Coho Monitor

Santa Rosa, California **July 2005**

Putting A Recovery Program Into Place

The Russian River was once home to tens of thousands of steelhead, coho and Chinook salmon, yet today these teeming salmon runs exist only in memories. The most dramatic declines have been observed in coho with only a few small remnant populations remaining. Concerned that the species faced extinction, a broad coalition of agencies, associations and volunteers developed a captive broodstock program to reverse this declining trend. Program partners capture fish from tributaries of the Russian River and raise them in the Lake Sonoma Congressman Don Clausen Warm Springs Hatchery for two years at which point they are spawned. The resulting offspring of wild fish are then planted into streams, where they spend their first winter before swimming to the ocean. If all goes well, after about a year and a half at sea, the fish will return to the Russian River and spawn naturally in the tributaries in which they were stocked. The long-term hope and goal of this effort is that once again we will see strong runs of coho returning to many Russian River tributaries.

Coho salmon have a three-year life cycle, typically living one and a half years in freshwater streams, and then migrating to the ocean for one and a half years before returning to spawn. In 2001, Department of Fish and Game biologists collected juvenile coho from the few streams where they remain, often saving fish from pools that were drying up or getting too hot for fish to survive. These fish were taken to the hatchery where they were carefully raised to maturity and spawned. Fish collections are repeated each year, resulting in two to three year-classes of fish in the hatchery at any one time. The oldest and first collected year-class was spawned in December 2003. Thus, the biologists have the dual challenge of raising multiple years of broodstock fish to maturity and successfully spawning them, while rearing one year of offspring for subsequent release.

The hatchery staff are faced with many challenges in raising these fish through their life cycle in fresh water. For the broodstock, special diets and feeding protocols were developed, disease outbreaks were overcome, and new holding tanks were built to increase fish activity. All of these measures contribute to raising healthy fish to mature adults with viable eggs and sperm for successfully spawning.

Hatchery staff use ultra sound equipment to confirm adult coho gender and readiness for spawning.

After hatching, special rearing protocols are followed with young fish. Visual contact with people is minimized so fish will retain their natural tendency to seek shelter on observing movement. This is a flight response to a potential predator. Feeding protocols were adapted and implemented that encourage active feeding behavior. Following enormous efforts on the part of many individuals, the final outcome has been thousands of small salmon ready each year for release into the natural habitat of Russian River tributaries. The hatchery staff has done an excellent job producing fish that quickly seek shelter and readily begin eating natural food items in the wild following release into streams.

Letting The Creeks Do The Nurturing

Once the young fish have reached the right age, they are released into tributary streams that have been identified as having suitable coho habitat. Program partners have released two separate year-classes, turning the

Spring and fall releases of coho salmon to Russian River tributary streams. Two year classes have been released, thus far. For the 2004 year class only a fall release was implemented. For the 2005 year class a spring release has been completed and a fall release is planned.

		Stream				
Year and Season		**Mill**	**Palmer** (trib. to Mill)	**Ward** (trib. to Austin)	**Gray** (trib. to Austin)	**Sheephouse**
2004	Spring	0	0	0	0	0
	Fall	3,433	0	1,775	0	952
2005	Spring	0	2,466	0	2,584	7,024
	Fall(planned)	4,500	2,000	4,500	2,000	1,000

After being trucked from the hatchery, young coho are transported to pre-identified pools in barrel back packs, complete with aeration to maintain oxygen levels (Backpacks were designed by Brett Wilson of California Department of Fish and Game)**.**

rearing over to the streams and the Russian River watershed (see "*Spring and fall releases…*" table).

This approach and strategy to let the creeks do the nurturing is by design. The program is working with the understanding and hypothesis that stream habitat conditions contribute to fish fitness more than hatchery settings. As a result, the program's stocking objective is to provide coho with the optimum amount of time in their freshwater habitat prior to migration to the ocean. Incorporated into this objective is a comparison of spring and fall releases. Program partners will use monitoring results to compare the success of these two release strategies and adapt future releases to contribute to the success of future year-classes.

They Are On Their Way

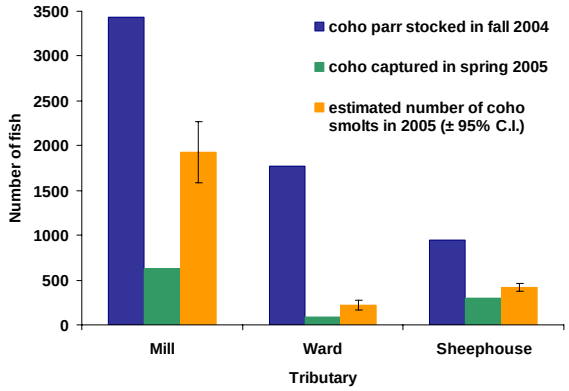
Having successfully released coho into Russian River tributaries, one of the next logical questions program partners have is do these fish survive the winter and make their way to the mainstem as they migrate out to the ocean. More specifically, we are interested in the condition and numbers of fish that make this next step of their life cycle.

Coho smolts captured in the downstream migrant traps. The smolt in the lower photograph was captured later in the spring and is more visibly developed into the smolt stage, with silver coloring and dark fin margins.

Through the 2005 spring monitoring of downstream migration we can gladly say that the fish released in October of 2004 are on their way. In each of the three stocked streams, outmigrating coho smolts were observed (*see "Number of coho" figure*). It is important to note that the number of coho observed in 2005, when compared with the

coho released in the fall of 2004, does not directly indicate over-winter survival rates, rather it should be considered a minimum count of fish that survived the winter.

In addition to over-winter mortality, other factors explain the difference in numbers released in 2004 and recaptures in 2005. For example, high stream flows reduced the efficiency of the traps and prevented continuous monitoring during the entire spring. There are also indications that some of the released fish migrated into the mainstem prior to the installation of downstream migrant traps in March 2005. Because we were unable to capture 100% of the downstream migrating smolts, we used a method to estimate population size. Results from these estimates indicate that survival of coho released in Mill, Ward, and Sheephouse was 56% ± 10%, 12% ± 3%, and 44% ± 5%, respectively.



Number of coho salmon per tributary that were released during fall 2004 and counted during downstream migration in spring 2005.

The Art and Science of Observing Fish

Tools of the trade for observing fish instream include a variety of nets and boxes made of durable materials (*see "Downstream migrant trap…" figure*). This type of effort also requires a committed and creative crew to tend traps. That durability, creativity, and commitment is vital to safeguard fish and protect equipment during flashy forceful streamflows like that in the Russian River.

An obvious question would be why sample during storm conditions. After spending a little over one year in freshwater, a coho juvenile will transform from a freshwater-tolerant parr into a saltwater-tolerant smolt. In the spring, coho smolts migrate from their rearing habitat in tributaries to the ocean where they grow into adults.

Downstream migrant traps are designed to capture coho smolts migrating from tributaries of the Russian River (upper). Fish are directed down into a holding box by weir panels and the net. Crews visit these traps each morning to count and release young coho and other fishes captured the night before (middle). Before being released, coho smolts are weighed and measured (lower).

The typical window for downstream migration of coho in the Russian River is from March to June each year. Young migrating fish also respond to increased flow and storms using the higher stream levels that follow rains to make their way downstream. Accordingly, crews installed and staffed traps in Green Valley, Mill, Sheephouse, and Ward creeks from early March to the middle of June this year.

Daily visits to the traps included counting, measuring, and releasing of any captured fish, as well as maintaining equipment. Ideally, sampling would be continuous throughout the entire season. However, given the severity of some storms this is not possible. In advance of predicted storm events, crews opened the boxes and in some cases removed the nets. On some occasions, the prediction of storm timing, location, and severity did not provide ample warning to take these preventative actions. Such was the case during the storm on March 19, 2005. To prevent equipment loss from such events, sampling crews modified trap deployment so that in high flows gear would lay down on the stream bed. This creative adaptation resulted in zero equipment loss during subsequent storms and shorter sampling downtime.

In addition to removing the equipment and opening the boxes during the highest storms, crews took other measures to insure fish safety. Firstly, the boxes are designed so that water flows freely through them, providing fresh water to fish inside. In addition, structures are incorporated within the boxes that create calm waters and provide captured fish a place to rest and until counted and released the following morning.

Not Just Coho

Monitoring in the tributary streams is providing useful information for a number of other fish species in addition to coho. Downstream migrant sampling identified 14 native and nine non-native fish species (*see "List of fishes…" table*). This data and information will provide documentation of potential dynamics between other salmonids like Chinook salmon as well as steelhead trout (see *"Other species of salmon…"* photograph). It will also add to our knowledge of species for which little is known such as Pacific lamprey (see *"In addition to coho…"*photograph).

Other species of salmon and trout were observed in the downstream migrant traps this spring such as juvenile Chinook salmon (upper) and juvenile steelhead (lower).

In addition to coho salmon, project staff have observed other fishes in the downstream migrant traps such as Western Brook lamprey (upper) and sculpin spp. (lower).

List of fishes identified at instream migrant traps during spring 2005 monitoring.

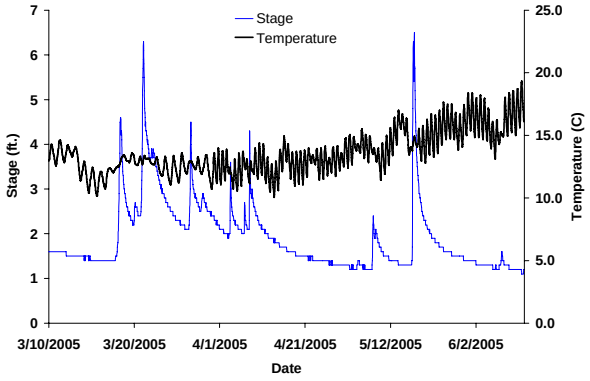
Common Name	Scientific Name
Native fishes:	
coho salmon	*Oncorhynchus kisutch*
chinook salmon	*Oncorhynchus tshawytscha*
steelhead	*Oncorhynchus mykiss*
sculpin sp.	*Cottus sp.*
roach	*Lavinia symmetricus*
Pacific lamprey	*Lampetra tridentata*
Western brook lamprey	*Lampetra richardsoni*
hardhead	*Mylopharodon conocephalus*
pikeminnow	*Ptychocheilus grandis*
threespine stickleback	*Gasterosteus aculeatus*
Sacramento sucker	*Catostomus occidentalis*
Sacramento blackfish	*Orthodon microlepidotus*
hitch	*Lavinia exilicauda*
tule perch	*Hysterocarpus traski*
Non-native fishes:	
bluegill	*Lepomis macrochirus*
green sunfish	*Lepomis cyanellus*
yellow bullhead	*Ameiurus natalis*
white crappie	*Pomoxis annularis*
black crappie	*Pomoxis nigromaculatus*
smallmouth bass	*Micropterus dolomieu*
largemouth bass	*Micropterus salmoides*
mosquitofish	*Gambusia affinis*
fathead minnow	*Pimephales promelas*

Where We Go From Here

Having not yet completed one year of monitoring, there is still much to do. This includes evaluating summer survival of fish released this spring, comparing results between different tributaries, and documenting the return of adult coho to spawn.

Surviving Summer Conditions – Because young coho live for one and a half years in freshwater streams they must survive both winter and summer conditions. Monitoring efforts, to date, have documented the level of survival through last winter for fish released during Fall 2004. With fish released this spring, monitoring will now focus on assessing summer survival. Monitoring crews will carefully enter pools wearing snorkels, masks, and wet suits. Their task will be to make visual observations of the number, condition, and behavior of fish in stocked streams. This work will be conducted in August and September, 2005.

Comparing Stream Conditions and Fish Response – This monitoring program is being conducted in a number of streams so that they can be compared. We will conduct this analysis over the next six months. This will include evaluation of fish response variables, such as fish survival and condition, and stream condition variables such as stream temperature and flow (see "*Stream stage height …*" figure). Where possible we will make correlations between the two for each stream we are monitoring.



Stream stage height and temperature at the mouth of Ward Creek from March 10, 2005 to June 14, 2005. Similar stream condition measurements are being made on the other streams where young coho have been released.

Return in December 2006 – A longer term step of the program is to document when adult fish return to spawn in the tributaries in which they were released. The anticipated return date for the first group of released fish is December 2006. These are the offspring of the first captive broodstock which were spawned in December 2003. Their return will mark the completion of a three-year life cycle and provide further feedback on the viability of the captive broodstock approach for coho recovery. At that time, weekly walks will be conducted in each stream to observe the presence of adult fish and indications that spawning has taken place.

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Editor's Note

This is the first of what will be an annual update of the ongoing collaborative efforts to monitor coho salmon re-establishment in Russian River tributary streams. This monitoring is important to generate the feedback needed to make adaptations to the Program's rearing and release strategies. Our intent for this newsletter is to provide you a summary of completed activities and steps planned for the future. We also want to extend our appreciation to all whom have contributed to the program's accomplishments thus far. This includes the numerous cooperating private landowners, whose participation and approved access to the streams is invaluable. An effort of this scale happens through a coordinated combination of many agencies and organizations including the leadership and contributions from California Department of Fish and Game, NOAA Fisheries, U.S. Army Corps of Engineers, Sonoma County Water Agency and others.

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