Spring Chinook Refugia

Conservation of California's Imperiled Wild Run

Fall 2015

Salmon River Restoration Council

The Spring Run

Lyra Cressey
SRRC Associate Director

There was a time when 100,000 wild spring salmon would run up the Klamath River and its tributaries; a time when stories tell of salmon so thick that horses balked fording the river through their masses. Entering the Klamath on the tide of the spring run-off, spring Chinook would migrate quickly upriver to the headwater streams, there to hold in deep, cold pools through the long months of summer. The Salmon, Scott and Shasta, as well as the Sprague and Williamson Rivers all hosted large populations that fed both humans and nature bounteously. Salmon and especially spring salmon, was the single most important source of food for the tribes living along the rivers of the Klamath, as well as the center of their spiritual lives. Prior to Euro American contact, up to 50% of native people's energy and protein came from the rich, nutritious salmon. There is no overstating the importance of spring salmon for the health and well-being of the entire Klamath River ecosystem.

Today, after a century and a half of mining, overharvest, dam building, logging and farming, wild spring Chinook salmon in the Klamath have essentially disappeared. Only the Salmon River and South Fork Trinity still host viable runs, and they are dangerously small. Over the past 25 years of monitoring, the Salmon River run has averaged just over 700 adult fish, with some years dropping to as few as 90. The South Fork Trinity run is even more imperiled, hovering close to an "extinction vortex" (see article page 12).

The Salmon River Restoration Council was formed in 1992 when a group of community members became aware of the significance of the dwindling population of spring Chinook salmon. Educational workshops and theatrical performances were held to increase local awareness of the issue, and

community members began participating in monitoring efforts being conducted by managing agencies. Since those early days the SRRC has become a leader in the effort to protect and restore wild spring Chinook populations in the Klamath. Many monitoring and habitat restoration projects have centered around understanding and restoring spring Chinook. We've focused on bringing tribes, agencies and communities together to develop solutions that will hopefully one day result in the recovery of these unique fish.

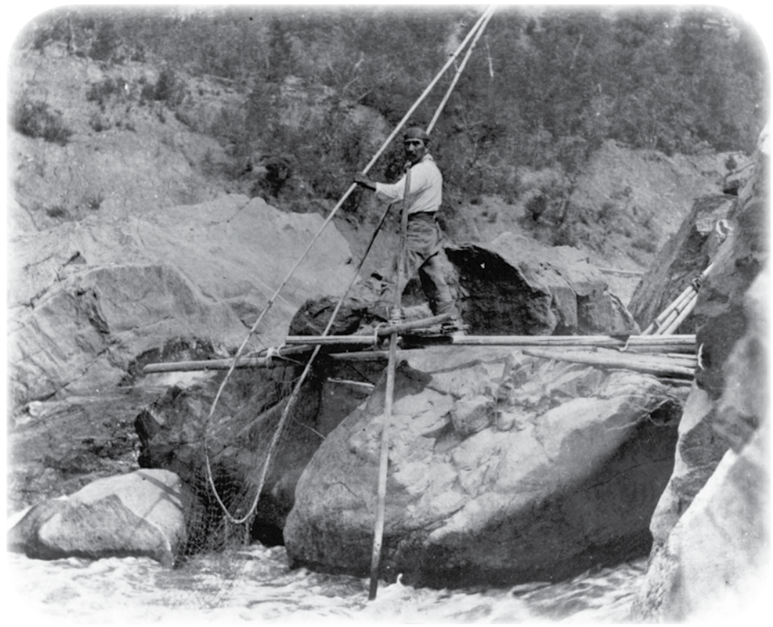
Despite wild spring Chinook salmon's distinct life history, cultural significance and imperiled population, they remain unmanaged as a separate run from fall Chinook, and unlisted under the Endangered Species Act. A complex genetic story and narrowly defined management parameters have led to unwillingness by managing agencies to separate the two runs. As the capabilities of genetic research rapidly evolve, that may be changing however. New techniques have enabled researchers to isolate the individual gene that makes spring Chinook unique from fall Chinook, which will likely have important implications for future management decisions.

On the Salmon River, spring Chinook have become somewhat iconic in the past 2½ decades, serving as a symbol for the many things that make this watershed so special and the importance of "preserving the best." We continue to strive towards a day when our children will be able to fish for Springers again in the clear green waters of the Salmon.

Photo left - An SRRC community restoration focused event in 2004 included a play, informational tabling,and local food.
Above - Springers on the Mainstem Salmon, photo by Will Harling
Right - Junie Donahue, Dip netting in the mid Klamath circa 1970's, courtesy of the Donahue family.

"Saruk Amkuuf"

Josh Saxon
SRRC Executive Director



Dip netting on the Klamath River, from the Daggett photo collection of the Siskiyou Co. Historical Society.

With the spring months comes the beginning of *pic-ya-vish* (world renewal ceremonies) for the Karuk people residing in the middle Klamath River and lower Salmon River regions. Near the confluence of the Salmon and Klamath Rivers a Priest and his assistant would harvest the first *ishyâat*, spring salmon, and begin the process of *saruk'ámkuuf*, spring salmon ceremony, that translates to "downhill smoke".

Utilizing special tools like trigger nets, obsidian blades and fire starters this ceremony marked the start of a period of time where all the tribes in the region refrained from harvest, and fish could pass and populate spawning grounds at higher elevations. Sustainable harvest practices have been a way of life since time began in Karuk country, and these practices led to harvest levels that provided a rich and abundant lifestyle for all river tribes. After *saruk'ámkuuf* was complete, runners and signals were sent downriver and upriver to communicate to those families that harvest had begun.

Tribal people living in the Klamath Basin still recognize the spiritual importance of *ishyâat* as a connection to our past and the key to our spiritual health and well-being into the future. While modern practices have greatly influenced tribal harvest methods, many of the ceremonial practices led by families today tie the people to significant places, life-giving food sources and traditional management practices. The traditional diet of the indigenous people of this region relied heavily on salmon, with over half of their yearly protein needs met by fish. Even today when the first fish are brought to the elders, families look forward to putting away jars of smoked fish for the wintertime. The people relied on annual ceremony, time tested harvesting protocols and communal generosity to prosper and be healthy.

The present condition of our *ishyâat* has prompted tribal fishermen, managing agencies, concerned community members and scientists to focus our collective efforts on restoring this keystone run of salmon. Because the spring run of salmon in the Klamath began the harvest season for all basin tribes, the importance of understanding their role in the short and long-term restoration of the Klamath region has been elevated. These fish not only contributed the bulk of fat content needed by humans coming out of long winters; the spawned fish also contributed to fertilizing riparian vegetation and sustaining wildlife. The life-cycle of our spring-run fish has been largely compromised, and if we lose this run the likelihood of negatively affecting a multitude of plant and animal species, as well as humans, who are reliant on *ishyâat* for spiritual balance and physical health increases. We need to look at this issue as a community and begin to voice our concerns to one another, fisheries managers and funders. These fish have sustained the people for many, many years. We owe them a debt of gratitude, and the least we can do is fight for their health and well-being.

Spring Chinook, To be or Not to be.....
A Klamath River Love Affair on the Rocks

Nat Pennington
Spring Chinook Specialist, and former SRRC Fisheries Program Coordinator

Spring Chinook were once the most prolific fish in the Klamath Basin. They thrived in the headwater streams of the Klamath, in tributaries such as the Sprague, Wood and Williamson rivers in Oregon and the Shasta, Scott, and Salmon rivers of California. By the early 20th century however, spring Chinook suffered precipitous declines due to large scale canneries, hydraulic mining, dams, and diversions. The majority of spring Chinook habitat was lost following the construction of dams on the Klamath, Shasta and Trinity rivers. Shasta River Springers virtually disappeared with the construction of Dwinnell Dam in 1926.

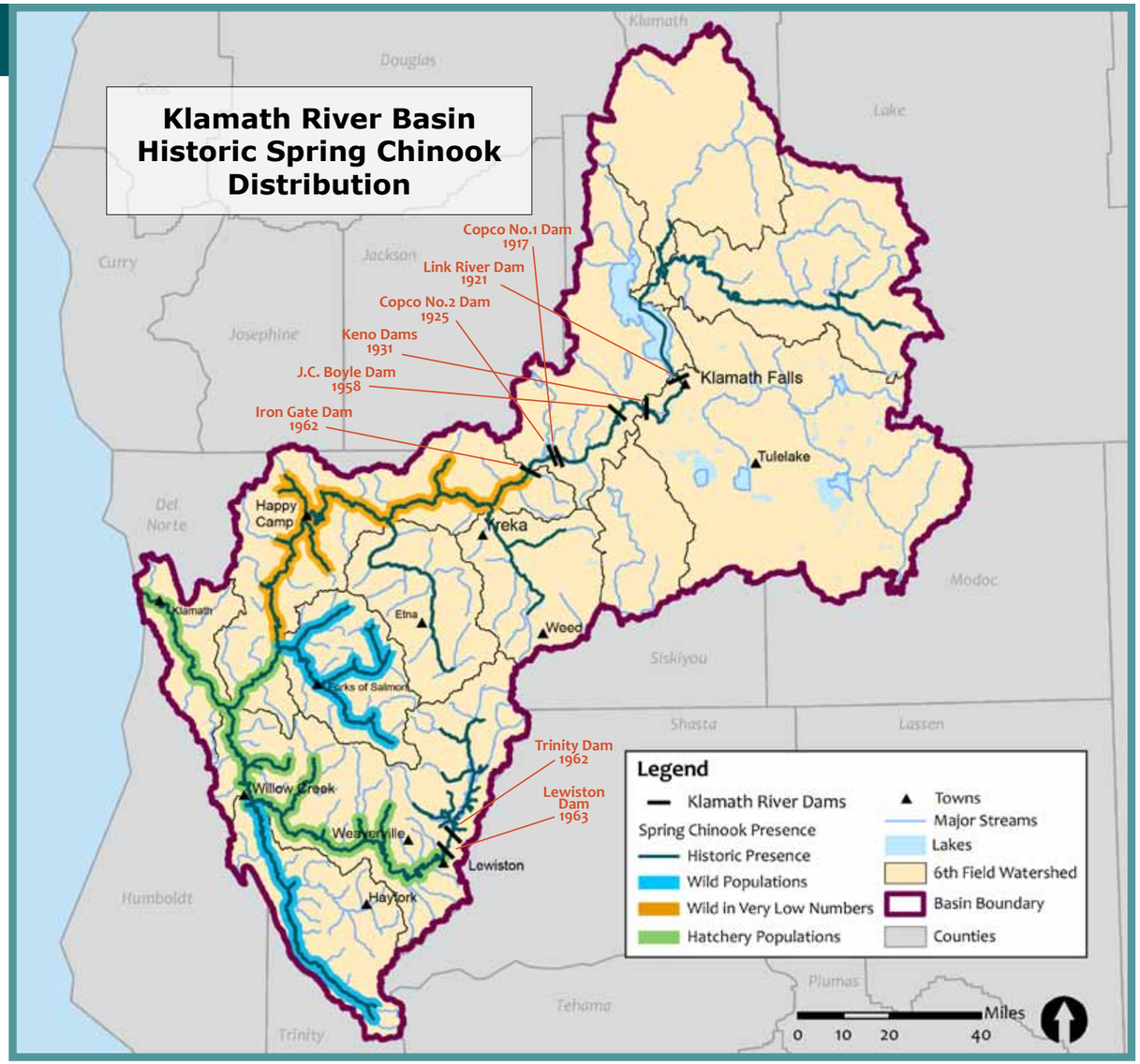
During the 20th century, the decline of spring-run Chinook continued as a result of further dam building, logging and road construction. Heavy sedimentation occurred as a result of the 1964 flood, when heavy rains on deforested slopes and logging roads caused catastrophic landslides. By the 1980s, Springers had been largely eliminated from much of their former habitat because the cold, clear water and deep pools that they require were either absent or inaccessible. In the Klamath River drainage above the Trinity, only the population in the Salmon River remains.

The Trinity River Hatchery (TRH) releases over 1 million juvenile spring-run Chinook every year. Because the Trinity River run of several thousand fish per year is sustained largely by the TRH, the Salmon River population may be the last self-sustaining wild (naturally spawning) population in the Klamath Basin. Apparently, all spawners in the mainstem Trinity River below Lewiston Dam are of hatchery origin. It is believed that historically spring and fall Chinook salmon returning to the Trinity River, were reproductively isolated. Spring-run fish spawned upstream in early fall, and fall-run fish spawned further downstream in late fall. However, construction of Lewiston Dam and the TRH in 1964 resulted in extensive compression of spawning habitat and the potential for inadvertent interbreeding of the two runs. A study completed by A. Kinziger suggested the occurrence of hybridization between spring and fall-run Chinook salmon returning to TRH. Although there is no proof, it is likely that spring and fall run Chinook were inadvertently interbred by the TRH.

On the Klamath side, the dams not only block fish passage, they degrade the water that passes through them to the extent that the spring-run hatchery at the lowest dam, Iron Gate, (which was one of the required mitigation measures to compensate for dam construction) failed in the 1970's because of poor water quality. Tribes in the Klamath Basin have suffered both economically and spiritually since the near extirpation of spring Chinook in the Middle and Upper Klamath. According to Jeff Mitchell of the Modoc and Klamath Tribes, "The Klamath and Modoc peoples collectively refer to themselves as 'the maqlaq' meaning the people. We are fish people, hunters and gathers. It is the fish that give us life. Our spring *c'iyal's* (salmon and steelhead) runs would occur around mid-March and last until the end of June. These fish runs were especially important to the tribal peoples because by the time February would arrive after long winters with deep snow our food rations would be nearly depleted. We

always knew if we could survive until our first fish runs in the early spring we would be blessed with the life once again. We would give thanks to the creator each spring in March during our first fish ceremony and thank the creator for this gift of life."

National Marine Fisheries Service debated designation of the Klamath spring-run Chinook as a distinct evolutionarily significant unit (ESU), eligible for protections under the Endangered Species Act, but decided, based on the genetic technology available at the time, that it was too closely related to fall-run Chinook to justify separation and protection. Nevertheless, according to the National Academy of Sciences, the presence of genetic differences and of great differences in life history, suggest that it should be managed as a distinct ESU. Currently, two ESU's are recognized for Klamath Basin Chinook: the Southern Oregon/Coastal Chinook ESU which consists only of fall-run Chinook that spawn in the main-stem Klamath roughly from the mouth of the Trinity River to the estuary and is tied to other runs in coastal streams from Cape Blanco, OR to San Francisco Bay; and the Upper Klamath/Trinity Rivers Chinook ESU which encompasses the rest of the Chinook in the Basin consisting of three runs (fall, late fall, and spring). Runs are named for the season of entry and migration up the river, which is not necessarily the same as the spawning time. Thus, spring-run Chinook migrate upriver during the spring, but spawn in mid-September to mid-October.



Spring Chinook populations still thrive in many of the Klamath's sister rivers, but some, like the Klamath population, are barely hanging on by a thread. In Oregon, spring runs exist in the Tillamook, Nestucca, Siletz, Alsea, South Umpqua, North Umpqua, Rogue, Willamette, Columbia and Coquille Rivers. The Siuslaw and the Coos populations are presumed extinct. Oregon is having some success recovering spring Chinook. For example, this year in the Rogue River, pre-spawning mortality in upstream migrating adult spring Chinook was successfully minimized despite very low river flows and poor water quality. The Rogue River population consists of a 60% wild run. Releases from Lost Creek Reservoir help meet flow and temperature targets in the lower Rogue River to keep disease outbreaks from occurring in spring Chinook. Over time, Oregon fisheries managers have learned the importance of not allowing disease to take hold in spring Chinook because subsequent losses can be devastating. Similar releases from Trinity and Irongate Reservoirs would serve to preserve Klamath Springers until dam removal gives them access to required habitat.

In California, Central Valley populations of spring Chinook exist in Antelope, Battle, Big Chico, Butte, Clear, Cottonwood, Deer, and Mill Creeks, as well as the Sacramento River and Feather River Hatcheries. Many of the Klamath's sister watersheds where spring-run Chinook are still present have their own ESU's, listed as either threatened or endangered under the Endangered Species Act and are therefore afforded priority with respect to habitat accessibility and dam release flow regimes. These watershed's runs include: Central Valley Spring Run (threatened), Upper Willamette Spring Run, (threatened), Snake River Spring Run (threatened), Upper Columbia Spring Run (endangered), and San Joaquin (experimental reintroduction).

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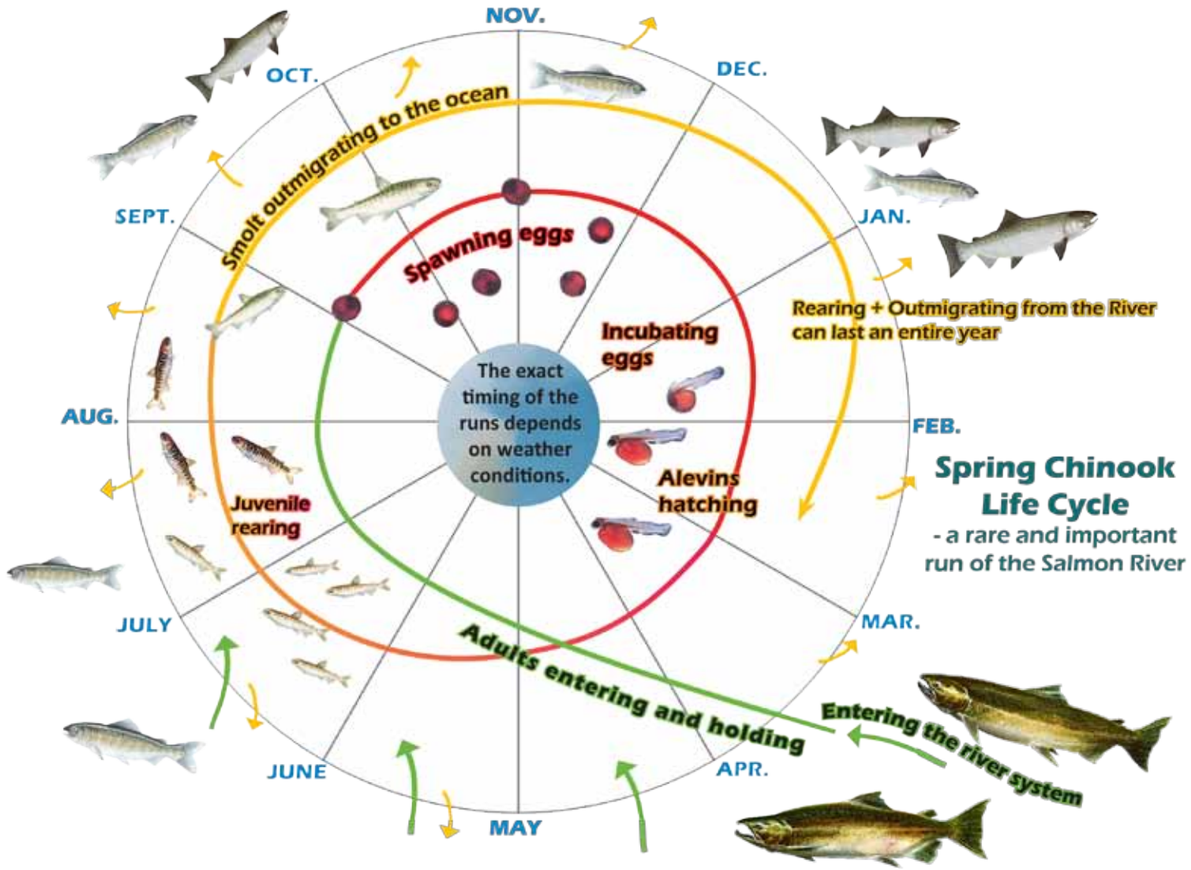


Like coho, spring-run Chinook have a stream type of life history, which means that juveniles remain in streams for a year or more before moving to the sea. In addition, the adults typically enter freshwater before their gonads are fully developed and hold in deep pools for 2–4 months before spawning. In California, this strategy allows salmon to spawn and develop in upstream reaches of tributaries that are often inaccessible to fall-run Chinook.

Spring-run Chinook enter the Klamath system from April to July and congregate in deep pools where they hold through September. Temperatures below 16°C generally are regarded as optimal for Springers because susceptibility to disease and other sources of mortality and loss of viability of eggs increase as temperatures increase. These beneficial habitat conditions currently exist above the Klamath dams. Many tributaries to Upper Klamath Lake do not exceed 19°C through the entire summer. Large accretions and subterranean springs exist under the current site of the Klamath dam reservoirs. These cool water pockets and deep pools, once uncovered (when the dams are removed), should provide sufficient cold-water refugia for the upstream migration of spring Chinook into Oregon.

Chinook juveniles in June, detail of photo from the SRRC Archives. Life Cycle graphic by SJ Hugdahl

New genetic research coming from a partnership with SRRC and U.C. Davis has great potential to shed light on the evolutionary significance of Klamath River spring Chinook. One beneficial application of this research would be the use of Genetic Stock Identification to manage the harvest in a way that protects wild stocks like Salmon River Springers and allows fisheries to target polluted stocks such as salmon interbred by TRH. In the Klamath Basin, quantitative Polymerase Chain Reactions (qPCR) are employed to identify presence and concentration of C. Shasta spores in the river. With the publication of the genetic research being developed by U.C. Davis, it may be possible to develop similar field assays for qPCR to determine origin and run timing of harvested fish as soon as they are caught, allowing for selective harvest.

It is clear that the protection of the Salmon River Springer is paramount for the true restoration of the Klamath Basin. According to many climate change models the Klamath's volcanic elevations may be most resilient in capturing snowpack as climate changes and therefore the restoration of the Basin is of utmost importance for biodiversity. Last year, the Klamath River community united and hundreds of concerned citizens traveled to the State's Capitol and the regional office of the Bureau of Reclamation to ask for more water to prevent a repeat of the 2002 Klamath fish kill, when 60,000 adult salmon died before spawning. The combination of public pressure and sound science prevailed and together we prevented disaster. Once again we need to put Klamath dam removal on the forefront of our efforts to preserve the environment. The SRRC has developed a limiting factors analysis for spring Chinook in the Salmon River and is currently working on a collaborative In-Stream Restoration Plan for the watershed. You can help by volunteering at your local Klamath Basin watershed group, attending public hearings and rallies and speaking on behalf of Klamath restoration, commenting on dam management and water plans, participating in citizen monitoring efforts and reporting fish dieoffs, and conserving water locally. Together, lets rekindle our love for these iconic salmon that are critical to our region's food chain and recover them for generations to come. -Nat Pennington

Nat says of himself, "I fell in love with spring Chinook at first sight, it was 1996, I was 19 and had been recruited as a volunteer to help the Salmon River Restoration Council (SRRC), which had just become co-coordinator of the annual Salmon River Spring Chinook and Summer Steelhead Population Snorkel Survey. The more I learned about these fish the more I have realized how important they are and I have not missed a single survey since."

Top - Salmon River Springers, detail of photo by Michael Bravo. Right - Mainstem Salmon River in summer, photo by Scott Harding

Spring Chinook Monitoring

Tom Hotaling
SRRC Fisheries Program Coordinator

Why do we care about spring Chinook and what are we doing out there counting them?

This is a common line of questioning that I receive about the work we do. Some folks don't know what a "Springer" is or why we would bother to count them, and some folks don't believe that counting the few remaining spring Chinook is a worthwhile activity.

The first thing I tell people is that spring-run Chinook are thought to have once been the largest run of salmon in the Klamath River Basin, with estimated returns of adult spawning fish ranging from 100,000 to 1 million annually. Secondly, after a century of decline the Salmon River is one of only 2 remaining populations of wild spring-run Chinook in the Klamath River Basin (see South Fork Trinity River article, page 12).

Spring-run Chinook population surveys on the Salmon River first started in 1980 when USFS Salmon River District fisheries biologist Jack West, began conducting index reach surveys to estimate the total population. This was a valiant early effort to gather baseline data on this population. After all, the Springers had always been the crown jewel of Pacific salmon harvest. The goal was to enumerate the remnant population that was returning to the spawning grounds.

Community awareness of this fragile population increased through community outreach and education efforts like Salmon-Ed, spearheaded by Petey Brucker. Local citizens of the Salmon River began participating in spring-run Chinook surveys and there was a concerted effort to eliminate poaching of Salmon River Springers. In 1990, the total population of spring-run Chinook in the entire Salmon River watershed totaled 169 adult fish. Within the local community, education efforts led to the understanding that residents of the Salmon River could have fished this population to extinction without even realizing it.

SRRC poster from the 1990's poaching awareness campaign. (silkscreen by SJ Hugdahl)

In the years since those early surveys, the annual Salmon River Spring Chinook and Summer Steelhead Population Dive has become a major monitoring event, coordinated by the SRRC and the USFS, with the participation of local tribes, volunteers, state and federal agencies. This is a basic monitoring effort, needed to understand the population size, based on returning adult fish. We are also monitoring the health of the adult population through these efforts.

The monitoring of Springers on the Salmon River is so important because it is the only data collected on this population. Without it, we would not know whether populations were increasing, or heading towards extinction. And why should we care if they go extinct, you might ask? Diversity is critical to survival of the species, and because we care about King Salmon in general, and our Pacific Coast fishery as a whole, we care about the diversity that the unique spring-run brings to that whole.

There are other questions that we have about spring Chinook that would make good research projects, given the time and resources. Things such as: what's the downriver extent of spring Chinook spawning in the Salmon River? And what can we learn from the overlap in spring-run and fall-run spawning? How many Springers are rearing in the Salmon River for a year or longer? How many Springers are out-migrating with fall Chinook? Where are the primary rearing habitats for spring Chinook? These things take time and energy and focus to study. And they are compounded by the over arching complication that we face when dealing with Springers, which is that to the naked eye, spring Chinook are identical in appearance to fall Chinook.

As new questions arise and new knowledge is gained, our monitoring efforts adapt to accommodate our changing knowledge of spring Chinook. Monitoring the wild population of these unique fish is the minimum that we can do to increase our basic understanding of their lives and work towards their recovery.

Above-Divers counting spring Chinook, photo by Tom Hotaling
Right -Springer in a bubble curtain, photo behind the graph by Michael Bravo
Above Right - Spring Chinook illustration, by Alan Crockett

The Story of Spring Chinook

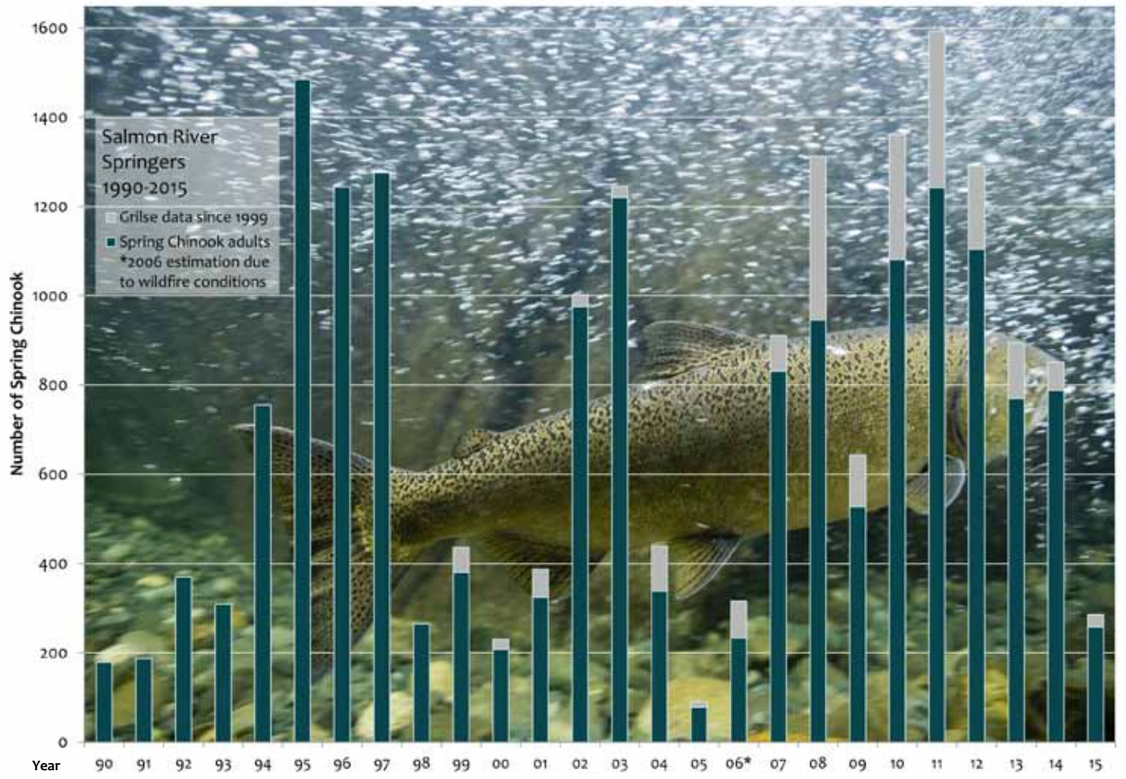
Hundreds of thousands of years ago, there was an event that caused genetic divergence in the Chinook salmon lineage. It was a genetic mutation that caused some Chinook salmon to return to the river from the ocean sexually immature. They would mature in the river, surviving the entire summer on their fat storage, and spawning as soon as river conditions allowed in the fall. This proved to be advantageous to these spring-run Chinook. They were able to migrate many miles further upstream because of their earlier migration when flows were higher. Because they were able to make a further journey up the river, they found prime spawning habitat, where spring-fed creeks flowed through meandering valleys, and where snowmelt fed streams provided cool water for many months. These streams were inaccessible to their fall-run cousins, from which they had recently diverged. And when the spring-run young hatched the following spring, they found themselves surrounded by food in a vast, unused rearing habitat.

For these reasons spring Chinook proliferated. Soon, they were more abundant than their fall-run cousins. They had a vastly superior rate of survival, because they stayed longer as juveniles in these rich river rearing habitats. There was no hurry to head back out to the ocean. So, they grew bigger. And the bigger they were by the time they made the journey out to the ocean, the more likely they were to survive to return to the river as adults.

And when they returned as adults, they were beautiful fish. They were the most highly sought salmon of all, because of their high fat content, and because they were the first fish to return after the lean winter months. Native people valued these fish above all others, and they treated them with ceremonial accord.

White settlers also valued these fish highly. Large canneries went into operation, and soon the harvest was more than could be sustained. The plight of the Springer in the modern world was further compounded by dams that cut off the habitat where spring Chinook once spawned. Further degradations to the habitat required by spring Chinook occurred with large scale mining operations, and extensive development of roads, which contributed to sediment input and the in-filling of deep pools, where Springer adults seek refuge through the long summer months.

Over the course of the previous 150 years, wild spring Chinook have been reduced to a mere fraction of what they once were. Only an estimated 10% of the historic population remains. And this remnant population exists only in a few key watersheds, such as the Salmon River, where the ruggedness of the terrain has prevented the infrastructure that has wiped out spring-run populations elsewhere.



Climate Change Refugees: Spring Chinook of the Salmon River

Dr. Joshua Strange
Stillwater Sciences Senior Fish Biologist

The rugged snow-capped mountains of the Salmon River provide the best chance of a long-term refuge for wild spring Chinook salmon in California in the face of global warming.
(photo by Scott Harding)

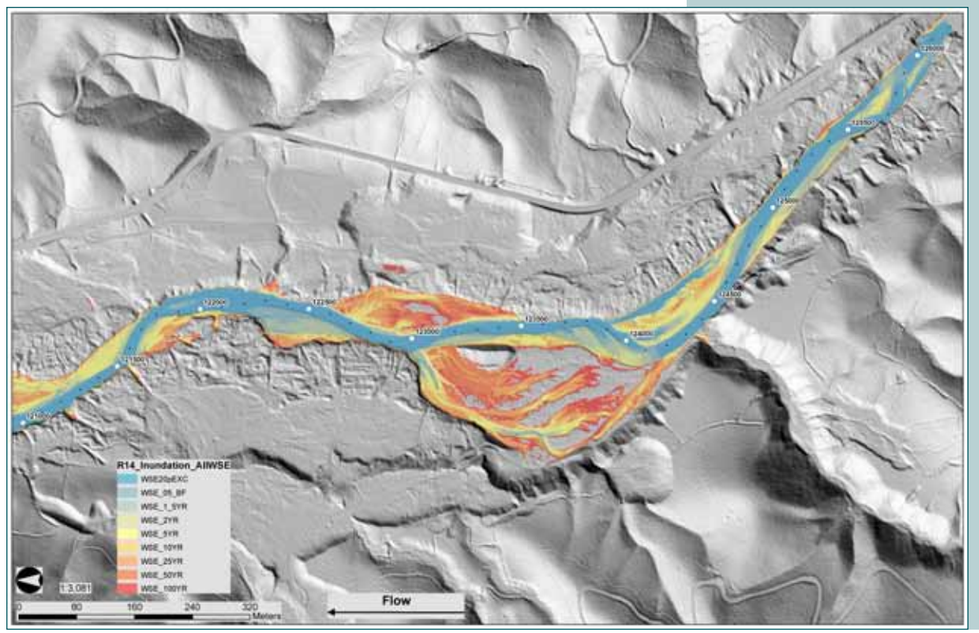
Spring Chinook salmon are the king of the kings. While typically smaller than their fall run cousins, Springers are the royalty of the salmon lineage; they are the first salmon to return after the lean winter months and go further upstream into the headwaters than any other run. Their pattern of migrating far upstream in the spring, and then over-summering in deep cold pools before spawning in the fall, results in the need for abundant fat reserves to get them through this long fasting period. These abundant fat reserves give them their famously rich taste that everyone craves, from babies to bear cubs, and is the key adaptation that allows this unique life-history pattern.

The other key to this pattern are the deep cold pools of the headwater streams that they migrate to, which allows them to conserve energy and stay healthy through the summer months. Historically, such places were abundantly available in the upper reaches of major tributaries to the Klamath and Sacramento rivers, but a combination of dam building, diversions, and the filling of pools with sediment from mining, logging, and roads have left only a few areas that can support Springers in California. In addition, only a few dams have the proper type of cold water releases to support spring-run Chinook salmon, such as on the Trinity and Feather rivers, but these runs are significantly comprised by hatchery domestication and interbreeding with fall-run Chinook salmon. That leaves only a select few rivers and creeks with wild spring Chinook runs - the Salmon and South Fork Trinity rivers in the Klamath Basin, and primarily Deer, Mill, and Butte creeks in the Sacramento basin.

But what will happen to these critically important cold water reaches in these few remaining spring Chinook salmon streams as climate change accelerates into the future? One study examined this question for Butte Creek, and despite using a wide-variety of plausible climatic scenarios, they consistently found the same result: namely water temperatures become too hot for over-summering spring Chinook by the end of the century. Understanding if temperatures will remain tolerable in the other California spring Chinook streams is uncertain, but two things are certain: 1) water temperatures will increase with global warming, and 2) the Salmon River offers the best opportunity to help ensure a long–term refuge for wild spring Chinook salmon in all of California.

The Salmon River can be the best long-term refuge for wild spring Chinook in California because it offers a unique combination of public land ownership, undeveloped wild land, high elevation mountains, minimal influence from stray hatchery fish, and a community that is actively committed to restoration. While this river has all of these valuable attributes, and much work has been done, there is still significant restoration work to do to make sure it can be a long term climate refuge for spring Chinook.

Springers in the Salmon River, by Michael Bravo



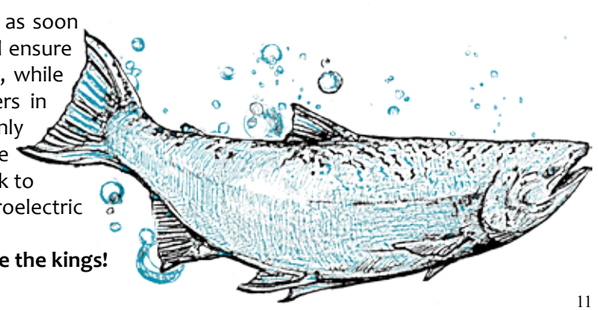
LiDAR-based inundation map of a site on the upper South Fork Salmon River showing historic mining scars and floodplain areas that are too high above the current channel (warm colors) to benefit salmon.
(from Stillwater Sciences)

A recent study examined potential restoration actions to counteract climate change and found reconnecting floodplains to the stream channel to be one of the most effective actions, in part because this allows for much more interaction of surface water with the underground water table, allowing it to cool and resurface as cold seeps and springs. Reconnecting floodplains also allows for a healthier community of riparian plants and trees, which provides cooling shade. Despite superficial appearances of being pristine, the Salmon River suffers from the legacy impacts of historic gold mining, both hydraulic and dredging, that left piles of bare cobbles and boulders on the floodplain and an excess of this large substrate in the channel, effectively armoring the channel and preventing it from properly interacting with the floodplain areas in-between all the bedrock gorges. This has led to a reduction in the amount of suitable spawning habitat, reduced the amount of shallow and sheltered areas that young fry salmon can use after hatching, and increased temperatures.

The Salmon River Restoration Council, in collaboration with the Karuk Tribe, US Forest Service, CA Fish & Wildlife, US Fish & Wildlife Service and its technical consultants and funders, is leading an effort to ensure that the Salmon River will be a long-term refuge for spring Chinook in the face of global warming. A large scale planning effort to restore floodplains and develop ways to revegetate bare mine tailing piles has started using state-of-the-science laser radar (LiDAR) based mapping of the river corridor. This gives a detailed view of the land surface without any vegetation and allows for the development of accurate maps of water inundation levels during critical river flow levels such as spring snowmelt and the average annual flood. These products in turn allow for all of the mining impacts to be plainly visible and for existing and potential floodplain areas to be identified. This analysis has revealed that in the Salmon River, many floodplain surfaces are now too high to be inundated frequently enough (as in every year as opposed to every 5 years or more) to provide meaningful benefits to salmon and the river channel. This effort will help identify and prioritize the floodplain areas that need treatment and develop specific restoration designs that will benefit multiple life-stages of spring Chinook salmon as well as coho and steelhead. In addition, pilot tests will be conducted to determine the best options for cost-effectively recontouring and revegetating mine tailing piles that are out of the floodplain and on bedrock terraces but still contribute to increasing water temperatures by baking in the sun and raising air temperatures along the river corridor.

Ultimately the goal is to implement as much of this restoration as soon as possible to help counteract the effects of global warming and ensure a long-term refuge for wild spring Chinook salmon in California, while substantially increasing the number of returning adult spawners in the process. The wild Springers of the Salmon River are not only a treasure for us here in the Klamath-Trinity region, but for the entire golden state, and will likely be the source of spring Chinook to recolonize the upper Klamath Basin once removal of the four hydroelectric dams on the mainstem Klamath is complete.

Long live the kings!



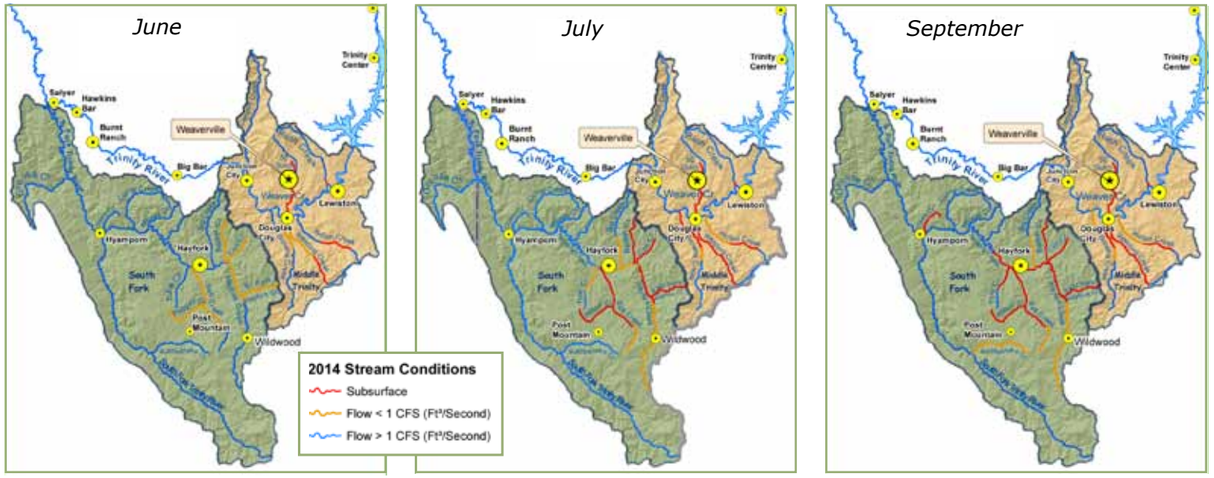
Spring Chinook illustration, by Alan Crockett

South Fork Trinity River
Spring Chinook Salmon

Josh Smith
Watershed and Fisheries Restoration Program Manager
for the Watershed Research & Training Center in Hayfork

The South Fork Trinity River (*left*) has the only remaining wild spring Chinook run in the Klamath outside the Salmon River. The South Fork's history of extensive resource extraction has taken a severe toll on water quality and fish habitat, and its population of wild spring Chinook hangs on the brink of extinction. The Watershed Center is partnering with the Yurok Tribe, Humboldt State University, the US Forest Service, and CA Department of Fish and Wildlife to learn more about the dwindling spring Chinook population. Our four priorities in this initiative include facilitating basic monitoring in the South Fork Trinity River (SFTR), Hayfork Creek and their tributaries, a Limiting Factors Analysis for spring-run Chinook, a genetics study, and educating local communities of the King salmon's precarious status.

Trinity County Drought Impacts 2014



The story of the SFTR is somewhat common in the Pacific Northwest - a tale of resource extraction and environmental degradation, however it is unique in that it has true potential for recovery and sustainability. The southernmost tributary to the Klamath River is larger than most people imagine, at 980 square miles the watershed is larger than the Salmon, Scott, or Shasta Rivers in area and it contains more than 90 miles of available anadromous waters along its mainstem alone. It currently holds the unfortunate distinction of being the longest undammed river remaining in California and its elevation ranges from 7,800 feet in the Yolla Bolly Wilderness to less than 400 feet at the confluence with the mainstem of the Trinity River.

The watershed's western boundary is North America's longest continuous ridge, the peculiarly uniform, linear and uninterrupted South Fork Mountain. Some of the region's straightest roads follow this ridgeline and early travel routes were established long before the roads were paved. The Humboldt Trail was probably the simplest and easiest route for Native American Tribes to travel between the north coast and the central valley. The area has been occupied by Nor El Muk Wintu, Chimariko, Tsnungwe, Hupa, Chilula, and Whilkut tribes; each tucked into folds of the mountains.

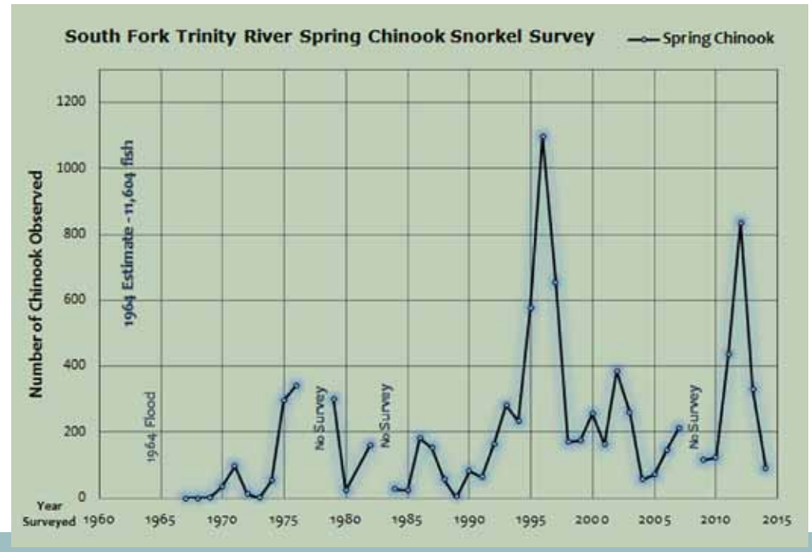
As the gold rush took hold of the Klamath Mountains this watershed was scoured but few rich veins were found. The middle reaches of Hayfork Creek, the river's largest tributary, saw several phases of gold mining but not enough to cause much damage until the dredge mines were developed in the 1920's. Some of the miners stayed despite the lack of gold and settled areas sparsely, turning to ranching and homesteading. The Native American Tribes of the watershed were displaced, yet none of the tribes became federally recognized.

The second natural resource rush came in the form of the Timber Rush. South Fork Mountain's topography, climate, and geology make it one of the most highly productive timber zones in the inland Klamath Mountains. Dozers made this timber accessible and efficiently harvested and logging boomed. Mills were set up on any available flat ground from Hyampom to the Yolla Bolly. The Hayfork Valley boasted 5-6 mills at its peak.

The story of the South Fork Trinity River started getting much more interesting in the 1960's. Bureaucratic scientists scoured the mountains trying to determine the best way to "utilize" the water resources. The rivers in this region also tell the story of development and extraction; perhaps this was the Blue Rush. They were looking hard when they surveyed the South Fork Trinity River for salmonids in preparation for building dams to tame it. Their estimates of spring Chinook populations in this single river in 1963 were around 10,000 and nearly 12,000 in 1964. These scientists were tagging more than 200 spring Chinook in individual holes during the surveys.

These dam surveys were closely followed by the 1964 floods that ravaged the region. The flooding occurred due to a "pineapple express" atmospheric river of warm rain on top of a heavy snowpack. The doubled volume of water from snow and rain washed down mountainsides recently ravaged with bulldozers. Bulldozers had revolutionized logging practices and entrepreneurs were driving them straight up and down mountains, utilizing streams as roads and skidding lines and causing massive gullies. South Fork Mountain's linear and uniform shape is derived from its fairly consistent geology. The underlying rocks make a significant change from older and sturdier metamorphic rocks like the Sawyers Bar complex in the eastern portions of the watershed (Hayfork), to extremely unstable Franciscan sea floor sediments that make up South Fork Mountain.

The effect of the '64 flood on the recently denuded and scarred landscape of the mountain was catastrophic, described by many locals at the time as "Biblical". The removed trees, the 'dozer gullies, poorly built roads, and the unconsolidated underlying schist combined in an unprecedented unraveling of the mountain. A massive assemblage of landslides often greater than 100 acres let loose, gullies turned into chasms, roads disappeared, bridges and culverts were washed away, and all of that sediment from the hillsides was deposited in the river. Dozens of feet of aggradation occurred in valley bottoms, pools filled up, and spawning gravels were smothered in fine sediment. The fish populations disappeared overnight and haven't returned to the same extent since. The average run size today on the South Fork Trinity River is a measly 200 spring Chinook, less than once was caught in an individual pool.

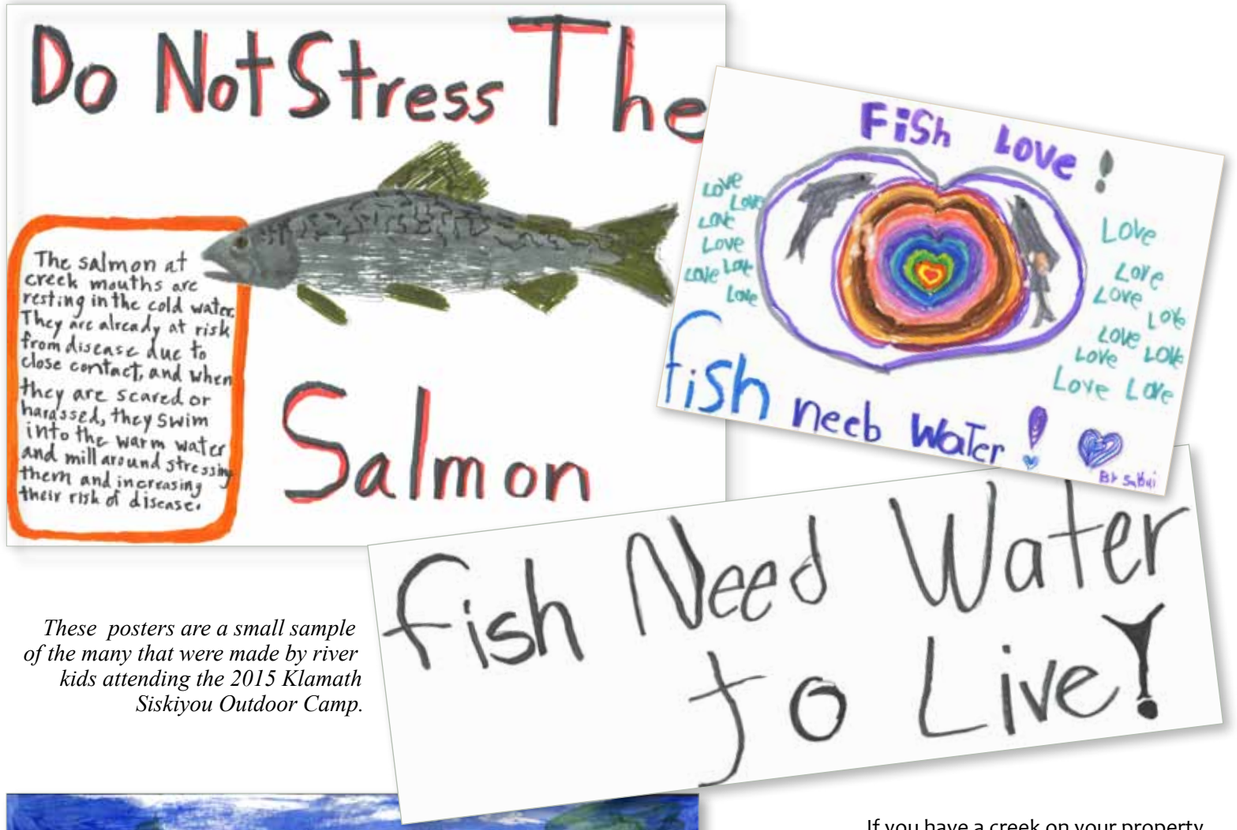


In a strange twist of fate, the sediment pouring into the valley during the '64 flood frightened the government's dam builders. The sheer devastation and the rate of sediment deposition in the locations where they had begun designing dams forced them to determine that the investment wasn't worth their while. Thus the worst environmental disaster in the recorded history of the river was simultaneously the river's savior; it stopped the building of the dam. The sediment that devastated the fish population in the short term may have kept it alive in the long run.

Fast forward to today and we see a wild river that is relatively intact and still retains one of the last remaining populations of spring Chinook salmon in the Klamath Basin and in fact one of the last populations in all of California. The sediment from the '64 flood is still working its way through the system causing problems but there are many signs of natural recovery; the question is: will it be soon enough? Geneticists say that the population will enter an "extinction vortex" with "deleterious consequences of inbreeding" if the population stays below an effective population of 200 fish. Essentially, we are right now on the brink of watching this amazing species be extirpated.

The So. Fork Trinity River has great potential for fisheries recovery. Within the watershed 79% of the land is publicly owned and human population is limited by rugged terrain. Few roads access the river and it has the extra protection of Wild & Scenic designation. There are two Wilderness Areas and numerous Roadless Areas that offer even further land protections. Large projects in the Hayfork Valley such as a sewage treatment system and a wonderful off channel storage system for community water supply have been developed which have greatly reduced human's impact on the stream. The Trinity County RCD and the USFS have been conducting road decommissioning within the SFTR watershed since the 1990's and have been very successful in reducing sediment inputs to the basin's water bodies and decreasing the potential for massive sediment producing events.

All these factors contribute to the South Fork Trinity River's vast potential as a wild salmonid stronghold, yet the keystone species in the watershed is about to vanish and simultaneously it remains one of the least funded watersheds in terms of fisheries restoration in the entire North State.



These posters are a small sample of the many that were made by river kids attending the 2015 Klamath Siskiyou Outdoor Camp.

If you have a creek on your property, even a small one, it is likely that fish will be trying to utilize it to stay alive during summer. Almost all of our creeks maintain cooler summer water temperatures than the river, which can exceed the lethal temperature threshold for fish during the heat of the summer by several degrees. The only way that fish can survive such temperatures is to escape for at least part of each day into cooler water.

Things that YOU can do in the hot summer months to help fish access critical cool water refugia include:

- **If your water comes from a cold water tributary, cut back on your lawn watering, hydro-power use and water use in general during a drought.**
- **Water-efficient gardening and landscaping techniques such as watering at night, utilizing timers to avoid over-watering and mulching and installing drip irrigation can significantly reduce your water use.**
- **Make sure swimmers dams and water diversions don't block fish access into creeks, or upstream.**
- **If your creek mouth gets blocked off by rocks or sediment that prevent fish from getting through, spend some time moving rocks to create channels and step pools that allow fish access to the creek.**
- **Return outflows from your micro-hydro system back to their source stream. Hydro systems use a tremendous amount of water, and by locating your hydro system near enough to the stream for water to return on its own, or by piping the water back to the stream, this water can provide your power while still supporting aquatic life.**

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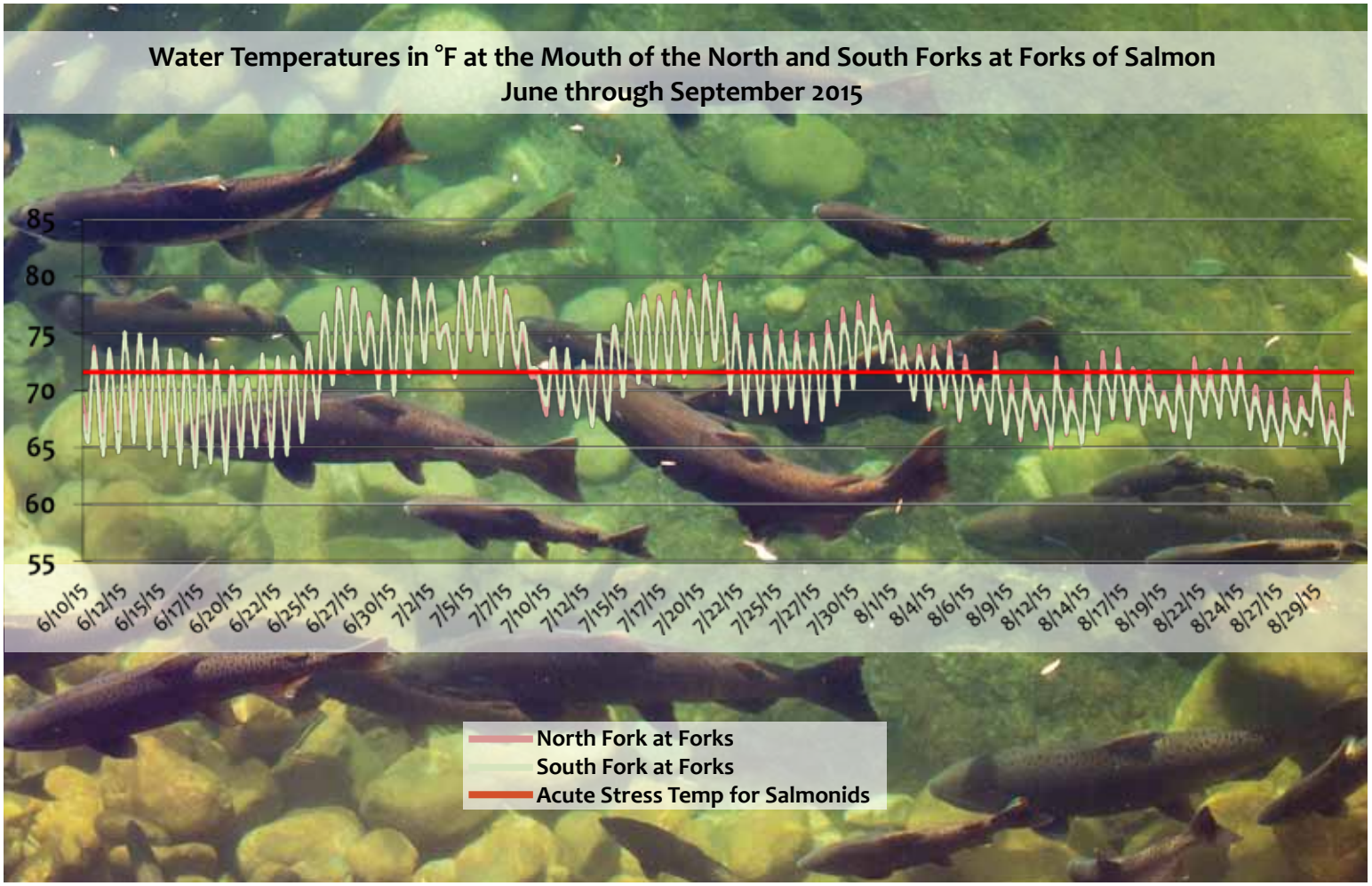

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Cover photos: Top - Main Stem Salmon River, photo by Scott Harding
Bottom - Salmon spawning in the Salmon River, photo by Janjaap Dekker
This page behind graph - Salmon holding, photo by Janjaap Dekker