Up the Concrete Channel, One Pool at a Time

by Sandy Guldman

2008

Spawning steelhead wait in San Francisco Bay until freshwater flows from Corte Madera Creek signal it's time to move up the creek to their spawning grounds. We have long known that the concrete channel, which extends a distance of 4,900 feet from Kentfield to Ross, is the first of the barriers the fish have to traverse because of fast flows when the fish migrate. But now, thanks to funding from the National Fish and Wildlife Foundation, we have discovered how serious this barrier is and we have developed proposals for improving it.

Michael Love & Associates (MLA), working with Jeff Anderson & Associates, have assessed the present channel configuration and developed conceptual designs for improving the resting pools and locating the pools in such a way as to enable fish to get up the channel over a wide range of stream flows. The analysis also describes the effect of redesigned pools on water height in the channel at the maximum design flow for the Corte Madera Creek Flood Control Project, 5,400 cfs (cubic feet per second). This article presents a short summary of MLA's work; the full report is available on Friends' website under "Reports."

In northern and central California, steelhead spawn in the fourmonth period December through March. Taking into account fish behavior, rainfall patterns and stream conditions in Corte Madera Creek, flows of 14 to 177 cfs were selected as the fish passage flows for this study. These flows define the range over which fish are expected to try to swim up the creek.

To reach their spawning grounds, fish need to swim upstream against fast moving water, and periodically find places to rest en route. Those places must be large enough to accommodate the fish and close enough together so that the fish can get from one to the next before they are exhausted. Research has shown that the water velocity in a resting area should be no more than two feet/sec for the average 24-inch steelhead typically found in Corte Madera Creek. Steelhead in this system also need a minimum water depth of about seven inches to swim most efficiently— including swimming in place. The minimum size for a resting area is two feet by two feet by seven inches deep. This provides space for the fish to maneuver in the pool and swim efficiently. Note that an effective resting area is where the water depth and velocities meet these criteria, not where the depressions in the concrete are this size; in the existing pools, water velocities in most of the concrete depressions are too high or the water is too shallow for a fish to rest. Sediment moving through the system may partially fill some pools, also reducing their depth.

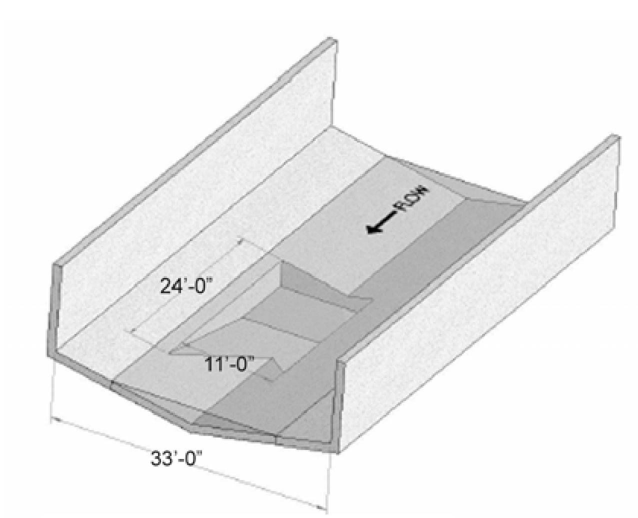
The upper 1,900-foot section of the concrete channel is slightly steeper than the lower section so water flows faster, and it is less influenced by tides; this is the section that challenges spawning fish. Indeed, this was recognized when the channel was constructed almost 30 years ago and 28 rectangular pools, spaced 64 feet apart, were included in the channel. Each pool is four feet long and 13 feet wide. The bottom of each pool is flat and is placed about an inch below the lowest point in the channel. Because the bottom of the channel is v-shaped, the depressions are 15 inches deep along outside edges.

The existing pools, although shaped the same, behave differently because the channel is not straight and the water velocities and depths vary along the channel. The existing pools provide some resting places at flows from 14 to 77 cfs. At 113 cfs and above, only a very few of the existing pools provide adequate resting places, so there are long stretches of channel without areas for fish to rest. That means the existing pools provide suitable resting habitat only over about half the range of fish passage flows. At low tides, success decreases from 7% to 1% as flows increase from 14 cfs to 177 cfs; success improves at high tides, but is still only 73% at 77 cfs and drops to 4% at 177 cfs. Clearly, the concrete channel is a serious barrier to fish passage.

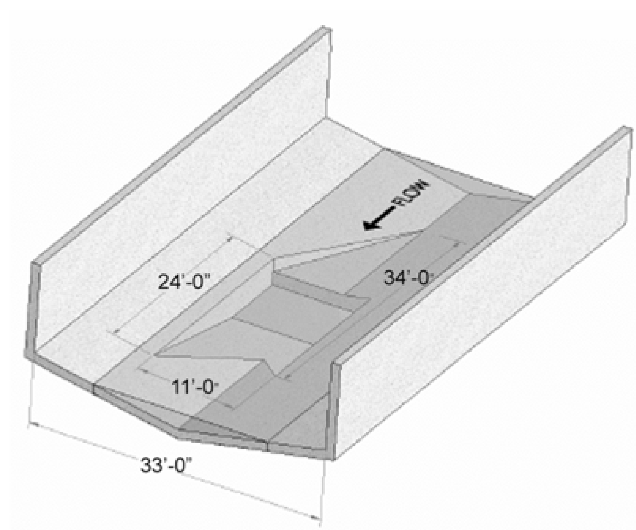
The straight and curved reaches of the concrete channel were studied separately. MLA developed several options for improvements and then identified a preferred alternative, using one pool configuration for straight sections of the channel and a second for curved sections.

Pool spacing is important, especially at high flows, so spacings from 100 to 300 feet were evaluated. Even the 300-foot spacing of improved pools resulted in substantially improved fish passage over the present channel; as pools are more closely spaced, passage improves, but with diminishing returns.

To allow for sedimentation in some of the pools that could reduce the amount of effective resting habitat, 150 feet was selected as the preferred spacing. At that spacing, a 65% success rate is expected at the maximum fish passage flow of 177 cfs, regardless of the tide. At 114 cfs and below, success is between 74% and 99%, with the higher rates at higher tides. This is a big improvement over existing conditions.



Preferred configuration for straight sections of concrete channel



Preferred configuration for curved sections of concrete channel.

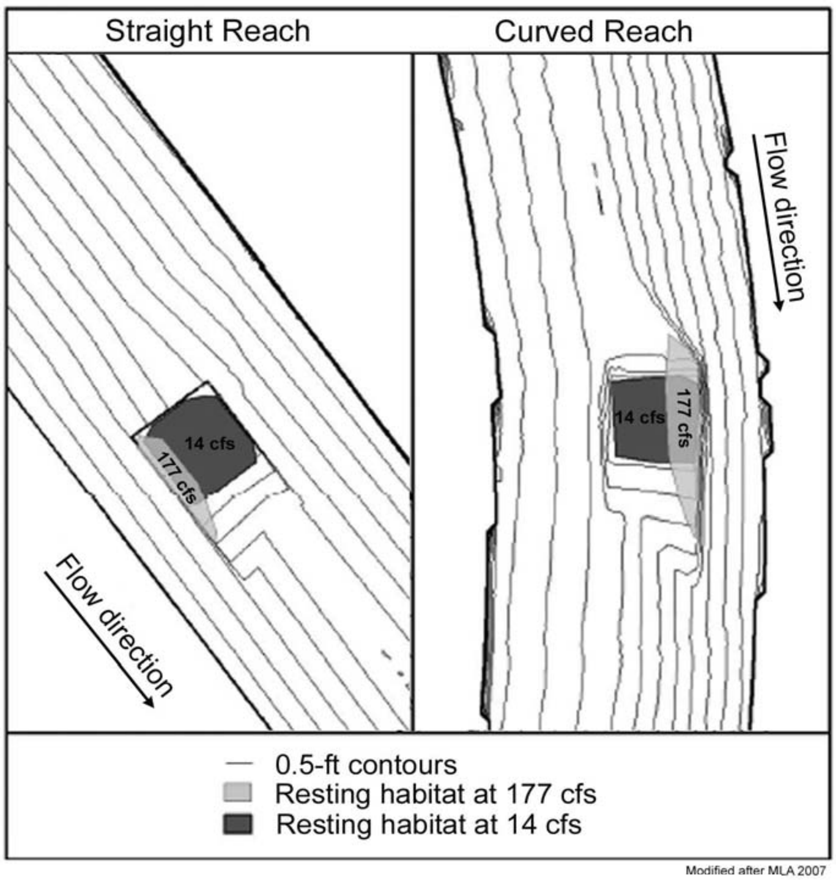
For flood management purposes, the design flow through the concrete flood control channel is 5,400 cfs. To achieve this with the existing configuration of the channel, the walls would have to be raised up to 36 inches in the concrete channel downstream of the pools. Replacing the existing resting pools with the preferred alternative at 150-foot spacing would require a further increase in bank height of approximately nine inches throughout the upper 1,900 feet of the channel, with an additional nine inches locally at each resting pool.

If new pools were constructed, existing pools would remain in place except where they were being replaced by new pools.

MLA's study shows what is attainable and how to do it. The key to finding the best answer is to make sure that we agree on the right balance between fish passage, flood impacts, esthetics, and cost. The appropriate place to address these issues is in the NEPA/ CEQA process for completion of the Corte

Madera Creek Flood Control Project, about to be initiated by the US Army Corps of Engineers and the Marin County Flood Control District.

This is our chance to be heard in support of improved fish passage as the project designs are formally developed, modified, and ultimately finalized. The goal is to reduce the frequency and severity of flooding in Kentfield and Ross without abandoning the steelhead. They must reach their spawning sites in Ross, San Anselmo and Fairfax if they are to survive. We have to speak up for them when it counts.



Resting Habitat with the Preferred Alternative

Website design by Karen Peterson, San Anselmo

Friends of Corte Madera Creek Watershed P.O. Box 415, Larkspur, California 94977
phone: (415) 456-5052 info@friendsofcortemaderacreek.org