

RIVERS INSTITUTE AT THE BRITISH COLUMBIA INSTITUTE OF TECHNOLOGY
AND RIVERS WITHOUT BORDERS

A TAKU SALMON STRONGHOLD

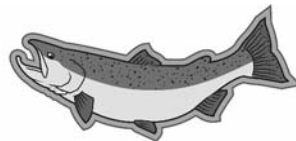
*Initial Assessment of an Exceptional
International Watershed*

2010

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AND THE RIVERS INSTITUTE AT THE
BRITISH COLUMBIA INSTITUTE OF TECHNOLOGY



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Overview

This brief paper provides an initial appraisal of the potential to establish a Taku Salmon Stronghold. It presents information and opinions about the transboundary Taku watershed that straddles Alaska and British Columbia. It puts forward an exploratory review of the Taku watershed's salmon values in relation to the scientific criteria and other qualifications established by the North American Salmon Stronghold Partnership.

The development of this paper was sponsored by Rivers Without Borders and the Rivers Institute at the British Columbia Institute of Technology. For Rivers Without Borders, this initiative is part of its ongoing effort to protect intact watersheds, promote wild salmon conservation, maintain biological diversity, and safeguard unique cultural values of the northwest British Columbia and southeast Alaska transboundary region.

The Taku is exceptional in many respects, including its fully intact state and its breath-taking natural beauty.

The Taku is exceptional in many respects, including its fully intact state, its biological diversity and its breath-taking natural beauty. It has served as a vital waterway and food source for aboriginal communities for centuries and a reliable source of salmon for commercial and sport fisheries for decades. Its relative isolation from industrial development and resource extraction has enabled the Taku to maintain extraordinary, virtually pristine natural environmental conditions and remarkably high salmon productivity.

This paper provides an explanation of the North American Salmon Stronghold Partnership, an initiative that identifies and reinforces the “best of the best” in wild Pacific salmon habitat. It explains the salmon habitat characteristics of the Taku River system in relation to the benchmarks of natural spawning, viability, and diversity that are hallmarks of the exceptional salmon river systems represented in the North American Salmon Stronghold Partnership. It sets the stage for a future scientific assessment of the Taku international watershed with a rigorous application of Salmon Stronghold criteria.

Many rivers and basin areas across the Pacific coastal and interior regions can demonstrate their value for wild salmon productivity. However, the Salmon Stronghold assessment process uses a thorough scientific methodology to measure and rank those attributes, and it provides validation for the most crucial Pacific salmon habitat. Consequently, rivers such as the Taku can be independently assessed and proven to have extraordinary importance for wild salmon conservation.

The Taku would qualify to join the North American Salmon Stronghold Partnership in every respect. As even the cursory review undertaken for this report illustrates, it possesses all of the characteristics of the core centers of wild salmon abundance and diversity identified around the Pacific Rim. It also exceeds the recent refinements of the Salmon Stronghold science assessment processes and additional criteria that introduce regional scale comparisons and high-productivity area factors. Formal recognition through the Salmon Stronghold program, coupled with effective resource management and monitoring, can ensure that the environmental values and integrity of the Taku watershed are sustained.

1. Salmon Stronghold Concept and Application

Frequent declines in the abundance and diversity of wild Pacific salmon stocks and the increasing unpredictability of their returns have been notable conditions and matters of concern in recent decades across most of North America's west coast. While conventional fisheries management has had some success in coping with the challenges of wild salmon conservation, few new ways of enabling salmon conservation have emerged or been adopted lately.

The rapidity and sheer scale of losses of salmon habitat called for a new conservation strategy that would reinforce the areas of salmon strength and protect unspoiled areas.

In the face of the recurring and highly erratic series of salmon population declines and losses of species and habitat diversity in many areas over several decades, fisheries resource managers and conservation advocates have typically adopted a crisis response, in reaction to these emergencies. Over time, salmon management has become primarily focussed on this “fire fighting” approach, assigning fewer resources to the prevention aspects of salmon conservation. Many highly productive salmon areas, such as the Taku and other northern rivers, have been largely ignored because they have, so far, only rarely been sources of severe problems.

Some scientists and fisheries managers in the 1990’s recognized this trend towards overlooking proactive prevention of problems in favour of crisis management. They pointed out that the limited budgets of fisheries agencies inevitably forced a rationing that led to a focus on immediate and frequently drastic stock declines at the expense of measures that would be beneficial in the long-term. The 1999 *Living Blueprint for B.C. Salmon Habitat* report by a group of Canadian fisheries experts called for priority-setting that would identify and protect the most critical and valuable salmon habitat. The report explained that the rapidity and sheer scale of losses of salmon habitat called for a new conservation strategy that would reinforce the areas of salmon strength and protect unspoiled areas, rather than assign virtually all financial and technical resources to those situations where habitat conditions had already deteriorated, often beyond the point of realistic restoration.

As a response to this situation, the North American Salmon Stronghold Partnership was created in 2004, an innovative program initiative of the Portland-based Wild Salmon Center. The program was directed towards protecting the core centres of wild Pacific salmon abundance and diversity.

The North American Salmon Stronghold Partnership has evolved into a voluntary and collaborative network-based initiative involving tribal and First Nation community groups, government agencies, fisheries scientists and local organizations. With administrative and technical support from the Wild Salmon Center, the eleven Salmon Strongholds that have been identified to date have local partnering organizations and volunteers who were first involved in the science-based assessment of their watersheds and continue to work in collaborative ways that enhance or safeguard those Strongholds.

While Salmon Strongholds have gained widespread interest and enthusiastic participation by government fisheries and wildlife agency personnel, they are essentially voluntary and do not involve regulatory functions. By collaborating through Salmon Strongholds, volunteers from all sectors (aboriginal communities, government agencies, ENGOs, and salmon harvesters) work towards achieving their common interests in salmon protection.

The partners in each Salmon Stronghold work together in activities such as fish passage restoration, land exchanges, stock status assessments, monitoring, pollution clean-up, regional planning, land set-asides for habitat conservation, and non-development agreements with landowners. Through their network, the partners share information among all of the Salmon Stronghold participants throughout the Pacific Northwest. They operate under a written Charter that spells out their principles and operating procedures. The essential elements of the Charter are explained in the “Principles of the North American Salmon Stronghold Partnership” description that is appended to this paper.

Salmon Strongholds enable a renewed emphasis on the prevention component in salmon resource management. They permit the achievement of the key objective of directing new salmon management funding and technical resources towards measures that can prevent the onset of wild

salmon crashes and habitat deterioration, rather than simply providing for after-the-fact responses. Salmon Strongholds are already active in four states: California, Oregon, Washington and Idaho. Canadian interest and participation in Salmon Strongholds led to an analysis in 2009 of the applicability and value of the approach in Canada. Following that report's recommendation, the Pacific Fisheries Resource Conservation Council sponsored an initiative that included a science-based Salmon Stronghold assessment and scoring of the Harrison River in British Columbia. In February 2010, the Council announced its designation of the Harrison Salmon Stronghold as Canada's first watershed to fulfill the criteria for membership and participation. Alaska state fisheries officials have shown an interest in Salmon Strongholds and are evaluating options for their future involvement.

A core value of Salmon Strongholds is protect the best, first. This approach involves conserving the most crucial salmon habitat through measures that will enable key habitat to remain intact as functioning ecosystems. It involves identifying and maintaining all of the ecological components in priority salmon habitat areas and ensuring that, where these areas are pristine, they can remain so.

2. *The Pristine and Productive Taku Watershed*

The Taku River and its tributaries are home to a substantial portion of the genetically and geographically distinct Pacific salmon populations distributed throughout British Columbia, Alaska and Yukon. A recent report by the Outdoor Recreation Council in British Columbia provided the following apt description of the Taku's remarkable characteristics:

As salmon populations decline and river waters warm in southern BC, the transboundary Taku River in BC's northwest corner has become even more important as a sanctuary for wild salmon... There are no fish farms along the Taku salmon migratory routes, and the entire watershed is unfettered by roads. As a result, the Taku and its many tributaries support healthy runs of all five species of wild Pacific salmon along with valuable commercial and subsistence fisheries in both BC and Alaska. It is the third largest salmon producer in Canada.

The notion of the Taku as one of North America's premier salmon producing areas is widely acknowledged.

The salmon-related features of the Taku have been well-documented in two reports that serve as particularly valuable references and sources of data on wild salmon and habitat status. Both reports were developed from escapement and catch data, as well as sampling and monitoring. The first is the as-yet-unpublished *Pacific Salmon of Northern BC and Yukon Transboundary Rivers* report prepared in 2008 for the Pacific Fisheries Resource Conservation Council. The second is the *Taku River Aquatic Biophysical Profile* report released in 2003 for the partners involved in the Taku Fish Sustainability Working Group. Contributing to both reports were First Nations fisheries specialists, government officials, stewardship organizations, and consultants.

These two reports emphasize the importance of the Taku watershed for both Canada and the U.S. They explain that the Taku includes a portion of the lower river in Alaska, including significant salmon habitat. In that sense, the Taku is an international, transborder waterway that requires joint management and coordinated salmon conservation efforts by both countries.

The 18,800 square kilometre (4.5 million acre) Taku watershed is vast: it covers an area roughly twice the size of Yellowstone National Park and larger than many countries. Its extraordinary geographic diversity is illustrated by the array of scientific classifications that describe it encompassing three major physiographic divisions, five ecosections, and seven bioclimatic zones.

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Within this range of geographic and climatic conditions in the Taku watershed biologists have observed an exceptional array of wild salmon life histories and unique genetic characteristics for several species.

According to the British Columbia Watershed Atlas, the five primary river systems of the Taku watershed include the Lower Taku River, Nakina, Inklin, Sheslay and Nahlin. While 90% of the Taku watershed is in Canadian territory, the river estuarine and river mouth areas are in American territory, emptying into the Pacific Ocean at Taku Inlet southeast of Juneau, Alaska. Other smaller rivers, such as the Tulsequah, Silver Salmon, Kowatua and Tatsamenie, contribute salmon in varying numbers. Of these tributaries and lakes, many produce more than one salmon species to contribute to the Taku's overall salmon productivity.

The Taku River Aquatic Biophysical Profile pointed out that there are serious concerns about the direct and indirect development impacts on salmon stocks and habitat from potential mining activity in the region, particularly in light of the apparent information gaps about the status and productivity factors of wild salmon habitat in the Taku watershed.

Thriving Salmon

The notion of the Taku as one of North America's premier salmon producing systems is widely acknowledged. Its status as a stronghold for salmon has been trumpeted even in advance of any effort to obtain official designation within the North American Salmon Stronghold Partnership. In an April 2010 column, former British Columbia cabinet minister Rafe Mair declared that the wild Taku watershed was a "Salmon Stronghold" under threat. Noted Canadian conservationist Mark Angelo was more specific about its salmon values when he explained:

... the Taku is the best international watershed left for salmon, hosting robust populations of the five Pacific salmon species. A multimillion dollar commercial and sport fishing industry depends on the Taku as does a less quantifiable but equally significant First Nations and Native American cultural connection of countless generations.

All five North American wild salmon species (sockeye, chinook, chum, pink and coho), as well as steelhead, are present in the Taku River system. In addition, there are varieties of trout (rainbow, cutthroat, dolly varden, bull) and many other fish species in abundance. Overall, it is estimated that there are 27 varieties of fish in the Taku watershed.

The highly advantageous conditions for salmon are directly related to the fact that the Taku remains wild, fully intact and without roads and other industry-related development. Much of the water in the Taku is glacial. While this circumstance has a limiting effect on the amount of available spawning and nursing habitat, it provides a high level of water quality. The vast proportion of wild Taku salmon originates from Canadian territorial areas, but significant stocks of chinook, coho and chum come from Yehring, Fish, Johnson and other lower Taku creeks in Alaska. While the Taku's Alaskan waters provide some spawning habitat, they are especially crucial for the rearing of juvenile salmon.

In addition to these environmental and ecosystem conditions, wild Taku salmon have a major economic dimension. As the largest salmon producing river is southeast Alaska, the Taku contributes in excess of \$8 million in economic activity and hundreds of commercial fishing-related jobs to the Juneau area annually. It is also crucial to First Nations communities in Canada reliant on the Taku salmon for economic, food, social and ceremonial purposes.

Taku Stronghold Dimensions

The methodology to determine the geographical boundaries and configuration of each Salmon Stronghold is flexible and somewhat arbitrary. The guideline for deciding what areas should be included or excluded suggests ensuring a degree of interrelatedness in the array of salmon species within the geography and the watershed's configuration, as well as the extent of commonality of interest among the local stakeholders, government agencies and other potential participants in the region.

The selection of a Salmon Stronghold's boundaries is also driven by the tenet of conservation biology that calls for "keeping all the parts."

For the designation of a Taku Salmon Stronghold, it would be appropriate to encompass virtually all of this outstanding salmon-producing watershed. While the Canadian upper reaches of the Taku system are vital suppliers of salmon to the overall drainage, the lower sub-watershed reaches nearer the ocean, including the vast Flannigan Slough, also appear to fit entirely with the criteria of the North American Salmon Stronghold Partnership for overall salmon productivity and diversity. In essence, both the Canadian and American spawning and rearing areas are integral to the geographical definition of a Taku Salmon Stronghold. As a consequence, this cross-border configuration of the Taku Salmon Stronghold would require an international effort to establish it.

The selection of a Salmon Stronghold's boundaries is also driven by the tenet of conservation biology that calls for "keeping all the parts". For the Taku, this would mean maintaining its ecosystem integrity and cohesiveness by ensuring that its salmon habitat remains intact and uncompromised. This is with regard to direct on site impacts – a dam, for example, or loss of riparian habitat because of development – as well as less immediate detrimental impacts such as pollution or siltation from upstream sources.

The Salmon Stronghold science assessment process anticipated to follow this report would determine precisely the geographic scope and boundaries of the Taku Salmon Stronghold so that all of the vital areas are included.

3. Applying Salmon Stronghold Criteria

A rigorous assignment of biological criteria serves as the basis for measuring and ranking prospective Salmon Strongholds. The scientific evaluation of habitat values required for every Salmon Stronghold is meant to ensure a sound and fully justified basis for a watershed or basin to become recognized as a Salmon Stronghold.

A group of scientists working with the Wild Salmon Center established a consensus that there should be three science-based criteria to measure a Salmon Stronghold's attributes, and a transparent methodology to apply the criteria. They proposed that each Salmon Stronghold be rated on the basis of:

Percent Natural Spawners - the percentage of adult fish (compared to hatchery releases) on the spawning ground in recent generations,

Viability - measured in terms of combinations of productivity and abundance,

Life History Diversity - heterogeneity and range of salmon species expressed within the salmon population relative to the historical range as well as across all populations within the species.

In the measurement of the outcome and scoring, known as the Population Stronghold Index, the

calculation provides for a doubling of the weight assigned to the life history diversity component. This additional emphasis is due to the relatively high importance assigned to maintaining genetic and geographical diversity across the watershed's wild salmon populations.

On the basis of even a cursory application of the Salmon Stronghold criteria, the Taku scores exceedingly high, and would rank well within the range that is required to qualify as a Salmon Stronghold.

The evaluation criteria initially established for the North American Salmon Stronghold Partnership provided an appropriate basis for measuring salmon habitat conditions in the lower Pacific U.S. states and in southern British Columbia. The criteria have not, however, been as fitting when applied to the northern coastal Pacific regions of British Columbia and to Alaska. The initial Salmon Strongholds were all crucial habitat but not necessarily high-productivity areas. The evaluation criteria was originally established to measure conditions in watersheds that were high-value salmon habitat, rather than high-productivity. Consequently, some refinements and additional considerations to supplement the science-based criteria, such as comparisons across regions, have been introduced for the assessment of new Salmon Strongholds. These additional factors are especially important for the northern British Columbia and Alaska regions where there is consistently greater salmon productivity and diversity and where considerably more habitat remains intact.

Percent Natural Spawners

The salmon in the Taku are overwhelmingly natural spawners. While minor enhancement projects have been undertaken in the past in an attempt to rebuild some depleted stocks, the only significant effort, initiated twenty years ago, had little impact in terms of improving abundance. Monitoring of the incubated and lake-implanted sockeye, for example, showed low survival rates of the enhanced stocks.

On the basis of even a cursory application of the Salmon Stronghold criteria, the Taku scores exceedingly high.

Enhancement in the Taku watershed was discontinued when it became clear that further activity would not be beneficial. In retrospect, the failure of salmon augmentation in the Taku has been advantageous in permitting wild stocks to remain at an exceptionally high proportion of natural spawners. A Taku sockeye salmon enhancement project was assessed in the recent report of the Pacific Fisheries Resource Conservation Council, stating:

Survival of enhanced fry in both lakes (Tatsamenie and Little Trapper) is considered poor, relative to wild sockeye... and has resulted in low abundance of enhanced salmon. Hyatt et al (2005) found that Tatsamenie Lake enhanced sockeye fry suffer from size mediated predation and suffer poorer survival relative to wild fry.

The resource management responses to salmon population declines in the Taku, such as the chinook declines of a decade ago, have been primarily in the form of tighter fishing restrictions, compared to other Pacific regions to the south where hatcheries were installed for stock rebuilding or replacement purposes.

In line with the precautionary approach of the North American Salmon Stronghold Partnership, fisheries management in the Taku has relied predominantly on natural processes rather than engineered approaches, such as hatcheries or fish farms, to restore wild salmon abundance. As a consequence, natural spawning and biological diversity have been maintained throughout the Taku watershed.

Viability

As the recent report for the Pacific Fisheries Resource Conservation Council also found, pink salmon is the most abundant species in the Taku, followed by sockeye. The pink salmon are concentrated in the Taku mainstem, while the higher-value sockeye are present in eight of the major tributaries.

At the same time, that report and others explained that coho and chinook populations are considered the largest for those species in northern British Columbia and southeastern Alaska. Chinook are present in nine of the Taku tributaries, possibly making them the most genetically diverse salmon species in the watershed.

Like salmon returns everywhere, the wild salmon in the Taku have been cyclical in their escapement levels and variable across species. Conservation measures to protect chinook and coho have been particularly important in light of declines in some segments of the Taku and the northern region more generally. The capacity of the stocks to rebound on the basis of fishing restrictions rather than enhancement, such as hatcheries, has reflected the importance of the unspoiled habitat of the Taku that has enabled stocks to regenerate their productivity with relative speed and effectiveness.

The Taku is not just another salmon-bearing northern watershed.

The array of climatic conditions in the Taku watershed and the variety of sources of wild salmon from different habitat - physiographic divisions, ecosections, and bioclimatic zones - is a tremendous advantage in terms of the Taku's viability. Its high salmon productivity from many diverse habitats makes the Taku more resilient to climate change related environmental stresses compared to watersheds with less diversity and cohesiveness.

The wide distribution of salmon stocks across the Taku watershed, as was cited earlier in this report, is another highly positive characteristic. The variety of stocks and their spawning and rearing locations across the watershed will provide a strong basis for measurement in the assessment process. The high scoring of the Taku in terms of this attribute in Salmon Stronghold criteria would be based on the overall crucial role it serves in maintaining wild salmon stocks.

The fundamental strength and viability of the Taku is also reflected in its estimated two million annually-returning salmon. While pink salmon returns are predominant (1,000,000), the numbers of coho (400,000) and sockeye (350,000) are also substantial. While the average returns of chinook (100,000) are not as high, this stock is particularly prized for its commercial and recreational fishing value, and the Taku has resumed its traditional position of having the largest chinook run among all of the transboundary rivers.

The viability is also evident in the extensive harvest and generally high escapement of the carefully managed Taku salmon stocks. The Canadian portion of the commercial, aboriginal and sport fisheries is focussed on the higher-value sockeye, coho and chinook stocks. The wild salmon harvest by American commercial (gillnet, seine and troll) and sport fisheries includes sockeye, chinook, coho, pink and chum. While fishing restrictions have been introduced for conservation purposes at various times, particularly to protect weak stocks, the harvest and escapement levels have remained fully viable and relatively predictable in comparison to many stocks in the south.

Life History Diversity

The presence of all five primary salmonid species in the Taku and multiple species in its tributaries demonstrates the extraordinary diversity of wild salmon across the watershed. *The Taku River Aquatic Biophysical Profile* report pointed out that the Taku has one of the highest

diversities of salmonids in North America, and possibly the world, with 12 salmonids (including grayling and round white fish) among the 27 fish species in the Taku basin.

Of the thirteen major Taku tributaries, most have more than one primary salmon species present. All five North American salmon species, as well as steelhead, are found in the Taku mainstem. Four of the salmon species are present in both the Nakina and Nahlin tributaries. This circumstance of wide salmon species dispersion across the Taku watershed provides a particularly clear illustration of the vibrant diversity that is crucial for designation as a Salmon Stronghold.

The unspoiled habitat of the Taku has enabled stocks to regenerate their productivity with relative speed and effectiveness.

Within each species, the geographical distribution in different tributaries further represents the distinct biological attributes, influenced by variations in habitat, that make the wild salmon unique within the Taku watershed. For instance, the Nahlin River chinook stocks are noted for their distinctiveness, and its interior coho stocks have been found to differ in various respects from the coastal coho. As another example, a Nature Conservancy and Audubon Alaska “*Freshwater Distribution and Species Richness Survey*” assessed salmon habitat in the Taku below the Tulsulquah to tidewater and gave this section the survey’s highest score.

The monitoring being carried out under Canada’s Wild Salmon Policy and the Pacific Salmon Treaty is intended, in part, to identify the distinct biological traits and measure the diversity of wild salmon. For the Taku, there are distinct genetic characteristics of the wild salmon throughout the tributaries and lakes that comprise the overall watershed. This genetic identification activity under the Wild Salmon Policy, in particular, will provide a valuable source of specific and detailed information for rigorous measurement in the Salmon Stronghold assessment process.

The review of the genetic and life history diversity of Taku salmon, even at a cursory stage, indicates an exceptionally high Salmon Stronghold score. The biological diversity of Taku salmon is largely due to the variety of spawning locations and unique habitat conditions of the different climatic zones and range of geographic conditions across the watershed. Protecting and maintaining watersheds like this one, with its multiplicity of salmon stocks, is a particular focus of the Salmon Stronghold effort.

Population Stronghold Index

In the science-based assessment process, the scoring based on calculations in the three foregoing criteria will generate a numerical value that indicates whether or not a proposed Salmon Stronghold meets the minimum score, based on a combination of attributes of percent natural origin spawners, viability, and life history diversity.

It is apparent, even in advance of the full assessment process to precisely calculate the Taku’s score, that the Taku would surpass all of the minimum required levels and possibly surpass the exceptionally high rating assigned to the Harrison River Salmon Stronghold. Carrying out the science assessment for the Taku is an important task that should be a cooperative effort of First Nations and tribal communities, resource managers, scientists and salmon harvesters. This group could form the nucleus for the local Taku Salmon Stronghold group that would engage with the network of participants in the North American Salmon Stronghold Partnership. The scoring typically involves participants from different disciplines and perspectives who are knowledgeable about salmon and can serve as informed and unbiased sources of analysis, data and historical information. They work individually and in groups to score the attributes of the watersheds and various species.

In due course, the full scientific assessment of the Taku for purposes of qualifying for membership in the North American Salmon Stronghold Partnership should draw from additional sources of information and expertise, including Fisheries and Oceans Canada, Alaska Department of Fish and Game, Transboundary Technical Committee of the Pacific Salmon Commission, and the Pacific Science Advice Review Committee of Canadian fisheries researchers.

4. Comparing Salmon Habitat Values

Additional factors have recently been introduced into the process of determining the overall qualifications of crucial salmon watersheds for official designation in the North American Salmon Stronghold Partnership. These elements include uniqueness of a watershed's salmon attributes, irreplaceability of salmon stocks, consistency of salmon runs, and others that enable comparisons of habitat conditions in high-productivity northern conditions of British Columbia and Alaska.

In this way, the identification of new Salmon Strongholds can involve more careful comparisons of potential Salmon Strongholds within a broadly-encompassing ecoregion to determine which one would most appropriately meet the standard of "best of the best" salmon habitat. The Partnership members recently initiated a series of meetings to look at potential new Salmon Strongholds in California and Oregon and compare them to determine which ones should qualify as strongholds. Similar exercises are anticipated for British Columbia and Alaska at some point, hopefully soon.

The Taku has one of the highest diversities of salmonids in North America.

For the Taku, a comparative scoring process would not be necessary since its status for boasting the region's most diverse and productive salmon attributes is already well documented. Any comparison from this perspective should also involve considerations of the intact nature of the Taku watershed and the importance of maintaining a "keep all the parts" conservation strategy. At present, the Taku watershed is still totally intact and totally unprotected. Resource development, particularly mining related activity, threatens to bring change. The watershed is very much at a crossroads.

Uniqueness and Irreplaceability

Special attributes and conditions in potential Salmon Strongholds are given consideration in determining if areas meet the qualifications to join the North American Salmon Stronghold Partnership. For example, the science assessment in the Harrison River revealed that some chinook species in that watershed had exceptionally different appearance and behaviour patterns; those differences go far beyond subtle genetic variations, and were highlighted in the assessment summary report. The uniqueness of various salmon species in the Taku should be expected to be revealed in its science assessment.

Likewise, the near pristine condition of the Taku, including the absence of roads and resource extraction and industrial activity, gives it the status of irreplaceability that has become a matter of growing importance for prospective Salmon Strongholds. There is concern about potential impacts that could be associated with new mining, roads, and industrial barging that has been proposed within the watershed, especially given the experience of other areas where salmon stocks have been directly and adversely affected by resource development projects that had initially been portrayed as being inconsequential for fish. In addition, there are issues with the abandoned Tulsequah Chief and Big Bull mines on the Tulsequah river near its juncture with the Taku mainstem. A half century after closure, the mine sites continue to be an environmental scar and source of toxic output. This situation is literally the watershed's only environmental blemish,

in need of rectification. Attaining a Salmon Stronghold for the Taku will be a critical step toward ensuring this unique salmon habitat is sustained.

High Productivity Regions

Wide salmon species dispersion across the Taku watershed provides a particularly clear illustration of the vibrant diversity that is crucial for designation as a Salmon Stronghold.

As was mentioned earlier, the current Salmon Stronghold science assessment and scoring regime would generate consistently high scores for most of the watersheds in Alaska and northern British Columbia. Virtually all of the northern coastal watersheds have natural stocks, multiple salmon species, strong viability and proven life history diversity. As a result, most if not all of the watersheds in the North would appear to qualify as Salmon Strongholds. A refinement of the science assessment or introduction of other elements into the scoring has become necessary to differentiate the most crucial northern salmon habitat areas.

There are six major watersheds adjoining British Columbia and the Alaska panhandle. Of these, the Iskut-Stikine, Tatshenshini-Alsek and Taku are major transboundary systems with some similarities. The scientific assessment of the northern region to determine the most eligible Salmon Stronghold should rigorously compare these river systems. Fisheries scientists and informed observers in the region have reliably observed that the Taku would be the most qualified of these watersheds for a Salmon Stronghold designation, but the scientific assessment is needed to confirm this generally-held view.

One approach to make an appropriate regional comparisons that is proving to be a valuable addition to the science assessment process is the use of Marxan analysis and conservation planning tools to refine the information used to determine Salmon Strongholds. Marxan has become a widely-used computer-aided technique to organize and portray key environmental data. It is particularly relevant for its capacity to deal with spatial distribution. The development of capacity to use Marxan for Salmon Strongholds has been supported by the Wild Salmon Center and has been proving to be valuable for northern regions. Fisheries researchers have already employed Marxan for various studies in the Taku and other northern areas, as well as for work related to implementation of Canada's Wild Salmon Policy.

Another approach that is becoming an especially useful addition for the assessment of potential Salmon Strongholds is risk analysis. This involves comparisons of the vulnerability of the most productive and diverse areas in the event of emerging problems and activities that might be particularly detrimental to salmon populations. Risk analysis techniques dealing with both qualitative and quantitative factors have become widely applied with considerable success, although their application to fisheries is still at a relatively early stage.

Risk analysis related to the Taku would be particularly helpful if applied to potential wild salmon impacts from any contemplated resource development. Employing the risk management approach would have considerable value in comparisons across Alaska's high-productivity watersheds to differentiate their salmon status.

5. Findings and Next Steps

The Taku is not just another salmon-bearing northern watershed. This watershed has an exceptional significance and value for Canadians and Americans, and it demonstrates all of the attributes of the "best of the best" in wild Pacific salmon habitat. The remarkable standing of the Taku, as the Salmon Stronghold science assessment will confirm, justifies the priority that should be assigned to protect this watershed and its wild salmon.

The review of the genetic and life history diversity of Taku salmon, indicates an exceptionally high Salmon Stronghold score.

An effort by the Province of British Columbia and Taku River Tlingit First Nation to establish an overall land use plan for the Taku is nearing completion. In their 2010 BC Endangered Rivers List report, the Outdoor Recreation Council pointed out the urgency of attention to salmon in the Taku:

The land use planning process underway between the BC government and the Taku River Tlingit First Nation has the potential to make, or break, the Taku's future... As the land use planning process has the power to devastate the river's sensitive ecology, it also presents the opportunity to safeguard it. However, the protection of salmon and their habitat must be given the attention and priority it deserves...

That impending land use agreement will be an important step that could be bolstered by the establishment of the Taku Salmon Stronghold. It is expected to call for salmon conservation to maintain the integrity of the Taku's salmon habitat, but it would also open the Tulsequah Valley on the lower Taku, with its history of historic mining pollution problems, to potential mining in close proximity to some of the best salmon habitat in the Taku watershed. The special significance for salmon was recently described by Rivers Without Borders:

Whether rearing in the Taku, leaving the watershed for their time in the ocean, or returning to spawn, virtually all Taku salmon must pass through Flannigan Slough and the Tulsequah waters immediately upstream. Safeguarding this habitat is key to maintaining the Taku's productivity.

The establishment of the Taku Salmon Stronghold, with technical and volunteer resources to implement conservation measures on a priority basis, is urgently needed and timely. It would serve as a practical precautionary contribution to wild salmon conservation and demonstrate the resolve of the supporters of the Taku land use plan to act swiftly to implement meaningful measures for wild salmon protection. The Taku Salmon Stronghold could be instrumental in helping to advance the land use plan's conservation objectives and serve as the means to begin immediately to marshal local involvement and resources for new salmon habitat conservation initiatives.

The Taku Salmon Stronghold would be groundbreaking in many respects.

- It would be unique in serving as the first transborder, international Salmon Stronghold.
- It would also be the first in the North American Salmon Stronghold Partnership to test the applicability of the additional qualifications, such as regional and high productivity comparisons of potential stronghold habitat, in addition to applying the science assessment criteria.
- And, it would be the first Salmon Stronghold in the high-productivity northern Pacific region, providing a model for the possible introduction of Salmon Strongholds in other Alaskan watersheds.

The Taku Salmon Stronghold could serve as a vital and innovative component of the Taku Land Use Plan. The framers of the plan are promising that it will provide for "world class" salmon management and protection of salmon resources in the Taku watershed. A Salmon Stronghold designation could help to make that promise a reality.

Commitments, such as the one made earlier this year by the Pacific Fisheries Resource Conservation Council to provide funding for a Taku Salmon Stronghold assessment, should be specifically related to innovation in evaluating high-productivity northern salmon stocks. With the leadership of organizations such as the Rivers Institute at the British Columbia Institute of Technology and Rivers Without Borders, the next step should be to proceed quickly to carry out the full science assessment of the Taku and make the detailed findings widely known.

6. Appendices

Principles of the North American Salmon Stronghold Partnership

THE SALMON STRONGHOLD PARTNERSHIP CHARTER SETS OUT NINE GUIDING PRINCIPLES FOR ITS WORK:

- 1. Voluntary Cooperative Approach.** The Stronghold Partnership is a voluntary public-private partnership entity promoting cooperative conservation.
- 2. Ecosystem Functioning.** During periods of rapid environmental change like that anticipated over the next 50 years, maintaining key ecosystem processes and functions is vital to ensuring healthy wild salmon populations and the ecological and economic benefits they provide.
- 3. Best Available Science.** The Stronghold Partnership will employ a science-based approach to salmon ecosystems, informed by and using the best available science.
- 4. Long Term Reliance on Natural Processes.** Management within Strongholds will be encouraged to rely on natural processes rather than engineered approaches to increase biological diversity (e.g. hatcheries, fish farms).
- 5. Building Local Efforts.** Extensive efforts are underway to identify causes for decline and promote recovery of listed salmon and steelhead throughout much of North America; the Stronghold Partnership will support and build on these efforts.
- 6. Improving Delivery Mechanisms.** Where possible, the Stronghold Partnership will seek to streamline and improve existing conservation delivery mechanisms in Salmon Strongholds.
- 7. Ecosystem Monitoring.** Long-term monitoring and assessment is essential to understanding ecosystem trends and identifying limiting factors and threats. Stronghold Partners will work together to support monitoring and assessment through enhanced coordination, information sharing and funding, as appropriate.
- 8. Policy Towards Local Communities.** Stronghold Partners will work closely with local communities and their elected representatives to ensure that actions taken under this initiative are locally supported and, where appropriate, are led by local groups or individuals. The Partnership recognizes and supports the role of working lands in the culture and economy of rural areas, and is counting on the participation of landowners and managers in this effort.
- 9. Governance.** Participation in the Stronghold Partnership is voluntary. Membership is established by concurrence of existing members. A Stronghold Partner may cease participation at any time. The members will adopt guidelines for decision-making, in-kind and financial contributions, staffing and related matters. Nothing in this Charter diminishes or limits the authority of any Stronghold member.

References

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