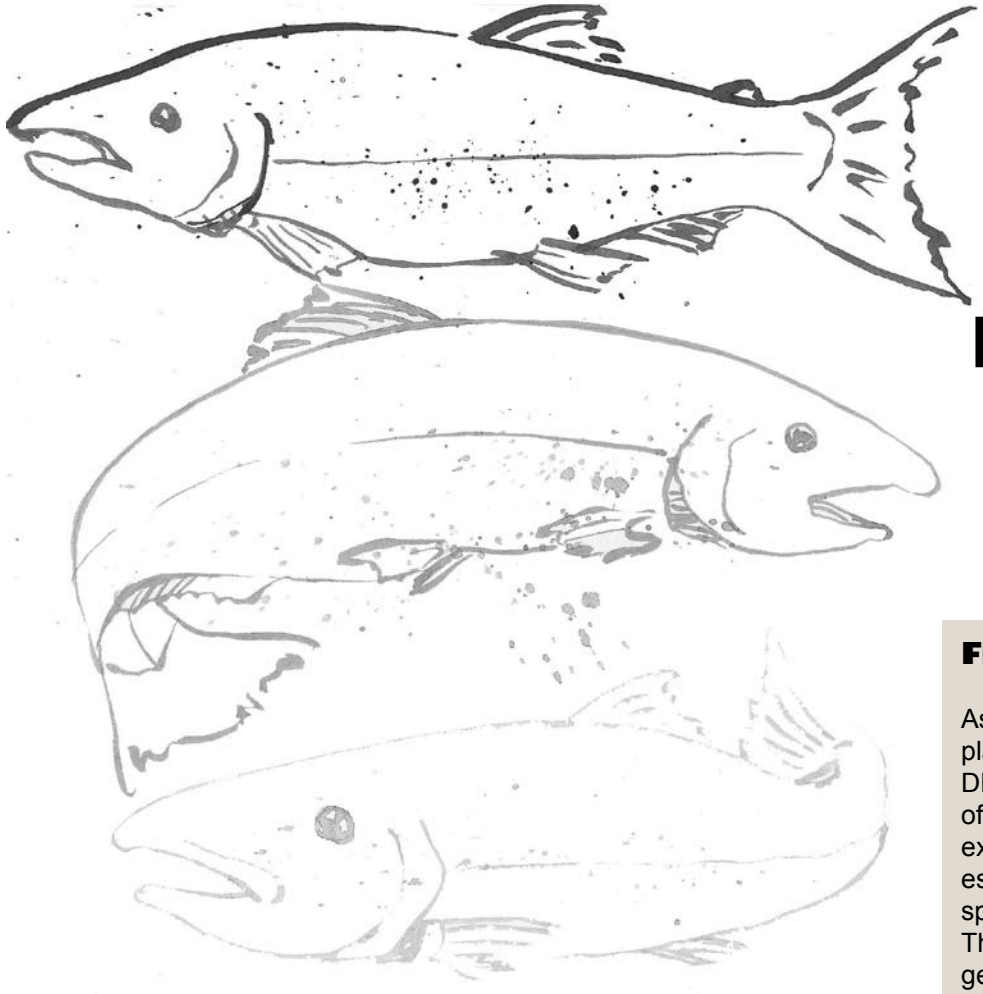
Spring Chinook

Oncorhynchus tshawytscha - Ishyaat - Snow Salmon or Ghost Salmon?



Salmon River Restoration Council

Summer 2006 Newsletter

As I was waking up this morning looking out into the Salmon Mountains, I found myself wondering what it must have been like when the Spring Chinook salmon were the largest run of salmon in the entire Klamath Basin, with hundreds of thousands of adults returning annually. The rivers were full of enough fish for everyone, all harvested in a way that insured the sustainability for the future generations of all people. I've heard Karuk elders describe this run as being the insurance policy for all the Chinook runs, because of their more diverse life history patterns, which increases their chances for survival to return and keep the cycle going.

Recent surveys show that this once majestic run of native Klamath fish boils down to less than 200 adults total returning to the Salmon and South Fork Trinity Rivers in 2005, with a handful of adults spread out in Clear Creek, and the mouth of the Scott River. In 2004, the Karuk Tribe's Fisheries Department tracked 1 Spring Chinook adult into Bogus Creek by Iron Gate dam. It could've been trying to swim home back up into the Upper Klamath Basin.

As the story unfolds we've found Salmon River Spring Chinook in the Salmon and Klamath rivers throughout the year. The juveniles larger than 1 inch observed are presumed to be "springers". Precise information is limited largely due to the lack of stock identification and life history assessment tools.

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Fishing the Chinook genome

As children we are told that everyone on this planet is unique. In the past decade or so, DNA sequence information from thousands of organisms has shown this uniqueness exists in a very measurable way. Differences in DNA are found between species, subspecies, populations, and even individuals. This variation enables the use of molecular genetic markers to understand genetic relationships between populations and families, convict or exonerate individuals accused of crimes, and determine if someone is predisposed to certain genetic diseases. They can also be used to track and identify individuals in a sea of many. While the ethics of these applications remain controversial in human societies, there is much less criticism surrounding the use of molecular markers to preserve and protect threatened and endangered species. In the field of conservation genetics, molecular markers enable scientists to assess the genetic diversity of the organism/s understudy so that management practices can be applied. This past spring, the Salmon River Restoration Council Fisheries program and Dr. Amy Sprowles began the initial steps of developing a type of molecular marker known as a single nucleotide polymorphism (SNP) for the wild and hatchery stocks of Chinook salmon, including the Spring run, of the Klamath basin.

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CONTACT US!!

The Restoration Council welcomes any and all comments, questions and suggestions regarding its work and the contents of this publication. Please let us know if you wish to continue receiving this and what you think!

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We're on the Web! www.SRRC.org

Let us know if you would like to receive a monthly email calendar of events pertinent to the Klamath Watershed.

Fire Info may be found at **www.inciweb.org**

News from the Watershed Center

Our year thus far has progressed with many meetings to educate and update the community and staff. March 1st was our annual Board of Directors meeting. A special thank you to Petey Brucker for stepping up to the helm as a new member and President of the Board, Toz Soto for taking the Vice-Presidency position and Kathy Duffy McBroom the Secretary-Treasurer position. A new member to the Board, Scott Harding, has filled our other vacancy. A big thank you to Edna Watson and Steve Gunther for their respective years of service, dedication and input. Their help was greatly valued.

We held our annual Vision Meeting at Otter Bar this spring on April 1st (no foolin'). Each project coordinator shared their respective project information with the 35 community members present. The community then shared their topics of concern and project suggestions.

There are several new staff members at the Watershed Center. A young family from Fort Collins, Colorado has joined us. David Pepin has a Ph.D. in Stream Ecology and will be taking on the position of Conservation and Science Director. Stacey Clark has accepted a position as Watershed Education Project Coordinator, and will be working with our children in the river schools. They have two lovely, vivacious daughters, Mica and Olivia, 6 and 4 respectively. The family is looking for housing in the Forks of Salmon area, as Mica will enroll in school there this fall.

Also, Laurie Bell Adams will be assisting with Watershed Education. Laurie is not new to the area; she resides at Somes Bar and has worked at Junction school with the kids. She originally ventured here from North Carolina.

We are here to serve the community, please stop in to visit, use the internet, make a copy, fax, scan a historical photo, set up a meeting, we will be glad to assist.

Kathy Duffy McBroom

Funding for the newsletter comes from the US Fish & Wildlife Service, CA Department of Fish & Game SB271 and the Klamath Fisheries Task Force

SRRC Staff and Project Leaders

Petey Brucker	Program Coordinator
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Les Harling	Staff Accountant
Nat Pennington	Fisheries Program Coordinator
Lyra Cressey	Water Monitoring Coordinator
Robert Will	Fuels Assessment & Junker Project Coordinator
Shannon Flarity	Noxious Weed Program Co-Manager
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Dave Pepin	Conservation + Science Director
Stacey Clark	Watershed Education Coordinator
Shannon Monroe	Bookkeeper
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Jake McIntire	Field Technician
Jessica Hanscom	Weed Crew
Celeste Martinez	Weed Crew
Clarence Hagmeier	Weed Crew
Irie Swift	Weed Crew
Miles Richardson	Weed Crew
Laurissa Gough	Screw Trap
Julian Rivera	Screw Trap
Lorelei Diamond-Holzem	Monthly Calendar
Dean McBroom	Klamath/Salmon Anglers & Guides Assc.

Historic and Current Range of Spring Chinook

Here's what the National Academy of Sciences says about the plight of the Klamath Basin Spring Chinook as excerpted from the *2004 Final Report on Endangered and Threatened Fishes of the Klamath Basin*. Historically the Spring Chinook "spread into tributaries throughout the basin, including the Sprague and Williamson Rivers in Oregon (*Moyle 2002*). The Shasta, Scott, and Salmon Rivers all supported large runs. Spring-run Chinook suffered precipitous decline in the 19th century caused by hydraulic mining, dams, diversions, and fishing (*Snyder 1931*) The large run in the Shasta River disappeared coincidentally with the construction of Dwinnell Dam in 1926 (*Moyle et al. 1995*). In the middle to late 20th century, the decline of the depleted populations continued as a result of further dam construction (for example, of Trinity and Iron Gate Dams) and, in 1964, heavy sedimentation of habitat that resulted from catastrophic landslides due to heavy rains on soils denuded by logging (*Campbell and Moyle 1991*). By the 1980s, Spring-run Chinook had been largely eliminated from much of their former habitats because the cold, clear water and deep pools that they require were either absent or inaccessible. Numbers of fish in the area continue to decline (*Moyle 2002*). Because the Trinity River run of several thousand fish per year is apparently sustained largely by the Trinity River Hatchery, the Salmon River population may be the last wild (naturally spawning) population in the basin. The Trinity River Hatchery releases over 1 million juvenile Spring-run Chinook every year, usually in the first week of June. Apparently, all spawners in the mainstem Trinity River below Lewiston Dam are of hatchery origin"

See Map on next page

Salmon River Chinook Life History

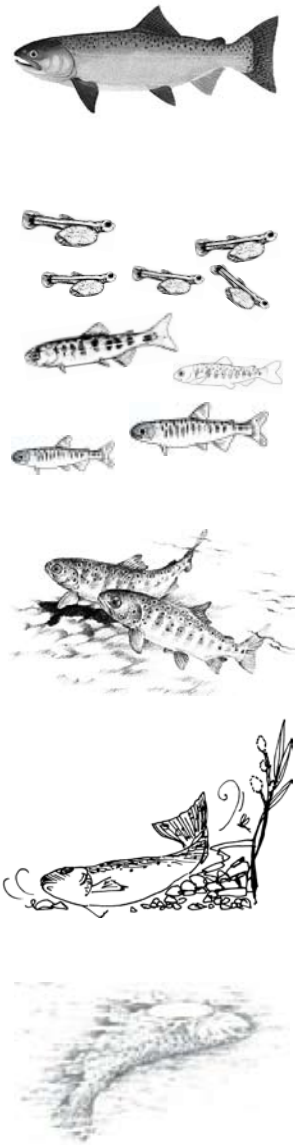
Periodicity Chart

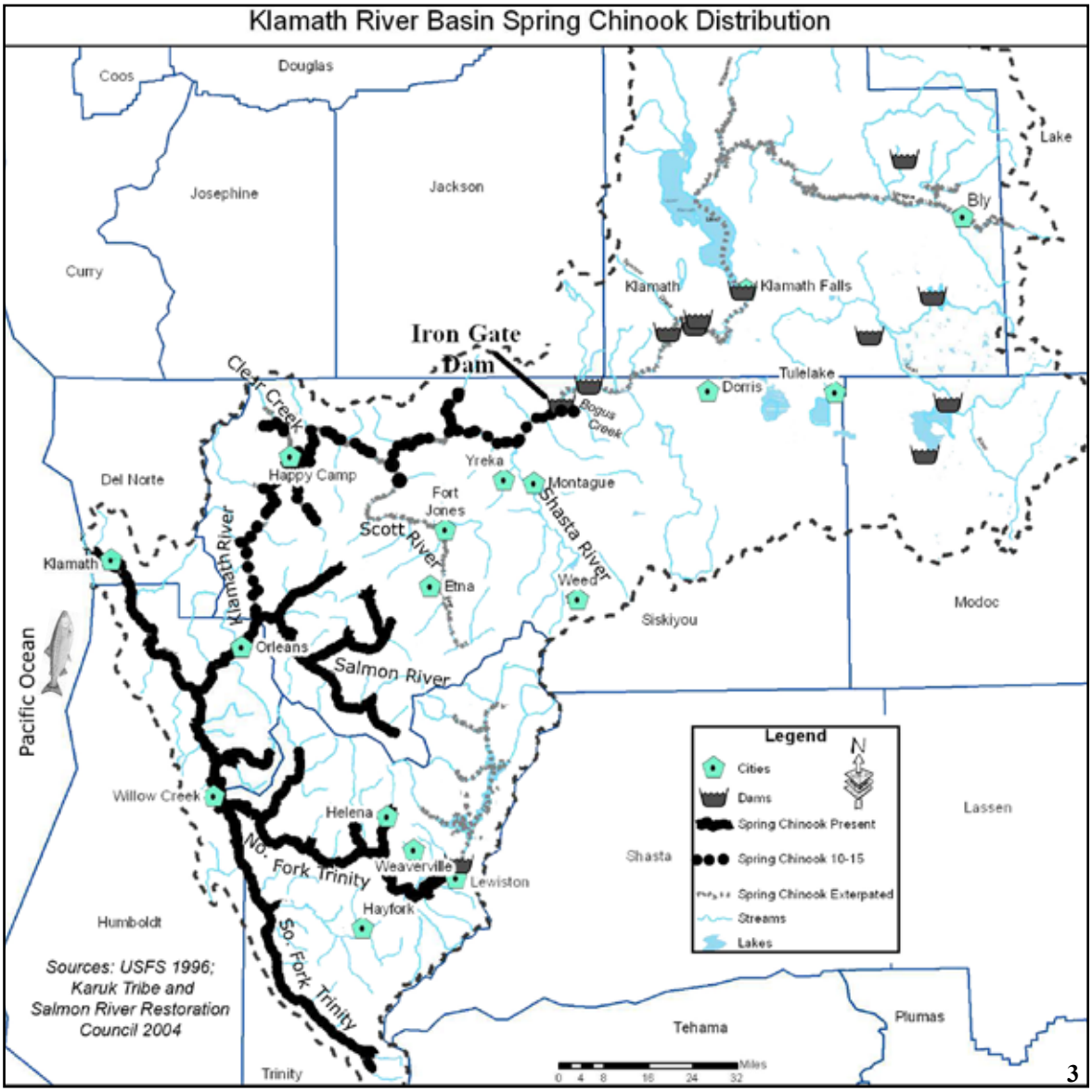
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Spring Chinook (Type II & III Juveniles[1])				Adult Migration and Holding								
									Spawning			
	Incubation/ Eggs									Incubation/ Eggs		
			Emergence/ Hatching									
	Rearing											
	Juvenile Out-migration											
Fall Chinook (Type I Juveniles[1])								Adult Migration and Holding				
										Spawning		
	Incubation/ Eggs									Incubation/ Eggs		
		Emergence/ Hatching										
	Type I fish are assumed to not rear in the Salmon River											
		Juvenile Out-migration										

Sources: NCRWQCB 2005, SRRC and KTDNR 2006.
1. There is no data available on the Salmon River to determine conclusively which type of juveniles (Type I, II, and III) are from spring and which are from fall Chinook. Best professional judgement has led to the assumption that the Type I juveniles are the Fall Chinook and Type II and III are Spring Chinook juveniles.

Spring-run Chinook enter the Klamath system from April to July, although most of the fish that appear later are apparently of hatchery origin (*Barnhart 1994*). The Chinook aggregate in deep pools, where they hold through September. Temperatures below 16•C generally are regarded as necessary for spring-run Chinook because susceptibility to disease and other sources of mortality and loss of viability of eggs increase as temperature increases (*McCullough 1999*).

In the Salmon River, temperatures of pools holding spring-run Chinook often exceed 20•C (*West 1991, Moyle et al. 1995*). Spawning peaks in October. Fry emerge from the redds from March to early June; the fish reside through the summer in the cool headwaters (*West 1991*). More precise details of the life history of spring-run Chinook in the Klamath basin are unavailable.





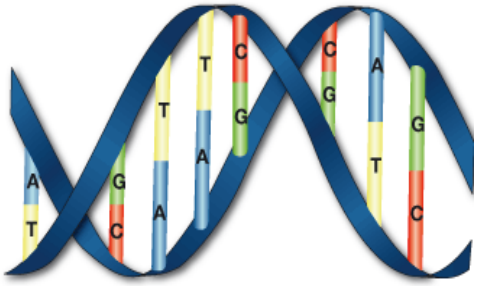
CSI Klamath: Fishing the Chinook genome for genetic stock identifiers.

Dr. Amy Sprowles and Nat Pennington

Continued from front page...

The Klamath River was once the third most productive river system for salmon in the United States. However, the effects of dams, mining, and logging have resulted in poor water quality and loss of habitat. Today, the once abundant Klamath salmon runs are less than 10% of their historic size. Recent closures of fisheries along the Oregon and California coast, due to the need to protect naturally spawning Chinook in the Klamath basin, have caused economic crises amongst fishermen and related businesses. Lack of universal marking through methods like coded wire tags in hatcheries or genetic identification in the Klamath Basin limits the ability of managers to protect weak stocks without complete fishery closures. The Klamath Fisheries Restoration Task Force Technical Work Group (TWG) developed a set of prescriptions designed to restore weak stocks in the Klamath Basin. One of the critical yet lacking tools recognized by the TWG is genetic stock identification for each of the wild and hatchery populations of Chinook salmon throughout the basin. If genetic markers are identified for each population of interest, biologists will be able to determine the natal origin and run timing of any Klamath Chinook they discover in the river or the sea.

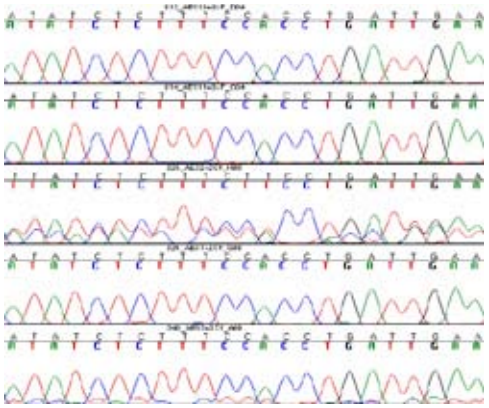
A molecular genetic marker is a segment of DNA positioned at a specific location in an organism's genome. Molecular markers are useful in studies of populations because the particular makeup of this segment of DNA (the molecular marker) varies from population to population and can be used to identify and track distinct populations (*Hartwell et al. 2004*).



A molecular genetic marker is a segment of DNA positioned at a specific location in an organism's genome. Molecular markers are useful in studies of populations because the particular makeup of this segment of DNA (the molecular marker) varies from population to population and can be used to identify and track distinct populations (*Hartwell et al. 2004*). With the advent of genome sequencing, single nucleotide polymorphisms (SNPs) have begun to emerge as an extremely useful new molecular marker for population and taxonomic analyses. In fact, SNPs are quite common. For example, approximately 90% of the genetic variation in humans is the result of SNPs. Moreover, because SNPs are associated with a very small and easily identified segment of DNA, studies of populations using SNPs can be compared over time and among laboratories. Additionally, new analytical tools enable this information to be generated very quickly. In management terms, this means that samples collected from Chinook harvest or mortality could be assigned their population origin in the Klamath Basin within a twenty-four hour period. The utilization of this form of universal marking, which is easily available and inherent in the tissue of every fish, will increase the effectiveness and efficiency of weak stocks management for the entire Pacific Northwest.

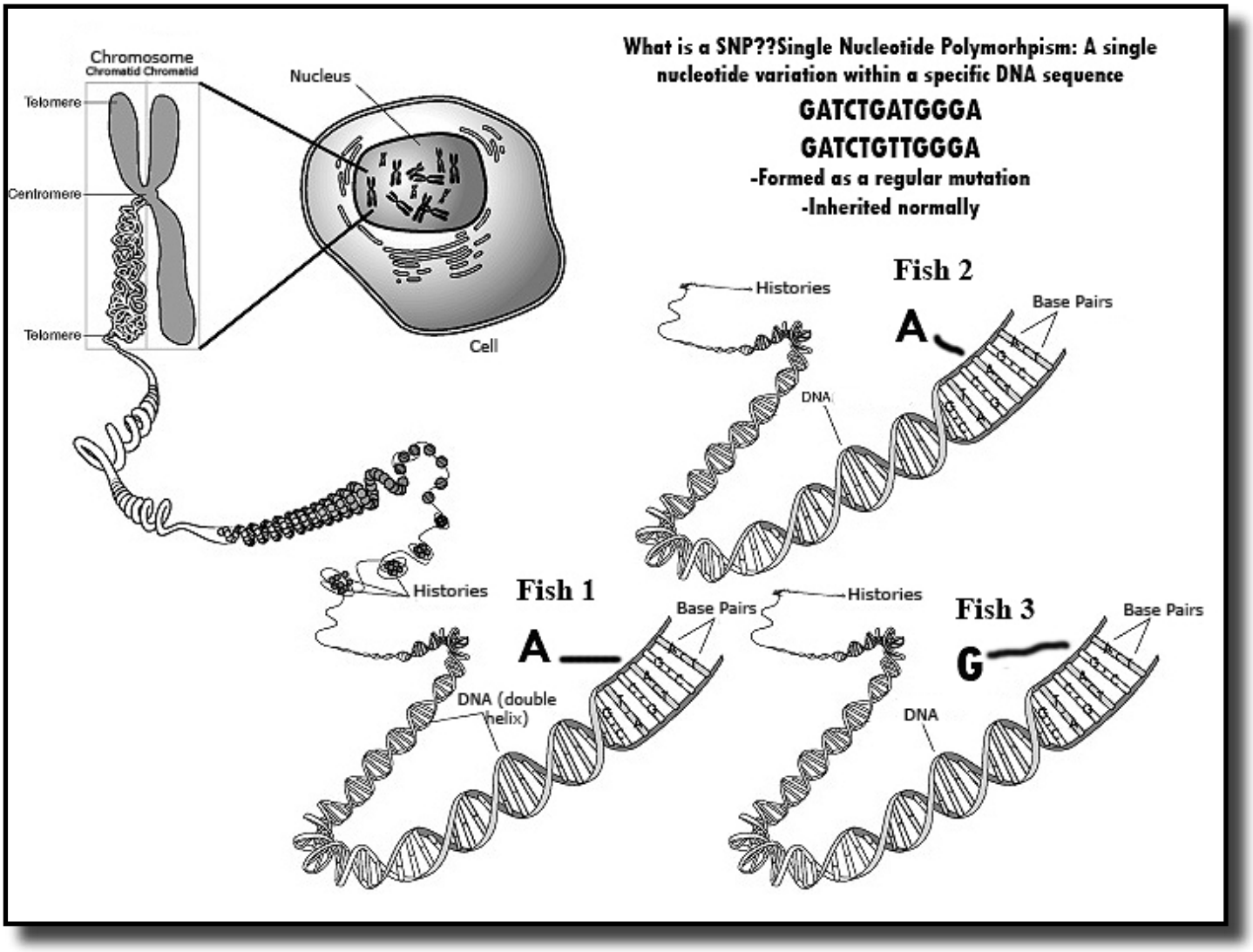
Though SNPs are relatively new to conservation genetics, they have already been applied to fisheries issues. The Alaska Department of Fish and Game (AKDFG) have developed SNP markers able to identify Northern Pacific populations of Chinook and Coho predominantly by watershed (*Smith et al, 2005a, 2005b, and 2005c*). Other laboratories have joined the effort and are working on a Pacific Coast-wide salmon SNP database. The Genomic Variation Laboratory at the University of California, Davis was able to develop SNP markers that differentiate populations of California resident rainbow and hatchery trout (*Sprowles et al. in press*). These markers are being used to identify populations of native fish that have hybridized with introduced hatchery strains and aide in repopulation efforts of habitats previously contaminated with the progeny of these hybrids.

This past semester, a pilot study for Klamath Chinook SNP development and genotype analysis was initiated by Dr. Amy Sprowles in the Biological Sciences Department of Humboldt State University. Fin, scale, and tissue samples of Klamath River, Salmon River, and Iron Gate Hatchery (IGH) spring and fall Chinook were donated by SRRC, The Karuk Fisheries Department, Yurok Fisheries Department, and the Orleans district of the US Fish and Wildlife Service. Amy, Dr. Mark Wilson of HSU Biological Sciences, and their classes of genetics students tested the samples to see which tissues were able to provide DNA suitable for genetic analysis. They were able to extract DNA from all three tissue types, including single scales of Salmon River fish collected in 2004 and 2005. The samples were then sequenced and the DNA sequences compared to look for differences (which would indicate SNPs). Finally, the DNA was analyzed for genetic variation, using one of the genome locations identified by the AKDFG. Though the data set is too small to draw broad scientific conclusions, differences were seen between the samples. This study and the work of geneticist Dr. Andrew Kinzinger of the HSU Fisheries



Department on Trinity River Spring and Fall Chinook (*Kinzinger et al. in prep*) have resulted in the development of proposals for Klamath Chinook SNP development to be performed at HSU through a collaborative effort between the scientists.

A full scale project for the development of SNPs as genetic stock identifiers for Klamath basin Chinook will require multiple steps and the involvement of many individuals and institutions. A significant sampling effort of the main spawning populations in the Klamath and Trinity rivers, including Salmon River Spring Chinook, Salmon River Fall Chinook, IGH Fall Chinook, Trinity River Hatchery Fall Chinook, Trinity River Hatchery Spring Chinook, South Fork Trinity Spring Chinook, South Fork Trinity Fall Chinook, Shasta River Fall Chinook, and Scott River Fall Chinook, will be required from fisheries biologists throughout the region. Once samples have been collected, the scientists at Humboldt State University will likely collaborate to perform the bulk of the molecular and statistical analyses. When the markers have been developed, they can be tested for their ability to analyze the relatedness of the populations to each other and to Chinook in other watersheds, analyze which populations of Chinook are in a specific location within the water shed at a given time, identify a Klamath River Chinook in the ocean fishery, and assign



unknown individuals to their stock. Finally, financial and technical support from regional tribal, state, and federal agencies will be essential for both marker development and management implementation.

Ultimately the goal of this project is to protect the wild salmon of the Klamath basin. It is clear that the success of this project will require the involvement of many people over years of time. Humboldt State University Fisheries is planning to host a workshop on Klamath salmon genetic stock identifiers in spring, 2007. If you are interested in attending or participating in the efforts of the project in any way, please contact the SRRC fisheries program.

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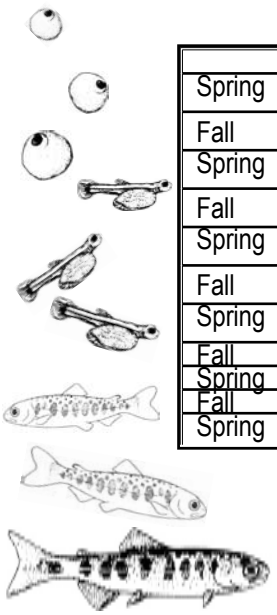
Klamath River Periodicity Chart for Spring & Fall Chinook



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Spring		Adult Migration/ Holding						Holding				
Fall	Spawning								Spawning			
Spring									Spawning			
Fall	Incubation / Eggs								Incubation / Eggs			
Spring	Incubation / Eggs								Incubation / Eggs			
Fall	Emergence / Hatching										Emergence / Hatching	
Spring	Emergence / Hatching										Emergence / Hatching	
Fall Spring	Surviving Juveniles Rearing in the Klamath Mainstem											
Fall Spring	Surviving Juveniles Out-migrating											

The Periodicity Chart shows Salmon River Springers are leaving the Salmon River and using the Klamath River year round. Conditions in the Klamath River lead us to believe that many of these fish are dying before they get to the ocean. This underscores our need to restore the Klamath system.

What the SRRC Does for the Chinook Spring Salmon

When we started SRRC in 1992, there were only 180 adult Spring Chinook counted in the Salmon River. Largely due to our early Salmon ED Cooperative Workshops and the commitment to the fish by key community members, the summer fishing for these fish in the Salmon River virtually stopped. We thank our community immensely for being willing to take the first giant step towards protecting and recovering the "Springers".

In 2001 the SRRC initiated and facilitated the Klamath Salmon Spring Chinook Voluntary Recovery Work Group which has been working on the recovery of the Klamath Basin spring Chinook. The Work Group members have identified and are working on achieving 7 key goals. A bibliography has been compiled and is available on the internet at the Klamath/Salmon Natural History Library web site, www.klamathsalmonlibrary.org, or as a hard copy at the Library in the Mid-Klamath Watershed Center in Orleans, CA.

The Work Group has identified key data gaps, promoted and implemented research activities, and is completing a Limiting Factors Analysis for the all life stages. The Work Group is also identifying remedial actions, including adequate stock identification and increases understanding of life history patterns.

Funding, although scarce, has been secured and other support has been enlisted by the SRRC to address these recovery actions, research needs and to accomplish the prescribed remedial actions. The SRRC has been active in the processes and activities related to the reintroduction of spring-run Chinook throughout the Klamath Basin.

Through our investigations we have uncovered various concerns about the Klamath Basin Spring Chinook. First, the National Marine Fisheries Service (NMFS), in their status reviews, have not recognized the Klamath Basin Spring Chinook as being an independent species that is its own "significant evolutionary unit". The "springers" in the Sacramento and Columbia rivers are given the status of an independent species and subsequently they receive many benefits from management. Without this management direction, the Pacific Fisheries Management Council, who recommends annual harvest levels to NMFS, has failed to develop a Fisheries Management Plan and Conservation Objectives for the Klamath Spring Chinook. This means that our fish can be indiscriminately caught as a Fall Chinook and that there are no minimum numbers of spawners identified as needed to sustain the Spring- run. Consequently, when our fish are in the Klamath Basin they have no specific management benefits for fishing, flows, habitat, or for migration barriers. This lack of recognition is at the heart of why the Spring Chinook get very little help and/or protection by managers, other than some tribal managers.

The SRRC has made various key presentations to, and worked with, Klamath Basin Fisheries Task Force, Klamath Fisheries Management Council, Pacific Management Council, and other fisheries management entities to promote the protection and recovery of the spring-run Chinook salmon in the Salmon River and for other stocks throughout the Klamath Basin.

The SRRC has developed several Salmon River spring-run Chinook educational products, including posters, brochures, web page, videos and power point presentations. The SRRC and its partners will continue to address the recovery goals and needs of Spring chinook. We are committed to using this less combative and more inclusive approach to attain the recovery of the Klamath/Trinity Spring Chinook salmon.

Existing Strategies and Plans to Help the Spring Chinook

Some of the documents that have helped guide the protection and restoration of their habitat essential for these fish in the Salmon River include:

1) A Proposed Strategy To Recover Endemic Spring-Run Chinook Salmon Populations And Their Habitats In The Klamath River Basin (USFS/West-1991).

2) Long Range Klamath Basin Restoration Plan (1991-USFWS-Klamath Restoration Task Force).

3) Northwest Forest Plan and KNF Land & Resource Management Plan, which promotes responsible management and restoration of the Spring Chinook habitat (USFS-1994).

4) Salmon River Community Restoration Plan (1994-2006) and **3 Year Funding Strategy**. The SRRC has developed and adopted this to provide guidance in restoration within the local community and with our various partners.

5) The Salmon River Subbasin Restoration Strategy (USFS/SRRC 2002), which assesses aquatic, riparian and upslope problems and prescribes an action matrix of prioritized and scheduled actions. The 2002 Strategy indicated that the major impacts to the Salmon River anadromous fisheries were likely occurring outside the Salmon River in the Mainstem Klamath River, the Klamath estuary or in the ocean.

6) Salmon River Total Maximum Daily Load Assessment (NCRWQCB-2005), which provides direction to reduce the water temperatures in the Salmon River through the protection and rehabilitation of riparian areas.

Additional Actions Still Needed to Head Towards Recovery

1- Recovery Strategy/Conservation Plan
Develop a Recovery Strategy and/or Conservation Management Plan. Identify the Klamath Spring Chinook as "there now" species, ESU (state and federal). Address factors limiting these fish in the Salmon River, Klamath Basin, and Ocean.

2- Ocean Fishing Regulation
Develop a Fish Management Plan and Conservation Objectives for Ocean Harvest. Complete population assessments. Develop and use harvest quotas to insure sustainability.

3- In-River Fishing Regulation
Develop in-river (Klamath/Trinity) state fishing regulations specifically to protect the Spring Chinook.

4- Life History Understanding
Develop a better understanding of the Spring Chinook life history patterns for adult and juveniles. Continue to utilize scales, otolith, and other methods for these assessments.

5- Stock Identification
Develop adequate stock identification markers to be able to distinguish native stocks from each other. Use genetic markers, including SNP techniques.

6- Recovery Work Group
Support the Klamath Salmon Spring Chinook Voluntary Recovery Work Group efforts and apply this approach to all of the other stocks (historic or current) in the Klamath Basin.

7- Bring the Salmon Home
Reintroduce Spring Chinook into their historic range, to insure that an adequate meta-population exists.

8- Traditional Tribal Practices and Management
Support traditional tribal fishing practices and management throughout the Klamath Basin.

9- Spring Chinook Population Surveys and Forums
Join the SRRC with its various cooperators to perform the annual population survey dive and come to our "Jammin for the Salmon" education and music festival. For more information contact Petey Brucker or Nat Pennington at the SRRC.

What Can You Do?

Participate and support all of the Spring Chinook surveys/dives in the Klamath Basin and participate in the activities and forums that focus on management and recovery of Spring Chinook.

In closing, a question keeps ringing in my head. Will a central symbol of the Klamath Basin people for time immemorial, the majestic Spring Chinook or snow salmon, fade out of our reality, only to end up as "ghost fish" in these salmonless rivers?

Petey Brucker

The Salmon River Rotary Screw Trap,

commonly called the Fish Trap, floats on the main stem of the Salmon River below Blue Hole and Merril Creek. The Fish Trap is a 5-foot cone containing spiral steps that is supported by aluminum pontoons. Water and fish enter the cone's mouth and are deposited at the other end into a screened "live box," which allows water to flow through the box, but not fish. The lid of the live box is on hinges, opening up to access and release the trapped fish each day.

I have been working for the SRRC and with the Karuk Tribe on this fish trap for 8 months of each year since 2001. For the past 3 years, the SRRC crew has also been working on the fish trap at Big Bar, on the Klamath River (which is a much larger trap-supporting an 8 foot cone and catching a greater number and variety of fish). The key reasons for operating the traps are to fill management data gaps related to juvenile abundance, health, life history migration patterns and stock ID.

A juvenile lamprey, or ammocetes.

A typical day at the trap consists of the following. We first count how many revolutions the cone makes in 3 minutes. We walk the plank to the trap carrying out buckets, nets, a measuring board and a data sheet. We fill a bucket with water and clean out the live box, sorting through the debris and placing the juvenile and small fish into the bucket. Then one of us catches, identifies, measures, and releases each fish one by one, with the utmost care, while the other records the data. The next step is to measure the water flow at the mouth of the cone at six different places. To do this, we plunge a small 'torpedo' with a propeller into the river for one minute intervals. Each time the propeller spins around, it spins a number on the read-out, which is like the mileage gauge on the dashboard of your vehicle. After recording these numbers we count the revolutions

Chinook juvenile being measured in a water-filled tube. Whether it's a Spring chinook is one thing we're trying to determine.

of the cone once more before leaving. The trap is moved to different locations throughout the seasons to keep the cone spinning at the optimum number of revolutions and to be catching the most fish.

The Salmon River Fish Trap usually catches Chinook salmon, steelhead or rainbow trout, speckled dace, lamprey juveniles (called ammocetes), marbled sculpin, Coho salmon and sturgeon. At Big Bar Fish Trap we catch the above fish as well as catfish, shad and bass. Some days we catch very few fish and some days over 1,000. The peak out-migration usually occurs in July when many of the juvenile Chinook leave the Salmon to make their long, perilous journey to the estuary and the ocean.

After doing this work for the past five years, it was beginning to seem routine. However, this year has been very different than the past 5. This year we've gone weeks without catching a single fish. We have only recently begun to see fish in the Trap.

This precipitous decline seems to be an indication that these sensitive fish are more at risk than ever. The factors affecting them reach far beyond the local in scale. It will take cooperation at many levels if we hope to save them.

Interested in learning more or checking out the trap? Call the SRRC at 530-462-4665.

By Laurissa Gough

Adoption Amongst Weeders of important noxious weed sites has been recognized as a major contributor to the health of local ecosystems. The duo of Delta and Frank Christ have been using hand techniques to control Marlahan Mustard along the Etna-Sawyers Bar Road for years. The benefits of this long term manual removal is evident. The magnitude of the Marlahan Mustard infestation along this roadway is significantly less than in comparable areas. Their persistence is commendable, and we are all thankful for their work.

Another dedicated individual is Lorelei Diamond-Holzem. In Sawyer's Bar, she has tended a Spotted Knapweed specimen for years (seen at left). Although most of its generation succumbed to the weed crews long ago, Lorelei has prevented the Education Plant from seeding, but preserved the plant. Many folks have used it to learn firsthand to identify this weed. Only recently did it finally expire of natural causes. Thank You Lorelei.

Another personal adoption story success is that of Phil Purcell, who took on a remote knapweed site on the lower Salmon. As the spur road is decommissioned, the work he has done to control the infestation is especially fortuitous. Thank you Phil for all your efforts.

There are many people who take this kind of initiative to control important weedy areas. If you can spare some time to help take care of the watershed around you, we'd love to hear about it. Our Cooperative Noxious Weeds program has proven so successful that Spotted Knapweed is now extremely hard to find. Control of Noxious weeds are one of the many things needed to help restore the watershed and it's fisheries. SRRC crews are branching out to dig other prioritized weeds present in the watershed. To help out, please contact us, or join us for Noxious Weed Workdays Tues-Thurs. at 9am in the Forks.

Big Fish, Big Problems Green Sturgeon in the Klamath River System

Species Reduced to Three Spawning Populations

The only remaining spawning populations of Green Sturgeon are in the Sacramento and Klamath River basins in California and possibly in the Rogue River in Oregon - rivers that have been extensively dammed, diverted, and polluted. These rivers have flow regimes affected by water projects, limiting suitable spawning conditions for green sturgeon. Increasing urban and agricultural demand for water threatens the future spawning success for the entire species. Sturgeons in general are highly vulnerable to habitat alteration and over-fishing because of their specialized habitat requirements, the long time it takes them to reach breeding maturity, and their sporadic reproductive success.

The southernmost green sturgeon populations occur in California, a region experiencing dramatic declines of its anadromous fishes due to dams, water withdrawals, and habitat alteration. A number of presumed spawning populations of green sturgeon have been lost since the 1960s and 1970s - from the Eel River, South Fork Trinity River, and San Joaquin River. Severe declines of green sturgeon have been noted recently in northern rivers which may have once had spawning populations, such as the Umpqua River in Oregon and the Fraser River in Canada.

It is currently estimated that each of the three known or suspected spawning populations of green sturgeon contain only a few hundred mature females. This is cause for alarm, because with so few females of reproductive age, not only do fish have a hard time finding each other for spawning, but also maintaining minimum population sizes for genetic diversity becomes a concern.

Over-fishing Takes Its Toll

Historic over-fishing was a major cause of decline of the species. There have been some huge catches, such as the 6,000 green sturgeons taken from the Columbia River estuary during a four-day sturgeon fishing season in 1986. The large size and sluggish nature of sturgeons make them easy to net and snag. Present fisheries for green sturgeon continue to deplete a stock of large, old fish that cannot renew itself at current harvest rates. The principal fisheries for green sturgeon are in south coastal Washington and in the nearby Columbia River estuary, yet there is no evidence of sturgeon spawning in that region.

These fisheries may depend on sturgeon from California that are attracted to the area for abundant food resources. Tribes living along the Klamath River, including the Yurok, Karuk and Hoopa, have a minimal subsistence fishery for Green Sturgeon. The Yurok Tribe Fisheries Department recently placed regulations on the amount of sturgeon that could be harvested by Yurok fishermen on the Klamath River to address current low population numbers.

Will Harling

The green sturgeon is a large, olive-green, bony plated, prehistoric looking fish, with a shovel-like snout and vacuum cleaner-like mouth used to siphon food from the mud. Green sturgeon (Acipenser medirostris) can reach 7 ½ feet in length and weigh up to 350 pounds. They are among the longest-lived of all freshwater fish, living up to 70 years. The green sturgeon can be separated from the white sturgeon that is seen occasionally in the Klamath River by its color (olive-green with three olive stripes as compared with gray and no stripes), by its fewer bony plates (23 - 31 in the lateral row as compared with 36 - 48), and by its pointed snout. The green sturgeon spawns in fresh water in the mainstem of large rivers. One fish tagged in the Klamath moved upstream past Ishi Pishi Falls and was retaken at Happy Camp. This is near the upstream limit of their known distribution. The presence of very small green sturgeon well upstream in the Klamath system suggests that adults go very far inland to spawn.

Photo top of page by Toz Soto

Photo above, juvenile sturgeon counted and measured at the Screw Trap on the Salmon.

Restoring salmonid habitat in the Salmon River watershed:
Whites Gulch and Hotelling Gulch Barrier Removal Projects Update

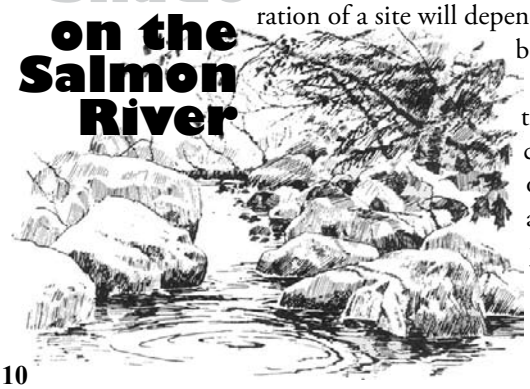
Whites Gulch: Two dams and a culvert on Whites Gulch, a tributary to the North Fork Salmon River, currently limit access to high quality spawning and rearing habitat for Spring chinook, coho, and steelhead. The SRRC, Siskiyou County, CA Dept. of Fish & Game, USFS, NOAA, and local private land owners have been collaborating on a project designed to ameliorate this problem. The objective is to restore access to approximately 1 mile of stream spawning and rearing habitat. These fish barriers have been identified by the 5 County Fish Passage Assessment in 2000 and the USFS during past habitat surveys, and ranked as the number 1 priority barrier in Siskiyou County, making this project a high priority for fisheries restoration. The Whites Gulch project will also improve and relocate an existing stream diversion that provides hydropower electricity to a local landowner.

Hotelling Gulch: Two culverts and a sediment trap near the terminus of Hotelling Gulch, a tributary to the South Fork of the Salmon, are affecting spawning and rearing of anadromous salmonids in the watershed. During the 1964 flood, the lower reach of Hotelling Gulch avulsed (diverted) to a new channel, which empties into the Salmon River approximately 100 feet upstream from its original location. This channel avulsion washed out the South Fork Road, causing a *massive* input of sediments to the Salmon River. As a fix, the Forest Service put in a sediment trap and 2 undersized culverts that are still there. These culverts act as effective migration barriers to the several species of anadromous salmonids that historically utilized the high quality habitat in Hotelling Gulch. These barriers have also been identified by the 5 County Fish Passage Assessment and the USFS, and ranked as the number 4 priority barrier in Siskiyou County.

The SRRC is collaborating with the Forest Service and Swanson Hydrology & Geomorphology to complete required environmental compliance and engineering surveys in order to prepare for subsequent projects that will re-align the stream to its original channel and replace the current culverts with a bridge or arch culvert. The long-term objective is to restore anadromous fish access to approximately 1.4 miles of critical habitat in this tributary.

The other fish barrier location on our county road is **Kelly Gulch.** The County Roads Department has a grant to replace the culvert at Kelly Gulch with a bridge. This work is being completed this August.

Finding the Shade on the Salmon River



In June, 2005 the Salmon River Total Maximum Daily Load study (TMDL) was released. The TMDL determined that the Salmon River is temperature impaired for fish, and that the best way to address the problem is to increase riparian shade. In response to that, the Restoration Council developed a project, funded by the Bella Vista Foundation, to assess the river's riparian zone. The assessment will locate areas that are deficient in vegetation (including tailing piles), and decide whether there is potential for more vegetation at the site. Restoration of a site will depend on accessibility, flood risk, aspect, soil type, cost and other factors. Many sites will be able to be planted by hand; some will require large scale site preparation.

Field work began this summer. Local crews have been surveying the river and prioritizing sites most beneficial for Spring chinook and other species. The team will also be collecting and propagating local riparian trees and bushes to be used for the revegetation of selected areas. In the fall, several acres of prioritized private property will be planted, as the first stage of implementation. This will be an ongoing project with many opportunities for community involvement. We hope to receive funding for further implementation next year.

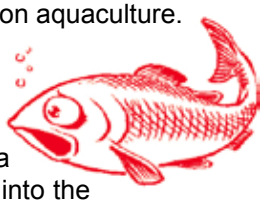
If you would like to get more involved in the Riparian Assessment project, please contact Lyra Cressey or Jim Villeponteaux at the SRRC.

Farmed Salmon: What's the Deal?

Did you know ... ?

Salmon farms are basically floating feedlots made of gigantic synthetic nets that contain large numbers of mass-produced and overcrowded fish. In fact, most salmon farms are able to raise more than 500,000 fish in an area the size of 4 football fields.

So, what's the deal with farmed salmon? How do overcrowded, farm-raised salmon differ from their wild counterparts? This article is a brief summary of a couple important human health and environmental concerns surrounding salmon aquaculture.



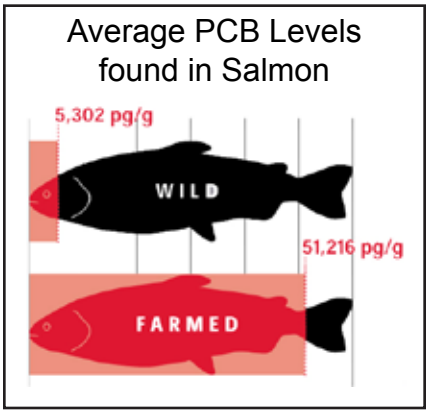
Antibiotics!

Farmed salmon need antibiotics to combat diseases that arise under overcrowded conditions in their net cages. These antibiotics, including oxytetracyline and various sulfa drugs, are administered via medicated food pellets. About 30% of the medicated fish pellets given to the fish go uneaten and fall into the open ocean -- entering the wild food chain.

These antibiotics have been found to kill natural marine algae and bacteria as well as cause deformities in halibut larvae. They also contribute to an increase in antibiotic-resistant bacteria. The BC Salmon Farmers Association tries to limit human exposure to antibiotics by imposing a mandatory waiting period after treatment to ensure that the antibiotics are cleared from the salmon's system prior to consumption. However, it is unclear how this is actually monitored.

PCBs!

PCBs (polychlorinated biphenyls) are those pesky, persistent, cancer-causing chemicals that were banned in the United States in 1977. Farmed salmon absorb PCBs from their food. In fact, the Environmental Working Group showed that farmed salmon purchased in the U.S. contain more PCBs then other food sources. EWG reported that farmed salmon have 16 times the PCBs found in wild salmon, 4 times the levels found in beef, and 3.4 times the levels found in other seafood. Both EWG and the Environmental Protection Agency recommend that consumers choose wild instead of farmed salmon, and that they should not exceed one 8 ounce serving of farmed salmon per month.



There are a few ways to decrease your exposure to PCBs from farmed salmon. Trim the skin and visible fat and prepare the fish in a way that reduces fat such as grilling or broiling. Also, try some canned salmon. Almost all canned salmon is wild.

Go Wild!

Whenever possible, we suggest eating wild Alaskan salmon instead of farm-raised fish. You'll be doing yourself a favor by reducing your exposure to antibiotics, harmful toxins like PCB's, and unnatural dyes. Your stomach will thank you as well, because wild salmon just taste better!

Type	Location	Texture	Flavor	Overall	Comments
Wild	Alaska	9.0	9.5	9.7	beautiful color; melts in your mouth; mellow
Farm-raised	Washington	5.0	5.5	4.83	greasy; fishy but tender; watery

A Wall Street Journal taste test scored farmed salmon at 4.83 out of 10. Wild salmon rated 9.7.

The excreta from an average farm are estimated to equal the sewage from a city of 7,500 people. The waste flows straight into the surrounding waters, fouling nearby habitat, causing disastrous plankton blooms, and destroying shellfish beds.

Article by Stacey Clark. Illustrations by Shannon Wheeler. Learn more at www.SalmonNation.com/fish/.

Year
Actual number

Salmon River Springers Population
Survey Results 1980-2005

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