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Winnemem Wintu
Salmon Restoration Plan
McCloud River

"When we first bubbled out of our sacred spring on Mt. Shasta at the time of creation, we were helpless and unable to speak. It was salmon, the Nur, who took pity on us humans and gave us their voice. In return, we promised to always speak for them."

Winnemem Wintu Spiritual and Cultural Belief.

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Short Legal Background

Historically, winter-run Chinook spawned in the upper reaches of Sacramento River watershed, including the McCloud, Pit, and Little Sacramento Rivers. The construction of Shasta and Keswick dam, however blocked access to their historic spawning areas. The population began a dramatic decline, to a low of approximately 200 spawners by the early 1990's. The run was classified as endangered under the state Endangered Species Act in 1989, and as endangered under the federal Endangered Species Act in 1994.

In June of 2004, the Bureau of Reclamation issued a new Central Valley Project – Operational Criteria and Plan (OCAP) in coordination with operations of the State Water Project (SWP), which implemented changes in the way water was to be managed throughout the CVP.

Based on that OCAP the National Marine Fisheries Service (NMFS) issued a Biological Opinion (Bi-Op) on the effects of the proposed long-term operations on Federally listed endangered Winter-run Chinook Salmon, Spring-run Chinook Salmon, Central Valley Steelhead, threatened Southern Oregon/Northern California Coast Coho Salmon, and threatened Central California Coast Steelhead, and their designated habitats in accordance with section 7 of the Endangered Species Act of 1973 (ESA), as amended (16 U.S.C. 1531 et seq.).

The original 'draft' of the NMFS 2004 Bi-Op determined that the new OCAP would jeopardize the likelihood of continued existence of a number of the listed species, in particular the Winter-Run Chinook. However, when the formal Bo-Op was released in October 2004, the determination had been changed from 'jeopardy' to 'no jeopardy'.[1]

Thus began a lengthy court battle with the filing of Pacific Coast Federation of Fishermen's Associations et al v. Gutierrez et al[2] which resulted in the invalidation of the NMFS Bi-Op, an issuance of a new Bi-Op in 2009 which was challenged by Water Districts, Water Agencies and Agricultural interests: e.g.:

San Luis & Delta-Mendota Water Authority et al v. Locke et al;
Stockton East Water District v. United States National Oceanic and Atmospheric Administration et al;
State Water Contractors v. Locke et al;

[1] The original draft had been leaked so the disparity was obvious. Congressman George Miller as well as numerous Environmental groups called into question the validity of the released Bi-Op.

[2] The Winnemem Wintu Tribe was one of the Plaintiffs.

Kern County Water Agency et al v. Gary Locke, Secretary of Commerce et al; and Metropolitan Water District of Southern California v. National Marine Fisheries Service et al.[3]

All cases eventually went to the Ninth Circuit Court of Appeals where the Court upheld the Bi-Op in its entirety, and remanded back to the District Court for Summary Judgment in favor of the Defendants.

The overwhelming significance of the validated NMFS 2009 Biological Opinion lies in the Reasonable and Prudent Alternatives (RPS)"

> Once a 'jeopardy opinion' issues, the Biological Opinion must outline any 'reasonable and prudent alternatives' that the agency … believes will avoid that consequence." (16 U.S.C. § 1536(b)(3)(A)). Reasonable and prudent alternatives ("RPAs") are alternative actions identified during formal consultation that can be implemented in a manner consistent with the intended purpose of the action that can be implemented consistent with the scope of the Federal agency's legal authority and jurisdiction, that is [sic] economically and technologically feasible, and that the Director believes would avoid the likelihood of jeopardizing the continued existence of listed species or resulting in the destruction or adverse modification of critical habitat. Id.

The Bi-Op made some significant findings related to the RPAs,;

- The spatial structure of winter-run resembles that of a panmictic population, where there are no subpopulations, and every mature male is equally likely to mate with every other mature female. The four historical independent populations of winter-run have been reduced to one population, resulting in a significant reduction in their spatial diversity. An ESU[4] comprised of one population is not viable because it is unlikely to be able to adapt to significant environmental changes. A single catastrophe (*e.g.*, volcanic eruption of Lassen Peak, prolonged drought which depletes the cold water pool at Lake Shasta, or some related failure to manage cold water storage, spill of toxic materials, or a disease outbreak) could extirpate the entire winter-run ESU if its effects persisted for 3 or more years. The majority of winter-run return to spawn in 3 years, so a single catastrophe with effects that persist for at least 3 years would affect all of the winter-run cohorts. Therefore, NMFS concludes that winter-run are at a high risk of extinction based on spatial structure. (Bi-Op, ps. 86-87)

- Diversity, both genetic and behavioral, is critical to success in a changing environment. Salmonids express variation in a suite of traits, such as anadromy, morphology, fecundity, run timing, spawn timing, juvenile behavior, age at smolting, age at maturity, egg size, developmental rate, ocean distribution patterns, male and female spawning behavior, and

[3] The Winnemem Wintu Tribe intervened as Defendant on each of the above cases to argue in defense of the new Biological Opinion.
[4] ESU = Evolutionary Significant Unit

- physiology and molecular genetic characteristics. The more diverse these traits (or the more these traits are not restricted), the more adaptable a population is, and the more likely that individuals, and therefore the species, would survive and reproduce in the face of environmental variation (McElhany *et al.* 2000). However, when this diversity is reduced due to loss of entire life history strategies or to loss of habitat used by fish exhibiting variation in life history traits, the species is in all probability less able to survive and reproduce given environmental variation. ***Id* at 87**

- Although LSNFH is characterized as one of the best examples of a conservation hatchery operated to maximize genetic diversity and minimize domestication of the offspring produced in the hatchery, it still faces some of the same diversity issues as other hatcheries in reducing the diversity of the naturally-spawning population. Therefore, Lindley *et al*. (2007) characterizes hatchery influence as a looming concern with regard to diversity. Even with a small contribution of hatchery fish to the natural spawning population, hatchery contributions could compromise the long term viability and extinction risk of winter-run. ***Id* at 87.**

  Finding the lack of subpopulations, loss of genetic and behavioral diversity, recognizing the adverse influence on naturally-spawning populations hatchery influence could have, and very limited spawning habitat, NMFS concludes:

"Therefore, NMFS believes it is necessary for Reclamation, in cooperation with NMFS, other fisheries agencies, and DWR, to undertake a program to provide fish passage above currently impassable artificial barriers for Sacramento River winter-run, spring-run, and CV steelhead, and to reintroduce these fish to historical habitats above Shasta and Folsom Dams. Substantial areas of high quality habitat exist above these dams: there are approximately 60 mainstem miles above Lake Shasta and 50 mainstem miles above Lake Folsom. These high-elevation areas of suitable habitat will provide a refuge for cold water fish in the face of climate change." 2009 Biological Opinion, p. 660.

Bridge

The 2009 Biological Opinion specifically calls out for volition passage alternatives to be investigated and considered. We have not seen any real evidence that the Pilot Project is even considering this option.

Fortunately, the Winnemem Wintu Tribe has a solution to the above, a full repatriation and restoration of the Salmon to the McCloud River, their Spiritual and Cultural home. It is those Spiritual and Cultural ties and beliefs that have sustained us thus far, and will continue to sustain us as we bring our NUR (Salmon) back home.

We therefore request that the following Spiritual, Cultural and Practical Fish Restoration Plan be included in the Pilot Project Plan and submitted out for public comment and consideration.

Cultural and Spiritual Aspects

DRAFT Summary of The Cultural and Historic Foundations of The Winnemem Wintu Salmon Restoration Plan

Please note this is a **preliminary and DRAFT summary document** and includes attachments and incorporates other material by reference.

This *DRAFT* is being submitted as part of the Winnemem Wintu Tribe's comments on the Bureau of Reclamation's Shasta Dam Fish Passage Evaluation and *DRAFT* Pilot Implementation Plan.

The Winnemem Wintu Tribe (WWT) was a party to the 2009 Biological Opinion. The Winnemem Wintu Salmon Restoration Plan is our proposal for returning McCloud River salmon to the McCloud River in the most culturally, scientific, and ecologically appropriate way.

A full cultural and historic foundational document will be submitted in due course. In the meantime, we submit the following summary information and list of supporting introductory documents, in particular for those who may not be familiar with our compelling story and our relationship to the McCloud River and the McCloud River salmon.

SUMMARY:

The Winnemem Wintu Tribe is a traditional, non-gaming, Native California Tribe, recognized as such by the State of California. The Winnemem lived along the McCloud River since time immemorial, as well documented in the archeological and ethnographic records as well as in the extensive oral history of the Winnemem lineage.

In addition, the historical record is replete with references to the long-standing relationship of the Winnemem to the river and its salmon as well as their well-documented attempts to hold on to their land, their homes, and their salmon. However, due to the savagery of others they suffered incomprehensible losses of life in the 19th century. They were able to survive ever under constant threat of extermination. Their survival is testament to their resilient spirit and strong

cultural ties, especially their knowledge and practices involving their life on the river and their main food source, the salmon from their river both of which they hold sacred.

After over a century of this duress, the Winnemem lost what remained of their life on the river, and their salmon, when the BOR constructed Shasta Dam. Although Congress passed a law in 1941 - a law designed to compensate the Winnemem for their losses, its provisions were not fulfilled. (55 Stat. 612) (Cited and incorporated by reference.)

http://digital.library.okstate.edu/kappler/vol6/html_files/v6p0140.html

A Wintu timeline outlining some of the significant events in the Tribe's history is attachment #1.

The following documents detail some of the enormous losses and challenges that the Winnemem have endured that are in the historical record:

The 1851 Cottonwood Treaty was negotiated and signed in good faith by the Wintu but it was never ratified by the U.S. (http://digital.library.okstate.edu/kappler/vol4/html_files/v4p1107.html) (Cited and incorporated by reference.)

The Norelputus letter is another example. In 1890, the revered Winnemem leader *Norelputus*, wrote to President Benjamin Harrison and in it he described their loss of land and life ways, and that they lived under threat of death. (Attached as Document #2.)

The Winnemem relationship with their salmon: The attached article from Fisheries provides an introduction to the relationship that the Winnemem have with their salmon. It was written by a fisheries biologist at U.C. Davis, formerly with the California Department of Fish and Game, Ronald Yoshiyama, along with Frank Fisher. (Attached as Document #3.)

A book that is devoted entirely to the relationship of the Winnemem to the salmon is also incorporated into this record by reference. Hoveman, A. Journey to Justice, The Wintu People and the Salmon Published by Turtle Bay, 2002.

The reports of the U.S. Fish Commission, written by Livingston Stone in the 1870's, amply document the integrity of the Winnemem, their way of life and the interrelationship with them, the river, and the salmon. See also the closing quote from the 1872 report. http://penbay.org/cof/uscof.html (Cited and incorporated by reference.)

The WWT provided comments to the FDA as part of the tribe's opposition to the genetic engineering of salmon. These comments include many references to the importance of salmon to the life, identity, health, and culture of the tribe. (Attached and incorporated as Document # 4.)

Cultural foundations: To the Winnemem Wintu, the McCloud River and their salmon are sacred. The concept of the sacred and sacred geography, known as sacred land and sacred places, is often misunderstood by those who have not studied traditional Native American belief systems or by those who are predisposed against native religions.

The Winnemem will endeavor to provide some guidance on this topic but only on being assured that the information will be treated with the respect that it is due.

Furthermore, significant cultural information on the Winnemem, their salmon and the river, will be provided during the NEPA and NHPA Section 106 process.

We provide one document at this time that explain some of the basic concepts and is an introduction to the idea of the sacred in nature in general and Winnemem places in particular. This document was part of the reading that accompanied a feature film on the Winnemem, recently aired on PBS nationwide. (http://www.sacredland.org/PDFs/SLReader.pdf) (Cited and incorporated by reference.)

A partial bibliography on Wintu scholarship is attached as Document #5.)

Closing comments:

The Winnemem relationship with their salmon is fundamental to their identity. Just as the salmon remember and return to their spawning grounds, the Winnemem continue to keep their ancient promise to the salmon.

The depth, complexity and intricate meanings of this relationship may be difficult to grasp for anyone educated in Western thought and religions. To say it is sacred, which it is, does not even fully capture the meaning. The stories, the dances, the songs, the practices, and the particular sacred places on the river are all part of this intricate system of the sacred. It is suggested that these beliefs be considered as a religion. And along with that, is the imperative that the U.S. government honor these beliefs as a religion, as it has a constitutional obligation to do. It is a fundamental legal principle in the United States that everyone is entitled to their chosen beliefs and practices. The United States government must not choose or favor one religion or religious belief over another. All these beliefs, as professed, are taken at face value.

While the Winnemem are willing to share some of their deeply held cultural beliefs, knowledge and stories with the public and government agencies, it should be understood that given centuries of hostility to Native religions and government policies and practices of racial and cultural eradication, and the lack of real legal protection for Native American Religious Freedom in the United States, that, even so, the Winnemem Wintu still expect that their cultural foundations and traditions be treated with the utmost respect.

Livingston Stone, who was sent to the McCloud River to establish the first U.S. fish hatchery there, sent reports back to Washington for many years beginning when he first arrived in 1872. He had great respect for the Winnemem, who he called the McCloud River Indians. He noted that they were industrious, scrupulously honest, and that they told him repeatedly they did not want him or any white man on their river. They said in various ways that “this is our land, our river, our salmon.” But Stone and the U.S. Fish Commission understood that the violence the McCloud River Indians had already experienced and the constant threats they

endured were an effective deterrent, allowing their intrusion to continue and eventually be devastating.

While still in his first year with the McCloud River Indians, Stone came to understand this one crucial point: that the Winnemem, their river, and their salmon are interwoven and inseparable. **This is a cultural and ecological principle that is at the heart of the Winnemem Salmon Restoration Plan.**

The following quote should be read not just as a matter of historical interest. It should become the foundation of all decisions the U.S. Government makes with regard to the Winnemem from now on, especially as regards their salmon.

In his first report, written in 1872, he said this about the relationship of the McCloud River Indians, and the McCloud River salmon. The italics are his.

"The supply of the (McCloud River) salmon has a singular natural protection arising from the fact that the McCloud River containing the great spawning-grounds of these fish is entirely held by Indians. As long as this state of things remains, the natural supply of the salmon stock may be considered as guaranteed. That this protection is one of no slight importance may be inferred from the fact that the appearance of the white man, on the American and feather rivers, two great forks of the Sacramento, has been followed by the *total destruction* of the spawning beds of these once prolific salmon-streams, and the spoiling of the water, so that not a single salmon ever enters these rivers now where they used to swarm by the millions in the days of the aboriginal inhabitants. I earnestly hope that the policy which has been pursued with the Modoc Indian, against whom a war of extermination is now going on, just north of the McCloud river, will never be adopted with the McCloud River tribe. It would be an inhuman outrage to drive this superior and inoffensive race from their river, and I believe that the best policy to use with them is to let them be where they are, and if necessary, *to protect them from the encroachments of the white man."*[5]

[5] 1872 Report to the Commissioner of Fish and Fisheries, pp 193-194.

Winnemem Salmon Restoration Project

Genetic Stock and Fish Passage Alternatives to Pursue During the Shasta Fish Passage Pilot Plan
26 January 2016

Best Genetic Stock − New Zealand Winter-Run Salmon

Wild, winter-run chinook salmon from New Zealand (NZ) watersheds are recommended as the best genetic source for the Shasta Fish Passage Pilot Plan (Pilot Plan) and re-introduction of chinook salmon to the McCloud River and other streams above Shasta Dam. Genetic diversity and adaptation to glacier-fed headwater streams have been preserved in NZ watersheds. This genetic diversity and necessary adaptive traits have likely been lost in the few remaining winter-run salmon forced to inhabit the Sacramento River below Shasta Dam and in the hatchery reared, captive broodstock considered for the pilot project. The NZ winter-run chinook would be best adapted to rear in the McCloud River during the pilot project and recover the McCloud River population. NZ winter-run are wild fish subject to the rigors of the natural environment, which maintains adaptive genetic diversity and selects for strongest to survive in cold headwater streams.

We know the point of origin of NZ salmon to be the Baird Hatchery on the McCloud River. We know from early written accounts that the first returning runs of NZ salmon came mainly in late fall and early winter and were identified as winter-run at the time (**Forest and Stream publication, 1910**). We know that today there are likely spring-run, fall-run and winter-run salmon stocks in NZ, based on observations by the experienced NZ Fish and Game biologist and hatchery manager, Dirk Barr (**see photo of him with a salmon captured from the Rakaia River in New Zealand**). From his observations, we know that spring-run and winter-run spawning behavior has been preserved in NZ. Although the relatively small NZ chinook hatchery program focuses on fall-run salmon, Mr. Barr has observed salmon running in spring, holding over the summer and spawning in the fall. This is spring-run salmon behavior in California. He has observed NZ winter-run salmon migrating furthest upstream to the glacier-fed headwater streams, as they historically behaved in the Sacramento drainage and the McCloud River. He has observed adult salmon in NZ catchments in all months of the year. We strongly believe that if genetic analyses of NZ salmon over the full range of run times are undertaken, the results will show that the spring-run, fall-run and winter-run genetic signatures present in Sacramento River populations will be found in NZ salmon populations. We are confident that wild offspring of winter-run salmon from the McCloud River still exist in NZ as healthy populations. These NZ fish will serve as the most fit genetic stock to be used in the Pilot Plan and for recovery of winter-run salmon to the Sacramento River drainage. Mr. Barr has noted no diseases in Chinook salmon in NZ hatcheries. NZ hatchery operations do not include winter-run fish, leaving them genetically unaffected by hatchery operations.

Previous genetic work performed on NZ salmon was inadequate to determine the full range of genetic diversity, with insufficient numbers of samples taken, with no data available on the timing or location of tissue sampling for genetic analysis. We suspect that samples were taken only from fall-run hatchery fish. Dirk Barr recalled that tissue samples were taken from hatchery fish a number of years ago. We recommend that genetic analyses be undertaken immediately on winter-run NZ salmon, at a minimum to confirm their genetic signature. A robust genetic study of all NZ runs should be completed during the pilot project. If genetic analysis cannot be done in a timely manner, we recommend that eggs from NZ winter-run salmon be used as the source of juvenile salmon to be used in the McCloud River during the pilot project. We suspect that NZ salmon have retained the full range of life history patterns present in their wild McCloud River ancestors. They will have the best chance of survival during the pilot project.

Chinook salmon are broadly categorized into two major life history patterns, stream-type life history and ocean/estuary-type life history. Both behavioral strategies are present in most populations. The former group resides for many months, perhaps more than a year in their natal streams before migrating to the estuary as large smolts. The latter group down-migrates early on as "small fry" and rear in the mainstem river and estuary for an extended period before smolting to the ocean. According to Moyle (2002), winter-run salmon juveniles spend 5−10 months of residence time in streams, followed by an indeterminate time in the estuary before smolting. Thus, the winter-run life history is uniquely intermediate between the stream-type and ocean/ estuary-type. Winnemem oral history confirms that juvenile salmon remained in the McCloud River for considerable time before down-migrating. Because large estuarine nursery grounds are limited in smaller NZ catchments, NZ salmon have likely retained the stream-focused life history. On the other hand, present day winter-run salmon in the Sacramento River have been forced to adapt to the large mainstem environment below Shasta Dam, which is very different from the McCloud River. Data on juvenile chinook movements of winter-run available from the Red Bluff diversion dam indicate that Sacramento winter-run salmon move downstream to the estuary at very small size while spending little time in the river reaches where they hatched. They have assumed the estuary-focused life history pattern and may have lost the stream-focused life history pattern that was likely common to historical residents in McCloud River prior to Shasta Dam. The stream-focused life history is likely most adaptive for successful salmon re-introduction, and salmon retaining this pattern are most likely to successfully survive in the McCloud River during the pilot project. This life history pattern is likely the most adaptive for surviving the rigors of down-migrating through the Sacramento River to the ocean because the juveniles will be larger during the journey and better able to avoid predation. The NZ genetic stock is most likely to have this adaptive life history pattern. On the other hand, the currently considered source of juvenile salmon to be planted in the McCloud River will be offspring of broodstock raised entirely in protected, unchallenging hatchery conditions from birth until breeding. Without the natural environment selecting for the strongest individuals, as presently occurs in NZ catchments, captive hatchery broodstock will be inappropriately weak genetic

sources of fit offspring. Captive broodstock are notoriously subject to inbreeding and infertility. Wild NZ winter-run would be the strongest genetic source for testing the viability of winter-run Chinooks in the McCloud River and completing a successful pilot program.

Besides the biological reasons for returning NZ salmon stocks in the McCloud River, there are the cultural and spiritual beliefs of the Winnemem people, which are perhaps most important. The Winnemem chief and other tribal members, young and old, have journeyed to NZ to visit Chinook salmon there. A strong cultural and spiritual bond has developed between the Winnemem and these salmon offspring from McCloud River ancestry. No such bond exists between the Winnemem and the few winter-run Chinook salmon still struggling in the Sacramento River today, after decades of massive hatchery intervention. Hatcheries produced millions of fry each year, that artificially selected traits found in salmon runs still remaining in degraded habitat below Shasta Dam and other rim dams in California. The Winnemem are spiritually connected to NZ salmon and hope that these fish will be returned to their ancestral home. They hope that the wildness and sustainability of salmon in the McCloud River will be protected with passage solutions that will require minimal human intervention. The "trap and truck" solution is unacceptable to them. It is their hope that volitional alternatives will be seriously examined and tested during the pilot project, with the best one being chosen for successful salmon re-introduction. Although volitional methods may require higher initial financial cost than the trap and truck alternative, they will likely be cost effective in the long run and require less human intervention.

Volitional Passage Alternatives to be Considered for the Shasta Fish Passage Pilot Plan

Adult Chinook Passage- Stillwater Creek Drainage

A volitional, adult Chinook salmon passage way between the West Branch Stillwater Creek and the McCloud River, via Shasta Reservoir, is a recommended alternative to be evaluated by the fish passage steering committee. This is an alternative approach to the trap and truck method for re-introducing winter-run Chinook salmon to the McCloud River, initially, and to the upper Sacramento River later on. The feasibility of a salmon passage facility provided herein (**see drawings**) may be examined by the steering committee. Fish-carrying pipes leading from the McCloud River to the facility on the reservoir periphery would be only partially filled, and the exit pipes would introduce fish into the atmosphere to avoid potentially lethal pressure changes that may result from nitrogen loading of the blood. The adult exit pipe into Shasta Reservoir could be attached to a floating structure and made flexible and/or telescoping. The holding pool in the passage facility could be designed into a sorting chamber to count winter-run adult Chinook salmon about to enter Shasta Lake.

The source for water through the fish-carrying pipes into the salmon passage facility should advisedly be the McCloud River, requiring a pipeline from the McCloud River to the facility. In

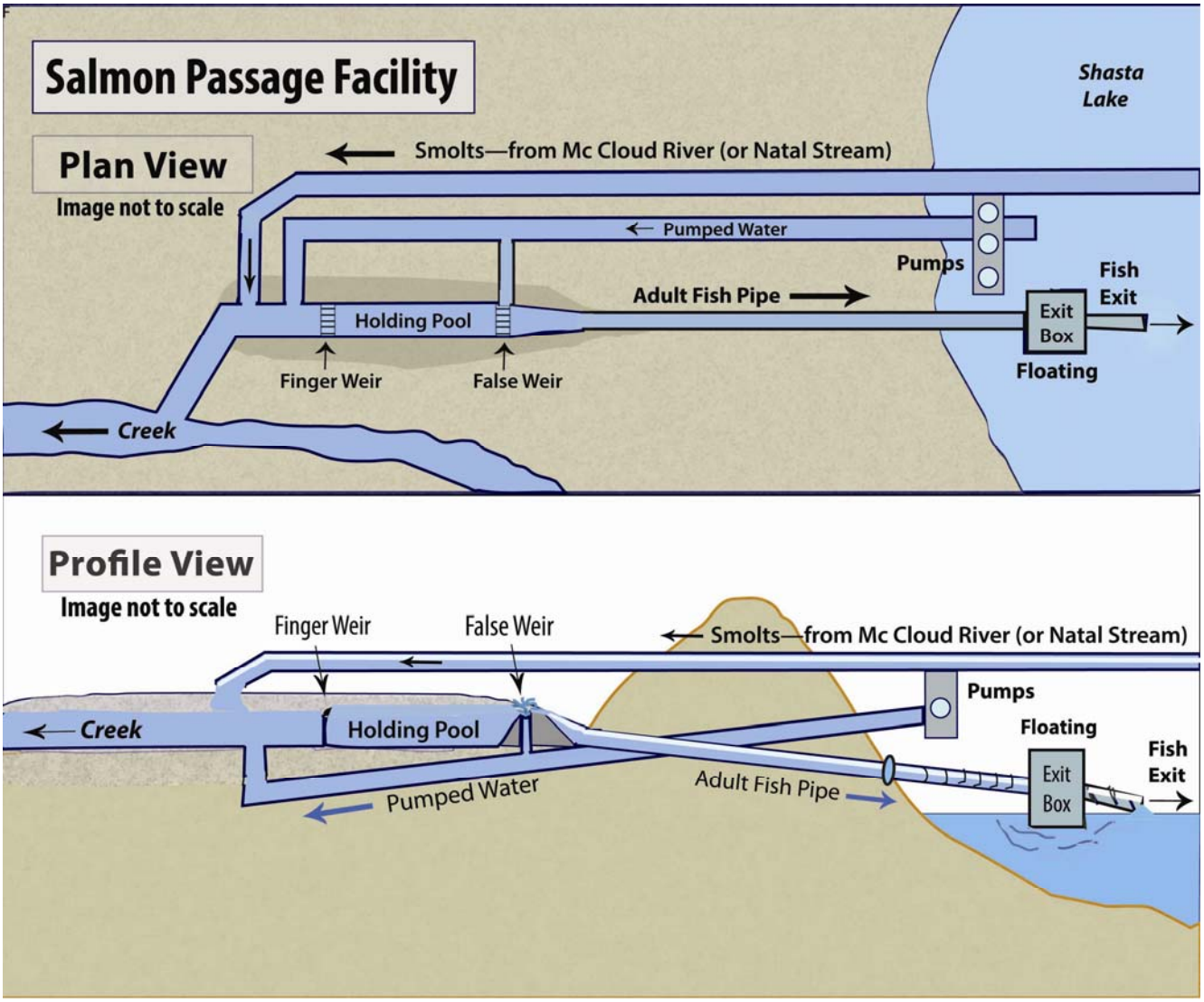
this way, undiluted McCloud River water would be run down Stillwater Creek to attract McCloud River adult salmon previously reared in the McCloud River as juveniles. This pipe will be required anyway to transport juvenile Chinook salmon pre-smolts and smolts from the McCloud River to the Sacramento River, via the Stillwater drainage at the appropriate pre-smolt/ smolt migration time.

The greatest advantage for using the Stillwater drainage for adult passage to the McCloud River is that the exit location from the passage facility would be just downstream of the McCloud Arm of Shasta reservoir. Adult salmon exiting this facility would have the least difficulty of finding the McCloud River after entering Shasta Reservoir (**see maps)**. However, information indicates that the Stillwater drainage is rainfall driven and can have variable streamflows during the wet season. It typically will not be flowing in its headwaters during the dry season. Streamflow in winter and spring may be significantly reduced by water storage reservoirs on tributary streams, thus increasing the potential need for flow augmentation from the McCloud River. The Stillwater drainage also passes through areas of human development associated with an expanding Redding, thus increasing the potential for water pollution, salmon poaching and habitat degradation associated with flood control.

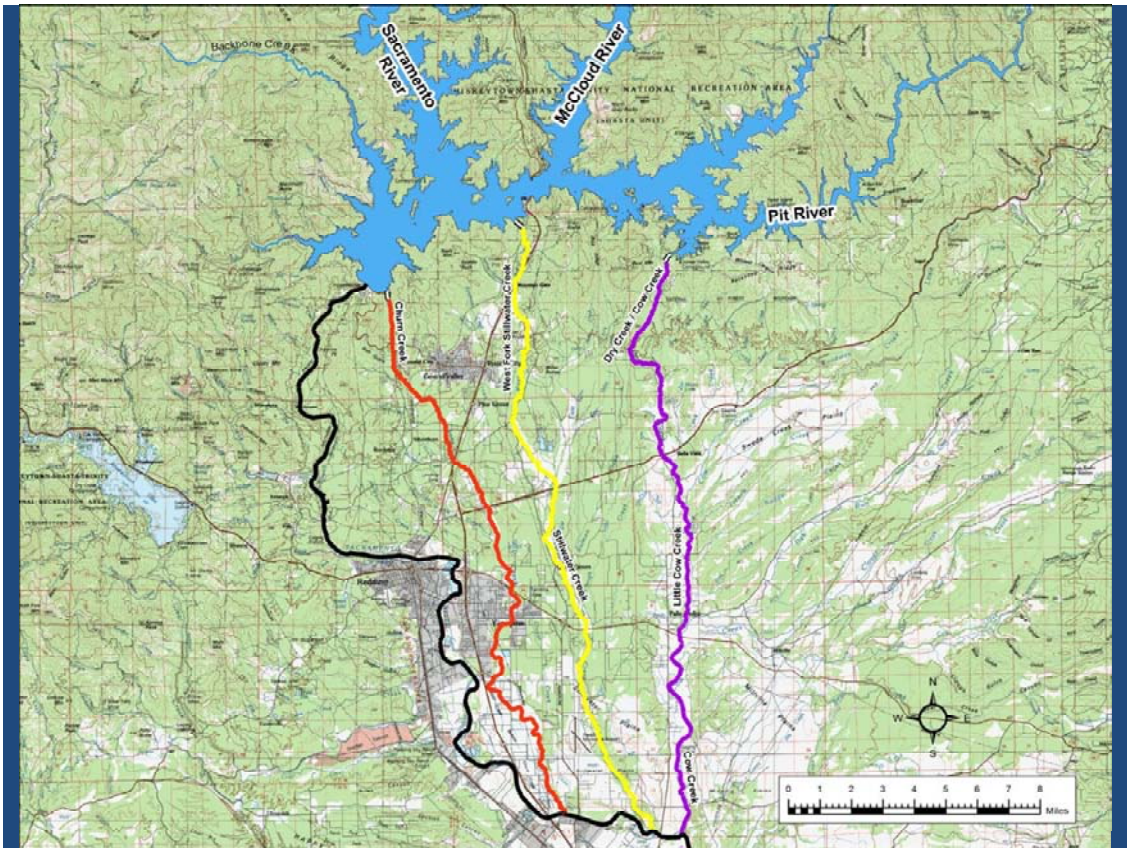
An adult, upstream Chinook salmon passage study will be necessary to determine the rate of water pumpage, if any, required from the McCloud River to provide adequate passage conditions at critical riffles or over man-made impediments for adult salmon to reach the salmon passage facility in the headwaters of West Branch Stillwater Creek. The water intake on the McCloud River will need to accommodate potentially higher winter flow augmentation required for adult Chinook salmon passage up the Stillwater drainage compared to water releases for pre-smolt and smolt down-migrants. The water transport pipe from the McCloud River must be of sufficient diameter to adequately augment upstream passage flows in the Stillwater drainage for migrating adult Chinook salmon. A staircase-type fish ladder, similar to the one used on the Clackamas River, may be required for adult salmon to reach the salmon passage facility (**see photos**). The Stillwater drainage may require real-time hydrologic gaging during the adult, winter-run Chinook salmon migration window (December – July, according to Moyle (**2002**)) to know existing streamflows and assess the need for flow augmentation from the McCloud River.

Since McCloud River water will be exiting Shasta Dam, as well as down Stillwater Creek with this alternative, adult salmon may mistakenly pass by the Stillwater/ Sacramento River confluence and continue migrating up the mainstem Sacramento River. However, adult salmon imprinted as pre-smolts and smolts on water from the Stillwater drainage mixed with McCloud River water are less likely to stray. If this passage alternative is chosen, migrating adult salmon will meet the confluence of East and West forks of Stillwater Creek, offering an opportunity for straying.

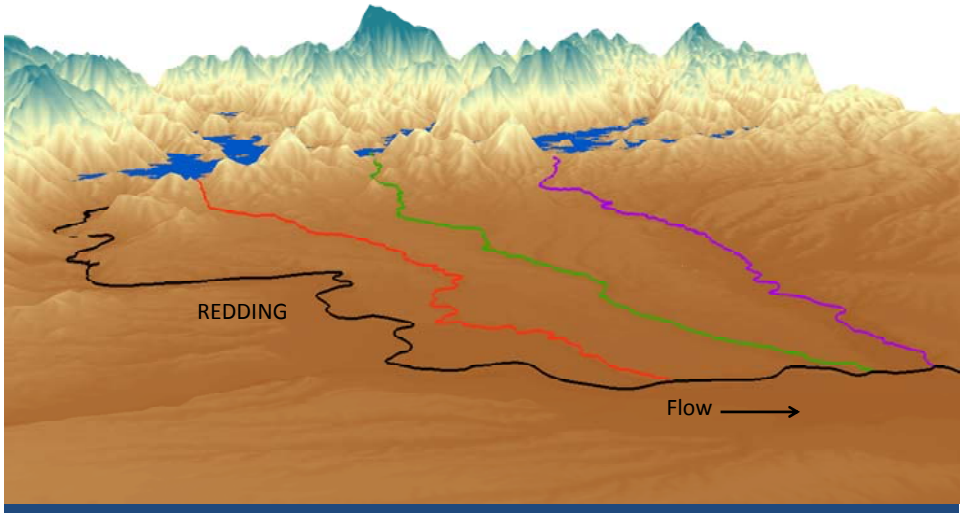
Dirk Barr, New Zealand Fish and Game Biologist
with Captured Chinook salmon from the Rakaia River.



Volitional salmon passage facility for winter-run Chinook salmon, to and from the McCloud River (bypassing Shasta Dam). (Modification of the Meral et al. design provided in the Fish Passage Feasibility Evaluation at Shasta Dam).



Sacramento River
Churn Creek
West Fork Stillwater Creek
Cow/Little Cow/Dry Creeks



Three passage options for adult Chinook salmon passage to Shasta Lake– Churn, Stillwater and Cow Creek drainages. (From Meral et al. Power Point presentation, entitled "Fish Passage Feasibility Evaluation at Shasta Dam.")

Staircase fish ladder on the Clackamas River, Oregon

Staircase fish ladder in the Columbia River Gorge

Adult Chinook Passage- Cow Creek Drainage

A volitional adult salmon passage alternative between the McCloud River and the Cow/Little Cow/Dry Creek drainage is a recommended alternative to be examined by the fish passage steering committee. This is a preferred alternative approach to re-introducing winter-run Chinook salmon to the McCloud River compared to the trap and truck method. However, with this alternative, if McCloud River water is being diverted by PG&E to the Pit River for electrical power generation during the winter-run Chinook salmon migration period, then adult salmon intended for the McCloud River may mistakenly migrate up the Pit Arm of Shasta reservoir upon release from the salmon passage facility on Dry Creek. The PG&E water diversion schedule from the McCloud to the Pit should be investigated. If PG&E water diversion from the McCloud River to the Pit River occurs during the adult Chinook salmon migration period, then adult fish may require ferrying from the salmon passage facility to the McCloud Arm or construction of a suspended or floating, open-air, screened flume (or partially filled pipe with portals) to the McCloud Arm may be required to prevent winter-run salmon from migrating up the Pit River. The suspended flume or pipe would transport water by gravity with an atmospheric freeboard. The water velocity in the suspended flume or pipe should be somewhat less than the adult salmons' sustain swimming speed, which has been estimated to be 3.4 feet/sec for Chinook salmon (Osborn and Powers 1985). A pipe floating on the reservoir could be made of flexible material, but it would require a flotation system and a pump system to send water through it, with atmospheric freeboard, to the vicinity of the McCloud Arm from the fish passage facility on Dry Creek. Even if McCloud River water is not entering the Pit River from power generation during the adult salmon migration period, adult salmon may have difficulty in finding the McCloud River Arm. As with the Stillwater drainage alternative, feasibility of a salmon passage facility like the one drawn above may be evaluated to collect the winter-run Chinook salmon spawners.

As with the West Stillwater alternative, the water source for water pumped into the salmon passage facility for adult salmon passage should advisably be the McCloud River, requiring a pipeline from the McCloud River to the facility. This pipe may also be used to pass juvenile pre-smolts and smolts at the appropriate time. An adult Chinook salmon passage study will be necessary to determine pumpage rates from the McCloud River, if any, to provide adequate passage conditions over critical riffles or man-made impediments for migrating adult Chinook salmon to reach the salmon passage facility. A staircase-type fish ladder may be required for the fish to reach the salmon passage facility. The drainage may require real-time hydrologic gaging to know existing streamflows and assess the need for flow augmentation from the McCloud River. The water intake on the McCloud River will need to accommodate potentially higher winter flow augmentation for adult Chinook salmon passage up the Cow Creek drainage compared to water releases for pre-smolt and smolt down-migrants. The water transport pipe from the McCloud River must be of sufficient diameter to adequately augment adult passage flows up the Cow/Dry Creek drainage. Since McCloud River water will be exiting Shasta Dam,

as well as down Cow Creek with this alternative, adult salmon may mistakenly pass by the Cow Creek/ Sacramento River confluence and continue migrating up the mainstem Sacramento. However, adult salmon imprinted as pre-smolts and smolts on Cow Creek water, mixed with McCloud River water, are less likely to stray. With this alternative, migrating adult Chinook salmon will meet 2 stream confluences after entering the Cow Creek sub-watershed (at Little Cow and at Dry Creek), providing opportunities for straying.

Advantages to using the Cow Creek drainage for adult salmon passage are the following;

1) Least disturbed sub-watershed of the three options provided, with salmon already present and the absence of urban/suburban development,

2) Greater watershed area with potentially higher streamflows in Cow, Little Cow and Dry creeks during migration times, requiring potentially less flow augmentation from the McCloud River,

3) Less water storage reservoirs within the sub-watershed, with potentially better adult fish passage conditions during rainfall events compared to other options,

4) Potentially shorter transfer pipe from the McCloud River to the salmon passage facility compared to other alternatives, and

5) Least disturbed adult salmon exit location with the lowest potential for pollution of the options presented.

Adult Chinook Passage- Churn Creek Drainage

A volitional fish passage alternative between the upper Sacramento River (above Shasta Dam) and the Churn Creek drainage is recommended for evaluation by the fish passage steering committee. This alternative would be most appropriate for achieving volitional passage to the upper Sacramento River rather than the McCloud River because the exit location from Churn Creek is closest to the Sacramento River Arm of Shasta Reservoir. A Churn Creek salmon passage facility should be examined because it would be closest to the Sacramento River Arm of Shasta Reservoir and would introduce adult fish to the reservoir just downstream of it. Feasibility of the same basic design of the fish passage facility depicted in the drawing above for West Branch Stillwater or Cow/Dry creeks may be evaluated for the Churn Creek alternative. The source of water entering the facility from above Shasta Dam should advisedly be the upper Sacramento River. If this alternative were to be used to provide adult passage to the McCloud River, then McCloud River water would need to be run through the facility. The water transfer pipe may also be used to pass juvenile pre-smolts and smolts at the appropriate time. An adult fish passage study will be needed to determine pumpage rates from the upper Sacramento River,

if any, to provide adequate passage conditions over critical riffles or man-made impediments for migrating adult Chinook salmon to reach the salmon passage facility. A staircase-type fish ladder may be required for the fish to reach the facility. The drainage may require real-time hydrologic gaging to know existing streamflows and levels of flow augmentation required to Churn Creek from the upper Sacramento River. The water intake on the upper Sacramento will need to accommodate potentially higher winter flow augmentation for adult Chinook salmon passage up the Churn Creek drainage compared to water releases for pre-smolt and smolt down-migrants. The water transport pipe from the upper Sacramento River must be of sufficient diameter to adequately augment adult passage flows up Churn Creek drainage. Since upper Sacramento River water will be exiting Shasta Dam, as well as down Churn Creek with this alternative, adult salmon may mistakenly pass by the Churn Creek/ Sacramento River confluence and continue migrating up the mainstem Sacramento. However, adults imprinted as pre-smolts and smolts on the Churn Creek drainage, mixed with upper Sacramento River water are less likely to stray.

Volitional Juvenile Chinook Pre-smolt and Smolt Passage from the McCloud River or another Natal Stream

We recommend a volitional, downstream fishway be examined for winter-run Chinook salmon smolts between the McCloud River and a nearby tributary watershed to the Sacramento River (West Stillwater or Cow) that empties into the Sacramento River, downstream of Shasta Dam. The feasibility of constructing a low-lying, seasonal dam, smolt collection facility in the river-run McCloud River (above the reservoir) or into an off-channel permanent facility for collecting fish, with a downstream transference pipe is recommended. The off-channel facility could be located at an outside of a bend to facilitate entrainment. When re-introduction of Chinook salmon to the upper Sacramento River is attempted, then a seasonal dam and fish collection facility is recommended in the river-run upper Sacramento River for collection of smolts and volitional transport via pipe to a Churn Creek salmon passage facility.

The seasonal dam would be designed to provide mechanical height adjustment, thus providing a sufficiently high wall to focus the streamflow into a narrower exit channel to create a fish holding pool in the McCloud River. If a seasonal dam cannot be designed with movable panels that allow height adjustment, then feasibility of designing an inflatable dam or flashboard dam should be explored. This fish holding pool would have a diagonal, self-cleaning rotary drum fish screen on one side, sufficiently large to bypass all streamflow of the McCloud River during the pre-smolt and smolt migration period, except for streamflow needed for the off-channel fish processing facility and volitional conveyance of juvenile salmon through a pipe to a downstream tributary to the Sacramento River. Water would be diverted through a bypass pipe outlet on the opposite side of the rotary drum fish screen (**see photos**) in the fish holding pool to pass Chinook pre-smolts and smolts, as well as other fish species into the off-channel fish processing facility. A similar design was used on Avintaquin Creek in Utah by Trout Unlimited for another application. A visual description of this rotary fish screen application in Utah is available on

YouTube. The rotary fish screen has the advantage of being self-cleaning (**see photos**). However, placement of a debris boom upstream of the fish holding pool to collect larger debris will be required.

The pipe leading from the holding pool containing the rotary drum fish screen may then empty into an off-channel fish sorting chamber in the fish processing facility to retrieve native, non-Chinook salmon fishes for re-introduction to the McCloud River (or upper Sacramento River with that alternative) leading into Shasta Lake. Then the remaining Chinook salmon pre-smolts and smolts will enter a gravity-fed transport pipe with atmospheric freeboard. Flow volumes in the outlet from the holding pool and in the smolt transport pipe leading away from the sorting chamber may be controlled by floating or adjustable weirs. Water temperature within the transport pipe to downstream tributaries should be considered, possibly requiring pipe burial, shading and/or reflective surfacing. The residence time for water transported at 6.5 ft/sec may be 4−5 hours from the smolt collection facility to the West Stillwater Creek salmon passage facility. Juvenile fish would be entering the pipe primarily during the night. According to Moyle (2002), winter-run juveniles move mainly in September−January. However, graphs of cumulative catch indicate that winter-run Chinook fry begin migrating down past the Red Bluff Diversion Dam on the Sacramento River from mainstem spawning grounds in high numbers in August (Poytress et al., 2014). The transport pipe will head to the West Branch Stillwater or Cow drainages from the McCloud River or to Churn Creek from the upper Sacramento River. Such sorting would also be required with the trap and truck method of Chinook salmon smolt collection. In order to protect the fish screen during high stormflows in the Mc Cloud or the upper Sacramento River, it must be removable or contained within a fish holding pool that will be adequately protected during the rainy season. If a permanent off-channel facility is constructed, the rotary fish screen would be better protected and seasonal removal may be avoidable. The seasonal dam must have retractable walls that make the dam a minimal bump in the streambed during the rainy season. If a seasonal dam with retractable panels is beyond design capabilities, then either a flashboard dam or inflatable dam may be appropriate. The seasonal dam may require a fish ladder associated with it to insure upstream passage of adult salmon and other native stream fishes during their migration season.

Fish-carrying pipes are nothing new. On the Clackamas River, Oregon, a long pipe is used to pass Chinook salmon smolts from above one dam downstream to below another. Smolts migrating downstream from the upper Clackamas encounter North Fork Dam, where a unique collection system passes fish into the North Fork fish ladder. The juvenile fish travel about 1-1/2 miles down the ladder to a separator, where they are diverted into a holding tank, identified and counted. Fish are then released into a 20-inch pipe that carries them approximately 5.3 miles to where they are released into the Clackamas River below River Mill Dam. The biologists there have learned that the transfer pipe must be partially filled with water, having freeboard atmosphere within. The fish exit must also be into the atmosphere to avoid excess pressure

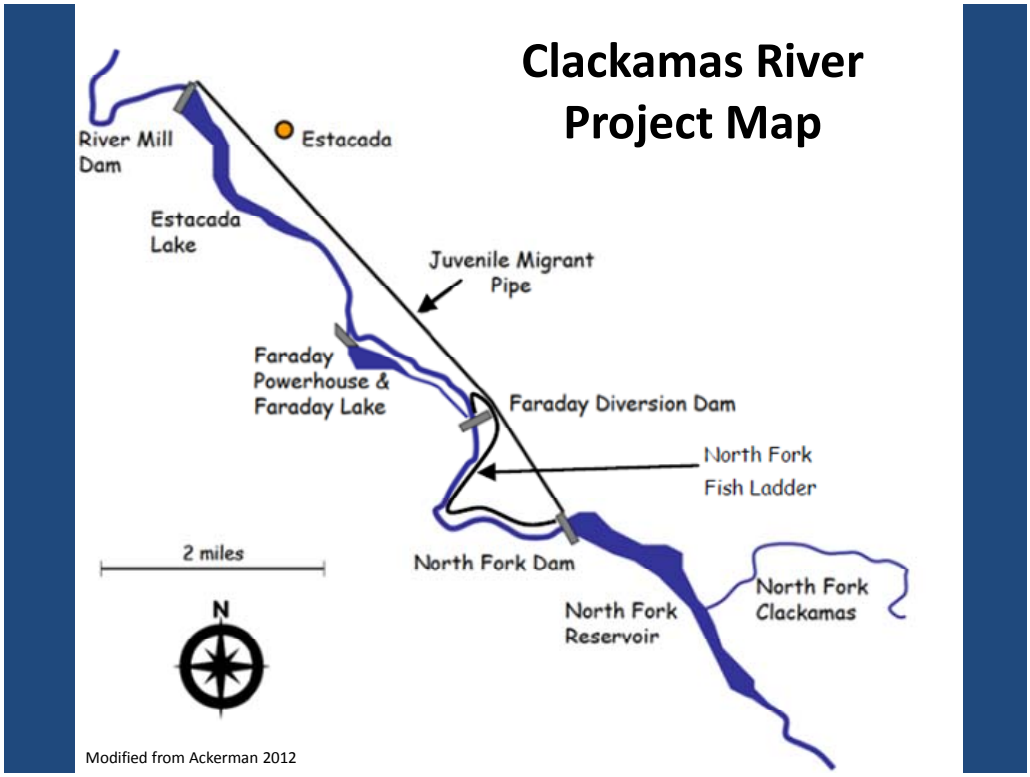
changes that may lead to nitrogen loading of the fishes' circulatory systems. The water velocity in the Clackamas River pipe is a maximum of 6.5 f/p/s (4.4 mph). The fish transport pipe from the McCloud River (or upper Sacramento River) should exit to the atmosphere (and not underwater) into the drainage chosen for adult Chinook salmon passage, to avoid potentially lethal pressure changes and excess nitrogen loading of the blood for fish.

The railroad line with its bridge (or the Highway 5 Bridge as an alternative) may be used to suspend the smolt transport pipe across Shasta Reservoir before it is directed to the West Branch Stillwater drainage and the adult/smolt salmon passage facility. Use of existing bridges for pipeline suspension over the reservoir would be a big advantage for using the West Stillwater Creek drainage for passage. If the Cow Creek drainage is used for adult and juvenile Chinook salmon passage to and from the McCloud River, then the shortest path may require a juvenile fish transport pipe suspended over the reservoir with a new bridge. Otherwise the pipe could be passed through the reservoir from the McCloud River fish collection facility to the salmon passage facility on Dry Creek. The pipeline pathway to Dry Creek need not follow the reservoir margin and may be shortened by placing it through the peninsula between the McCloud River and Squaw Creek arms. However, the pipe must be gravity fed during the juvenile Chinook salmon passage period to maintain atmospheric freeboard inside. If the transport pipe is not suspended sufficiently high above the reservoir, then an underground tunnel may be required through the reservoir periphery to the fish passage facility on Dry Creek.

If the Churn Creek drainage is used as a fishway to transport Chinook salmon smolts from the upper Sacramento River, then design of a pipeline crossing of the reservoir from the Sacramento Arm may be required. Feasibility of using existing bridges should be explored. The transport pipe diameter must be sufficiently large to release sufficient passage flow into West Branch Stillwater Creek (or Dry Creek if the Cow Creek drainage is chosen or Churn Creek if it is chosen for adult and juvenile passage) to maintain up-migrant passage conditions for adults and down-migrant passage conditions for pre-smolts and smolts during migration periods. The fish passage study required for adult passage may also be used to determine minimum flows for smolt passage. As stated previously, the drainage chosen for smolt passage may need real-time hydrologic gaging to know existing flows through the drainage during smolt migration and the flow required for augmentation to insure smolt passage.

Diagonal, rotary drum fish screen

Rotary drum fish screen



Juvenile migrant pipe on the Clackamas River (from Berg, Hannon and Beckwith Power point, entitled "Fish Passage at Large Dams in the Pacific Northwest")

REFERENCES

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Poytress, W.R., J.J. Gruber, F.D Carrillo and S.D. Voss. 2014. Compendium report of Red Bluff Diversion Dam rotary strap juvenile anadromous fish production indices for years 2002−2012. U.S. Fish and Wildlife Service Red Bluff Fish and Wildlife Office, 10950 Tyler Road, Red Bluff, CA 96080. Prepared for: California Department of Fish and Wildlife Ecosystem Restoration Program and the U.S. Bureau of Reclamation.

Conclusions

The pilot program as described in the Draft does not test the feasibility of any volitional alternative to upstream or downstream fish passage. It is tailored for a trap and truck solution, and is, therefore, incomplete and inadequate. (Don Alley, comments on Draft Pilot Project Plan, Nov. 6 2015)

We concur with Don and oppose any 'trap and truck' only project plan. The 2009 Bi-Op specifically calls out for volition passage alternatives to be investigated and considered. We also believe that a 'trap and truck' only scenario is actually setting the project up for failure. Though, there has been some success with 'trap and truck' systems, the overall scorecard shows large inefficiencies and unsustainability; whereas, removing migration impediments (such as providing and actual swim-way to and from spawning grounds) has the highest probability for success and is naturally sustainable. [Note: a good example is the removal of the barriers on the Elwa River in Washington, and the subsequent return of migrating salmon in the thousands]

We are also greatly concerned about the lack of genetic diversity in the current Salmonid populations residing in the Sacramento River for a number of reasons:

1. There is only one (1) existing ESU of the Winter-run Chinook left in the Sacramento River due to the barriers of Keswick and Shasta dam blocking migration to historical spawning grounds for the last 70 years. In that time, the genetic pool has degenerated from lack of species diversity, and impacts from hatchery manipulation.

2. We have continually requested that the Winter-run Salmon in the Rivers of New Zealand, (seeded from the McCloud River, Baird Fish Hatchery winter-run salmon in the late 1890s and early 1900s.) be utilized as the Salmon stock for reintroduction to the McCloud. This would not only restore Salmon to the McCloud with a genetically superior diversity, but add a second ESU to help ensure the winter-runs continued survival. When presented, we are told that the Salmon in NZ are not winter-run, and did not come from the Baird Fish Hatchery, but from the Battle Creek Hatchery. We know this assertion to be inaccurate based on Cultural and Spiritual Knowledge, but also based on historical documentation. (See Forest and Stream article dated August 6, 1910, attached document #6).

There are a myriad of other concerns and conclusions we can draw from the proposed Pilot Project as it stands in its current state, but the main conclusion we can draw is that we reject the Draft Pilot Project as it now currently stands, and request that the Winnemem Wintu Tribe's Salmon Restoration Plan be included into the Draft Pilot Project Plan, and that the comment period Draft Pilot Project Plan be reset from the day of inclusion.

Respectfully

Winnemem Wintu Tribe

Document 1

Winnemem Wintu Timeline

Winnemem Wintu Tribal Timeline

Pre-contact:	14,000 Wintu live along the northern rivers. Early contact with trappers brings deadly epidemics to the Wintu.
1848	Pearson Reading discovers gold in Shasta County. California Gold Rush affects Wintu population, lands, and water and food sources.
1851	**Cottonwood Treaty** calling for a 35-square-mile reservation for the Wintu, signed August 16 at Reading's ranch on Cottonwood Creek.
1852	The U.S. Senate refuses to ratify the Cottonwood Treaty, and 17 other treaties. The treaties were filed under an injunction of secrecy not lifted until 1905.[1]
1860	William Curl (future tribal leader Dolikentillema) born along McCloud River tributary.
1875	U.S. President Ulysses Grant sets aside 280 acres of Winnemem land on the McCloud River for a government fish hatchery (Baird), established for salmon breeding.
1887	**"Last Dance."** The Winnemem hold their last (public) war dance at Baird (now under the waters of Shasta Lake). After 1887, the war dance and other ceremonies went underground, to be held only in secret.
1889	**The Wintu-Yana Petition** to U.S. President Benjamin Harrison. This letter from Norel Putis was a direct plea by the Winnemem Wintu for rectification of conditions resulting from the failure to ratify the Cottonwood Treaty. It asked for better treatment of the Wintu and Yana, who suffered from the violent incursion of non-Indians.
1893	U.S. President Grover Cleveland authorizes the **issuance of land allotments** to non-reservation Indians. These allotments of up to 160 acres allow Winnemem to remain on the McCloud River.
1890s	Toxic smoke from copper mining smelters causes a massive die-off of trees around the McCloud and Sacramento Rivers.
1907	Florence Violet Curl (Puilulimet) born Nov. 28 on the McCloud River. She is recognized at birth by tribal doctors as a future leader.
1910	Decimated by disease and violence, fewer than 400 Wintu remain.
1914	Horace Wilson of the Interior Dept. submits a letter to the Commissioner of Indian Affairs stating that the Winnemem (Baird) Indians along the McCloud River should have land purchased for them.
1915	In April, Indian Agent John Terrell proposes the purchase of lands above the government fishery at Baird for the Winnemem. He describes the self-sufficiency of the tribe based on salmon and crops, and gives a census of the Indians present which includes Flora Curl, age 5. In August, Terrell reports to Washington that D.P. Doak, who owns tracts of this land on the McCloud River, refuses to sell land for the Indian allotments, waiting instead for higher prices due to speculation of the building of a new dam to provide power. The letter also states that the government will provide lands for the Indians removed due to the dam's construction.
1922	With funds from the Snyder Act, which authorized Indian assistance, Redding Rancheria is created for homeless Pit River, Yana, and Wintu from desolate bands. The Winnemem remain on the McCloud River.
1928	First trip to Washington, D.C. related to **California Claims Cases**. Joe Campbell and Alfred Gillis, Winnemem Wintu, travel by train from San Francisco to Washington, D.C. to plead for an investigation of the Winnemem case in the U.S. Court of Claims for the "lost" 1851 Treaties.
1937	U.S. government retakes allotments to begin removal of Winnemem from the river. William Curl passes away, and is buried by the river. The Indian Land Acquisition Act for the Central Valley Project is introduced.
1938-1945	Construction of Shasta Dam. At its completion, it creates the largest man-made reservoir in California[2].
1938	Florence Curl relocates from the flooding at Baird to a village site located at the base of Bear Mountain, northeast of Redding. The property is owned by Andy Jones, whom Florence Curl marries. The village is still inhabited into the 21st century by Winnemem Wintu.
1941	Winnemem Wintu delegates go to Washington to fight for the passage of a bill to allow California Indians to employ their own attorneys to press claims against the government. The Winnemem, aware of the proposed settlement of the claims case, warn other tribes that it is unacceptable. The **Central Valley Project Indian Land Acquisition Act** is signed into law. Only one provision of the law will be met: the creation of a trust land cemetery for the Winnemem in Central Valley (now Shasta Lake City). The Bureau of Indian Affairs calls on Florence to locate cemeteries along the river for removal. Bodies from 183 Winnemem graves are disinterred along the river, including those of William and Jenny Curl, the recently-deceased parents of Florence Curl Jones.
1943	Winnemem are removed from their homelands on the lower McCloud River (Baird area). Water from the filling of Shasta Lake will soon inundate these village areas and sacred sites.
1944	U.S. Court of Claims awards $17 million to all California Indians to compensate for the 18 unratified treaties. This works out to $1.25 per acre. The government deducted $12 million for the 600,000 acres made into rancherias and reservations. Winnemem did not receive their land, but continued to press their claim for lands within the homelands and for the allotment denials for children of previous allottees.

[1] Journey to Justice, Alice R. Hoveman ©2002 Turtle Bay Exploration Park p. 30

[2] U.S. Dept. of the Interior, Bureau of Reclamation website, http://www.usbr.gov/dataweb/html/shasta.html#general, 9/3/04

Winnemem Wintu Tribal Timeline cont.

1943-1963	Over a 20 year span, Winnemem actively oppose the settlement offer of $1.25 per acre.
1950s	Former U.S. President Herbert Hoover heads commission endorsing termination policies for California.
1952	Current Winnemem Wintu Tribe spiritual and tribal leader Caleen Sisk born.
1953	Termination sentiment prompts Congress to pass Resolution 108, which declares all Indians should be free of government control and eligible for services available to any citizen. Public Law 280 transfers responsibility for Indian policy from the federal government to state and local agencies.
1954	California Senate committee hearing finds most reservations are unprepared for termination. State does not want to accept responsibility for correcting the BIA's financial failures and fights federal termination legislation.
1958	Despite California's efforts, the first California Rancheria Bill is enacted, terminating 41 rancherias.
1960s	The Winnemem continue to oppose the land claims decision. The 1960s saw a rise in radicalism, and more Indians went to colleges and universities as well as vocational programs. Winnemem students began to come home with vocational training paid for by BIA funds. Toward the end of the decade, as surplus government land was being seized by Indian groups, plans began for the Wintu to occupy Toyon Center, an abandoned government housing project developed for the builders of Shasta Dam.
1970s	During this decade numerous Winnemem Wintu attend colleges on BIA higher education grants. These will later be denied to the same individuals as the Bureau tells them they are no longer recognized Indians. Winnemem challenge this action in Malone vs. Morton.
1971	Toyon Center occupied by the Winnemem, other Wintu, and other outside Indian people. This site was held until 1989 when the government forced the residents out and bulldozed all of the buildings to the ground.
1978	The **American Indian Religious Freedom Act** is passed. Florence Jones receives a use permit to practice Winnemem ceremonies on what is now considered U.S. Forest Service land. This is believed to be the first successful use of AIRFA. This current permit with the USFS expires in 2005.
1980s	Ceremonies continue openly for the Winnemem and permits and Memoranda of Understanding and of Agreement are developed for the protection of tribal gathering places, ceremonial sites and sacred places. The Winnemem Wintu work with government agencies and programs on education, health, and housing.
1985	The Indian Health Service of the Bureau of Indian Affairs terminates services to Winnemem tribal members.
1986	Caleen Sisk-Franco receives a federal Fish and Wildlife Permit allowing her to hold and carry Eagle feathers.
1989-90	The BIA completes destruction of Toyon and during cleanup burns down a building designated in a federal court stipulation agreement to serve as an administration building. This agreement also forces the Wintu-Toyon group to petition under the Federal Acknowledgment Process to hold the land. The Winnemem support the Wintu-Toyon band's efforts. The Winnemem also seek redress for the attempt to terminate the government-to-government relationship between the U.S. and the Winnemem by the BIA—despite other agreements between the Winnemem and the USFS, BLM, and USFWS. The Winnemem continue to meet with Caltrans, U.S. Forest Service, BLM and other state and local agencies to protect herbal gathering areas, sacred places and waterways.
1987-1999	The Winnemem engage in a lawsuit against the Forest Service to stop development of a ski resort on Mt Shasta. In a victory for the tribe, the Forest Service halts the development.
1990	On June 16, Caleen Sisk-Franco, her husband Mark Franco, nephew Rick Wilson and Susan Marie engage in a fast for acknowledgement of the Winnemem's tribal status, under the direction of Winnemem spiritual and tribal leader, Florence Curl Jones. The fast lasts 21 days and is brought to a close by Senator Daniel Inouye's promises to assist the Winnemem Wintu in clarifying their status.
1993	The Indian Health Service terminates service to the Winnemem Wintu. Mark Franco and Rick Wilson begin a fast to the death. A delegation including Florence Jones and Caleen Sisk-Franco goes to Washington to speak with Assistant Interior Secretary Ada Deer, who orders IHS to resume services to halt a "preventable tragedy."
1995	Florence Jones retires and begins transition to her successor Caleen Sisk-Franco, the new leader of the Winnemem Wintu. Additional permits are obtained from the federal government and easements, granted by private lumber companies and facilitated by the USFS, are obtained for sacred sites on private lands.
2001	In August, Florence Jones and the Winnemem are profiled in a nationally-broadcast PBS documentary, *In the Light of Reverence*.
2002	On June 4th, Winnemem Wintu leaders Caleen Sisk-Franco and Mark Franco testify before Congress on sacred sites protection, and the raising of Shasta Dam and the catastrophic effect it will have on remaining sacred sites and ceremonial grounds still in use after all the years of cultural genocide.
2003	Florence Jones passes away on November 22. Her obituary is printed in the *New York Times* and the *Los Angeles Times*.
2004	From Sept. 12-16, Winnemem hold Tuna Leliit Chonas – Hu'p Chona ("dance in the old way," or war dance) at Shasta Dam to oppose the proposed raising of the dam and the flooding of tribal cultural properties.

Document 2

Norel Putis Letter

DEPARTMENT OF THE INTERIOR. INDIAN DIV. | RECEIVED MAY 22 1890

May 19/90

~~The President~~

~~Herewith communication from Winter & Yama Indians~~ regarding certain relief &c

1 encl.

(0-1)

May 22/90

Referred to the Commissioner of Indian Affairs who will give in this communication his most serious consideration and report to the Secretary what he concludes as to the complaint of these Indians and whether any relief and if so what relief, can be given

J. M. Noble, Secretary.

15834 | OFFICE OF INDIAN AFFAIRS Rec'd MAY 22 | 1890

Int. Department
May 22, 1890.

Refers petition from Winter & Yama Indians requesting certain relief, and calls for report rel. to same.

1 inc

Allen

To J. Curtin Jun 21/90
OB 200/392

Lett. Sec Oct 20/90
L.B. 200/1

21/90

Sent to Secy of Interior for his consideration

(2-0)

To our Great Chief Benjamin Harrison
President of the United States.

Sir

We the undersigned representatives of the Wintu and Yana peoples have met together at Redding Shasta Co. California, on this 7 day of November 1889 and after due deliberation have resolved to send you the following statement and petition:

The Wintu people before the Whites came into the land of our fathers owned and inhabited the country extending from Mount Shasta on the north to Carquines Straits on the south. The western boundary of this country was the mountain range west of the Sacramento valley except in the region between north Yallo Balley and Edgewood where the line went west of the range and the Wintu

occupied one half of the present county of Trinity.

The Eastern boundary beginning at the south was the Sacramento River to Tehama, from that point northward the Wintu had a strip of country east of the Sacramento following the line of Little Cow Creek and including the triangle of land between Pit River, Cow Creek and the Sacramento, north of Pit River it extended to the head-waters of Squaw Creek and the McCloud River. Within the above limits no other people but the Wintu lived. For untold generations, from the time the Yapaitu left the earth, they owned all the valley on the right bank of the Sacramento with the foothills and northern uplands as well as the eastern half of Trinity county.

The Yana, known by the Whites as Nosas, though Yana is their own name for themselves, held and inhabited from the first that country lying between the Wintu land and that range running north and

south from Lassens Butte as from a center. The northern limit of this country was Round Mountain and the southern Deer Creek at or near Vina the great estate of Senator Stanford.

When white men came the Wintu and Yana owned three-fourths of the whole Sacramento valley from Mount Shasta to the waters of San Francisco Bay, the greatest extent of rich, beautiful and valuable land in the State of California. All this land has been taken from us to the last acre: we have never received any value for it, not a single dollar nor even one kind word.

How did we lose our land with its fisheries, its hunting grounds, its acorn forests, its fields of clover, the blossoms of which were pleasant food to us?

To describe this to you our Great Chief we will use the words of one of our oldest and wisest men, Norelputus, who was in years of reason and strength when the first new settlers came. He says: "We thought the white men were the Yapaitu, the ancient people, the

spirits of our religion who lived in this world before the Wintu came into it. Some of these Yapaitu were turned into the animals, birds, plants, rocks that are in the world now and the rest went far away beyond the edge of the world where they lived happily.

We thought that the white men were the Yapaitu who had come back, we called them Yapaitu and call them by that name yet from habit though we have learned to our cost that they are a different people.

Believing the new people to be Yapaitu we said to ourselves at first There will be a better life now, more justice and happiness in the world, but as soon as the new people were numerous and strong, they took our women, our children, took our land, killed our men. When our people saw they had to do not with Yapaitu but with people who had no respect for us they wished to band together and defend their wives, children and land.

White men came to me and said: "If your people raise a hand not one of them will live, we will kill

them all". I told my people Dont you fight, live in peace, there is room for all in this big country. I was mistaken - We agreed to leave the whites in peace, but the whites would not leave us in this land which we held to be ours since it belonged to our fathers and in justice it is ours yet for no man has bought it from us.

No matter where we built a house a white man came after awhile and said: "This is my land". If we answered, No this is our land. he said: "You Indians just get out of here, if you dont I will shoot you, I bought this land, I got this land from Washington" Then we had to go for if we rose up against one white man all white men would kill us. So we had to leave in silence and go to another place with tears in our eyes, and I had to think in my heart. It must be that Washington told the white people, when you go to California kick the Wintu, swear at the Wintu, drive the Wintu from their land, kill the Wintu.

When we went to a second place and put up houses

we lived there a while then another white man came and said: "Clear out of here you Diggers this is my land" and after that we were driven from place to place till now in this land of ours there is no place so barren that we can hold it.

From the time that white men began to take our country they killed a great number of us, in one place fifty, in another twenty, in another one and even two hundred.

If one of us at this time stands at a fence and looks into a field, a man cries out. What are you looking at you Indian, be off, dont hang around here. If our women go to gather acorns a white man drives them away saying: "Those are my acorns, dont you take those acorns. I want them for my hogs."

From being a people many thousand in number, strong, happy, rich we have been turned into a people a few hundred in number, a poor, weak remnant without land, without money, without education, without credit, looked down upon by men who slew our kindred and

(8-D)

possess our ancient home.

Such are the Wintu people to-day.

What is the condition of the Yana or Nosas?

The Yana were two thousand in number at the lowest calculation. This people who were perfectly innocent, who did no harm to the whites were massacred in 1864 so that of the two thousand there remain to-day but twenty-four and the majority of these would not be alive had it not been for the humane efforts of Mr. Oliver of Redding and Mr Roberts of Round Mountain who secreted some and warned others to escape.

The destruction of the Yana was wrought by two bands of men who bound themselves by oath to spare neither age nor sex, and they kept their oath. They slaughtered little children, they spared neither youth nor middle age nor the most advanced decrepitude. When they had finished their work the Yana land was clear and not one person of the race, so far as they knew was left alive.

But we will not distress you with this narrative

Mr. Jeremiah Curtin of the Smithsonian Institution who has collected the details of this sad history and who will deliver this paper to you and who has been empowered by us to act in our behalf at Washington will give further information should it be your good pleasure to receive it.

Such are we the Wintu and Yana peoples, few in number, poor and weak.

We turn to you our Great Chief and ask for some little share of justice. We know that whatever other men may do or think, you as Chief of the various races of men in this great country wish to render even justice to them all, and that before you as before the law all men are equal. We believe therefore that you will pay earnest attention to our request which is:

Obtain for us some small sufficient share of land out of that which was once our possession.

Obtain for us some means of beginning to live like white men on that land and some means of instructing

our children so they may live after us in decent fashion.

We ask this as payment for the land we lost and for the blood of our kindred which has been shed.

Should you our high chief be unable to obtain this justice which would be of small cost to the American Nation but precious to our peoples then we beg you to inform us so we may see our position and know at last that for us there is neither justice nor equality in this White man's Republic.

Norel his X mark Putus

Kolchiluli his X mark

Doki his X mark Chiriki.

Diki his X mark Yet

Norel his X mark Tewis

Lakchi his X mark Haras

Olel his X mark Yoshi

Panti his X mark Yuptci

Pathwi his X mark

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Pathwi his X mark

Yopim his X mark Waituluma

(11-D)

Topi his X mark Wita

Nomel his X mark Yuptci

Nom his X mark Yuptci

Pui his X mark Tewis

Kubim his X mark Topi

Tsarau his X mark Putus

Not his X mark Womühl

Sawal his X mark Haras

Hlok his X mark Hiwi

Katcim his X mark Topi

Wai X Poruma

Turuk his X mark Wita

Teoko his X mark Peri

Taiumus his X mark Tot

Paii his X mark Hlai

Kaia his X mark H.

Kedi his X mark Yali

Bilékut his X mark

Tei his X mark Chiltik

Pat his X mark Hololo

Nov his X mark Putus

Document 3

Baird Station and the McCloud Wintu

Long Time Past: Baird Station and the McCloud Wintu

ABSTRACT

The U.S. Fish Commission's Baird Station, established on the McCloud River at the northern end of the Sacramento Valley in California, was the first salmon hatchery on the North American Pacific Coast. During its early period of operation (1872-1883) under the supervision of fish culturist Livingston Stone, Baird Station produced a reliable and seemingly limitless supply of chinook salmon (*Oncorhynchus tshawytscha*) eggs for the stocking of eastern U.S. streams and for shipments to overseas countries. The local native people—the McCloud Wintu—played a vital role in the station's operations. Their cultural and economic entwinement with the salmon resource and contribution to the station's mission were recorded in Stone's official reports. That near-forgotten story is retold here for new generations of fisheries workers—of the fish that once were, and of a people who still are.

In August 1872, Livingston Stone, newly appointed fish culturist for the U.S. Fish Commission, was dispatched to California on a mission to procure Pacific salmon eggs for planting into eastern U.S. rivers where the native Atlantic salmon stocks had been depleted (Stone 1883a, 1897; Hedgpeth 1941). Upon his arrival in San Francisco, Stone spent a period of fruitless inquiry in learning—to his "very great astonishment"—that the spawning grounds of the Sacramento River chinook salmon (*Oncorhynchus tshawytscha*) were generally not known, even to the state fish commissioners (Stone 1883a). Eventually, however, Stone was directed to the McCloud River in the upper Sacramento Valley by W. W. Montague, chief engineer of the Central Pacific Railroad, who had seen "Indians spearing salmon" during the fall spawning time (Stone 1883a:218; 1897:207). Journeying north with two assistants, Stone found the salmon he had sought and there also he met the McCloud Wintu people. In his words:

> … we came upon several camps of Indians with hundreds of freshly caught salmon drying on the bushes. Salmon could also be seen in the river in such numbers that we counted sixty in one spot as we stood at the water's edge. It was evident that this was the place to get the breeding fish…. (Stone 1874:168, 1897:207).

Thus, Stone established the U.S. Fish Commission's salmon egg-collecting station on the McCloud River, about two miles above the juncture with the Pit River, which in later years was called Baird Station (Stone 1897). It was set in a landscape still unsullied by civilization's excesses:

> On the darkest nights the scene on the river bank was exceedingly wild and picturesque. Behind us was the tall, dark shadow of Persephone Mountain, and before us at our feet ran the gleaming, rapid current of the McCloud, while the camp-fire threw an unsteady light upon the forest, mountain, and river, suddenly cut off by the dense darkness beyond…. It was quite impressive, in the midst of the surroundings, to reflect that we were beyond the white man's boundary, in the home of the Indians, where the bear, the panther, the deer, and the Indian had lived for centuries undisturbed (Stone 1874:172, 1897:208).

Also, notably:

> The miner's pick and shovel have upturned the banks of other rivers, or the farms of white men have stretched along their waters, but, for some reason or other, the civilized races have very singularly left the McCloud River to its aboriginal inhabitants. The consequence is, that the McCloud River presents an instance of what is becoming extremely rare,… namely, a region which is just as it was before the white man found it, and a race of aborigines, whose simple habits have not been corrupted by the aggressive influence of communication with the whites (Stone 1874:177).

Historical synopses of Baird Station have been presented in earlier works (Hedgpeth 1941; Lichatowich 1999; Yoshiyama 1999) and details on the egg-collecting and hatchery activities were provided by Stone and others in U.S. Fish Commission reports (e.g., Stone 1874, 1876a; USFC 1892). The purpose of the present paper is to highlight one aspect of the station's operations as related by Stone's accounts—viz., the contribution of the local native people, the McCloud Wintu. Although the relationship of the McCloud Wintu and Baird Station was briefly described previously (Yoshiyama 1999), a more detailed recounting is deserved because of its historical richness and potential future ramifications. That relationship was an uncommon, if not unique, early example of how people of different cultural backgrounds and perceptions came together to conduct a highly successful fisheries

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venture, made all the more remarkable by the initial mistrust of the parties. It is a story of beauty and poignancy—and, in a way, one that has not yet ended.

Stone's Reports: 1872-1884

The following sections present a narrative and passages from Stone's reports related to the early years of Baird Station and the interactions with the McCloud Wintu. During that period the Wintu were still numerous in the area and were able to substantially contribute to the success of the station's operations. Stone's reports were published in the serial volumes of the U.S. Commission of Fish and Fisheries ("U.S. Fish Commission"), including several historical résumés (Stone 1883a, 1885a, 1897), but they are largely inaccessible to present-day fisheries workers. Those reports reveal much historical information on Baird Station—the first salmon hatchery on the Pacific Coast and one of the earliest fisheries management efforts in California by non-native people—and they include invaluable ethnographic fragments on the McCloud Wintu. The nascent hatchery operations at Baird Station coincided with the opening of a new era in American fisheries management based upon extensive artificial propagation of native and non-native species and their translocations across great distances (Bowen 1970; Dill and Cordone 1997; Lichatowich 1999). In fact, Stone's arrival on the McCloud River was only shortly preceded by the earliest reported introductions of non-native fishes into California—American shad (*Alosa sapidissima*) and brook trout (*Salvelinus fontinalis*) in 1871 and possibly goldfish (*Carassius auratus*) in 1867 (Smith 1896; Shebley 1917; Dill and Cordone 1997).

This narrative is roughly divided into several parts that describe the establishment of Baird Station, the notable events during the station's first decade of operation, and the involvement of the McCloud Wintu. Although Stone's writings reflect the terms and perspectives of a bygone time, we have retained much of his own words for they best convey the nuances of what he saw and felt and because a paraphrasing would lose information possibly significant to more discerning

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The U.S. Fish Commission's Baird Station was established on the lower McCloud River in the northern Sacramento Valley of California, within the territory of the McCloud Wintu people. A group of McCloud Wintu is shown here next to racks of drying salmon with the buildings of Baird Station in the background (ca. 1882).

Background to early U.S. salmon culture, historical highlights at Baird Station, and later events
(based on U.S. Fish Commission reports [i.e., Stone and USFC references], Hedgpeth [1941], and Lichatowich [1999]; additional references on specific points are given below)

1866 New Hampshire Fish Commission sends agent to New Brunswick (Canada) to procure Atlantic salmon eggs—the first U.S. salmon-breeding effort. Livingston Stone retires from Unitarian ministry and begins career as fish culturist raising trout and Atlantic salmon in New Hampshire.

1868 Stone sent to Mirimichi River in New Brunswick to establish a hatchery in cooperation with Canadians; local opposition leads to abandonment of project.

1869 U.S. purchases Atlantic salmon eggs from Canada for "the preposterous sum of $40 in gold per 1,000, or nearly $45...in [U.S.] currency."

1870 Stone and four other fish culturists meet to organize the American Fish Culturists Association (AFCA), later to become the American Fisheries Society (Bowen 1970; Thompson 1970).

1871 First meeting of AFCA; the association petitions federal government to establish salmon hatcheries on Atlantic and Pacific coasts.

1872 Stone is appointed deputy commissioner of U.S. Fish Commission and sent to California to obtain Pacific salmon eggs; arrives with Myron Green and Willard T. Perrin (August 30) on the McCloud River to find spawning salmon and meets the McCloud Wintu. Operations (McCloud River Station) established 3 mi above juncture with Pit River. First shipment of 30,000 eggs sent in late-October to East Coast (New Jersey); 24,000 eggs lost in transit, but 6,000 eggs hatched and planted in "tributaries of the Atlantic." Cost of season's operation is $100 per 1,000 eggs shipped.

1873 Hatchery relocated to 2 mi above the Pit River juncture. First water wheel built to supply water to the hatchery, celebrated by raising American flag over camp. Local fisherman claims prior rights to the fishing ground and extorts "a considerable sum" from Stone. Shipment of 2 million salmon eggs in good condition to East Coast proves the feasibility of the hatchery.

1874 Weir built across the McCloud River for the first time to block the salmon run and aid egg-collection. Deep trays (Williamson troughs) successfully used for incubating the eggs. First consignment of 25,000 eggs sent to New Zealand. California Fish Commission pays $1,000 for 850,000 eggs for planting in the McCloud River. Due to successful operations the station is recognized as a "permanent station of the Fish Commission" (Stone 1897:212).

1875 50,000 eggs sent to New Zealand and Australia. A portion of collected eggs hatched and planted in McCloud River and other Sacramento River tributaries. President Grant designates (in December) the station and 280 acres as a government fishery reservation.

1876 Local fisherman's spurious land claim for the fishery reservation and illegal fishing jeopardizes Stone's operations; the dispute is referred to U.S. Attorney General. Stone's prediction of solar eclipse in March "a matter of great astonishment to the Indians" (Stone1878b:936). Eggs sent to eastern states in a railroad "private ice car" for the first time. Egg shipments to New Zealand (cost of 50 cents per thousand eggs) and Sandwich Islands (Hawaii).

1877 Small military unit sent to guard the salmon reservation and station from encroachment by settlers and illegal fishermen. Current-wheel for hatchery water supply set on flat-boats. Illegal fishing by Sacramento River cannery operators depletes the spawning run into the McCloud River and greatly reduces the egg-take (Stone 1879). Increased "foreign demand" for salmon eggs; shipments sent to European nations, Canada, Australia and New Zealand.

1878 January-February flooding damages the station. Baird Post Office established; the egg-collecting and hatchery thereafter known as Baird Station. Threat of hostilities from "northern Indians" against the station and McCloud Wintu. July solar eclipse—the "grizzly bear that eats the sun" (Stone 1880:746).

1880 Telephone—"teen klesch (talking spirit)"—installed at the station; "Indians were in great glee over it, . . . soon talking to each other over the wires" (Stone 1883b:599).

1881 February flood of epic proportions destroys the station; facilities rebuilt in the summer. Current-wheel damaged and water supply disrupted in September; Wintu help save hatchery's 7.5 million eggs.

1883 Blasting for railroad construction on the upper Sacramento River prevents salmon runs from entering the McCloud River

1884 Railroad construction continues to block salmon runs into the McCloud; Baird Station operations suspended.

1885 Salmon "scarcer than ever before" in McCloud River (Stone 1887:131). March solar eclipse.

1886 Salmon return "in great numbers" (Green 1887). Last McCloud Wintu communal fishing drive reportedly held at Baird (Du Bois 1935).

1888 Baird Station reopens under supervision of George B. Williams, Jr., with primary purpose to collect eggs for stocking Sacramento River tributaries. Fall run is used for the first time to augment the egg collection.

1892 Stone resumes post as superintendent of Baird Station

1897 Stone leaves Baird Station to take a position at Cape Vincent Hatchery, New York. G. H. Lambson becomes superintendent.

1898 New hatchery constructed. Winter run did not arrive in McCloud River; thousands killed, probably by toxic pollutants, near Keswick in the Sacramento River (USFC 1900; Smith 1902).

1902 Conchoolooloo dies in January and is buried on the fishery reservation.

1935 Baird Station permanently ceases hatchery operations.

1943 Shasta Dam Project completed; blocks salmon access to the Upper Sacramento, McCloud, and Pit rivers. Coleman National Fish Hatchery (Battle Creek) begins operations to mitigate for salmon losses caused by Shasta Dam (Cope and Slater 1957).

1989 Sacramento winter chinook run listed as endangered by the California Fish and Game Commission and as threatened under U.S. Endangered Species Act (Williams and Williams 1991).

1994 Federal listing designation of Sacramento winter chinook run changed to endangered (NMFS 1994).

1998 Newly opened Livingston Stone Fish Hatchery on Sacramento River starts artificial propagation of winter chinook run.

1999 California Central Valley spring chinook run federally listed as threatened (NMFS 1999).

eyes than ours.

Following this extended narrative (for 1872-1884) is a section that briefly recounts later events (post-1888) at Baird Station. A historical outline that includes Baird Station's entire hatchery period is given in Box 1. The paper's final sections present a synoptic commentary on recent circumstances of the McCloud Wintu people and the Sacramento River salmon runs, followed by a brief perspective on the putative early success of Baird Station's mission.

The Beginning

Immediately after arriving on the McCloud, Stone and his small party set to work "… and on the morning of September 1, 1872, the hatching-works of the first salmon-breeding station of the United States were located on this stream" (Stone 1874:169, 1897:207). Their activities were ill received by the local native residents who expressed their displeasure "with furious and threatening demonstrations." Concerning the reaction of the McCloud Wintu, Stone (1876a:408) wrote:

> Their success thus far in keeping white men off had given them a good deal of assurance, and they evidently entertained the belief that they should continue, like their ancestors before them, to keep the McCloud River from being desecrated by the presence of the white man… .They assembled in force, with their bows and arrows, on the opposite bank of the river, and spent the whole day in resentful demonstrations, or, as Mr. Woodbury expressed it, in trying to drive us off. Had they thought they could succeed in driving us off with impunity to themselves, they undoubtedly would have done so, and have hesitated at nothing to accomplish their object; but the terrible punishments which they have suffered from the hands of the whites for past misdeeds are too vivid in their memories to allow them to attempt any open or punishable violence. So, at night, they went off, and seemed subsequently to accept in general the situation.

The McCloud Wintu were forced to accept the reality of Stone's presence—palliated somewhat by the understanding that the fish crew would collect the salmon for eggs but yield the carcasses to the Wintu, thus ensuring the people of their traditional food source (Turner 1875; Stone 1876a,b). The arrangement gained grudging acceptance by the Wintu and, no doubt, eased the way for their eventual participation in the egg-collecting operations. Thus, the stage was set for one of the earliest and perhaps boldest salmon propagation endeavors in the history of North American fish culture, and one which "soon in capacity and actual results eclipsed all other similar establishments in the world" (Stone 1883a:220).

Yet, despite the tentative coexistence of newcomers and natives, there were continuing tensions. In 1873, a white settler named George Crooks was killed in a dispute with certain McCloud Wintu tribesmen on Greens Creek, four miles upriver of Baird Station (Stone 1876a, 1882b). It was there that Stone later established (in 1879) the U.S. Fish Commission's trout hatchery and where his assistant Loren Green had a "little incident" with several Wintu, as related by Stone (1882b:718):

> …on looking up he saw to his great surprise three Indians standing over him, each with a drawn knife in one hand and a rifle in the other, and here, on the very spot where the last settler was murdered, they told him the same story that they had told the murdered man, viz., that this was their land, that the white men had no business there, and that they did not want white men on the McCloud river at all. The young man had no weapons about him, and was wholly at their mercy. They would undoubtedly have killed him, as they would certainly have been glad to do, if they could have summoned up the courage to face the consequences. But though they staid with him three hours,… they finally left him as they found him, in possession of the place.

CALIFORNIA DEPARTMENT OF FISH AND GAME FILES

The founders of Baird Station in 1873: Myron Green, Livingstone Stone (center) and Willard T. Perrin, as identified in Hedgpeth (1941).

The lingering mistrust during the early years stemmed from the Wintu's resentment and fear that the ever-increasing intruders would usurp their salmon and ancestral land (Stone 1876a,b). Their fears were realized in some instances and seemingly justified in other respects. For example, Stone (1876b:464) reported that in 1874:

> Possibly relying upon the general protection afforded by the presence of so many white men at our camp, one of the neighboring ranchmen did what had never been attempted before on the McCloud, namely, to drive a flock of sheep into the Indian country on the east side of the river. Hitherto this land had always been given up to the Indians for pasture for their horses, and when the sheep came, destroying every blade of grass, and leaving a desolate waste for their horses, the Indians resented it, as well they might. It certainly seemed cruel in the extreme, but, agreeably to the maxim that there is no great loss without some small gain, our camp was kept in capital mutton… from the sheep which

> brought such calamity upon the original owners of the soil.

Also, regarding an issue perhaps no less distressing, Stone (1876b:467) noted:

> Near our camp is the graveyard of their chiefs and magnates, where good Indians of the McCloud have been buried for centuries. The living members of the tribe are in constant fear lest we should dig up these graves for relics. This fear, caused without doubt by the casual remarks of our party on the subject, is well illustrated by the following unique petition brought to me one day, with great formality and seriousness. The Indian woman who brought it had employed some white friend to draw it up for her. It reads thus:… 'This is to certify that Mrs. Matilda Charles Empire,… is now on a pilgrimage to the graves of their ancestors, and she prays Commissioner Stone not to disturb any of her friends and relatives who have gone the way of all flesh, and thus they will ever pray… '

Eventually, however, progress in relations was made. Stone (1876b:467) remarked:

> The first two years, 1872 and 1873, they regarded us with more or less dislike and suspicion. This year [1874] there was an entire change in them. They seemed to have learned that we were their friends, that we had a genuine consideration for their welfare…and when I passed over to them the thousands of salmon which we caught and had used for spawning, their hearts were entirely won over, and I think that we now have as individuals the confidence and friendship of the tribe.

As one Wintu expressed to Stone (1876a:409), "I understand,… you give Indian salmon; you only want spawn; that all right!" The Wintu at that time had an oft-used saying, "Chocky yapitoo *chipkalla*; kelail yapitoo *challa*— The white men near here, *bad*; the far-off white men, *good*" (italics in original). "Stone and his men had earned the apellation of "the far-off white men" (Stone 1876b:467).

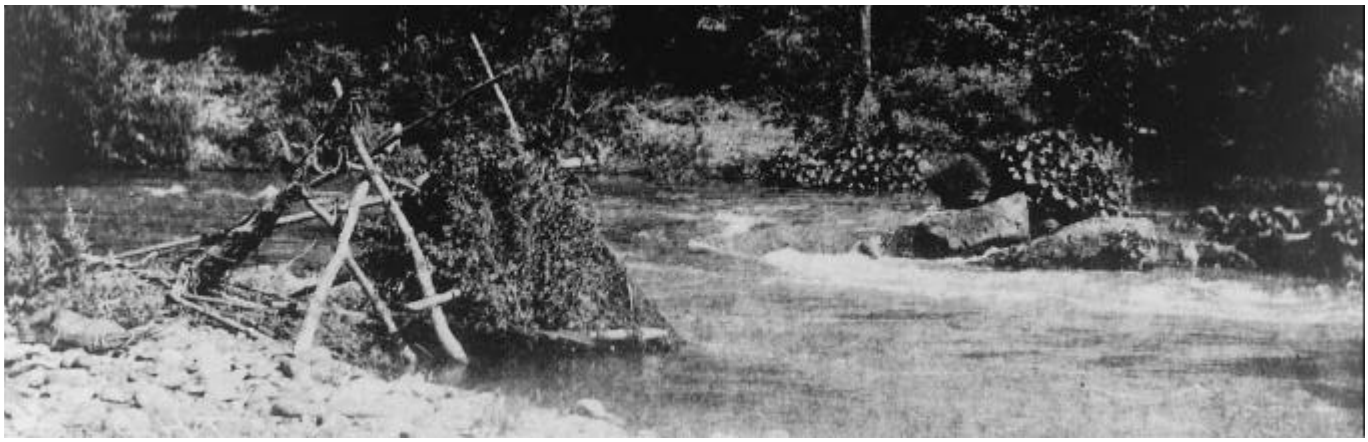
The McCloud Wintu—the "Middle-River People"

Comprehensive general accounts of the Wintu nationality are given by Kroeber (1925), Du Bois (1935) and LaPena (1978). As with many northern California tribal groups, the Wintu on the whole had been substantially affected after 1850 by the massive influx of gold-seekers and settlers into their territories (Merriam 1955; LaPena 1978; Guilford-Kardell and Dotta 1980). By the early 1870s, California tribes had been essentially negated as a threat to settlers (Castillo 1978).

The McCloud Wintu—the "Winemem" in their native language—were a distinctive and numerous subgroup of the Wintu, particularly favored by their salmon rich homeland (Du Bois 1935; Guilford-Kardell and Dotta 1980). They were also fortunate in that the land contained little gold and its rugged nature was ill-suited for farming (Stone 1874, 1897). In this section, we draw on Stone's perceptions of the collective personality of his McCloud Wintu associates and neighbors (herafter, "Wintu"). We also include information from other sources to augment Stone's observations on Wintu salmon fishing.

Stone's early impressions of the Wintu and their ways were given in his first report (Stone 1874:177):

> The Indians themselves are a good-featured, hardy, but indolent race. I found them always pleasant, genial, and sociable, though, like other Indians, very sensitive when their pride was wounded. They at first adopted the plan of ordering all white men out of their country, and were the last of the California Indians to yield to the encroachments of civilization… but the stern consequences of conflict with the whites have taught them to abstain from any violent vindication of their rights. They will still always revenge a wrong inflicted on them by their own people,… but I think they are a well-disposed race by nature, and have no malice naturally in their



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Shaded brush-booths for spearing salmon were used by Wintu fishers on the McCloud and Upper (Little) Sacramento rivers: "Above a quiet pool where salmon were in the habit of resting the spearman built a platform to support a brush hut, in which he sat with slender, twenty-foot spear-shaft projecting up through the leafy roof.... These huts...may still occasionally be seen by the traveller from his Pullman window" (Curtis 1924:87). Photograph ca. 1887.

hearts toward any one, and will not injure any one who does not first injure them. Every one told me, before my arrival and during my stay on the McCloud, that the Indians would steal everything that they could lay their hands on. I am glad that this opportunity is afforded me of bearing testimony to the contrary, which I wish to do very emphatically. I would trust the McCloud Indians with anything…. And… on the arrival of some gold coin, when I had reason to expect an attack from *white men* [italics in original], I gave the gold to one of my Indians, and told him that I depended on him to protect that and me till morning…. and the next morning the faithful Indian handed me the gold just as I gave it to him.

With all their good traits, however, murder did not seem to have the obnoxious character that it has among more enlightened people. Almost every McCloud Indian we met had killed one or more men, white or red, in the course of his life, but it was usually because they were goaded to it by ungovernable jealousy or revenge….

The McCloud Indians live and sleep in the open air in the summer. In the rainy season they build wigwams or huts of drift-wood and dry logs, which they inhabit pretty comfortably through the winter. In the summer and fall they live mainly on the salmon and trout which they spear. In the winter they live on the salmon which they catch and dry in the fall, and on acorns, which they gather in great quantities in the woods. They hunt with bows and arrows, with which they occasionally kill a bear, though a few of the more enterprising have rifles. They trap a very little, but the salmon of the river are so abundant that they are not obliged to resort to hunting and trapping at all, and do not do much of either.

The McCloud Wintu employed a variety of salmon-fishing techniques—viz., spear, basket-trap and nets (Stone 1874; Curtis 1924; Du Bois 1935). Spearing was done in the open, at favored spots along the river (E. C. Stone 1896), or in conjunction with small brush-booths (Redding 1881; Townsend 1918; Du Bois 1935). Stone (1884c:302) noted:

The usual method practised by the McCloud River Indians for capturing salmon is spearing. Their spear is a very long and comparatively slender pole, thickest in the middle, and tapering toward both ends… twenty-five feet may be considered a fair average length… and in the middle it is not far from an inch and a half or two inches in diameter. It is always painted black with a preparation of pitch…. When preparing to strike the fish, the Indian poises the spear over his head, and throws it with great velocity at the victim.

The Indians throw their spear with great dexterity, and are usually successful in getting salmon with it. They go spearing in the morning and evening, but usually in the morning, from daylight to sunrise. They capture with the spear nearly all the salmon that they eat fresh; but in the fall, when they are preparing to dry their winter's stock of fish, they catch them in another way.

Spear-points "made of ankle-bone of deer… for spearing salmon" were among the many Wintu artifacts sent by Stone to the Smithsonian Institution (Stone 1876a:427; cf., Sargent 1880b).

Small brush-booths for spearing salmon were used by the Wintu on the McCloud and Upper Sacramento rivers (Sargent 1880b; Townsend 1918; Curtis 1924). These structures were "about six feet high," built of a framework of poles covered with leafy boughs and shaped like a "tall beehive" (Sargent 1880b:441; Redding 1881:444). In describing them, State Fish Commissioner B. B. Redding (1881:444) remarked:

The ingenuity displayed by the Wintoon Indians, of the McCloud, in capturing salmon, shows a knowledge of some of the laws of physics hardly to be expected from so primitive a people…. Everything being ready, the Indian lies on the poles…. No light comes to his eyes except that coming up through the water…. The Indian can see to the bottom of the stream, and all the fish that pass, while the fish cannot seen him. With his spear always poised,… but few of the unsuspecting salmon escape, that venture to pass beneath his structure.

These booths or "salmon houses" ("buki") were recognized as belonging to individual family-groups but etiquette dictated that anyone could visit them during fishing and expect a gift of salmon, at times leaving the owners with few fish by the end of the day (Du Bois 1935).

Stone (1876b:469) reported, "The Indians fish a good deal in the river about this time [August 13], at night, diving, themselves, for the salmon with a hand-net, which they use in the water with wonderful skill"; "but this mode is only resorted to once or twice a year, and is made an occasion of festivities rather than a means of acquiring food (Stone 1884c:302)."

Large communal fishing drives were conducted during midsummer at night on the McCloud and Sacramento rivers using nets of various sizes, the salmon being herded and caught by teams of netters, torchbearers, and fish-clubbers (Curtis 1924; Du Bois 1935). Torchbearers generally waded along the river and only a few individuals were skilled in swimming with torches (Du Bois 1935). Sargent (1880b:442) described one such nocturnal salmon drive whereby "ancient custom and superstition called for a starlight night" and the torchbearer swam down the rapids with a large torch of bundled pitch pine "some seven or eight feet in length, and a half a yard or more in circumference."

She observed:

The torch buoys him up, for the greater part of it is under water. The blaze … gives a ghastly appearance to the upturned face that ducks under the water every few moments to wash off the falling sparks. After him come the whole band, yelling through the foam, frightening and dazzling the fish…. The men with the net disap-

They seemed to have learned that we were their friends, that we had a genuine consideration for their welfare… and when I passed over to them the thousands of salmon which we caught and had used for spawning, their hearts were entirely won over…

> pear, as they swim right into the midst of a dark pool of salmon…. Indians who can carry a torch successfully, or dive with the net and bring up the most fish, are held in great respect…. To dodge the rocks in the rapids, and dive in almost bottomless holes, requires both expertness and fearlessness (Sargent 1880b:443).

Stone (1874:172, 1897:208) noted:

> Most of the salmon used for drying are taken in August and September, when they are spawning or falling down the river exhausted, after spawning. They are then easily captured by spearing, or by traps.

He described the primary Wintu means of catching post-spawned salmon, unusable for his own purposes but eminently suited for procuring a winter supply:

> The Indian trap consists of a fence of stakes or bushes, built out into the river, at a fall or rapid, in the form of a letter V, having the angle down stream, and a basket-trap at the angle. This method proved perfectly worthless, as of course it must, for catching healthy fish, as this contrivance catches only the exhausted fish that are going down the river, and none of the good fish that are coming up.

To dodge the rocks in the rapids, and dive in almost bottomless holes, requires both expertness and fearlessness.

And, in reference to specimens of dried salmon procured for the Smithsonian Institution, Stone (1874:210) commented:

> The Indians, very singularly, *prefer* the exhausted and dying salmon for drying to the fresh and prime ones. As soon as a salmon is speared or taken from the trap it is opened—the spawn always being saved as a luxury—and split and hung on a bush or fence made for the purpose, in the open air…. When the salmon are sufficiently dried, they are tied together in bundles, and packed away around the sides of the lodges. These specimens were presented by one of the McCloud chiefs, and, repulsive as they seem, they represent the main support of the Indians during the winter, and are highly valued by them (italics in original).

Judging from the migration timing of Sacramento River salmon (Vogel and Marine 1991; Yoshiyama et al. 1998), the salmon that the McCloud Wintu primarily dried for their winter food-stores were of the spring chinook run caught during the spawning season (August-September). The winter chinook run, reportedly "abundant" in the McCloud River during June and July (Stone 1874:183), undoubtedly also was harvested. The fall chinook run, which entered the McCloud River mainly around mid-October and later (Stone 1874; USFC 1896b; Du Bois 1935) probably were used to some degree, but their availability would have been limited as the rainy season progressed (e.g., USFC 1893, 1895, 1896a).

Stone's reports made no mention of salmon-related ceremonies such as the often mandatory "first-salmon" rites observed by many salmon-fishing tribes in the Pacific Northwest region (Gunther 1926; Suttles 1990) and California (Gunther 1928; Swezey and Heiser 1977; Yoshiyama 1999). Stone's heavy schedule during the salmon season may not have allowed him to observe some key Wintu ceremonies which most likely were held away from the hatchery location. Invitations to some Wintu celebrations were extended to the station's denizens; e.g., "The Indians have gone over the mountains on a bear-hunt… and, if they are successful, they will give a Chil-chu-na, or bear-dance. The old chief, Con-choo-loo-loo, invites you to be present" (Sargent 1880a:465. Notably, one visitor reported witnessing, in the summer of 1879, a salmon-related ceremonial dance at a Wintu village about one mile above Green's Creek:

> We learned that the dance and gathering was an annual meeting, partly religious, and that it is given as an expression of gratitude for the return of the salmon to the river (Redding 1880:564).

However, in a later extensive survey of the Wintu, Du Bois (1935:15) stated, "There was no trace of a first-salmon ceremony." Possibly by that time any former first-salmon or related ceremonies had been long abandoned and communal memories thereof faded, particularly if the ceremonies were seemingly only subtly connected to salmon.

Workers and Allies

The Wintu quickly became an integral, if not indispensable, part of Baird Station's activities. In 1874, Stone's crew "numbered nine white men in all" and a Chinese cook brought up from San Francisco, bolstered by "more or less Indians throughout the whole season, the largest number working on any one day being fourteen" (Stone 1876b:437). By 1879, the Wintu contingent had increased to twenty or thirty workers each year, and Stone (1882a:699) came to the opinion:

> …they are very efficient and valuable assistants, particularly in handling the fish, drawing the seine, picking over the eggs, and similar work. If we could not have the Indians to help us, it would be very difficult to supply their place.

Stone (1883b:598) further remarked on his Wintu associates:

> I cannot speak in too high terms of the character of the work which some of the Indians do for us. There are now [1880] nearly a dozen of them who have been with me, more or less, since I came to the McCloud River, who are splendid workers. They are faithful, steady, industrious, and very intelligent. During my first year here I gave all the Indians the same pay; now I discriminate between the best workers and the others, and give the higher class 25 or 50 cents a day more than the rest. This little addition to their pay, or probably the distinction which it implies, affects them perceptibly, and it becomes quite conspicuously a matter of pride with them to make their work correspond with their increased pay.

The Wintu's abilities to work in the water were especially valuable:

> We discovered one day that the salmon, by their violent and repeated attacks on the dam, had at last forced a passage-way underneath the rack and were escaping. I immediately put three Indians on the break to repair it. The water was very cold and very swift, and it would have been extremely difficult for white men, unless experienced divers, to do the work; but the Indians, diving down to the bottom of the river… worked with great skill and perfect self-possession, although remaining sometimes a very unpleasantly long time under water…. I do not know how we should get along without them, particularly as the snow-water of the McCloud is so cold that white men cannot stay in it any great length of time. (Stone 1880:745).
>
> Twice, when the seine got snagged in deep water, it would have been almost impossible for us to have freed it without Indian help. On each occasion they dove for the net and released it, the water being quite deep and at the time almost like ice water…. They are the best men we could have when work is to be done in the water or fish are to be handled (Stone 1884b:840).

The task of winnowing dead eggs from the live ones presented a challenge that was met from another quarter:

> The best help for doing this I have found to be the more careful class of Indian women. These women, accustomed to patient and monotonous labor, are unusually adapted to the work and give excellent satisfaction. Many, especially the younger and more frivolous ones, I have found it necessary to discharge, but there are some who work faithfully and patiently at it, whose work could not be surpassed. The patient habits which their native education has given them, together with their dexterity and delicacy of touch, especially fit them for this kind of labor (Stone 1878b:942).
>
> These Indian women come regularly to the fishery every year when the proper season arrives and pick over the eggs daily…. Some of them, I think, have picked over the eggs every year of the ten years that the station has been in existence on the river, and the station could hardly get through the picking season without them (Stone 1883a:228).

The Wintu contribution to Baird Station's operations was recognized by U.S. Fish Commissioner Spencer F. Baird who noted, "Mr. Stone pays a tribute of acknowledgment to the industry and fidelity of the Indians living on the [fishery] reservation; no class of men, perhaps, being better able to render the service required" (USFC 1883:XXIX). Again, "Mr. Stone… bears cheerful testimony to the help of the Indians in the vicinity of the station. Their services were almost invaluable to him in the prosecution of his work" (USFC 1884b:LXX).

Most of Baird Station's Wintu workers were unnamed, but there was "Lame Ben, Uncle John, One-eyed Jim and others" in 1873 and "Jeff Davis" in 1882 (Stone 1876a:403, 1884b:840), and "Indian Joe" was mentioned in Stone's unpublished correspondence to Spencer Baird (letter of 15 September 1875, Smithsonian Institution Archives, Record Unit 52, Incoming Correspondence Vol. 206). "Chicken Charley" was a familiar figure at the fishery locality (Sargent 1880a; Stone 1880), but it is unclear whether he helped in the operations. Also, during 1883, "Short Jim" and other Wintu assisted at the U.S. Fish Commission's trout hatchery on Greens Creek, upriver from Baird Station (Stone 1885c). Their often unusual names led Stone once to express concern that the payroll voucher for the Wintu workers might be viewed as a joke by the penurious accounting clerks at the Treasury Department (letter of 15 September 1875, as cited above).

A severe flood in February 1881 destroyed Baird Station, but the facilities (shown here) were rebuilt later that year. Photograph (undated) from Stone (1897).

The local Wintu leaders noted by Stone were "Conchoolooloo, the head-chief of the tribe, [who] lived very near us on the bank of the river" and "Jim Mitchell," a village headman who lived in the forest a half-mile away at the site of a Wintu "porum boss," or council-house (Stone 1876b:467). Stone (1874:213) stated, "Con-choo-loo-la [sic] is probably the last of the great chiefs of the McCloud Indians." That personage

evidently was the same chief Kaltcululi or Kolcho-loo-lie recorded by others (Du Bois 1935; Hogue 1977). Du Bois (1935:22,32) stated that Kaltcululi was respected "for his sagacity and wisdom" and regarded as "the most noted craftsman of the McCloud area" in his time.

Finally, the disciplined efforts of the non-Wintu hatchery workers earned effusive praise from Stone and other observers (Turner 1875; Stone 1876b; Hedgpeth 1941).

> With the time and men at my command, the construction of the bridge and dam was an undertaking of no small magnitude… the more serious because the snow-water which forms the river is so cold that the men working in it… could not endure it long without severe suffering. Fortunately, I had with me a force of loyal and resolute men, who were daunted at nothing, and through their courage and resolution these and all other obstacles were overcome (Stone 1876b:438).

Even modern readers may appreciate Stone's (1876b:460) keen enthusiasm:

> I think I ought to mention particularly here the services rendered by Richard and Waldo Hubbard, grandsons of Governor Hubbard, formerly United States Senator from New Hampshire. These two young men were always found equal to any occasion… Tall, stalwart, and muscular, they added a good deal to our reputation with the aborigines of the McCloud by throwing their champion wrestlers, while their strength, at the same time, when turned, as indeed, it always was with undauntable resolution and energy, to the work of the camp, rendered their services invaluable… . By singling out these two, I do not mean to disparage the others, for all worked well, and the Hubbard boys typified rather than contrasted with the work that was done by all.

Events and Operations at Baird

The first years of Baird Station's operations were filled with the challenges and uncertainties of capturing and spawning the salmon and handling the eggs. Indeed, the entire venture in seeking Pacific salmon eggs for the Atlantic coast streams was viewed "with great distrust," as Stone (1883a:217) reflected:

> It was considered very doubtful whether California salmon eggs could be procured in large quantities. It was considered doubtful whether, under the changed conditions of the Pacific slope, salmon eggs could be brought to the shipping (packing) age in a healthy state; and finally it was generally thought to be decidedly impracticable to transport them alive a distance of over three thousand miles from one ocean to the other…

On a familiar note, the vagaries of funding discommoded those early fishery workers:

> More than once my remittances from Washington being unexpectedly delayed, we were obliged to sell part of our clothing and some of the cooking utensils to obtain money for our immediate necessities (Stone 1883a:217).

The early operations were marked by continuous innovation by Stone's crew and, while the egg-takes were limited, they proved the practicality of the venture (Stone 1876a,b, 1897). In the first year, 1872, Stone obtained spawners from the Wintu for "a slight money consideration" (Stone 1897:221). The first batch of eggs was spoiled because of water-supply problems, but additional eggs were obtained "by hook and by crook, by resorting to every possible means of securing spawning fish" (Stone 1883a:220).

In 1874, the construction of a weir and bridge across the McCloud to block the salmon run was an event of great importance because it confined the salmon in the river where they remained in healthy condition but were easily captured (Stone 1876b, 1897). The effect of the weir was dramatic:

> About four o'clock in the afternoon, a few days after the passage of the salmon was obstructed,… it was announced that the salmon were making their first assault upon the dam. The whole camp collected on the bridge to witness the attack. It was a sight never to be forgotten. For several rods below the bridge the salmon formed one black, writhing mass of life…. Piled together one above another, they charged in solid columns against the bridge and dam, which trembled and shook continually

Courtesy, National Anthropological Archives, Smithsonian Institution, negative #76-14451

McCloud Wintu tribespeople assisted in salmon egg-collecting operations at Baird Station on the McCloud River, California, during the 1870s and early 1880s. Photograph ca. 1882.

> under their blows. Not daunted by their repeated failures, they led attack after attack upon the fence,….
>
> For an hour and a half this fierce assault continued, when, exhausted by their efforts,… they fell back… arrested, for the first time since the McCloud formed its channel, in their progress up the river. The Indians, who were watching their movements, were wild with excitement over the scene, which, even after a residence of centuries on the river, was new to them, and they begged for permission to spear the salmon. This, however, I did not give, as I felt obliged to save all the fish for their spawn (Stone1876b:440).

There was the challenge and excitement of capturing the salmon:

> At a given signal three Indians jumped into the foaming rapids below the bridge, and by splashing the water with their arms and limbs and making as much of a disturbance in the water as possible did everything they could to frighten the salmon out of the rapids. On reaching the deep holes, where the fish lay collected by hundreds and perhaps thousands, the Indians dove down in the very midst of the swarms of salmon, and, stirring them up with their long poles, succeeded in driving them out…. The Indian swimmers, their dark heads just showing above the white foam, screaming and shouting in the icy waters and brandishing their long poles, came down the rapids at great speed, disappearing entirely now and then as they dove down into a deep hole. As soon as they approached within about four rods of the fishing-skiff, the boat shot out from the shore, the second boat man braced himself and his oars for a quick pull down along the bank. The man at the stern of the first boat began paying out the seine, the fishermen on the beach gathered at their respective ropes, the men on shore began throwing rocks in the rapids, and in a few moments the net was drawn to the beach with an enormous mass of struggling, writhing salmon, often weighing in the aggregate not less than four or five tons (Stone 1880:751; 1897:214).

The great abundance of chinook salmon in the McCloud River—perhaps the most celebrated salmon stream in California (CFC 1890; Stone 1897)—deserves mention. Stone (1897:212) remarked, for the season of 1875:

> They were so thick in the river in July that we counted a hundred salmon jumping out of the water in the space of a minute, making 6,000 to be actually seen in the air in an hour. Nearly 9,000,000 eggs were taken, and there were more to be had for the taking.

The presence of salmon in spawning condition during that July would indicate great numbers of Sacramento winter-run chinook salmon.

Even more impressively, "1878 was the year of the immense gathering of salmon in the McCloud" (Stone 1897:218). Stone (1880:749; 1897:213) marveled:

> I have never seen anything like it anywhere, not even on the tributaries of the Columbia. On the afternoon of the 15th of August there was a space in the river… where, if a person could have balanced himself, he could actually have walked anywhere on the backs of the salmon, they were so thick…. This leads me to say that the most extraordinary feature about the fishing season this year was that the salmon in the river did not seem to be diminished by our constant seining. We made enormous hauls with the net every day, spawned a large number of salmon, and gave a large number to the Indians for their winter supply, but always the next day the spawning salmon seemed to be as thick as ever.

The date of that observation would have corresponded with the spring run. For the spring run alone of that year, Stone (1880:763) attested:

> During this time [the 40 days before October 5] we caught and examined, one by one, nearly 200,000 salmon. We took and impregnated at least 14,000,000 eggs.

Also in 1878, in apparent reference to the winter run spawning in the upstream reaches:

> By the 10th of July,… the river was closed to the upward migration of the salmon. I was the more willing to close the stream as early as this because vast numbers of full-grown salmon,… had escaped the nets of the Sacramento fishermen and had already fully stocked the upper waters of the McCloud with spawning fish (Stone 1880:742).

However, despite the seeming plenitude of salmon, unrestrained commercial fishing on the Sacramento River at times seriously depleted the numbers and sizes of spawners entering the McCloud River (Stone 1879, 1882a)

Perhaps the darkest time at Baird was during 1878, engendered by apprehensions of a widespread native uprising among all the western tribes "between the Missouri [River] on the east and the Cascade Range and the Sierra Nevadas on the west" (Stone 1897:214). The most immediate trouble stemmed from outlying groups in northern California who threatened violence against the station and associated McCloud Wintu, and Stone (1882a:699) also noted there were "threats of mischief… by some restless spirits nearer home" and "many Indians not far from us had caught the infection." Stone (1880:747) observed:

> Some of our Indians were very much alarmed, and for several days a good deal dejected over this news, and they told us stories of ancient fights that they had had with the northern Indians, and how the Modocs and Yreka Indians had made war on them and burned their children and carried off their squaws… and we began to think that there might be something serious in the excitement in our neighborhood. At all events, as we had only one rifle at the fishery I thought it prudent to be at least better armed, and accordingly telegraphed for arms and ammunition. The

I have never seen anything like it anywhere, not even on the tributaries of the Columbia. On the afternoon of the 15th of August there was a space in the river…where, if a person could have balanced himself, he could actually have walked anywhere on the backs of the salmon, they were so thick….

> excitement, however, gradually died away…. This was the end of our Indian scare, and after this we thought nothing more about it.

With news of hostilities from farther afield "having been checked by the vigilance of the War Department," the fish commission crew resumed its focus on collecting salmon eggs (Stone 1882a:699). It was also in 1878 that a post-office was established at the fishery reservation and named Baird, and the hatchery thereafter was officially known as Baird Station (Stone 1883a, 1897).

An unprecedented catastrophe occurred in January-February of 1881 when torrential rains flooded the McCloud River, washing away Baird Station and, perhaps more grievously, part of the neighboring ancestral Wintu burial ground:

> Again the river fell, but this time the fall was succeeded by the greatest rise of water ever known in this river before, either by white men or Indians now living… the rain poured down in torrents. It is said by those who saw it that it did not fall as rain usually falls, but it fell as if thousands of tons of water were dropped in a body from the sky at once…. On the 2d of February the McCloud River began to rise at the rate of a foot an hour….
>
> The water was soon a foot above the danger-mark, and the buildings began to rock and totter as if nearly ready to fall… they toppled over with a great crash and were seized by the resistless current and hurried down the river…. When the day dawned nothing was to be seen of the main structures which composed the United States salmon-breeding station….
>
> It must be over two centuries since the McCloud River rose, if ever, as high as it did last winter…for just behind the mess-house, and exactly under where the fishery flag floats with a good south breeze, is an Indian grave-yard, where the venerable chiefs of the McCloud have been taken for burial for at least two hundred years, and there is no knowing how much longer. One-third of this grave-yard was swept away by the high water last winter, and the ground was strewn with dead men's bones.
>
> Now, the fact that the Indians have been in the habit of burying their dead in this spot for two centuries proves that the river has never risen to the height of last winter's rise within that time, for nothing could induce Indians to bury their fathers where they thought there was the least danger of the sacred bones being disturbed by floods (Stone 1884a:1063, 1897:215).

Still another challenge "of the gravest character" came later that fall when the current-wheel was badly damaged, thus disrupting the hatchery's water supply and imperiling the entire season's collection of eggs. As related by Stone (1884a:1071):

> It happened the 18th of September, on a remarkably quiet and pleasant Sunday morning….
>
> As soon as the accident was discovered not a moment was lost in establishing a line of buckets from the river to the hatching house to supply water to the eggs. Every white man and Indian that could be pressed into service was employed,…. I do not know what we could have done in this emergency without the Indians; but I do not think we could have saved the eggs except by their aid. They worked splendidly, most of them from eleven o'clock in the morning, when the wheel broke down, until four o'clock the next morning, when it was started again—seventeen hours of continuous work, with two very short interruptions,… some of them were carrying buckets of water that weighed sixty or seventy pounds each…. I do not think they could have held out much longer. I have seen white men look as tired as they did, but I never saw such a tired look on Indians' faces before as there was on the faces of those red heroes who saved our salmon eggs…. I must not forget to say here that the white men worked as heroically as the Indians, though their work was not as exhausting…

Instead of seeing from 6,000 to 8,000 jumping in an hour,…I did not see one jump for several minutes. In the meantime all the Indians we met had the same story to tell—that there were no salmon in the river.

Notwithstanding the successful efforts of the Baird Station work-force to fulfill the station's mission for over a decade, external events overtook them. In 1883, railroad construction on the Upper Sacramento River obstructed and destroyed much of the salmon run, causing "great dismay… [over] the nonappearance of the salmon in the upper tributaries of the Sacramento" (Stone 1897:216). Stone (1885b:989) testified for that year:

> We unpacked the new seine… and made a haul with it,…. Instead of catching five hundred or a thousand salmon, we caught but one, and that a small one…. Instead of seeing from 6,000 to 8,000 jumping in an hour,… I did not see one jump for several minutes. In the meantime all the Indians we met had the same story to tell—that there were no salmon in the river.

Similar circumstances in 1884 let to the closure of Baird Station for four years (Stone 1886, 1897).

All during that early period, too, the McCloud Wintu waned. By 1879, Stone (1882a:700) had noted their decline:

> Settlers are beginning to come to the McCloud River. They take up a claim, burn the Indian rancherias, shoot their horses, plow up their graveyards, and drive the Indians back into the hills, the ultimate result of which must be approximate starvation.

It was said that the McCloud Wintu held their last communal fishing drive at Baird "around 1886" (Du Bois 1935:15).

Afterwards: Tides of Change

Baird Station was reopened in 1888 and resumed shipments of salmon eggs to eastern U.S. destinations. More importantly, a large portion of the collected eggs were reserved for stocking local streams "with the definite purpose of aiding in the maintenance of the salmon fisheries of the

Sacramento River, which had been for several years rapidly deteriorating" (USFC 1892:XXXV). Stone and his workers had stocked fry into the McCloud River and other northern Sacramento River tributaries as early as 1874 and 1875 as an ancillary activity (Stone 1876b, 1878a, 1897)—averaging more than two million eggs annually in the late 1870s and early 1880s (Stone 1882a, 1884a; Smiley 1884b). However, the greatly depressed condition of the Sacramento salmon runs in the late 1880s called for intensified efforts (USFC 1892). By the early 1890s, the great majority of eggs taken at Baird Station were hatched either there or at Sisson Hatchery on the Upper Sacramento River and the young salmon planted in the McCloud River and other Sacramento River tributaries (USFC 1894, 1895, 1896a).

While the results of early plantings of Pacific salmon into eastern U.S. streams and foreign countries generally were failures (Stone 1897; Hedgpeth 1941; Towle 1987), it was believed that the Sacramento River salmon runs were maintained largely as a result of stocking operations from Baird Station (Stone 1882a; Smiley 1884a; CFC 1900). Stone (1884a:1070), for example, enthused:

> I may add here that this vast increase in the number of salmon in the river is the direct result of the artificial hatching of young salmon at this place. For several years past the United States Fish Commission has presented to the State of California 2,000,000 salmon eggs or more each year…. This artificial stocking of the [Sacramento] river has resulted in a wonderful and wholly unprecedented increase of salmon in this river.

Likewise, one California fish commissioner avouched to the state legislature that "a million of salmon could be artificially hatched and placed in the river for less than $800; and if it were desirable, and the legislature made sufficient appropriation, the commissioners *could fill the river so full of salmon that it would be difficult for a steamboat to pass through them*" (italics in original; Smiley 1884a:202). Yet, the efficacy of those early plantings was later questioned (Hedgpeth 1941; Skinner 1958)—but whatever the cause, the salmon returned to the McCloud River, occasionally in great numbers (Green 1887; Guilford-Kardell and Dotta 1980).

In 1897, Livingston Stone transferred to a new post on the East Coast and G. H. Lambson took charge of the McCloud River operations (USFC 1899). By that time college men were routinely employed at Baird Station for one dollar a day during summers (Hedgpeth 1941) and the Wintu apparently were no longer a major part of the workforce. In January 1902, Conchoolooloo, friend and ally, passed away. Lambson eulogized the old chief:

> He was a consistent friend of the white people, and in former years saved the superintendent from being killed by the Indians. His influence was always exerted toward keeping his people sober and industrious. He was buried on the [fishery] reservation upon a hill, where he had selected a site for his grave (USFC 1904:73).

Of Stone, who died in 1912 (Hedgpeth 1941), it may suffice to quote Wintu tribesman Joseph B. Campbell, who was born in September 1872, the same month and year Baird Station was established (Hogue 1977:61):

> My boyhood was spent on the McCloud. I watched the rebuilding of the salmon hatchery at Baird, about 1881…. Livingston Stone was superintendent then. The Indians liked him.

In the end, the McCloud River salmon runs eventually diminished and Baird Station ceased hatchery operations in 1935 (Hedgpeth 1941). The McCloud Wintu likewise continued to fade, their destiny seemingly twined with the salmon. By 1938, large portions of the McCloud watershed were held by non-Wintu entities. Of almost 50 miles of river historically accessible to salmon (up to Lower McCloud Falls; Yoshiyama et al. 2001), the uppermost 34 miles (69%) alone were controlled by the newspaper magnate William Randolph Hearst and two private fishing clubs (Wales 1939). Wales (1939:288) stated:

> The salmon and the Wyntoon Indians, once abundant, are now almost gone. The Indians, though disappearing rapidly, will probably be represented by a few scattered individuals along the river after the salmon have been shut off completely by the new Shasta Dam….

The completion of Shasta Dam in 1943 as part of the Central Valley Project blocked the salmon runs from all former spawning grounds in the upper Sacramento, McCloud and Pit rivers (Needham et al. 1943; Slater 1963; Yoshiyama et al. 2001), while the rising waters of Shasta Reservoir displaced the remaining Wintu from the lower reaches of the McCloud (Smith and Weymouth 1952; Slater 1963). Final testimonies by Wintu informants just before their exodus from the McCloud watershed are given in Hogue (1977).

To be, or not to be: that is the question

After their displacement from the lower McCloud River, a number of the McCloud Wintu continued to reside in areas just south of Shasta Reservoir, mainly near the city of Redding (L. C. Malone, Wintu Tribal Council, pers. comm.). By 1948, for the entire Shasta County (which includes roughly half of all ancestral Wintu lands; Du Bois 1935) there were records of "only 687 Wintus, including mixed bloods" of all Wintu subgroups combined (Hogue 1977:2). The 1990 Census tallied 2,244 Wintu persons (LaPena

This artificial stocking of the [Sacramento] river has resulted in a wonderful and wholly unprecedented increase of salmon in this river.

1994). Specific enumeration of tribal membership is often complicated by the mixed tribal ancestries of contemporary native people but the current number with Wintu affililation may be roughly estimated at 2,500 persons (L. C. Malone, pers. comm.).

Today, as with many Native American groups in California, the Wintu people are not formally recognized as a tribal entity by the United States government. The lack of federal recognition of numerous Native American tribes or local communities ("rancherias") in California and elsewhere stems largely from past U.S. legislation that divested various native groups of tribal status and, hence, of their cultural identity—viz., Dawes Allotment Act of 1887 (24 Stat. 388) and Termination Acts of 1953 (House Concurrent Resolution 108 and Public Law 83-280, 67 Stat. 588) (AILTP 1988; Forbes 1993; Marino 1994) and the California Rancheria Act of 1958 (Public Law 85-671, 27 Stat. 619 as amended in 1964 by 78 Stat. 390) (Castillo 1978; Forbes 1993). A practical consequence of the termination policy for many groups was the curtailment of federal entitlements (e.g., health care, housing and educational benefits) to which tribal members formerly had access and the loss of extensive tracts of tribal lands (Kehoe 1992; Marino 1994; Wilson 1998).

The combined Wintu and a number of other California native groups currently seek federal recognition of tribal or "band" status (Kehoe 1992; LaPena 1994)—a long and complex process that a U.S. Bureau of Indian Affairs (BIA) official once described as "more difficult and time-consuming than getting approval to build a nuclear reactor" (Sacramento Bee, 24 February 2000). Wintu actions toward gaining federal recognition were initiated almost thirteen years ago (L. C. Malone, pers. comm.). Aside from the more commonly taken BIA process, federal recognition alternatively may be granted through congressional action or by executive order (D. Theodoratus, California State University, Sacramento, pers. comm.).

As for the salmon runs that formerly entered the McCloud River and adjacent branches of the upper Sacramento River drainage, the winter chinook run thrived for a while below Shasta Dam. However, continued degradation of environmental conditions eventually caused the run's precipitous decline and consequent listing as endangered under both federal and state endangered species laws (Williams and Williams 1991; Yoshiyama et al. 1998). The spring chinook run also declined and was listed by the state as endangered and federally listed as threatened (Yoshiyama et al. 1998; NMFS 1999; Moyle 2001). The Sacramento River fall chinook run is still abundant, although its numbers are substantially less than half a century ago and are heavily sustained by hatcheries (USFWS 1995; Yoshiyama et al. 2000). Recent trends in spawning escapements in California Central Valley rivers indicate that the salmon runs have started to recover from the very low levels of the early 1990s (PFMC 1999; Yoshiyama et al. 2000). Nonetheless, the overall depressed numbers of all Central Valley salmon runs bear testament to the slings and arrows of outrageous fortune and sea of troubles that the salmon, like the Wintu, have faced since that time long ago when Livingston Stone first saw them.

Chinook salmon eggs or fry from the McCloud River were eventually sent to at least 37 states and 14 countries, including destinations as far away as Italy, Japan, Australia, and New Zealand.

Finis?

We have tried to convey, largely through Livingston Stone's near-forgotten writings, the early story of Baird Station—the efforts of the first U.S. Fish Commission crews and their Wintu associates to supply salmon eggs for stocking eastern United States rivers and for shipments to other countries (Hedgpeth 1941; Towle 1987; Yoshiyama 1999). Surmounting physical challenges and social obstacles, the Euro-American and Wintu hatchery workers cooperated to collect over 70 million salmon eggs during the first decade or so (1872-1883) of operations (USFC 1884a; Stone 1885a), from which more than 18 million young salmon were planted in the Sacramento River system (Smiley 1884a) and over 33 million eggs were distributed to other United States streams (Smiley 1884b; Stone 1884a; Towle 1987).

Chinook salmon eggs or fry from the McCloud River were eventually sent to at least 37 states and 14 countries (Smiley 1884b; Towle 1987), including destinations as far away as Italy, Japan, Australia, and New Zealand (Stone 1876b; USFC 1878, 1899). Admittedly, very few of the distant plantings were successful and the grand scheme to establish Pacific salmon fisheries throughout the Atlantic seaboard and in the Mississippi River drainage, as well as overseas, ended in almost total failure (USFC1892; Stone 1897). By 1888, U.S. Fish Commissioner Marshall McDonald was forced to conclude:

> These experiments were undertaken on a scale unprecedented in the history of fish-culture. Millions of eggs were transferred to the eastern stations,… and the fry planted in nearly every one of the larger rivers south of the Hudson. In no single case did the experiment prove satisfactory… (USFC 1892:XXXV; Stone 1897:219).

Stone (1897:219) further remarked:

> …the result was a stupendous surprise and disappointment. The eggs hatched out beautifully. The young fry, when deposited in the fresh-water streams seemed to thrive equally well. They grew rapidly and when the proper time came were observed to go down in vast numbers to the sea. What afterwards became of them will probably remain forever an unfathomable mystery.

With the clarity of hindsight, the failure of that planting program might be largely ascribed to the haphazard allocation of salmon eggs and fry to destinations determined more by the enthusiastic imagination of sportsmen and fish culturists, as well as political demands, than by their ecological suitability for the fish (Bowen 1970; Towle 1987; Lichatowich 1999). The unbounded optimism underlying those early hatchery and planting efforts for salmon was seemingly justified by notable successes with some other species—e.g., carp (*Cyprinus carpio*) from Europe into the United States and American shad and striped bass (*Morone saxatilis*) from the Atlantic coast to California (Smith 1896; Shebley 1917)—although the potential ramifications of wholesale translocations of non-native species were not fully appreciated and often hardly considered (Bowen 1970; Dill and Cordone 1997). The emerging sentiment of that era on the promise of artificial fish propagation was articulated by George B. Goode, Assistant Director of the U. S. National Museum, who noted that the salmon rivers of the Pacific coast were "so thoroughly under control by the fish-culturist" that it was possibly "cheaper to make fish so plenty by artificial means, that every fisherman may take all he can catch, than to enforce a code of protection laws" (Goode 1886:1152). That perspective was subsequently belied by the widespread depletion of salmon stocks through overfishing and massive environmental alterations (Netboy 1973; Lichatowich 1999). Nonetheless, the rapid development of fish culture in the United States from the late-1860s onwards engendered a fisheries management gestalt based on artificial propagation and widespread transplants of salmon and other fish stocks far beyond their natural ranges (Smith 1896; Bowen 1970; Lichatowich 1999)—the pervasive consequences of which may never be fully understood but which we must now confront in fisheries restoration efforts (NRC 1996; Lichatowich et al. 1999; Reisenbichler and Rubin 1999).

Yet, despite the overall failure of those initial, far-flung plantings of salmon, it was Stone's early shipments of spring-run chinook salmon eggs to New Zealand that laid the groundwork for later plantings of fall-run chinook salmon (from Battle Creek and other northern Sacramento River tributaries) in 1901-1907 that eventually thrived in those streams half a world away (USFC 1902; Hardy 1972; McDowall 1994). The New Zealand stocks are among the few cases where self-sustaining chinook salmon runs have been established outside the natural species range (Davidson and Hutchinson 1938; Healey 1991; McDowall 1994).

Stone's reports are relevant to the efforts of present-day fisheries workers to rebuild salmon stocks in California because they attest to the countless numbers of salmon that once swam the McCloud River, from which they are now debarred. Furthermore, his detailed accounts are notable not only for their enduring grace and general historical value but because they provide irrefutable documentation of the occupancy by the Wintu people on the lower McCloud River back to circa 1870 and evidently much earlier (Stone 1884a, 1897). Indeed, Stone's accounts of the McCloud Wintu and their unmatched salmon trove were briefly presaged by the ethnographer Stephen Powers' notes on the "Wintun":

> A party of six Indians on McCloud's Fork speared over 500 [salmon] in one night, which would at moderate calculation give 500 pounds to each spearman… (Powers 1874:532; 1877:234).

Such evidence of long-term residency is important in the efforts of contemporary Native American groups such as the Wintu to gain federal acknowledgment of their tribal identity.

In closing, Livingston Stone, a founding member of the American Fisheries Society, received crucial assistance from the McCloud Wintu people in his mission to supply eggs for the U.S. Fish Commission's salmon plantings in the eastern United States and the California Fish Commission's hatchery program to perpetuate the Sacramento River salmon runs. Almost 130 years have passed, and those two fish agencies continue to pursue their mandates—as the National Marine Fisheries Service and the California Department of Fish and Game—to protect the fisheries resources and serve the economic, scientific and recreational needs of the American people. Yet, the Wintu now struggle for federal recognition of their very existence. Perhaps it is time to repay the debt.

Acknowledgments

The staff and consultants of the Turtle Bay Museum (Redding) and the McCloud Wintu people—past and present—gave the inspiration for this paper. We especially thank Alice Hoveman for researching Livingston Stone's unpublished letters from the Smithsonian Institution Archives and Dorothea Theodoratus who gave valuable insights on the tribal recognition issue and other aspects of Native Californian culture. Ms. Linda Curl Malone helped us better understand some current issues facing the Wintu people. We thank several reviewers whose suggestions added to this paper, and J. Homiak and P. Fleming for facilitating the loan of photographs from the National Anthropological Archives. This work was made possible by support from the Giles W. and Elise G. Mead Foundation.

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Document 4

WWT FDA comments on GMO Salmon

Re: Docket No. FDA–2011–N–0899

Draft Environmental Assessment and (FONSI) Preliminary Finding of No Significant Impact Concerning a Genetically Engineered Atlantic Salmon

These comments are submitted on behalf of The Winnemem Wintu Tribe of Northern California, Caleen Sisk, Chief - on behalf of herself as Chief, and on behalf of the tribe, and by Claire Hope Cummings, M.A., J.D., a lawyer and expert on the use of genetic engineering in food and agriculture.

Summary: The cultural, social, and economic impacts of this application must be considered. A full EIS is essential to evaluate this unprecedented and controversial product and all its complex international and domestic health, cultural, environmental, policy and legal implications.

We make four arguments:

1. NEPA and other federal laws require a full study of this application. Both study and consultation with native tribes to evaluate the cultural, social, economic, health and other human impacts is legally and factually appropriate.

2. Salmon are a vital cultural, nutritional, and economic part of the lives of native people in North America and therefore any artificial genetic alteration of any salmon must be studied carefully to consider the social, cultural, and economic impacts on human populations and communities.

3. There is precedent for U.S. government to take legal action in response to the cultural impacts of the transgenic manipulation of a species that has high cultural value. In Hawaii, taro has spiritual significance to Native Hawaiians, just as the salmon do to Native Americans. Both state and local government in Hawaii have taken legislative action to consider, study, and ban the genetic manipulation of taro on this cultural basis.

4. The EA assumes that the applicant's precautions will prevent environmental harm, without requiring a showing or scientific assessment of essential issues, in particular, waste water from facilities used to produce, grow and process the transgenic salmon. An alarming new study finding transgenic antibiotic resistant molecules in open rivers means that the applicant may be polluting water with modified molecules. Thus the applicant and FDA must first carefully study and take action to control the impact of these transgenic fish have on water at all stages of growth, including any dead fish, the fry, any eggs or other fish parts and on all water ways, including the water used in transportation and in preparation of fish products, water used and disposed of in commerce as well as all the resulting health impacts on human communities.

The Winnemem Wintu Tribe Address: 14840 Bear Mountain Road, Redding, CA. 96003 http://www.winnememwintu.us/. The Winnemem are a salmon culture living in Shasta County, California. Winnemem means "middle water" and refers to the McCloud

River, internationally renown for its fishing. In 1872, the very first US Fish Hatchery at Baird was established on the McCloud River. The Winnemem Wintu people taught Livingston Stone about the wild Chinook Salmon and eventually worked at the hatchery. Salmon have always been a part of the Winnemem diet and subsistence fishing practices but they are far more important than that to the Winnemem people's beliefs and values.

In their own words: *"We are a traditional tribe who inhabits our ancestral territory from Mt. Shasta down the McCloud River watershed. When the Shasta Dam was constructed during World War II, it flooded our home and blocked the salmon runs. The salmon are an integral part of our life ways and of a healthy McCloud River watershed. We believe that when the last salmon is gone, humans will be gone too. Our fight to return the salmon to the McCloud River is no less than a fight to save the Winnemem Wintu Tribe. As salmon people and middle water people we advocate for all aspects of clean water and the restoration of salmon to their natural spawning grounds. Sawal Mem, Sawal Suhana (Sacred Water, Sacred Life)"*

A film about the tribe's work to return the salmon to the McCloud River is called: ***Dancing the Salmon Home***. <http://www.dancingsalmonhome.com/>

Chief Sisk insists that the FDA understand that salmon, all salmon, is sacred and salmon must not be genetically altered. "*After all the struggles and strife of the Winnemem Wintu Tribe to sing, dance, and retain ceremonies for salmon, we are still here to give voice for the future of salmon in the struggle to exist in our natural state because we carry the gift of voice given to human by salmon. The best work to restore Chinook Salmon to natural habitats must take precedence over all other planned changes to salmon. The healthier the salmon runs, the healthier the water is for all of us. Our songs and dances are for the salmon that was created by Olebis (Creator) and the salmon are the "rightful" water companions for all."*

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1. NEPA Compliance and other legal issues:

The decision to disregard the cultural, nutritional, environmental, economic, and sociological issues implicated in this application is not supported by the facts, policy, science, or the law. The FONSI states (repeating the language in the Draft EA) that the "social, economic and cultural effects of the proposed action on the United States have

not been analyzed and evaluated because the analysis in the draft EA preliminarily indicates that the proposed action will not significantly affect the *physical environment* of the United States."

In full, the draft EA states that the "Social, economic, and cultural effects have not been analyzed and evaluated in this draft EA. Courts have held that under NEPA, social and economic effects must be considered only once it has been determined that the proposed agency action significantly affects the physical environment. Our analysis in this draft EA preliminarily indicates that the proposed action will not significantly affect the physical environment; therefore, economic and social effects on the United States have not been evaluated."

The "analysis" referred to in the EA is nonexistent. The draft EA position is based on faulty assumptions, not analysis, and thus the conclusion is unfounded. Nothing was done except to consider a self-defined "physical environment." In reality, the physical environment includes more than was considered in the EA. The economic and social effects were eliminated from consideration without examining them. The applicant is saying that since they decided not to look at the cultural issues, they know those issues will not be impacted. This focus on the "*physical environment* of the United States" is a ruse and the applicant ignores obvious physical and other interrelated complex aspects of this proposed organism as it applies in the U.S. both physically, and otherwise.

The question the FDA must ask is who decided on this narrow focus, and, on what basis? Why was no process involved? Were the genes used in this construct considered part of the physical environment? They are still present in the fish being sold in the U.S. and the transgenic attributes of the fish will be present in the product sold in the U.S. Did the applicant consult native tribes for whom salmon is a sacred, about the physical impact of this product on them, when it is imported into the U.S? In other words, even using the very narrow definition used in the Draft EA, further study and consultation was a legal obligation. Or was this an arbitrary *a priori* decision or a planned avoidance of the issue? What we are saying is that even if you define physical to only include the finished product imported into the U.S. for sale, these impacts are extensive and interrelated and thus unavoidable on that basis as well.

The Winnemem have a sacred trust. They are charged with responsibility for interdependence and the health (spiritually and physically) of the salmon, the waters, and the people. The federal government has a public trust to consider these same waters and tribal ways of life that include this interdependency between the physical and cultural. Had consultation occurred, as mandated by law, this error in assumption and focus would have been obvious. There are many salmon cultures in the U.S. and Canada and they must be consulted on the physical, cultural and socio-economic impacts.

The EA does not show any studies, consultation, or facts to support the contention that this product has no physical impact in the United States. We are providing here, just several of many compelling reasons why there may be an impact. The mere fact that hundreds of thousands of U.S. citizens have commented on this proposed product and

stated their opposition to it on economic, moral, social and cultural grounds in itself raises the issue. Salmon, for instance, are consumed for their nutritional value, which comes from their habitat. For consumers, what they eat is often a social and moral issue. Thus this product has BOTH physical and social impacts. What a person eats is both physical and social. These two values are inseparable when it comes to food. The physical includes the social and these aspects are all related to the environment and thus the narrow definition of physical environment is misplaced here.

The fact that this is the first transgenic living animal to be produced for human food in the United States makes it an economic, social, cultural, and physical issue. Moreover, the comments of dozens of native salmon and fishing tribes objecting to transgenic salmon is plain evidence that there are social, cultural, and economic impacts. Ignoring this information is, in itself, a violation of NEPA.

The genes of Chinook Salmon will change the character of the transgenic Atlantic fish. The Winnemem are concerned that it will also cause a vulnerability to the Chinook Salmon and cause a rippling effect of all the ecosystem that depends on Chinook. The beliefs involved are based in both the physical issues and its cultural and spiritual properties. Regardless of one's belief system the Winnemem have a right to theirs and what they say is: "*We, the Winnemem Tribe, as a salmon people, will see, feel, and taste these effects before others and feel the impacts before other populations as we depend on salmon in a cultural way."*

Another violation of NEPA is obvious in the Draft EA in that it details the applicant's twisted and expensive efforts to avoid the legal constraints governing this unique and unpopular product. It should be asked: why has the applicant gone to such extraordinary lengths, such as developing the eggs in Canada, shipping them to Panama for growing out and processing before shipping the product to the U.S for marketing? Is this being done to avoid U.S. law? And if so, why is the FDA allowing this unusual process to go forward since it is obviously constructed to go around rather than comply with U.S. law?

Furthermore, once approved, the EA does not evaluate all federal regulatory issues involved and thus it is not adequate to oversee the importation of the processed fish and its physical and health impacts in the U.S. The EA does not show how this importation might involve the Fish and Wildlife Service, the Customs and Border Protection, the APHIS/USDA and the National Marine Fisheries Service regulations, not to mention Clean Water Act since transgenic molecules will be released from this product into U.S. waters. Have the possible defect action levels (DALS) for the FDA in the imported fish been evaluated in advance, such as molds, excreta and insect parts given that they will be grown out in the tropics. Will color additives, packaging, and other issues be evaluated and by whom, under what conditions? Will it carry an import label? Where is the evaluation process for "import" into and out of countries and their food distribution system? Will new importation and related production plants be developed in the US based on the first production process in other counties? In other words, will genetically engineered salmon or fish parts, as they move from Canada to Panama, go through any special permit process before being imported into the US?

We have special concerns about the microbial effects on all the water involved. There will be water changes as the fish go from Canada to Panama to USA. This physical issue must not be ignored. The transport water is unstudied, as is water used in the disposal of dead or unused fish parts. The applicant decided only certain physical issues are to be considered, but even those were of extremely limited scope, given the complexity and unique origin and production process used for this product. The intention apparently is not to comply with U.S. law but to circumvent environmental and perhaps customs regulations. What studies have been done on the use and disposal of the water?

The approval of this application on the basis of a FONSI is tantamount to agreeing to this ruse and being complicit in undermining the basic mission of the agency. The hazards that are proposed and evaluated in the EA are very real (exposure pathways) but they are an insufficient means to fully evaluate the scope and complexity that the first live transgenic animal implies.

As the FONSI admits, the production of this product outside the United States is always a possibility, regardless of what the agency does. And the uncertainty and variables are extremely unpredictable and very much outside the scope of this NEPA assessment. Apparently, to prevent an "outside the United States" threat, the FDA has decided to ignore the obvious problems and impose some weak conditions on its production. Again, this makes no sense since these conditions are, by definition offshore, and thus are not adequately enforceable. Unlicensed GM salmon would have little chance of being allowed into the U.S. in any case.

Another way the agency assists this applicant in its contravention of U.S. law is by making the "no effect" determination under ESA and the "no significant effect" under NEPA. In the language of NEPA and the FONSI, the agency says it has "no significant effect on the quality of the human environment in the United States." We completely disagree and suggest this decision is not only in violation of U.S. law, it is arbitrary and without foundation. This is a politically motivated decision on the part of the FDA to favor a single commercial biotechnology company that is clearly acting against the public interest and clearly expressed objections. The definition of "physical" must be expanded to include the issues raised here. Furthermore, since the physical environment is impacted (through water disposal and product consumption, etc.) a full analysis of the cultural and socio-economic implications must also be conducted.

2. Why do cultural and social issues matter in this case?

A "finding of no significant impact" on "the human environment," as defined in Sec. 1508.14 is that "human environment" shall be interpreted comprehensively to include the natural and physical environment and *the relationship of people with that environment.* (Sec. 1508.8).) While "economic or social effects are not intended by themselves to require preparation of an environmental impact statement" they must *not* be disregarded when compelling cultural and economic interests of impacted human communities are made clear to the agency. We submit that compelling interests apply here.

The FDA has not consulted with tribes and fishing groups directly impacted by this application. Tribes that have sent comments on this FONSI detailing the cultural and economic issues include the Aleutian Pribilof Island Community Development Association and the Sitka Conservation Society of Alaska, The Karuk Tribe of Northern California, and The Inter-Tribal Sinkyone Wilderness Council, ourselves and others. Fishing interests and environmental groups have given even more details regarding the impacts and we join in these multifaceted objections.

NEPA extends to "the natural and physical environment and the relationship of people with that environment." Agencies must assess the "aesthetic, historic, cultural economic, social, or health [effects]...whether direct, indirect, or cumulative" (40 CFR 1508.8) Furthermore, the definition of "significantly" under NEPA (Sec. 1508.27) includes anything where the extent of which is uncertain, it establishes a precedent, is unique or controversial, all of which apply here. Thus, there is a greater duty to evaluate the risks *especially if the possible effects are unique or unknown*, as established here. Thus a FONSI is inappropriate.

The entire FDA process is distorted by not giving the greatest airing of issues, wide study of alternatives, and the diverse public involvement that is necessary in this case. Primarily, however, we argue that there is such widespread and longstanding cultural significance to salmon that to disregard these values, it is not only a violation of all applicable laws protecting culture, it is also an act of racism and religious discrimination.

In brief, salmon are integral to cultures, ecology, and economic lives of all who live in the West and Northwest. There has already been so much degradation to salmon habitat in the region that many runs are endangered. And salmon, although it is a totem animal for many people, are in a precarious situation with an uncertain future. Both commercial and native fishing communities have depended on salmon runs for hundreds of years. The traditions of tribes are special in that they also make cultural connections to the restoration of these salmon runs and these traditions are thousands of years old.

The indigenous cultures that have occupied the coast and inland waterways have salmon traditions that go back thousands of years. Salmon are at the heart of their lives and ceremonies. Ecologically, the salmon are as vital to the West coast as the redwood forests, bears and eagles, all of which are part of an intricate web involving the entire cultural and natural basis of life.

All of these living organisms, along with the Winnemem Wintu, are known to have Chinook Salmon DNA in their make-up. And now this applicant is using Chinook genes in their patented commercial product, in direct violation of Winnemem values. Chief Sisk says: *"Salmon songs, dances, and drum beats on the rivers reaches the life of salmon just as the high mountain waters call them home from the ocean. This ancient and culturally practiced process is one that brings required health to all waters and mountains for all living things in reach of salmon. We realize that our "Science" and our cultural knowledge is overlooked in these studies."* This is an example of the cultural

implications, which, generally speaking, should be obvious. All the applicable environmental and cultural preservation laws require that they be considered. "*Our traditional and cultural science should be considered since we hold the most senior water rights and fishing rights for the Chinook salmon."*

Does the fact that this transgenic salmon include genes from the Atlantic and Chinook salmon, along with ocean pout (and undoubtedly other patented genetic constructs) matter? While it is not stated anywhere that we can find in the EA, is it a presumption that all these specific salmon genes, when removed to a laboratory or fish hatchery, somehow exempts these fish from being considered "salmon" as the ordinary person might think of it? How does a genetically modified organism become the sum of its parts when more than one species is involved? If it is not salmon in the ordinary sense, then what is it? The FDA considers this to be a "drug" that will be consumed by humans. However it does not require that this particular drug to be tested on humans or even rats. Using GRAS in this situation is simply not logical. It is either a food or it is a drug. If it is a drug it must be tested before allowing people to ingest it.

No human health impacts are being considered for the product itself or for the genetic constructs that have been added into the product. Chief Sisk says that *"Since Winnemem and other tribes are major salmon eating peoples it would seem that the effects would be levied in our communities first, therefore, we must insist that FDA require long range testing and results that transgenic salmon will have on babies, children at stages of growth, adults and diseases of multiplying cell structures. Also, studies should include the effects of consuming less Omega 3 and less healthy Omega 3's as well. The transgenic Atlantic salmon would replace high quality salmon with a low quality fast growing salmon that is also a potential health hazard - and this is being allowed only for the sake of fish sales at the market."*

Thus, there is clear and abundant concern and opposition to this product in the U.S. and it will face an outright ban in other countries. The Winnemem are concerned that ultimately, this poor quality fish will undermine the place of salmon in the North American diet. Rather than substituting one dietary item for another, transgenic salmon will in fact *reduce* the social and dietary value of salmon entirely. Approving this application will thus degrade salmon as we have known it for everyone. The biosecurity and the inherent integrity of this organism is a crucial social, cultural and biological value as well as a nutritional issue.

There are several issues here. One is that the FDA, incorrectly, but for purposes of this argument, is operating on the assumption that conventional foods and transgenic foods are alike. As a matter of logic, and the Winnemem do not agree, but if the FDA considers transgenic salmon to be the same as all salmon then *all* the beliefs and cultural issues of native people related to salmon are implicated. If it is equivalent, then all the cultural aspects of that generic "salmon" must be considered.

According to the Winnemem and other tribes, the genes of the Chinook *are* the Chinook. "*The Chinook are guided by the stars, the oceans currents and fresh waters, the songs,*

the dances, fires and the drums that call them up river to the streams and tributaries. This is a great fish that we should be doing all that we can to bring them back in the appropriate numbers in the wild and in the healthy rivers to benefit world health. They are here for us, they support our life and instead of misusing the salmon for private profit they should be restored to their natural and sacred place in our rivers."

The Winnemem believe that *"whatever a person eats becomes a part of them. This is why the cultural traditions includes ways of taking a live relative (animal) for food. The prayers one learns for taking and gathering the foods has a profound effect on a person's physical health, mental health, and growing connections of responsibilities to and for each other as well as for the lands and waters we relate to. This understanding is part of the ceremonies for all plants, trees, animals, birds, fish, water and air."*

Chief Sisk: This must be seen as an "extreme" effort to replace "real salmon" with untested and less quality fish. Perhaps, this is a way to ignore needs of "Chinook salmon" in the watersheds and open waters. It would seem that this is a violation of a public trust and definitely a violation of cultural and traditional obligations to tribes. It must be evaluated when the public is expected to become reliant on a transgenic farmed food, while slowly replacing an existing high quality health food. It must also be acknowledged that the existence of what the public calls a "Frankenfish" is unmeasured in threatening with a profound impact on the environment and waterways of the natural wild salmon. It must also be realized that Tribes will be among the first to suffer the results of the modified unlabeled "Frankenfish." It will change health standards to below what it is now understood as the Omega 3 and nutrimental values in the wild fish, while the farmed transgenic fish values will be below human health needs, noting as well the effects of the hormone risks to a vulnerable peoples of all ages. The Winnemem also call attention to the use of antibiotics as a way of reducing the quality of food, by overriding the natural process of selection leaving the healthiest to survive that provide the healthiest food sources. This healthy stock then proves to reproduce healthiest stocks of food sources.

The Winnemem Wintu are concerned that when salmon is altered by man *in any way* then it does not retain the right to be called a "salmon" and that this transgenic fish will confuse consumers. Chief Sisk says: *"Man made GE salmon no longer holds the knowledge of wild salmon and must not be confused with "real" salmon. Just as only certain people can be called Winnemem Wintu because of DNA and the fact that they have the same contact with the environment and cultural and traditional jobs and knowledge they are responsible to and for within that place, the make-up of salmon has so much to do with the waterways they swim in and that salmon, without that waterway knowledge, is not a salmon!*

People should not be mislead to think that growing this product in another country means it is anywhere near as healthy as real salmon who have to battle their way home. The relationship between the fish, the place, the waters, the rivers and the ocean are part of an ancient covenant that the government must respect and preserve. Our tribal ceremonies cannot help the man -designed low life GE fish. No dancing and no drum

beat vibration in the waters will give the heart life to this fake and genetically dumb transgenic fish. Tribal rights adheres to one ingredient survival foods like "real salmon" and un- altered salmon as being the healthiest foods. The tribes are among the highest health risk humans that have been impacted by fake foods of all kinds. Doing this extreme experiment to this one food, our salmon, the healthiest food choice that tribes rely on, is "wrong" in countless ways."

These are not contrary arguments. Because to consumers, however it is regarded, as unique in its transgenic form, or as equivalent, or as something else entirely, it will be called a salmon and will be marketed in the U.S. as salmon. Thus the FDA has decided that it is entitled to be regarded as such by consumers. But with transgenic salmon, consumers will not be getting all of the social and cultural values of salmon that they have come to understand as part of the story of salmon in the United States. Because salmon have deep cultural and economic roots in America, the meaning it has to these native tribes and their beliefs is entitled to the full protection of U.S. law, and even the meaning it has to consumers as a high value food or as an iconic fish should be protected.

There is a tendency in federal agencies to forget that America is made up of many diverse cultures, particularly the unique cultural values of its original inhabitants. Setting aside the obvious racial implications of this longstanding bias, there is a sound legal framework that requires federal agencies to take cultural and historic conservation into account.

Assuming the FDA does not have anthropologists, ethnographers and other social scientists on staff, there are easy ways to review available data on the topic of the cultural significance of salmon in the U.S. A simple search on line shows that salmon are commonly held to be sacred by many Native Americans. Searching for "salmon and native ceremony" immediately yielded 1,960,000 results, for instance.

And these social values are not restricted to native peoples within the context of their own communities. For many Americans, eating salmon, enjoying it as part of the rivers and coastal waters is a "quality of life" issue. Most Americans, native and non-native, place a high value on our diverse traditional native heritage and food ways and the law protects those interests as well. Respecting salmon as a totem animal is a value based not only in native cultures but also across the board. And it's the basis of a thriving tourism industry and related economic activity. Salmon, as we know it now, is a life style value throughout North America. Seventy percent of British Columbians say that "maintaining and restoring salmon runs in B.C. is as important to British Columbians as protecting French is to Quebeckers." http://www.theglobeandmail.com/news/british-columbia/bc-residents-consider-salmon-a-cultural-touchstone-survey-finds/article594381/

Nor is salmon ceremony restricted to native religions, but may also involve both native and Christian elements. For instance an abstract of *"The Fish God Gave Us" The First Salmon Ceremony Revived* says: *"Following the 1974 court order restoring their treaty-guaranteed salmon fishing rights, Coast Salish Indians of Puget Sound have reinstituted the long abandoned First Salmon Ceremony. The restored ceremony follows the pattern established in the nineteenth century of incorporating Christian symbols into native rituals and appealing to a Supreme Being as the ultimate source of legitimacy. However,*

it differs from other contemporary Indian rituals significantly, because it expresses a direct connection between ritual and economic power and because it attempts to justify the new economic order to non-Indians as well as Indians by emphasizing the antiquity of Indian association with salmon and the special God-given role Indians play in preserving this resource for all people of the Northwest."

In the case of the Winnemem Wintu, Chief Sisk says: *"Salmon is in our traditional stories, songs and dances. We must stay pure to exist in the ancient circle connecting our tribal customs to salmon. The Winnemem Wintu have a right and a responsibililty to protect salmon, and certainly NOT allow them to be genetically modified in anyway. They must not have their genes and DNA subject to exploring ideas. It must be recognized as an inherent right of Indigenous Peoples for the Winnemem Wintu to hold the salmon as a relative that is so intrinsic to our culture. There are complete ecosystems based on the clarity, knowledge and health of the salmon."*

"The Winnemem Wintu object to GE production, as it would certainly impact our obligation to salmon and would change the traditional responsibility to salmon and our relationship that exits for thousands of years. It is also the right of the tribes to expect the same engagement with the nutritional values such as the Omega 3's to maintain a quality of health. Salmon are part of our traditional exchange with the Winnemem Wintu, the trees, birds, animals, plants and soils as they purify the waters on each of their once in their life journey."

Chief Sisk weaves together the tribe's work to bring back the salmon to the McCloud river with a traditional salmon story, as part of her comments.

"One day coyote noticed fox was smoothing sticks and fashioning them into children who would help him find food. Coyote was filled with envy and soon started to build his own family. Impatient and greedy, coyote made his children with rugged, knobby sticks and built them much larger than him, thinking they would hunt more food this way. When he finished, however, his roughly-hewn children disobeyed his orders, turned against him and beat him up.

My tribe, the Winnemem Wintu, is a traditional salmon people that come from Mount Shasta in California, and we learned long ago from coyote it's dangerous to mimic the Creator. It's a lesson yet to be learned by AquaBounty, the company behind the genetically engineered salmon likely to be approved by the FDA. The GE salmon, which many have nicknamed Frankenfish, have been spliced with a poutfish gene and a growth hormone so it'll grow twice as fast. While the FDA is assessing their safety based on AquaBounty's own flawed studies, anyone with common sense can see Frankenfish poses a great threat to wild salmon.

If they escape into the ocean, they'll compete with wild salmon for food, contaminate the gene pool and possibly cause extinctions. This comes at a time when Pacific salmon runs have recorded historically low numbers, and when many, including my tribe, fear they may soon be lost forever. AquaBounty is like coyote building with sticks, and the GE

salmon are as shoddily constructed as coyote's children. Thus, we find it ironic that the government is fast-tracking the GE salmon yet skeptical about our own unorthodox but far safer plan to return Chinook salmon to our river, the McCloud.

Recently, we traveled to New Zealand where, under the auspices of local Maori tribes, we held a ceremony for the Rakaia River salmon, genetic descendents of the sacred fish that once spawned in the McCloud. During World War II, the Shasta Dam was erected, and it flooded our villages on the McCloud and permanently blocked our salmon from returning home. Thankfully they were not gone forever because in the 1870s, a McCloud River hatchery sent salmon eggs to New Zealand where they eventually spawned a stable fishery. Because it's impossible to know which current Sacramento salmon were once McCloud salmon, we've received approval from the Maori and New Zealand Fish and Game officials to import the Rakaia salmon back home.

We want to build an open-air hatchery to rear the young fry and re-introduce them to McCloud waters. To get the salmon around the dam, we've proposed using a natural creek that runs from the Sacramento and parallel to the dam's reservoir. If that creek was connected to the reservoir, our salmon would be dropped close to the McCloud's mouth. Once they get a whiff of their spawning waters, the salmon will find their way home. In New Zealand, Maori and biologists alike support this plan, but stateside agencies say they're worried about the genetics of the salmon, and that they might pose a danger to other California salmon.

There are no other salmon in New Zealand, and the Rakaia run is healthy and disease-free. The fish have undergone some genetic changes in the past 150 years, but if they adapted from the McCloud to the Rakaia, they surely can re-adapt back. Before the dam, the Winnemem spent our entire existence observing the salmon and passing this knowledge down through our stories. "Shouldn't thousands of years of direct observation be more respected than AquaBounty's farcical studies?"

The Winnemen are arguing that in all cases, fish and water management and approving the genetic manipulation of fish (and possibly associated water molecules) government agencies have a mandated legal obligation to consult and work with the Winnemem to ensure the best cultural and biological result.

Chief Sisk: *"I wish the government would remember why we're so close to a world without salmon. They built dams that destroyed the spawning grounds, dug mines that polluted the rivers and then acted surprised when the salmon disappeared. They've since been trying to replace the salmon they've destroyed with coyote-like machinations – trapping the salmon and hauling them by truck around the dams, building factory-like hatcheries and now the unholy conception of Frankenfish.*

All this effort and money spent, and the salmon are still imperiled. So if they're going to allow AquaBounty to raise the Frankenfish, they should at least allow us to try our plan that poses no danger, that splices no genes and that aims to restore the world to the way the Creator made it, the way it was meant to be and the only way we'll ever bring the

salmon (and ourselves) back from the brink of extinction. Unfortunately, the government is so busy inspecting fox; they're allowing coyote to run rampant."

The law on religious and cultural values in the United States and the role of the federal government is quite clear: the holder of the value or belief is to determine its importance, not the government, and certainly not a private company who wishes to destroy these beliefs as part of their desire for private profit. Assuming, therefore, that the commonly understood meaning of the word *sacred* applies, then we are talking about not only a living creature but something that has important religious and cultural significance.

When it suits molecular biologists, they like to say all genes are just their physical properties, and they claim biological uniformity to them all. They argue that to the FDA to get approval of foods that are genetically altered. When it suits them to claim that certain genes alone or in combination have unique properties, they claim the uniqueness of some genes and take that claim, inconsistently and hypocritically, to the patent office. The point is not the obvious hypocrisy, but that deciding one way or another is not based on science, facts, or the law. Science now shows irrefutably that transgenic constructs are not equivalent to those produced in natural breeding. So the federal government's choice that there is substantial equivalence here is based on an outdated policy. It is a political and commercial decision. Chief Sisk says: *"This fish should not be called a salmon, as it is just a mere man made fake and an extremely reckless food source. After altering DNA to create something that is less than the original salmon, this company is creating some sort of living creature that should not be called a salmon. All the altering makes it not a salmon and it is seen as interfering with the sacred connection to Olebis (Creator)"*

It is a fundamental principal of ethics that just because something can be done does not mean it should be done. Ethical implications were completely left out of the analysis in the Draft EA. However, the history of biotechnology is clear, the early scientists were concerned with the ethical considerations. Unfortunately, once private companies took over the technology, and its potential for profit became apparent, these companies designed a regulatory framework that favored their private interests and disregarded the ethical values. (The history of biotechnology and the inadequacy of U.S. regulation is fully documented in the book: *Uncertain Peril, Genetic Engineering and the Future of Seeds* – which is incorporated into this argument.) Worse, all consideration for human and environmental health is disregarded in favor of a business model for evaluating the risks these products pose to the environment and society. Decisions about evaluating these risks were made before any such products were on the market and before the science for testing and properly evaluating them were even developed, which is reckless on its face and not a legally defensible position.

The existence of this strong bias in molecular biology dates back at least one hundred years, to the rise of eugenics. The idea is that technology can improve on nature. When Watson and Crick described the structure of DNA it was popular for them to claim they had discovered the "secret of life." The now discredited "central dogma" of molecular biology was based on this intellectual hubris. Not all genes are interchangeable and the fact is we still do not know how the whole genetic framework of life really works. We are

just beginning to understand more fully the role of RNA and transcription factors. And we now understand that recombinant DNA technology was based originally on this faulty understanding of this "central dogma." The FDA's analysis of this "drug" is not based on science but on these discredited policy and commercially interested decisions.

As science progresses, we find more and more reason for caution in the use of recombinant DNA. In particular we are just learning about the role of microRNA in the human body and we now regularly see examples of horizontal gene transfer. Other countries that do study human and environmental health in regards to recombinant DNA are finding serious risks. And yet, even as our scientific understanding unfolds, the legal framework in the U.S. used for evaluating these products remains wholly inadequate. In the 20 years since the policy decisions that framed the role of the FDA were made no evaluation of the public interest and the public health, let alone the ethical considerations have been made. The use of this technology far exceeds our understanding of it.

The "FDA has concluded that food from AquAdvantage Salmon is as safe as food from conventional Atlantic salmon, and that there is a reasonable certainty of no harm from consumption of food from triploid AquAdvantage Salmon. Further, FDA has concluded that no significant food safety hazards or risks have been identified with respect to the phenotype of the AquAdvantage Salmon (FDA, 2010)." This statement was not made because of scientific testing or scientific basis for the claim.

This conculsion is a policy decision, one that does not address the basic issues involved. The FONSI and Draft EA describe the genetic construct as several fish trait genes but are these the only rDNA present in the organism? Has that genotype, after 8 generations, been established as stable in the genome? The pre-occupation with sterility and the possibility of escaping transgenic fish are warranted. But they are not the only issues here and they do not address the other evident problems.

Our concern here is that, typically, a biotechnology company will restrict its information and narrow the questions it decides to ask to a very low level of inquiry. It is bound to be confined to an inquiry that supports their desired outcomes. Will AquBounty allow its constructs to be studied by independent scientists? Has any independent peer-reviewed science been conducted and cited that could ascertain the likelihood that rDNA or fragments could survive the manufacture, development and food processing of this construct and then enter the human body and/or the environment?

To not answer these and other key scientific questions is tantamount to releasing a drug on the market without testing it at all. We suggest the FDA put this entire application on hold and ask Congress to come up with some legal framework that would allow FDA scientists to independently evaluate and test these products for their impacts on human health, society, the ethical implications of all aspects of this technology – especially, in this case, where an entirely new and unique food will enter the human diet.

No scientific findings were provided by the applicant that showed this transgenic fish will be safe to eat or even nutritionally equivalent to natural salmon. What will be the impact

of the growth hormone used in the creation of the fish on humans, especially on babies and adolescence during their growth years? Has the FDA considered the possible effects on adults with immune deficiency or the aging, who are encouraged to consume fish frequently? Will GE salmon and its parts be used for other fish products such as vitamins and plant food? Production will not be limited to human consumption, but could extend to cat food, dog food, and probably fish food for hatcheries.

The Winnemem are concerned that this transgenic life form could eventually affect all life, including birds, bears, coyotes, mountain lions, eagles and plants and minerals. Once placed in the stream of commerce and thus into the natural world, there is no control. The Winnemem believe all life is connected - but not just physically as molecules, but spiritually and in ways that are not immediately knowable.

There is one last issue we wish to raise with regard to the salmon itself. As the late "top doctor" Florence Jones, spiritual leader of the Winnemem Wintu would say about so many of the intrusions into her lands and traditions: "*what gives you the right?"*

We ask: what gives this company the right to decide what a living being, in this case a very significant totem fish should be? What gives them the right to alter its genes and construct a new living relative? What gives the government the right to approve a genetically altered living animal to be used for food? What gives anyone the right to change salmon into a genetically altered food for market and not even let unsuspecting consumers know what it is? As with all ethical challenges, this involves the slippery slope problem. If we say ok to fish, what will be next? Why not designer children? Are fish property? Who owns them? Are they only "things" or do they, as living beings have rights? It was not so long ago that certain humans were considered property. People of color and women were considered property.

The traditional beliefs and cultural customs of Native Americans will bear the burden of this attack on wild salmon, but the salmon have an inherent right as a living being to a natural life and to respect as a work of the Creator. The extension of rights to all living things is an important cultural and religious value.

The Winnemem Wintu are pointing out that the FDA is ignoring all these cultural implications of the salmon in the environment, land, rivers, and oceans and the great concentric circles of meanings and values that impact everyone. Salmon are interconnected with the waters, rock and gravel beds, sands, trees, water critters, flowers, birds, animals and other fish communities. They act as the gills or filtering water systems for these waters and ultimately for all living things, including humans. The Winnemem say that no human, be it a person, or a company, or the government, has the right to change the fundamental genetic makeup of living things, the fundamental cycles of life on earth. This is a moral issue but what is the law if it does not protect basic morals?

Thus, this application impacts ancient cultural values, crucial economic and moral issues of deep religious significance to many Americans, and the hopes and dreams of all those

who love salmon and want this magical and potent fish to thrive, just as it is. Its inherent integrity is inviolate.

The intent of NEPA and other applicable laws, and even the First Amendment is to assure the citizens of the United States that their government will not approve an action (especially by a private industry) that treads so clearly on and circumvents these moral and ethical questions with such impunity.

We understand that some people may not agree with native cultures that hold the salmon sacred. Or they may believe that the basis of life is simply made up of molecules and that all life on earth simply exists to be in the service of humans. Some may belief that all life is sacred and there are lines that must not be crossed, such as here, where we would refuse to allow the genetic recombination of any living being. Some Americans, as the thousands of comments already submitted show, object to genetically engineering anything. Others want safety studies, or they are concerned about the environmental issues. For whatever reason we hold them, U.S. law protects all of our beliefs. And when a government agency is taking an action that significantly impacts these beliefs, they must not be so flagrantly ignored, as they are here.

In our democracy, the role of our government is not to choose one belief over another, or to ignore them all, it is to evaluate them, consider them, and resolve the conflicts, according to the law. NEPA provides a way to air, in public, the pros and cons, and to provide for a full and fair process, as do other laws relating to religious freedom, and cultural preservation. To do otherwise is to circumvent the law, disregard science, and arbitrarily side with a particular bias. In this case, the applicant proposes a "drug" manufactured by an industry for commercial use, a private commercial use, which is, by definition, not in the public interest. Their conflicts of interest and deficiencies are readily apparent in their draft EA. The only remedy is a full EIS.

3. There is legal precedent for government action in the U.S. to take into consideration the cultural value and impacts of a transgenic organism.

Taro, the common name for *Colocasia esculenta*, is a staple of the diet of many nations and, like salmon, it has rich cultural, economic, and nutritional values. In Hawai'i it is considered to be an ancestor of the Hawaiian people. It is revered as a sacred plant as well as an important part of their diet and food economy. After Native Hawaiians strongly objected to the genetic manipulation of taro by the University of Hawai'i, they, and other researchers, and the government, took action to address these concerns.

Three actions were taken. One, the University of Hawaii decided not to subject Hawaiian taro varieties to genetic manipulation. In a second important action, the state of Hawai'i passed a law protecting Hawaiian taro. In a related action its genetic manipulation was stopped for a period of years in order to study the cultural and social impacts. Hawaii created a public agency known as **The Taro Security and Purity Taskforce** (http://www.tarotaskforcehi.blogspot.com/) funded and administered by the **Office of Hawaiian Affairs**. Its 2010 report to the legislature is titled "*E ola hou ke kalo; ho'i hou*

ka 'aina le'ia: The taro lives; abundance returns to the land." The report specifically states that in order to protect the integrity of taro, no genetic manipulation or alteration is allowed. The report is a very complete study of the economic, social, agricultural and cultural implications of taro and addresses its biosecurity.
http://www.oha.org/pdf/TSPTF_Report_091229.pdf

Thirdly, as reported by the Maui News on October 3, 2009 the government of Maui, Hawaii approved a ban on GMO taro. "The taro bill prohibits anyone from testing, propagating, growing or introducing genetically engineered or modified taro, or *kalo*, within Maui County. Council members voted 9-0 to approve the ban, saying they believed taro's cultural and spiritual significance to Native Hawaiians was more important than any other factor."
http://www.mauinews.com/page/content.detail/id/524344.html

Of course there are other governments taking actions to protect the cultural importance of plants and animals that are being proposed for genetic manipulation, including Japan and India, but we cite this U.S. example because it is in compliance with U.S. law and policy. And this makes it clear that these significant cultural values must be considered when native people make a claim related to their most cherished beliefs. Cultural biosecurity concerns are a fundamental human right and the FDA must consider them in its review of this application.

4. Critical New Water Issues Demand a full EIS:

The applicant states that a well inspected containment system, and the use of "triploid, all-female populations with eyed-eggs as the product for commercial sale and distribution" will guarantee no adverse environmental impacts. The applicant states that "use of physical, biological, and geographical/geophysical forms of containment… [and] for the proposed action (i.e., approval of an application for AquAdvantage Salmon), the conditions proposed in the materials submitted by the sponsor in support of an NADA would limit production of eyed-eggs to a single specific facility on PEI, Canada, for delivery to a single specific land-based facility in Panama for grow-out (i.e., rearing to market size), with harvesting and processing (e.g., preparation of fish fillets, steaks, etc.) in Panama prior to retail sale in the United States. The specific proposed limitations on the production and use (grow-out) of AquAdvantage Salmon, including the production of triploid, all-female fish populations, are designed to mitigate potential adverse environmental impacts."

The FDA takes the applicant's word for this, and, as explained above, provides for specific conditions of use. Unfortunately, it does not provide for a means to ensure these precautions are followed but states instead that "In the event of an approval of the application, the approval would only allow AQUADVANTAGE Salmon to be produced and grown-out in the physically contained freshwater culture facilities specified in the sponsor's NADA." However, the applicant's intentions to develop many other facilities are plainly stated. And the environmental laws and regulations of the countries where they will manufacture and produce this product will most likely not protect the natural

environment. Once approved, even as restricted in this first instance, this technology will proliferate. This has significant policy and environmental implications.

A significant concern to us is that the applicant has not provided for any consideration to what happens with the waste water from all three of these supposedly regulated international facilities, or even and especially the water used in, on, or with the processed fish that are imported into the U.S. The Draft EA states: "Disposal of AquAdvantage Salmon (including non-viable eggs, mortalities, and culls) and the non-viable waste material associated with the production, processing, and consumption of AquAdvantage Salmon (e.g., feces, fish pieces) would not require handling that is different from that used for wild or domesticated non-GE fish: the rDNA gene construct added to this fish is stably integrated into the genome; it is not infectious, communicable, or transmissible from these materials." The studies and charts that accompany this statement do not validate its stated conclusions. And the known peer-reviewed science regarding the stability and transmutability of rDNA does not support this conclusion.

The applicant claims, but does not prove, that its rDNA is stable and fully integrated into the target genome. In fact it is just as likely to be highly infectious and able to transmit its materials into other living organisms. More importantly, in this instance, it is the impact on water that we want to bring to the FDA's attention. **The Draft EA simply did not ask the right questions.** The questions should include whether or not all water, including the waste water, been subjected to chemical and molecular analysis to ensure that it is entirely purified of **all** contaminants before being distributed into the physical and human environment. The applicant focuses on filters and chemical contaminants, but will the waste water be tested for rDNA molecules and genetic constructs? Studies of the effects on ground waters, evaporative waters, and open waters must be considered.

One of the most outrageous and unsubstantiated claims made, industry-wide by biotechnology companies, is the stability of their patented rDNA. Anyone familiar with biotechnology is aware of studies that clearly show the impacts of genetic contamination. The facts and science simply do not support industry claims. Genetic contamination of living organisms is a fact, and the exchange of transgenic constructs with other living organisms is a fact. What makes the industry's denial of responsibility for their patented genes, as they continue to live and breed in the environment, even more alarming is the growing body of evidence that these constructs may pose serious human health problems.

As an example of such threat we cite an alarming new study showing that recombinant DNA molecules are now showing up and interacting in open waterways. And while the source of this genetic pollution is unknown, it is known that these transgenic molecules are exchanging genetic information with other molecules. Researchers in China have found recombinant drug resistant DNA, bacteria that are part of the manufacturing of genetically modified organisms, in every river they tested. And these bacteria are now exchanging their genetic information with the wild bacteria in rivers. As the study points out, bacteria already present in urban water systems provides "advantageous breeding conditions for the(se) microbes."

Attached as Exhibit A is the study mentioned above: **A Survey of Drug Resistance bla Genes Originating from Synthetic Plasmid Vectors in Six Chinese Rivers**
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Antibiotic resistance is perhaps the number one threat to public health today. The China study found these antibiotic resistant genes in the Pearl, Yangtze, Yellow and three other major waterways. And they suggest that these waterways may, as a result, "represent a source of antibiotic resistance in humans." While this research can only now be confirmed in China, and we cannot extend it elsewhere, since they found these resistant bacteria in every river tested, it should be considered commonplace, especially in places where transgenics are produced and consumed, such as in the United States.

Transgenic pollution is common in agriculture. U.C. Berkeley Professor Ignacio Chapela was the first to identify the presence of genetically engineered maize in local maize varieties in Mexico. He is an authority on transgenic gene flow. Commenting on the China study, he says it is alarming that "DNA from transgenic organisms have escaped to become an integral component of the genome of free-living bacteria in rivers." He adds that "the transgenic DNA studied so far in these bacteria will confer antibiotic resistance on other organisms, making many different species resistant to the antibiotics we use to protect ourselves from infections." And, Chapela points out that while this means we can expect to see more antibiotic resistance, that's "only one of many possible insertions of transgenic DNA into these bacteria."

We do not know the source of the transgenic DNA in China's rivers. "It could come from intentional releases (such as agricultural fields) or from unintentional escapes from contained situations (labs, industrial facilities)," says Chapela. But his concern is that these findings are only the proverbial tip of the iceberg. "There are all sorts of bacteria and recombinations that may result from this contamination, he says" The problem is, since we are not studying the impact on molecules in waterways, we just don't know.

Fish farming requires the use of antibiotics. And transgenic fish are even more susceptible to disease and presumably require more antibiotics. What then will this farming process contribute to the growing problem of antibiotic resistance and is there any evidence that the waste water from all contact with these fish: in Canada, Panama and the U.S. will not be "advantageous breeding grounds" for problematic microbes?

A full EIS must be conducted that includes all the issues raised in this comment. We join the growing public outcry against approving this application and decry the lack of oversight on these issues by the FDA.

As other comments have noted, the public opposition to this application has come close to a half-million people who object to the approval of transgenic salmon. We join more than 300 organizations concerned with the environment and both human and animal health, along with native and non-native fishing communities, retailers and restaurants who pledge not to sell this product, and the consumers who will not buy this product, and

dozens of members of Congress, including our Senator Boxer who has called for both labeling and for a transparent and scientifically based full analysis of this application.

In closing, we adopt and incorporate into our comments all the policy, environmental, health and legal arguments as set forth by the Center for Food Safety. We also support the labeling of all genetically modified foods although we wish to see this technology banned because of our basic moral position that recombinant DNA technology should not be used in food and farming, and no living being should be genetically engineered.

We demand a full environmental impact statement that evaluates all the environmental, health, safety, cultural, economic, and social issues.

Submitted April 26, 2013

Caleen Sisk, Chief - on behalf of herself as Chief, and on behalf of the tribe, and by Claire Hope Cummings, M.A., J.D.

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EXHIBIT A

A Survey of Drug Resistance bla Genes Originating from Synthetic Plasmid Vectors in Six Chinese Rivers

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[*]Supporting Information

ABSTRACT: Antibiotic resistance poses a significant challenge to human health and its rate continues to rise globally. While antibiotic-selectable synthetic plasmid vectors have proved invaluable tools of genetic engineering, this class of artificial recombinant DNA sequences with high expression of antibiotic resistance genes presents an unknown risk beyond the laboratory setting. Contamination of environmental microbes with synthetic plasmid vector-sourced antibiotic resistance genes may represent a yet unrecognized source of antibiotic resistance. In this study, PCR and real-time quantitative PCR were used to investigate the synthetic plasmid vector-originated ampicillin resistance gene, β-lactam antibiotic (bla), in microbes from six Chinese rivers with significant human interactions. Various levels of bla were detected in all six rivers, with the highest levels in the Pearl and Haihe rivers. To validate the bla pollution, environmental plasmids in the river samples were captured by the E. coli transformants from the community plasmid metagenome. The resultant plasmid library of 205 ampicillin-resistant E. coli (transformants) showed a bla-positive rate of

27.3% by PCR. Sequencing results confirmed the synthetic plasmid vector sources. In addition, results of the Kirby-Bauer disc-diffusion test reinforced the ampicillin-resistant functions of the environmental plasmids. The resistance spectrum of transformants from the Pearl and Haihe rivers, in particular, had expanded to the third- and fourth-generation of cephalosporin drugs, while that of other transformants mainly involved first- and second-generation cephalosporins. This study not only reveals environmental con-tamination of synthetic plasmid vector-sourced bla drug resistance genes in Chinese rivers, but also suggests that synthetic plasmid vectors may represent a source of antibiotic resistance in humans.

1. INTRODUCTION

Antibiotics remain in widespread use across the globe, popular among both healthcare providers and patients for their low toxicity, high efficiency, and relatively low cost. However, over-and misuse has promoted the emergence of antibiotic-resistant strains at an alarming rate.[1−4] The 2010 outbreak of Enterob-acteriaceae expressing the New Delhi metallo-β-lactamase-1 (NDM-1) gene served to enhance not only public awareness of the threat of drug-resistant bacteria to human health but also research efforts to better understand and control this phenomenon.[5,6]

Ecological investigations have found drug-resistant bacteria in natural water bodies, and many of the associated resistance genes have been identified.[7−10] Urban water sources have been reported to contain various contaminants that pose known and unknown risks to human health, ranging from pharmaceutical residues to animal husbandry or human waste products.[10−14] This milieu may create antibiotic selection pressures that promote evolution and survival of drug-resistant bacteria. Furthermore, the flow-storage characteristics of urban water systems may represent

advantageous breeding conditions for the microbes, effectively making polluted urban water a processing and storage "pool" of resistant bacteria and resistance genes.

The plasmid is an extra-chromosomal DNA molecule associated with prokaryotes and some unicellular organisms, which carries a variety of resistance genes and plays an important role in genetic diffusion of the resistance phenotypes.[15−20] Such exchange of genomic information has been shown to occur via conjugation and transformation processes, as well as through the actions of transposons and integrons.[19,21−25] Plasmids have been exploited as experimental tools to facilitate rapid and efficient genetic engineering. To improve transforming efficiency and clone yields, synthetic plasmid vectors were developed with series of selectable genetic markers,[26−28] among which antibiotic resistance sequences proved especially useful.[29] Further manipulation to

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achieve hyper-transmissibility allowed these synthetic plasmids, carrying multiple drug resistance genes, to be readily horizontally spread in the laboratory setting.

Over the past decade, genetic engineering technology has expanded beyond scientific research into practical industries, including biofuel fermentation, agriculture, and environment bioremediation.[30−36] Consequently, the synthetic plasmid vectors used in industrial applications have a greater chance of uncontrolled discharge into the environment, where they may pose a risk of transferring their antibiotic resistance genes to natural microbes. Several studies have attempted to assess the ecological risk of such wayward genetic material.[22,26,30,33,35,36] Stotzky and Babic reported that recombinant DNA molecules or fragments could be introduced to bacteria by bacteriophage or plasmid vectors.[22] Another group demonstrated antibiotic resistance transference occurring from engineered lactic acid bacteria and genetic-modified plants.[30] To reduce the risk of resistance diffusion, several antibiotic-free gene markers, such as the lacZY marker (Monsanto Agricultural Co.), have been developed.[26,27,36,37] However, the antibiotic marker-containing plasmids were used extensively and are still in widespread use in laboratory settings. Thus, environmental contamination by synthetic plasmid vector-sourced antibiotic resistance genes remains a threat.

This study was designed to detect drug resistance genes originating from synthetic plasmid vectors in environmental water samples, particularly rivers near metropolis areas with ap-preciable human interaction. A synthetic plasmid vectors-sourced drug resistance gene, β-lactam antibiotic (bla), was selected for the study. This gene encodes a specific β-lactam hydrolase, which is used for screening under antibiotic selective pressure and is the most common gene marker of synthetic plasmid vectors. The bla recombinant gene was derived from the wild-type β-lactam hydro-lase genes that confer robust drug resistance to pathogens and include the extended spectrum β-lactamases (ESBLs)[4,19] and New Delhi metallo-β-lactamase-1 (NDM-1),[5,6] but which also

have high mutation rates.[15,38]

The prospective surveillance study of resistance genes originated from synthetic plasmid vectors described herein was carried out by PCR and qPCR. To validate the vector sources, a metagenomic approach[39] was adapted to capture various plasmids from the water samples for analysis. By these methods, blaDrug resistance gene contamination was detected in aquatic micro-ecosystems and evidenced to have originated from synthetic plasmid vectors. These data not only identify a potential source of antibiotic resistance but also provide a novel method to obtain plasmids from complex environmental samples and unculturable microbes.

2. MATERIALS AND METHODS

Sampling Sites. Water samples were collected from six rivers in China between March and June in 2011: the Sungari River, the Haihe River, the Yellow River, the Yangtze River, the Huangpu River, and the Pearl River. These rivers transverse five metro-polises of eastern China with dense populations (Figure 1), and represent typical groundwater bodies. The sampling sites were downstream of the urban regions.

Enrichment of Microorganisms. Briefly, 10−15 L water samples were filtered though a sterilized steel filter (Millipore, Billerica, MA, U.S.) equipped with a 0.22 μm polycarbonate membrane under 0.1−0.2 MPa pressure. Then, the membranes with collected bacteria were immersed in 3% beef extract solution (BD Biosciences, Franklin Lakes, NJ, U.S.) in a magnetic stirring apparatus and incubated for 30 min. The eluted bacteria were

Figure 1. Geographic distribution of rivers sampled in China. Water samples were collected from the Sungari River in Harbin (site A: 45°46′54.59″ N, 126°37′4.92″ E), Haihe River in Tianjin (site B: 39°6′58.36″ N, 117°13′20.66″ E), Yellow River in Ji′nan (site C: 36°43′32.93″ N, 116°59′37.20″ E), Yangtze River in Shanghai (site D: 31°24′44.12″ N, 121°29′42.20″ E), Huangpu River in Shanghai (site E: 31°29′9.83″ N, 121°30′1.98″ E), and Pearl River in Guangzhou, Guangdong Province (site F: 23°4′10.65″ N, 113°26′11.70″ E).

recovered by centrifugation at 8000 rpm for 10 min at 4 °C. The pelleted cells were subjected to three washes with phosphate-buffered saline (PBS) to eliminate chemical impurities. Finally, the cells were resuspended in PBS and stored at −80 °C until use for plasmid extraction.

Plasmid Extraction. Plasmids were extracted with the E.Z.N.A. Plasmid Mini Kit II (Omega, Doraville, GA, U.S.),

according to the manufacturer's instructions. The purity and concentration of plasmids were determined by the GeneQuant 1300 spectrophotometer (GE Healthcare, Uppsala, Sweden), and samples with sufficient purity (A260/A280 = 1.8−2.0) were applied as template in PCR analysis.

Development of Universal Primers. Gene-specific primers targeting the sequences of synthetic plasmid vectors-sourced antibiotic resistance blá genes were designed with the BioEdit sequence alignment editor (v7.0.9) and Primer Premier 5 software (Premier Biosoft International, Palo Alto, CA, U.S.). In total, three pairs of primers were designed, including one pair for routine PCR amplification and two pairs for qPCR. To avoid amplification bias caused by multicloning sites and sequences of inserted fragments surrounding the blá gene, the blá-Q-1 F/R primers were designed near the 3′ sections of the blá sequence. In addition, the traditional sequencing primers of the pBR322

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Table 1. Primers Used in This Study

primers	target sequences	sequences, 5′-3′	p
pUC-F pUC-R	cloning regions in the pUC vector	TGTAAAACGACGGCCAGT	PCR
		CAGGAAACAGCTATGAC C	
pBR322-F pBR322-R	cloning regions in the pBR322 vector	AAGTGCCACCTGACGTCTAA	PCR
		GCCTGCCACCATACCCAC	
blá-1F blá-1R	locus 3086−3558 region in the pBR322 vector	CAAGCAGCAGATTACGCG	PCR
		TAGCTTCCCGGCAACAAT	
blá-Q-1F blá-Q-1R	locus 3143−3305 region in the pBR322 vector	TACGGGGTCTGACGCTCA	qPCR
		TAAGCATTGGTAACTGT	
blá-Q-2F blá-Q-2R	locus 3038−3903 region in the pBR322 vector	TTGATCCGGCAAACAAAC	qPCR, curves
		CCGGGCAAGAGCAACTC	

vector (GenBank accession nos. J01749) and pUC vectors (pUC18: L08752 and pUC19c: L09137) were used in the analysis, all of which covered insertion sites for sequencing detection of exogenous genes. All of the primers are listed in Table 1 and were synthesized by Invitrogen Co. (Shanghai, P. R. China).

PCR. To detect the blá gene in water samples, PCR was carried out in a 50 μL reaction mixture containing 0.25 μL of GoTaq DNA polymerase (5 U/μL), 10 μL of 5× GoTaq Flexi Buffer, 5 μL of 25 mM $MgCl_2$, 1 μL of 10 mM dNTPs, 2 μL of each primer (blá-1F and blá-1R), 2 μL of extracted plasmid, and 27.75 μL of nuclease-free water. The DNA polymerase and main reagents were provided by Promega (Madison, WI, U.S.). The reactions were carried out with an Applied Biosystems Inc. (ABI) 2720 thermocycler (Carlsbad, CA, U.S.) under the following con-ditions: (i) initial denaturation at 95 °C for 2 min; (ii) 35 cycles of 95 °C for 30 s, 60 °C for 45 s, and 72 °C for 1 min; and (iii) nal elongation at 72 °C for 5 min. Positive control reactions were carried out using the pBR322 and pUC19c vectors (TaKaRa, Dalian, China) as template, and the amplified blá gene product from each was 480 bp in length.

In addition, traditional recombination screening PCR was performed to confirm the presence of a complete insert. The 50 μL reaction mixture was similar to that described above, but with the primer pairs for the pUC vectors and the pBR322 vector (pUC-F/R and pBR322-F/R). The thermal cycling conditions were as follows: one cycle of initial denaturation at 95 °C for 2 min, followed by 30 cycles of denaturation at 95 °C for 30 s, annealing at 53 °C for 45 s, and extension at 72 °C for 90 s, and with a final elongation step at 72 °C for 5 min. The PCR products varied in length according to the inserted fragment.

All PCR products were resolved by electrophoresis in 2% agarose gel. The fragments were visualized by staining with ethidium bromide and evaluated by digital processing with the ImageQuant 350 imager (GE Healthcare, Piscataway, NJ, USA). qPCR. To quantitatively assess the levels of blá genes in water samples, a qPCR assay was performed with the ABI 7300 Real-Time PCR System and TaKaRa's SYBR Green I quantitative PCR kits, according to the manufacturer's instructions. The reaction was carried out in a 20 μL mixture containing 10 μLof 2× SYBR Premix ExTaq, 0.4 μL of ROX reference dye, 0.4 μL of each primer (blá-Q-1 F/R), 2 μL of plasmid, and 6.8 μL of nuclease-free water. The following three-step PCR program was used for amplification: an initial denaturation step at 95 °C for 30 s, followed by 40 cycles of 95 °C for 5 s, and 60 °C for 31 s. Each sample was tested three times in separate runs and assayed in triplicate for each run.

The blá-Q-2 F/R primers, whose amplification products covered the entire blá sequence, were used to prepare the qPCR

standard curves (gene copy numbers from 10^2 to 10^7). The standard curves were repeatable and consistently presented significant correlations ($r^2 \approx 0.99$, data not shown).

Construction of the Plasmid Metagenomic Library. A plasmid metagenomic library was constructed as follows: Briefly, samples of total plasmids extracted from different water samples were transformed into electro-competent Escherichia coli HB101 cells (TaKaRa) by a mini-pulser (Bio-Rad, Hercules, CA, U.S.) using a pulse voltage of 2.5−3.0 kV and resistance of 200 Ω for 4−7 ms. The electroporated cells were selectively cultivated by incubation in Super Optimal Broth (SOB) culture medium (BD Biosciences) containing 60 μg/mL ampicillin (Sigma-Aldrich, St. Louis, MO, U.S.) and stored at −20 °C.

Antibiotic Sensitivity Test. The Kirby-Bauer disc-diffusion test, recommended by the Clinical and Laboratory Standards Institute (CLSI, U.S.),[24,25] was used to profile the antibiotic susceptibilities of the ampicillin-resistant E. coli transformants obtained from river samples. Antibiotic discs (National Institutes for Food and Drug Control (NIFDC), P. R. China) were placed on plating media that had been coated with the respective resist-ant strains. After 24−36 h of incubation at 37 °C, the inhibition zones′ diameters were measured and compared with the standard value scales published by the NCCLS to make initial estimates of resistance. Results were also contrasted to the inhibitory zones produced by the quality control strain, E. coli ATCC 25922, as well as the negative control strain, E. coli HB101.[13,38,40] Intergroup differences were evaluated for statistical significance by one-way ANOVA test and the Fisher's least significant difference test (known as the LSD multiple comparison) using the SPSS statistical software (v16.0; Chicago, IL, U.S.).

Sequence Analysis. To ensure the accuracy of PCR results and further investigate the resistance gene sources, PCR products amplified from the water samples and the recombinants in the plasmid metagenomic library were subjected to direct sequenc-ing. For this procedure, the PCR products were first purified by an agarose gel purification kit (TaKaRa), according to the manu-facturer's protocol. The sequencing protocol was carried out by Invitrogen Co. The sequences were compared against the GenBank nucleotide database using the online BLAST and VecScreen tools to determine the recombinant vector elements.[41]

3. RESULTS

Existence of Vector-Sourced Resistance Genes in Chinese Rivers. The presence of synthetic plasmid vector-sourced resistance genes was determined in six Chinese rivers with significant human interaction. PCR detected blasequences of synthetic plasmid vectors in samples from all six rivers (Figure 2). In addition, PCR with sequencing primers for the commonly used

Figure 2. PCR detection of vector-sourced resistance genes in Chinese rivers. The primer pairs of pBR322-F/pBR322-R (A group), bla-1F/bla-1R (B group), and pUC-F/pUC-R (C group) were used to detect the pBR322 vector, blagene, and pUC vector in the water samples from the Sungari River (Lanes A1, B1, C1), the Haihe River (Lanes A2, B2, C2), the Yellow River (Lanes A3, B3, C3), the Yangtze River (Lanes A4, B4, C4), the Huangpu River (Lanes A5, B5, C5), and the Pearl River (Lanes A6, B6, C6). Lanes A0, B0, C0: negative control reaction (PCR grade H_2O without template); Lanes A7, B7: positive control reaction (with vector pBR322 as template); Lanes C7: positive control reaction (with vector pUC19c as template); Lane B8: negative control strain (Klebsiella pneumoniae ATCC 700603); Lane B9: negative control strain (E. coli ATCC 35218).

laboratory vectors, pBR322 and pUC, also produced amplifica-tion products from the samples from all six rivers (Figure 2). These data demonstrate the existence of environmental microbes carrying ampicillin-resistance genes sourced from synthetic plasmid vectors.

Distinct Distribution Profiles of the Vector-Sourced Resistance Genes in Chinese Rivers. SYBR Green I qPCR assay confirmed blagenes in samples from the six rivers and demonstrated the quantitative distribution profile among these water sources (Figure 3). The concentrations of blain the Pearl

Figure 3. The number of bla in different river samples. Total microorganisms were extracted from 10 L river samples and assayed by qPCR for detection of the bla gene. The error bars represent standard deviations.

and Haihe rivers were the highest, reaching up to $(4.7 \pm 0.6) \times 10^3$ copies/mL and $(3.0 \pm 1.0) \times 10^3$ copies/mL, respectively ($p > 0.05$). Meanwhile, the Yellow River showed the lowest concentration of bla, with $(6.7 \pm 5.0) \times 10^1$ copies/mL.

Plasmid Metagenomic Confirmation of the Vector Sources of bla Environmental Contamination. To validate the synthetic plasmid vector sources of resistance genes con-taminating Chinese river microbes, plasmid metagenomes were applied to capture various ampicillin-resistance plasmids from the water samples. The bla gene was successfully PCR-amplified from only 27.3% (56/205) of the ampicillin-resistant trans-formants (Table 2). All 205 of the transformants were tested for their resistance to β-lactam and other basic antimicrobial drugs (Table 3) and interpreted according to the CLSI guidelines. The resistance spectra of transformants originated from the Pearl and

Table 2. Distribution of bla in the Plasmid Metagenomic Library

sample sources	transformants, n	bla-positive strains, n	detection rate, %
Sungari River	36	9	25.0
Haihe River	32	7	21.9
Yellow River	35	8	22.9
Yangtze River	33	12	36.4
Huangpu River	33	10	30.3
Pearl River	36	10	27.8
Totals	205	56	27.3

Haihe rivers were found to include third- and fourth-generation of cephalosporin drugs (e.g., cefotaxime and cefoperazone). The resistance spectra of other transformants were mainly directed to the first- and second-generation cephalosporin drugs (e.g., cefalotin, cephazolin, cefmetazole, and cefoxitin). The transformants originating from the Sungari River showed the highest resistant rate to cefalotin (47.2%).

Transformants with resistance to tetracycline were found from all six rivers, which was also found in isolated strains from the Pearl River.[42,43] In addition, some transformants showed resistance toward other antibiotics (e.g., gentamicin and sulfanilamides). All of the various resistance phenotypes detected between the transformants and control strains were significantly different (Fisher's LSD test, $p < 0.05$) (Tables S1 and S2 of the Supporting Information, SI).

We also examined the minimal-inhibitory concentration (MIC) of ampicillin toward all 205 transformants. The results showed that the transformant strains originating from the Pearl and Haihe rivers had significantly higher MICs than the HB101 control strain (both: 120 μg/mL vs 60 μg/mL). (Table S3 of the SI).

Sequence Identity of bla Environmental Contaminants and Plasmid Vector Sources. PCR products of six river samples and six transformants (Code Nos. A-029, B-018, C-020, D-010, E-024, and F-013) in the plasmid metagenomic library were selected for sequence alignment and phylogenetic analysis which aimed to explore similarity between neighboring seq-uences (GenBank Accession Nos.: KC145817-KC145828). Alignment hits most frequently represented artificial or synthetic constructs, including cloning, expression, shuttle, gene-fusion, and gene trap vectors (see Figures S1 and S2 of the SI). In addition, VecScreen results demonstrated that the segments matched most strongly to the pBR322 vector, with sequence identities up to 100% (Figures S3 and S4 of the SI). Further systematic (one-by-one) analysis of the matched regions revealed the presence of a partial bla in all, which suggested that bla contaminants exist in the rivers

Table 3. Resistance of Recombinants to Different Antibiotics

antibiotics				
Cefalotin				
Cephazolin				
Cefmetazole				
Cefoxitin				
Cefotaxime				
Cefoperazone				
Piperacillin				
Meropenem				
Chloromycetin				
Gentamicin				
Tetracycline				
Ciprofloxacin				
Sulfanilamides				

and bla exists in the transformants of the plasmid metagenomic library.

4. DISCUSSION

The bla gene was developed by recombinant technology as a functional fragment (~861 bp) to support cloning applications. Over the years, this antibiotic-selective sequence has been introduced into a series of popular cloning vectors, including pBR322, pUC18, and pUC19c, which have become key tools of genetic engineering in the laboratory and beyond, such as in agriculture. Although the bla gene sequence of the synthetic plasmid vector (locus 3293−4153) is identical to that of the wild-type plasmid,[44,45] a substantial difference in the sequences upstream of the bla gene was apparent. Specifically, the trans-posase gene that is present in the wild-type Tn3 was lost, and the pBR322 locus 1763−3146 was obtained from another plasmid, pMB1. These differential sequence features make it possible to distinguish the synthetic plasmid vector-sourced bla from the wild-type plasmid-sourced bla using sequence-based methods, such as PCR with primers designed to span the loci of 1763− 3146 and 3293−4153. Furthermore, the pBR322 locus 2347−4353 was found to be shared with pUC19. Hence, in this study, synthetic plasmid vector-specific PCR and qPCR primers targeting the regions of 3086−3558 and 3143−3305 were used to survey the existence and distribution of vector-sourced ampicillin-resistant gene contamination in environmental microbes (Figure 4). To our surprise, the bla gene from the synthetic plasmid vector was detected in samples taken from all six of the rivers targeted for surveillance. Moreover, the richness of bla in those rivers was not uniform. The Pearl River, which showed the most enriched levels of bla, is the largest river system in Southern China and flows through a large industrial area, where it receives a large amount of industrial and domestic waste from Guangzhou. Previous studies have also identified the Pearl River as the most antibiotic-polluted river in China, with levels being higher than those found in rivers in the United States and other developed nations of the Western hemisphere, regardless of season (spring or summer).[46] In addition, the Haihe River, which is the largest water system in Northern China, showed the second highest level of bla pollution in our study, and previous studies have detected significantly enhanced levels of sulfonamides.[42]

However, the mere presence of the bla sequence does not provide direct evidence of origination from a synthetic plasmid source, and it necessary to obtain and analyze further sequences associated with the bla gene in the environmental samples to identify the plasmid source. Environmental samples are com-posed of a complex and dynamic bacterial community, and a large portion of those microorganisms are not amenable to culture in lab. Even in culturable microorganisms, however, not all plasmids are amenable to capture by traditional culture methods. Meta-genomic technology, which involves transforming environmental genomic DNA into a laboratory culture-competent recipient strain,[39] is a unique way to study complex genetic samples from ecosystems without purifying strains. It has recently been proven useful in performing diversity analyses of environmental samples.[47,48] Therefore, we performed a novel adaptation of this approach to capture plasmids carried by unculturable microbes. In the original description of the metagenomics procedure, PCR-derived DNA fragments from environmental samples were first recombined into plasmid vectors and then introduced into labo-ratory bacteria.[39] Since our study concerned the plasmids within environmental microbes, the procedure was modified so that the plasmids were extracted and electro-transformed directly into the laboratory strains. Antibiotic selective pressure was used to identify clones expressing resistant plasmids, which were then isolated and analyzed. We named this approach "plasmid metagenomics". Using this procedure, we constructed a plasmid metagenomic library of 205 environmental plasmid-carrying E. coli HB101 strains,

which showed a positive blárate of 27.3%.

Collectively, the results from this study demonstrated environmental pollution of synthetic plasmid vector-sourced drug resistance genes in China. Previous studies of drug resist-ance genes in aquatic ecosystems have reported correlations between distribution and antibiotic contaminations[10,11,13] and environmental deterioration caused by human activities.[9] It has also been reported that drug resistance could be transferred from genetic-modified crops to environmental microbe species inhabiting the soil,[31] or from lactic acid bacteria in food to the intestinal bacteria.[47] The data from our study suggest that pollution of synthetic plasmid vectors-sourced drug resistance genes in rivers may be another cause of drug resistance in animals and humans. Therefore, the potential hazards of environment release of synthetic plasmid vectors and genetically modified products containing the vector components should be given more attention.

In conclusion, all six rivers near metropolitan areas in P.R. China were found to be contaminated by bládrug resistance

Figure 4. Sequences in pBR322 targeted by the PCR primers and qPCR primers. The target regions are loci 3086−3558 and 3143−3305, respectively.

genes that had originated from synthetic plasmid vectors. Thus, synthetic plasmid vectors may be a potential source of antibiotic resistance.

ASSOCIATED CONTENT

* Supporting Information

This information is available free of charge via the Internet at http://pubs.acs.org/

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Notes

The authors declare no competing financial interest.

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Document 5

Partial Wintu/Wintun Bibliography

Partial Wintu/Wintun Bibliography

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Document 6

Forest and Stream, August 6, 1910, p. 220

Of American fishes the following species have been brought into New Zealand: Rainbow trout (*Salmo iridcus*), eastern brook trout (*Salvelinus fontinalis*), whitefish (*Coregonus clupeiformis*), chinook salmon (*Oncorhynchus tschawytscha*), sockeye salmon (*O. nerka*), landlocked salmon (*Salmo scbago*), Mackinaw trout (*Cristivamer namaycush*), lake herring (*Argyrosomus artedi*) and catfish (*Ameiurus vulgaris.*) Of these we have successfully acclimatized the rainbow trout, brook trout and the catfish, and as the chinook and sockeye salmon have now returned from the sea to spawn three seasons in succession, I think that we can fairly claim that they are established as well.

The following account of the introduction of the fishes mentioned above may be of interest:

Three consignments of rainbow trout eggs were obtained from California by the Auckland Acclimatization Society in 1883 and 1884. These, I believe, were the only rainbow eggs which have been brought to this country. A considerable percentage were lost on the voyage down, but sufficient were saved to provide a stock of brood fish for the hatcheries, and a number to plant in some of the northern rivers. It took some years to work up a stock of spawners at the hatcheries, and as the young fish were produced they were planted in streams all over the Auckland Province. It is about fifteen years since rainbow trout commenced to be caught by anglers, and now they exist in immense numbers in almost all the rivers, lakes and streams in that part of the country.

These fish grow to a great size in this country. While the most common weight caught by anglers is from two to eight pounds, specimens are frequently taken ranging from ten to eighteen pounds, and occasionally over twenty pounds. On the walls of my office I have six mounted specimens taken in the spawning season from a stream flowing into Lake Tarawera; the smallest of these is twelve pounds and the largest eighteen pounds. Heavier specimens could have been procured, but these were chosen on account of their elegant shape. They are most plentiful in the streams flowing into and in Lakes Rotorua and Rotoiti. By angling (and anglers are restricted to thirty pounds weight a day), over twenty tons of trout have been taken out of these two small lakes this season. Rainbow trout fishing has now become one of the chief attractions for tourists to the Rotorua district, and the value of this fish to the country, both for sport and food, is immense.

The first eastern brook trout eggs brought to this country were imported by a Mr. Johnson, of Christchurch, in the South Island, about 1882, and from Mr. Johnson's importation various acclimatization societies obtained eggs from which they subsequently raised stock fish for their hatcheries. From these hatcheries large numbers of young fish of various sizes have been planted in streams both in the north and south. They made a good showing in a few streams for a time, but since the introduction of the rainbow and English brown trout into these streams the brook trout in some instances have wholly disappeared and in others have been greatly reduced in numbers. Our people think highly of this beautiful fish and are much disappointed because better success has not attended the efforts made to thoroughly establish them in our waters.

The first importation of chinook salmon eggs was made in 1875 and from that date to 1880 several shipments were made, some by the Government and some by acclimatization societies. On arrival the salmon eggs were parceled out to different acclimatization societies and the young fish when hatched were planted in rivers from the north of Auckland to the far south. Through want of experience, unsuitable water at the hatcheries and planting the young fish in rivers when the conditions were entirely unsuitable for them, no results were obtained from these shipments.

In 1900 the Government decided to make a vigorous and systematic effort to acclimatize this fish. A site for a salmon station was chosen on the Hakataramea River, a tributary stream of the Waitaki, and the erection of the hatching shed was commenced in November of that year. The Government decided to confine its efforts to one of the rivers considered to be the most suitable for these fish, and the Waitaki was chosen, as in its general characteristics it bears a considerable resemblance to the rivers on the Pacific coast of America which the chinook salmon frequent in the spawning season.

In January, 1901, the first shipment of chinook eggs for the Government salmon station arrived. They were supplied by the United States Bureau of Fisheries, from its station at Baird, California, on the McCloud River. The shipment came over in charge of G. H. Lambson, superintendent of the Baird station, and arrived in excellent condition.

From 1901 to 1907 five importations of eggs were made, invariably arriving in splendid condition, the loss in most of the shipments not amounting to more than one-half per cent.; i. e., 99½ per cent. of good eggs were unpacked into the hatching boxes at Hakataramea. The total number of eggs in the five shipments reached about 2,000,000, and from these fully 1,700,000 young fish have been turned out. They were planted at various ages from fry to two-year-old fish, but about 90 per cent. were planted just after the sac was absorbed.

Now, as regards the definite results obtained from the young salmon planted. In 1905 salmon were reported as having been caught by anglers in the tideway near the mouth of the Waitaki River, and a specimen of these fish was identified by the late Sir James Hector as a male of the genus *Oncorhynchus*. In May and June, 1906, salmon were found spawning in the Hakataramea River, and specimens were identified by Sir James Hector and myself as chinook. In April and May last year (1907) quite a run of salmon came up the Waitaki River and spawned in several of its main tributary rivers. In the Hakataramea from 300 to 400 salmon spawned in the two miles of river before it joins the Waitaki, and a number of these fish were caught and stripped and about 30,000 eggs put down to hatch. The eggs hatched out well, and a number of the young fish are now being reared at the salmon station for experimental purposes. This season the run of spawning salmon in the Waitaki is similar to last year as to quantity, but on an average the fish are considerably heavier, and they seem to have run higher up the main tributary rivers of the Waitaki. Several dead and "spent" fish measured from three feet to three feet ten inches in length. Owing to floods when the best run was on, we were able to collect only about 50,000 eggs this season. From the knowledge now acquired with regard to the run of fish in rivers further inland, arrangements will be made to collect eggs on several streams next season. A point which will be interesting to salmon authorities is that as far as we have gone we have had no "summer" run of salmon; they have always come in April, May and June—months which correspond, as regards season, with November, December and January in the Northern hemisphere, and the months when the "winter" run of chinook salmon takes place in the Sacramento. Now, I understand that the five shipments of eggs imported to this country from 1900 to 1907 were all from "winter" run fish, and so far we have only had a "winter" run of spawning salmon here.

Only one importation of sockeye salmon eggs was made to this country. A shipment of 300,000 was presented to the New Zealand Government by the Canadian fisheries department in 1902. Most of the young fish were planted in streams flowing into Lake Ohau, a lake fed by rivers flowing down from the snowy Southern Alp Range. In 1905 and 1906 reports were received of salmon spawning in the rivers at the head of Lake Ohau, but we were not able to procure specimens until the "run" which took place in April last year.

The officer who visited the locality reported having seen a large number of dead salmon. He netted a number of fish and brought six specimens, the examination of which by experts proved them to be sockeye.

The first shipment of whitefish eggs was brought from America in 1877, and from that year to 1904 several shipments were brought over. Owing to the want of expert attention on the voyage, these shipments generally arrived in indifferent condition, and as none of the hatcheries had proper appliances for hatching the eggs, I am afraid that most of them were killed. In 1904 the New Zealand Government determined to make a systematic effort to acclimatize this fish and erected hatcheries, equipped with the proper whitefish hatching jars, on Lakes Te Kapo and Kanieri. Four shipments of eggs were brought over from 1904 to 1907, and as they were carefully packed and selected

(*Continued on page 232.*)

Anglers' Club of Milwaukee.

Milwaukee, Wis., July 30.—*Editor Forest and Stream:* Following are the scores made at the contest held Wednesday, July 27:

	¼-ounce.	½-ounce.
A. F. Bingenheimer	99 3-15	98 1-15
Harry Mullen	98 1-15	98 4-15
T. A. Forsyth	98 1-15	98 8-15
C. A. Rhine	97 11-15	98 1-15
M. A. Beck	97 9-15	98 14-15
Albert Lahman	97 5-15	97 11-15
C. L. Tolfson	..	98 3-15
M. H. Williams	..	97 1-15
Chas. Vandenburg	..	97
W. F. Lathrop	..	96 10-15

A. F. Bingenheimer won the quarter-ounce event with the high score of 99 3/15, which is the highest score ever made at any of the contests held by this club.

The national tournament will be held in Chicago, Aug. 18, 19 and 20. We would like to have as many as possible attend this tournament.

The next contest will be held at Washington Park, Wednesday, Aug. 3.

C. L. Tolfson, Sec'y.