Park Service estimated that the number of blueback returning to the river was less than 5,000 (National Park Service 2013). The QIN fisheries suffered heavily from the impacts of poor logging practices at the hands of the Bureau of Indian Affairs. The clear cutting of forests caused log jamming, which reduced the capability of streams to support the fish

habitats and as a result decimated the number of returning salmon (James 2002). However, the QIN is working diligently to revitalize the salmon population. In 1974 the QIN received a welcomed victory in the seminal court case *United States v. Washington*, also known as the Boldt decision. The Boldt decision reaffirmed the QIN treaty rights to fish in their usual and accustomed fishing grounds as well as the right to manage their own fisheries. The latter is a right that is solely given to the QIN and no other tribe in Washington State has that control in their fisheries management. In asserting this right, the Quinault Department of Natural Resources has a variety of fish enhancement projects to restore the salmon population to its historic levels. There are two hatcheries owned by the QIN; a pen-rearing facility in Lake Quinault for the Quinault River and the Salmon River Culture Facility, to benefit the Queets River (James 2002). The United States Fish and Wildlife Service also runs a state-owned hatchery, the Quinault National Fish Hatchery, located on Cook Creek, a tributary of the Quinault River. The QIN produces 5-10 million juvenile salmon and steelhead annually (Ruby *et al.* 2010), but unfortunately, the blueback populations are still low.

In order to enhance blueback populations, the QIN has collaborated with a non-profit conservation NGO in the Upper Quinault River, above Lake Quinault, to create salmon habitat through engineered log jams and shoreline stabilization. While similar restoration projects often measure success based on ecological and financial returns, this project is attempting to develop socio-cultural measures of success as well. In order to do this, we first needed to understand how salmon and the QIN are related.

Methods

The research team first met with the QIN's cultural liaison to design the most culturally appropriate research methods. The cultural liaison is a well-respected member of the QIN

community and is the author of many documents related to the importance of salmon to the QIN. He served as a collaborating researcher throughout the entire process, providing background materials, commenting on the research materials and methods, setting up interviews, and clarifying tribal views of salmon.

Based on our discussions, we decided that semi-structured, in-person interviews with adults were the most appropriate data collection methods. For the interviews, we targeted a range of demographics from the QIN population to make sure that the findings were not biased towards one particular gender or age group (Table 1).

Table 1. Number of interviews conducted by age group.

<i>Age</i>	<i>20-50</i>	<i>51-80</i>	<i>80+</i>	<i>Total</i>
<i>Male</i>	2	7	2	11
<i>Female</i>	2	4	1	7
<i>Total</i>	4	11	3	N=18

The interviews were conducted with the tribal liaison present for all of the interviews in order to make the subjects more comfortable as well as to assist the researchers with navigating cultural appropriateness. We prepared four general questions for the interviews: 1) What was the subject's role in the community pertaining to salmon, 2) How or why salmon was important to them and the community, 3) How does salmon influence culture, and 4) What do they think when they think of a healthy river. The latter was included to get a sense of the relationship tribal members associated between healthy rivers and fish. Five interviews focused primarily on these questions. Due to the continuous mention of the economic value of salmon and of logging as an additional income generating activities, we added questions about how salmon is important to the tribal economy and how logging affects salmon. Each interview subject gave their consent to be interviewed and all interviews were recorded on a digital audio recording device. The identities

of the interview subjects were kept confidential with only the research team having access to their identities.

The interviews were then pre-coded in order to identify general values ascribed to salmon. Two members of the research team determined inter-coder reliability by pre-coding the same interview and both came up with a very similar set of values associated with salmon. The values were divided into social, economic, and ecological domains. Originally, Donatuto *et al.*'s (2012) framework was used as a method for developing domains for values but this framework was deemed too narrow. The framework by Biedenweg *et al.* was more comprehensive for the values associated with salmon. Using that framework for coding, these values were then divided into seven domains: governance, economics, spiritual, cultural, psychological, physical, and social.

The interviews were then transcribed and the transcripts uploaded into ATLAS.ti, qualitative coding computer software. The first analysis of interviews coded concepts into the seven domains. These domains captured the range of salmon cultural meanings, so a second analysis of interviews involved the development of specific attributes within each domain. Because informants discussed multiple concepts simultaneously and linked concepts, quotes could be coded into multiple domains and attributes.

Using ATLAS.ti, we created a 'network view' of all the domains and attributes and their relationships to one another. The network view provided a visual representation of the domains and attributes associated with salmon as well as the strength of the domains and attributes and their ranking in order of how often they are mentioned and how many times they are linked to other domains and attributes. There are two ways that the domains and attributes were linked to each other in this study. Firstly, the domains were linked together with the phrase "associated

with” if they ever occurred simultaneously in the same coded segment of interview. The attributes were linked to each of the domains with the phrase “part of” to signify that each attribute was part of a domain. Lastly, all the domains were labeled as “part of” QIN well-being. These linkages were then used to create a network view of all the domains and attributes (Fig. 2).

Finally, we presented these domains and attributes at a community meeting to solicit feedback about how well they represent the general QIN population and to request clarification on certain attributes.

Results and Discussion

We identified 26 attributes associated with salmon within the seven domains (Table 2). In this section we describe these seven domains in more detail and how the data are interrelated among attributes and domains. The domains and attributes are ordered according to the number of times they are mentioned and amount of links they have to other domains and attributes.

Table 2. The attributes associated with salmon as well as description and the domain they fall into. Ordered by the number of times mentioned and the number of links to other domains and attributes.

Domain	Attribute and description
<i>Economic</i>	Jobs from hatcheries: Hatcheries provide a major source of jobs for the tribal community Economic dependence: Dependence on salmon as a source of income (either year round or seasonally) Household consumption: Salmon is an inexpensive food source for families Jobs from guiding: A common seasonal means of making money among tribal members Diverse job opportunities: Salmon provides a variety of seasonal jobs to the Quinault
<i>Social</i>	Non-monetary trade: Exchanging salmon for other goods and foodstuffs Communal events: Salmon bringing members of the community together Family dynamics: Salmon provides connections between generations Sharing: Salmon is distributed among members of the community with special consideration for elders
<i>Physical</i>	Nutrition: Salmon as a key nutrient and a way of healing the body Availability: Salmon is readily available for consumption
<i>Cultural</i>	Ceremonial traditions: Participation and/or observation of ceremonies involving salmon Knowledge transmission: Traditions and values about/of salmon are passed down to younger generations Moral Traditions: Salmon is associated with respect for the old ways and nature
<i>Governance</i>	Fair allocation of fishing grounds: The allocation of fishing grounds is fair and unbiased Salmon fishery management: Effective management of salmon fishing and populations Transparent communication: Scientists and officials readily communicate with members of the tribe Forest Management: Effective logging policies do not harm salmon habitat Participation: Tribal members actively participate in salmon resource management decisions Treaty rights: Usual and accustomed salmon fishing grounds are protected and rights are exercised
<i>Psychological</i>	Pride: Salmon is a source of pride for the community Identity: The Quinault tribal identity is tied to salmon Emotion: Salmon invokes an emotional response Job satisfaction: Jobs related to salmon provide a certain level of satisfaction
<i>Spiritual</i>	Connection to nature: Salmon provides a spiritual connection Beliefs: Cultural practices ensure the return of salmon (i.e. First salmon ceremonies)

Economics

Salmon is a vital component of the QIN's economy; the most common domain mentioned among the interview subjects was economics. Economics is defined as any monetary benefit that salmon provides to the QIN. Respondents mentioned economics 162 times and it is connected to 10 other domains and attributes. Although tribal members receive both direct and indirect economic benefits from salmon, these attributes describe only the direct economic benefits respondents perceived to be from salmon.

The most common attribute associated with economics was jobs provided by hatcheries. 55% of the respondents mentioned how hatcheries are a main source of employment for the QIN community. Many respondents talked about their personal experiences working at the hatcheries.

Because back in the day when we used to brood stock up in Lake Quinault, I was working at the pen rearing when that was going on, and we did a lot of sockeye spawning surveys. That is where we used to work. *Male (M) Age 50-80.*

When I was working at pen rearing we planted fish in Stevens Creek in Humptulips. We planted fish in the Hoh River that came out of the pen rearing site. *M 50-80.*

According to a female respondent, hatcheries are a male dominated field with very few females working in them.

Yeah, I think it is what it is. Because back then, when I was brood stocking, the girls got to do everything – go on a boat, pack the fish in a tube, and they used to spawn the fish. And now they don't, the men, the guys, have to do it now. *F 50-80.*

While older members of the community (ages 50 and above) discuss their actual experiences of working at the hatchery, younger members of the community (below 50) did not mention the jobs that are provided by the hatcheries.

Well hatchery return is like bar none the best hatchery return in any river. *M 20-50.*

Instead, the younger members expressed a sense of pride regarding the hatcheries run by the QIN but did not mention that they ever worked in a hatchery. This could possibly be due to the fact that these respondents were currently unemployed.

Besides jobs from hatcheries, salmon also provides guiding jobs, another attribute. 33% of respondents mentioned guiding as a source of income. Due to the Boldt decision, non-tribal people who want to fish in the reservation are required to have an Indian guide. Guiding jobs can either be a primary or supplementary source of income.

I forgot about that, the guides that go up to the river or take their clients out. They'd pay them to fish on the river in the boats, whole fishing, and that's how some of them make a majority of their money too, guiding. *F 20-50.*

Well a lot of them make their living off it [guiding]. You got fish guides up the river who fish. This is how they survive. *F 80+.*

Guiding is another job that primarily done by men. Although female respondents mentioned guiding, it was not about their own experiences, but in reference to other members of the QIN community.

Diversity of job opportunities is another attribute that was mentioned by 33% of the respondents. Because the blueback season is only from March-July (James 2012) respondents are able to have diverse job opportunities throughout the year. Salmon provides seasonal jobs for community members and in a variety of facets.

Yeah, this is a fisheries building over here, and there's anywhere from five to twenty people that are out [looking] for jobs [there]. And that's basically all seasonal basis. *M 50-80.*

For some of the respondents, the seasonality of jobs was beneficial. They will have different jobs in the different seasons.

I do a bit of construction in the summertime. It gives me a little more time in the summertime with my family and my kids. *M 20-50.*

Whereas for others, the seasonality of jobs resulted in a decrease in job security and was a source of stress. Due to the fact that many of the jobs depend on how well a fishing season is going; lower fish returns seem to cause a decrease in the number of guaranteed jobs offered to the QIN members. One respondent in the employment sector described how the season affects the amount of jobs available.

It's hard to say how many we're going to employ because we never know until we get it up and going, and it's going to fluctuate from season to season, and who do you keep along the season ... and that's some of the problems we have here in Taholah. *M 50-80.*

Salmon is also important for household consumption. 61% of respondents described how they eat salmon and how salmon is a main source of protein. Not only do members of the tribe enjoy eating salmon, they believe that it is a less expensive source of food.

I think families still survive on that [salmon]. You know that's some families that's what you have. Living 45 minutes from Safeway makes it a pretty big deal. The way the economy is the way the gas prices are. You know driving back and forth takes a little bit of money to get out there and buy groceries and buy beef. *M 20-50.*

The Quinault reservation is located in rural, coastal Washington and it is difficult for the QIN members to get to the grocery store. Salmon provides an easy and inexpensive way for members to feed their family. Preserved salmon also has a long shelf life for consumption throughout the year.

We can put [up] fish and smoked fish that you eat throughout the year. *F 20-50.*

While salmon is associated as a source of income for the community, it also allows for members to engage in non-monetary trade (22%). Salmon has historically been used for trading between families as well as other tribes. (James 2012, Storm and Capoeman 1990). While trade is not as popular today, QIN members still trade amongst each other and along the coast.

You know, I believe that it is a trade and a commerce. People will, you know trade different things for their fish and they buy it. *M 20-50.*

Some of the common goods salmon is traded for are canoes, medicines, whale meat, and elk meat (James 2002).

But they use the fish the same way we all do up and down the coast, medicine and culture and celebration and trading for other items that they need. Then somebody will trade them too for something that they need. It helps out both families. *M 50-80.*

55% of respondents mentioned some form of economic dependence on salmon. It is unclear how many members of the community are dependent on salmon as a source of income, but the interviews suggest that the combination of fishing, working in the hatcheries, and guiding provide a significant source of income. Some respondents claimed that salmon (through a variety of means) provided 50% of their income while others said roughly 20%. Those who did not graduate from high school used salmon as a way to make a living.

Some of them don't know how to read. But that's the ones that go fishing. That's how they make a living. *F 50-80.*

The primary economic theme from all interviews was that salmon is a vital source of the QIN economy that can only benefit from an increase in abundance of salmon. Salmon provides a variety of jobs for the QIN with many members of the community depending on salmon either as a source of income or an economic way to feed their families. If salmon populations continue to decline, many tribal members will lose an important source of income and food.

Social

Salmon is associated with a variety of social aspects of the community that in turn enhances the social well-being of the QIN. The social domain of salmon was mentioned 144 times and connected to 9 different domains and attributes. There are 3 main attributes associated in the social domain of salmon; communal events, family dynamics, and sharing.

72% of respondents discussed the importance of salmon in communal events. Salmon is featured at a variety of events such as community dinners, funerals, and celebrations.

There are always big celebration with the blueback and the king salmon. *M 50-80.*

Another big component of the social function of salmon is that it is used as a selling point for fundraisers. Members of the community will donate salmon in order to help students raise money such as a bus to a basketball game. Salmon also helps with the connections between the members of the tribe.

I'm not one to sell. I try to help out with the community and stuff for different fundraisers for the kids and stuff. *F 20-50.*

These events that bring people together often use salmon as the selling point. Simply put, the events involving salmon allow members of the community to connect with each other.

They [high school students] use the blueback for their fundraisers. It brings us together. *M 20-50.*

According to 67% of respondents, salmon is also an important aspect of family dynamics. Like many other tribes, elder members of a family are highly respected and received special treatment by other members of the community (Burger 2012, Colombi 2012, Donatuto *et al.* 2012, James 2012, James 2002). Elder respondents (50 and above) felt that those who grew up with elders were more respectful and engaged in the donation of salmon to elders.

I don't know if they still teach it yet or not. I heard some of these younger guys, not all of them; they give the first that they caught to an elder. It's been passed down to some of the family. *M 50-80.*

Salmon also enhances family dynamics through the community events such as family dinners. These events allow members of a family to get together.

When people have their family dinners that's this time of year and later in the spring and early summer you know that is the fish that we go to. *M 20-50.*

Tied with the two attributes mentioned above, the attribute of sharing salmon was mentioned by 40% of respondents. Sharing includes not only the act of eating together, but also giving salmon to others in the community for different uses.

We share and give it away and sometimes my husband will use it when he goes to different places and just give it to people ...because they don't get the fish from around here. It's not a trade. He just gives it to them. *F 20-50.*

People from around the area would know when we are baking fish so they all come over and join us. So we cooked not one for the crew but 5 or 6 around the fire. That's blueback. *M 50-80.*

Families share salmon between themselves and amongst the community, but it is especially important to share with the elders (Donatuto *et al.* 2012). Many elders cannot fish due to bodily restrictions and a lot of them are unable to afford to purchase salmon. They depend and expect younger generations to share salmon with them.

Well, my husband fishes. When he starts for the season, his, all his catch for that week goes to the seniors. It's like that every year. And then the spring salmon, when he catches them, if he gets a great big one, we have to cook it and give it to the seniors. It's always been like that every year. They get fed first. *F 50-80.*

A decline in salmon means that it is not as readily accessible to members of the community and this in turn hurts a person's willingness or ability to share. One respondent mentioned a season where he only had three blueback, two of which he shared with elders. A decline in salmon means that there is less to go around, and in turn, less to share.

I told Nelson I would give him some blueback last year but I only had 3. I gave one to Rose, her sister works at the senior program, Gladys. She does the hair out here. I gave her a blueback last year. *M 50-80.*

All three of the attributes associated with the social domain of salmon are clearly interrelated. Communal events enhance family dynamics and both of these in turn are enhanced by sharing.

Physical

There are two attributes under the physical domain; abundance and nutrition.

Respondents referred to the physical domain 127 times and it is linked to 8 other domains and attributes. While salmon is important socially and economically, tribal members also depend on salmon as a source of food. As stated previously, historically, salmon was one of the traditional foods that the tribe would subsist on and it has remained as a primary (or at least desired) source of protein (Storm and Capoeman 1990). 67% of respondents mentioned that availability of salmon was important to them. However, due to the decline in salmon, many members of the tribe are not able to eat salmon as often as they would like and they feel this associated with availability. Availability is directly related to consumption.

Well, a lot of people like to eat fish here. And we don't, we didn't get to have very much fish this year. So the freezer is pretty well empty on stock up on salmon. *M 50-80.*

This availability is critical to the nutritional values of tribal members. 39% of respondents associated salmon with diet, viewing it as a healthy source of protein that contains vitamins and nutrients that will make them live a long and healthy life.

Salmon? It's healthy. Salmon is good for you. Like Omega 3 in salmon? Might make you live longer. *M 50-80.*

Others feel that there is a decline in health correlated with the change in diet associated with salmon availability.

My daughter lives in town, but she don't get any either. And I think the system, your body system, when you go without too much [salmon], then it's not accepting those kind of oils and stuff when you're eating it. And you get allergic to it. My daughter used to just love fish, but she said now when she goes to eat it, her stomach gets upset. *F 50-80.*

Elders prefer to eat salmon when they are sick because they believe that it makes them better due to its nutritional value.

But that is another fish that our elders use for medicine and stuff. In the soups mostly because of all the minerals and stuff that are in the ocean. *M 50-80.*

Here salmon is associated with a nutritional value but also a notion of healing as well. More salmon available for consumption could improve the physical health of community.

Cultural

Salmon is inherently tied to Quinault culture. The cultural importance of salmon was mentioned 124 times and is linked to 10 other domains and attributes. Like many other tribal communities, the Quinault view salmon as part of their culture (Colombi 2012, Donatuto 2012, Ebbin 2011, Castleden 2009, Gerwing *et al.* 2006). Ceremonial traditions are one attribute of culture (33% of respondents). The first salmon ceremonies are one of the most common cultural ceremonies in the tribe. The first blueback caught of the season should be shared amongst the family and given away to elders. The bones are then placed back in the water to ensure a healthy salmon harvest for the next year (James 2012).

Just mainly the first salmon ceremony. Primarily that. Our different ceremonies it [salmon] is the highlight of the meal part. Cooking on the stick. The way we prepare the fish on a split stick and you know there are the different ceremonies giving, weddings, coming of age different things like that, salmon is your main course. *M 20-50.*

The concept of moral traditions is another attribute of culture and was mentioned by respondents 61% of the time. While discussing salmon and the restoration project, members also expressed their appreciation, or reverence for nature.

Mother Nature does what she wants and time with tell. *M 20-50.*

Their respect for nature allows them to acknowledge that they are not fully able to control the quality of the river and that there are a variety of factors of affecting the salmon populations.

Almost all of the respondents recalled how salmon is tied to the old ways as well as the new traditions that are emerging and there is a changing morality around salmon. They mention how times have changed and their way of life is not a simple subsistence lifestyle.

They don't live in the world where we can just go out and live on the land anymore, not if you want to drive around in the car. They're buying out more motors and running stuff down the river, but I think it's good because I've sure seen some of the young people, it seems like they really changed their ways. *M 50-80.*

That's how it was back then, too. But again it was probably, they lived off the land back then, too. I think if I had my choice, that's probably what I would want to do. *F 50-80.*

However, salmon is part of the cultural traditions that elders hope will be carried out by future generations through the transmission of knowledge (33%). Knowledge transmission is vital to maintaining the cultural viability of the QIN and is an aspect that is mentioned by Donatuto *et al.*'s work as well. Many fear that the traditions will be lost as younger generations grow up and do not learn them.

Because that way they're not learning the traditions, they're not learning from the elders, they're not learning from the fishermen – you know, so that knowledge isn't passed on to them if they're living in Aberdeen or some other city. *F 80+.*

Governance

The governance of salmon affects well-being in a variety of ways. Respondents discussed different aspects of governance 103 times and it is linked to 11 other domain and attributes. Firstly, the way salmon is allowed to be fished in the reservation is through the allocation of fishing grounds (28% of respondents). The division of fishing grounds among the tribe is a complicated and frequently contentious process. Respondents felt that the tribal council does not allocate fishing grounds in a fair and unbiased fashion, and this can result in a decline of salmon as well as limiting equal access to salmon.

I'll tell you right now how this is going to work and it has a lot to do with our board members that are on the fish and game. It has always been political down here. Well our president he fishes the first ground. Our vice president fishes the first ground on the South side. *M 20-50.*

The change in allocation of fishing grounds is also perceived negatively.

They changed a lot of our rules. I don't know. I don't think they're good for the river because like all things groups that are family oriented they will look after their family and they will change the setup. 255 feet a [fishing] ground. It was that way all the way up the river. It's a lot of changes. *M 50-80.*

The management of the salmon fishery is also a contentious issue (40% of respondents described management problems). Respondents describe how they feel that salmon is not being effectively managed.

Different management. You have bad management. You got a poor council that doesn't understand how to make money but they can sure spend it. *M 80+.*

Forest management is another governance attribute that subjects associated with salmon. 56% of respondents attributed management of logging to a decline of salmon.

The forest service ruined their spawning grounds in the upper Quinault. Logging. *M 80+.*

The logging. The habitats, the logging take 'em away the habits. *M 50-80.*

Timber harvesting on the Olympic Peninsula has devastated salmon habitat. Poor logging management practices are almost universally described among respondents as one of the main causes for the decline in salmon. While there are some regulations in place to prevent this such as buffer zones, there is a feeling of lack of enforcement to illegal and irresponsible logging.

There are places where they logged carelessly. Bad timber practices. I mean right now there is anywhere logged close to the river 150-200 foot buffer zone and they can't fall the timber that close to the watersheds. Like the Quinault River and the Queets River, they are everywhere and that is a huge issue. *M 50-80.*

In addition to the actual resource policies, respondents also referred to the policymaking process as influencing their well-being in relationship to salmon. Specifically, transparent

communication was mentioned by 28% of respondents. Respondents described a lack of communication between scientists and the community, affecting salmon management and understanding of what is being done to help the river. Many respondents were also unaware of the restoration project by TNC and how it would help the salmon population.

I just think there's gotta be a little more focus on how they go about getting the fisherman in the public know. I don't know how much impact they had on the manmade dams in the upper Quinault. I don't know if that is being effective. *M 50-80.*

Respondents who mentioned a lack of communication were those who had had jobs in a fishing capacity. However, they did not know of the success of the restoration either. Those who were completely unaware of the restoration project, did not have jobs that were directly associated with fishing.

Participation is tied to a lack of communication. 16% of respondents discussed the lack of opportunities to participate in the decision making process. Specifically, members felt that those who were in charge of managing salmon or timber did not listen to their opinions.

Lastly, tribal treaty rights are another component of governance 28%. The QIN values its sovereignty as a nation and view their treaty rights as an integral part of their management of salmon. Because the QIN and other tribes fought so hard for their fishing rights, salmon has become a symbol of their sovereignty (Donatuto *et al.* 2012).

Court wise, the State [of Washington] can't bother us. Which is a plus for us. Again you still under court ruling and if you abuse that it will go back to the court. A lot of people don't believe that. I was involved in the court case that determined that. *M 80+.*

The QIN values its treaty rights even further as they were granted power over managing their own hatcheries, a right that is unique to them. The ability to self-govern themselves and self-manage their fisheries is extremely important to the QIN.

Psychological

The psychological well-being of QIN tribal members is deeply intertwined with the abundance of salmon. This manifests itself in the discussion of individual pride, identity, job satisfaction, and other emotional responses. Salmon as a source of pride for the Quinault people and was mentioned by 56% of respondents.

This is the prized fish of who we are. We are a fishing people but the blueback and the sockeye is very, very important to our lifestyle. *M 20-50.*

The kids, when they used to make their capes and stuff, described like they would be fishermen or hunters and stuff like that. *F 20-50.*

The QIN is incredibly proud of who they are as a nation and their salmon. The blueback is prized and they believe that it is the best sockeye available.

Salmon is a part of the Quinault identity and a way that they feel separate from the rest of the world.

I mean we are a fishing people and without clean water and without fish our identity kind of goes away. We kind of blend in. Yea so ecologically it all ties back to the water for us. Very important on our survival. *M 20-50.*

Salmon is important to the uniqueness of the QIN. Another respondent put it in very compelling terms:

If we didn't have salmon we wouldn't have us. *F 50-80.*

Ensuring salmon abundance is vital for the QIN to maintain a distinct identity. This identity is prevalent among all generations. High school students refer to salmon as the tribe's mascot.

Older members discuss how salmon is the "heartbeat of our people". As stated, without salmon, there would be no Quinault.

Another important aspect of the psychological important of salmon is job satisfaction. For those who choose a salmon dependent profession, they benefit from the flexibility of that profession. Respondents refer to the freedom of being able to come to go as they choose.

Well, yeah. I always tell people I'm kind of glad things changed in a way, even though I really enjoyed fishing, and I always felt kind of, like, I'm my own boss when I'm fishing. You don't have to answer to somebody. *M 50-80.*

Youngsters from 20 to 30, are going into the fisheries because you don't need an education. You don't need too much experience or knowledge. They like the freedom of being able to come and go as they choose. *M 50-80.*

Due to the ties to pride, identity, and job satisfaction, salmon also evokes a lot of emotion amongst the tribe. Some express their love for salmon:

Of course, when it does come in, boy, we sure love it. *M 50-80.*

Others express sadness or dismay at the decline in abundance:

It's sad. It's sad to see it all go. I am not that old. It's gone. Those days are gone. *F 50-80.*

The notion of sadness described by the decline in salmon is related to the concept of solastalgia, or anguish felt by the decline of natural resources (Albrecht *et al.* 2007). The decline in salmon could potentially have mental health implications on the QIN community. Overall salmon is a vital aspect of the Quinault psychological well-being.

Spiritual

The spirituality and cultural importance of salmon are very much related to each other but are still distinct. Spirituality was mentioned 24 times and linked to 4 different domains and attributes. The two attributes of spirituality are connection to nature (27%) and beliefs (33%).

Salmon provides a connection to nature that is beyond the tangible benefits and that is far beyond

oneself. Respondents express a connection to place that is associated with the Quinault River which has allowed them to survive on the same land for hundreds.

So it's been a pretty important piece of land [the Quinault River] and water to allow us to survive for generations. *M 20-50.*

Salmon is also tied to many tribal beliefs. Fishermen will often look to nature to predict how plentiful the salmon harvest will be.

But I do know when there is a lot of snow; the old timers would look to the mountains and determine the run. *M 20-50.*

While the first salmon ceremony is a cultural tradition it is also an important spiritual practice as are the beliefs behind it.

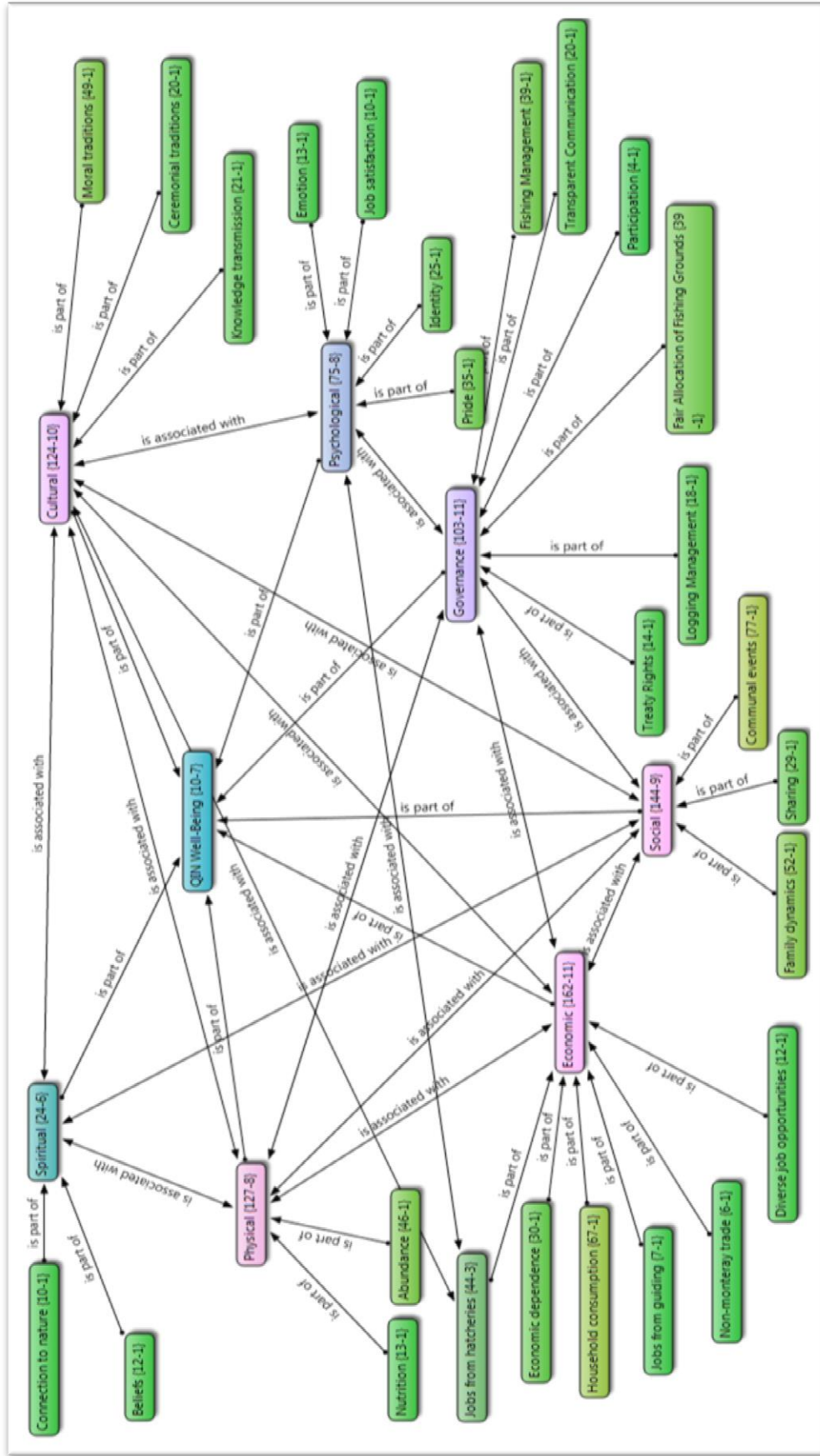
If you don't then your greed is taken over and then you seem you don't catch as much fish. But when you give it one of the elders in the village, the abundance of fish will come. That's the way we were taught on the river. *M 50-80.*

Interrelationships

As shown in Figure 2, the seven domains that describe tribal well-being associated with salmon are intertwined by way of their attributes. Tribal members do not talk about salmon in just one specific domain due to their influences on each other. For example, quotes show that a respondent will talk about how the physical availability of salmon affects the cultural, economic, and social domains. A decline in salmon can result in a decline in sharing, ceremonies, and mental health. Another way the attributes are interconnected is through the fact that they could potentially fall under a variety of domains. While we placed identity within the psychological domain, we could also easily categorize it within the cultural domain. There is an inherent conflict in categorizing attributes into separate domains; however, this is necessary to facilitate how scientists think of human well-being. The development of specific categories also ensures attention to the diversity of aspects of human well-being. The interconnectedness of attributes

shows how the tribes value salmon from a variety of aspects and these aspects positively and negative influence each other. The interconnectedness of the values is prevalent among other tribal communities. For example the Huu-ay-aht First Nations located on Vancouver Island, B.C. discuss how everything is one, everything is connected (Castleden 2009). This sentiment is expressed throughout tribes in the Pacific Northwest. Not only is the Quinault relationship with salmon interconnected among the domains, it is also dynamic, nonlinear.

Figure 2. A network view of all the values associated with salmon developed using ATLAS.ti. Color coded by number of times mentioned and number of links {# of times mentioned, # of links}



Conclusion

This study explored two questions: 1) what is an appropriate framework for categorizing tribal values associated with salmon and 2) what are those values and how can they be organized and presented to assist in developing attributes and indicators for NRM? The original hypothesis was that Donatuto *et al.*'s framework for measuring tribal health would be encompassed by the attributes of tribal well-being related to salmon. While there are some overlaps between Donatuto *et al.*'s indicators used to measure health and the attributes we found to be associated with salmon, we concluded that the Swinomish Cultural Health Index framework was too specific to effectively apply to the Quinault context. Firstly, the four indicators of the index (food security, ceremonial use, knowledge transmission, and community cohesion) were relevant, but not comprehensive. They did not address the importance of material benefits, which we found to be of primary importance to well-being, nor psychological health. Another difference was in the distinction between cultural and spiritual customs pertaining to salmon. Donatuto *et al.* treats cultural and spiritual customs as essentially the same thing. While these two domains are similar and related, we found them to be distinct and needing to be examined both separately as well as together. While the Swinomish Cultural Health Index specifically sought to focus beyond economic attributes, we concluded that to examine well-being we needed a more holistic view that encompassed economic and psychological well-being and distinguished between cultural and spiritual health.

As a result, we found the Human Well-Being Framework (Biedenweg *et al.* 2013) to be an appropriate framework to display tribal values associated with salmon. It allows for more flexibility to natural resource context and graphically is an effective way to depict the QIN's

relationships to salmon due to the interrelationships and its dynamic nature. Furthermore, although Biedenweg *et al.*'s wheel is general, it allows for specific applications. When the wheel was shown to the cultural liaison and members of the tribe at the community meeting, they commented that this was an informative way to grasp how salmon is important to the community. They believed that it allowed for all of the values to be interconnected and many likened it to a tribal medicine wheel, which depicts and teaches about important aspects of their culture. Furthermore, the wheel reconciles the conflict between how scientists view HWB and how tribes are intertwined with natural resources. The wheel allows for separate categories that benefit resource managers, but allows for the tribal perspective of interconnected between the values of salmon. Similarly the wheel developed by Biedenweg *et al.* can show important well-being aspects of salmon.

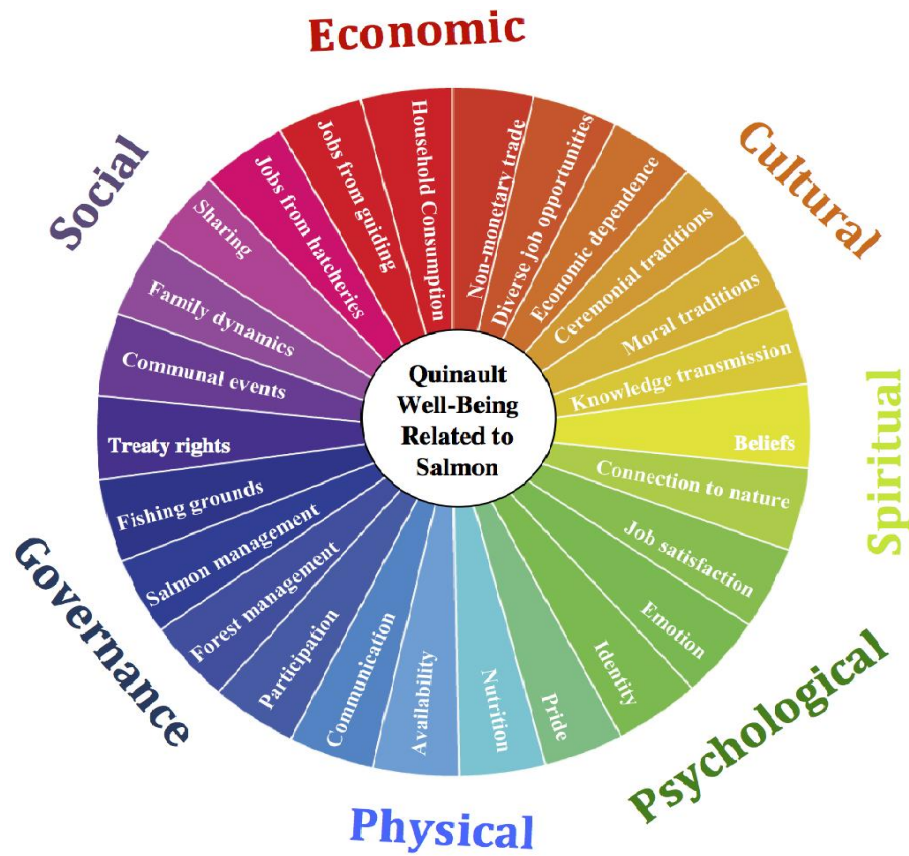


Figure 3. Quinault well-being related to salmon. Seven domains with 29 attributes.

Figure 3 shows the application of the human well-being framework in the QIN context. The seven domains are depicted on the outside of the wheel. Although the colored spokes of the wheel were designed to represent individual indicators with varying lengths depending on their measures at a point in time, we used the spokes to represent the attributes associated with the seven domains and have not assigned any measure to them. This wheel provides a holistic approach to describing the values identified with salmon.

The overall goal of this study was to explore how we might evaluate a restoration project's success beyond ecological indicators. Our first step was to develop method for eliciting and identify the values associated with salmon, presented in this article. Next steps include identifying the socio-cultural values surrounding a healthy river and a healthy forest, as those are key aspects that might need to change in order to restore salmon habitat. Once we identify the socio-cultural values associated with salmon, timber and healthy rivers, we can then develop appropriate indicators that can be used to compare across potential scenarios or monitor over time. Indicators are often used for ecological targets and are rarely found in conversations about cultural health. Some of these indicators are inherent in the attributes such as the amount of salmon one consumes per week or the amount of ceremonies a tribal member participates in per year. Other indicators might require a subjective Likert-style scale, such as measuring one's identity associated with salmon on a scale of 1-5. To be effective, these indicators must be refined with tribal members.

While salmon is important as a cultural keystone species for the Quinault, it is also the economic lifeline of the community. Additionally, although the economic value of salmon was qualitatively discussed in our interviews, we did not conduct an actual valuation of salmon in dollars. To understand the true economic value of salmon, as well as timber, a next step is to

conduct economic valuations of the salmon and timber industries. In this way, socio-cultural values associated with the different drivers of salmon health can be combined with ecological and dollar values to provide a more holistic understanding of the tradeoffs of different restoration scenarios. Due to the impacts of logging practices on salmon, the community will need to see what tradeoffs they would be willing to make. Comparisons need to be made between the value of a healthy forest and the value of salmon and if these two aspects can complement each other.

Natural resource management attempts to manage for healthy social-ecological systems. To begin addressing this, restoration projects must measure success beyond ecological returns. In this article we demonstrate how socio-cultural values associated with salmon can be determined and suggest how such information can be translated into indicators used for planning and monitoring purposes. Salmon is directly tied to QIN well-being, and transcends beyond material benefits. The multitude and magnitude of values associated with salmon furthers the importance of the restoration project. “Without salmon, there would be no Quinault”.

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