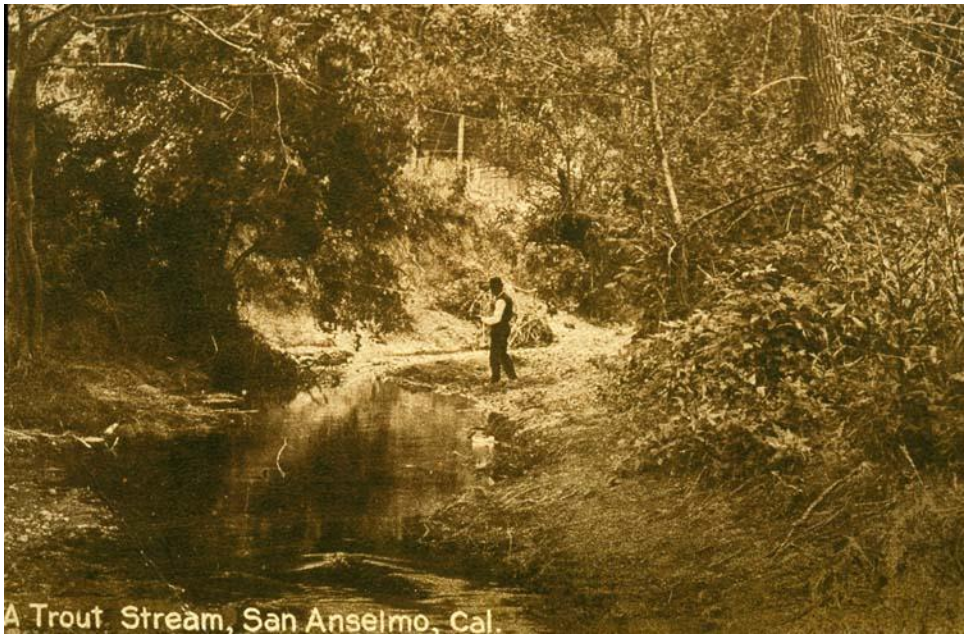
Stymied Steelhead

by Sandy Guldman (2020)

The information in this article was condensed from a draft report prepared by Michael Love and Associates, as part of work funded by a grant to Friends from the California Coastal Conservancy.

Abundant steelhead trout (*Oncorhynchus mykiss*) and coho salmon (*Oncorhynchus kisutch*) spawned in the creeks of the Ross Valley during the 1940s and 50s. Over the years, these creeks were degraded as fish habitat by hardened banks, culverts, and dams for swimming holes and stock ponds. Fewer and fewer fish returned to spawn. The final insult was the construction of the concrete channel in Kentfield and Ross, built by the US Army Corps of Engineers (USACE) in the 1960s with the intended purpose of reducing flooding. Making it through that barrier is something only the most robust fish can accomplish. About 10 years after its construction, coho salmon were extirpated from the watershed. A very small population of steelhead trout, now listed as threatened under the Federal Endangered Species Act, lingers on.



A postcard dating from about 1900 promotes the Ross Valley for fishing.

The section of concrete channel upstream of the College of Marin campus is the primary barrier to fish passage within lower Corte Madera Creek. Although two streams that historically supported salmonid species, Larkspur Creek and Tamalpais Creek, can be reached without passing through the concrete channel, both of them are seriously impaired: neither supports coho or steelhead populations.

The concrete channel reaches from Kentfield, downstream of Kent Middle School (KMS) to near the Ross post office. Below College Avenue, adjacent to the KMS campus, the channel provides poor fish habitat, but they can move through it. Then, as spawners attempt to move upstream, they encounter higher water velocities and the trip becomes even more challenging.

Two features to aid migrating salmonids were included in the design. The 33-foot-wide concrete channel has a v-shaped bottom that provides a low-flow zone for fish, and the upper part of the channel includes small depressions, intended to serve as resting "pools" for fish during higher flows.

In 1972, a wooden bulkhead, about five tall, was built at the upstream end of the concrete channel as a "temporary" structure to prevent erosion upstream. The bulkhead includes a wooden Denil fish ladder intended to facilitate fish passage. Although the USACE had planned to continue the concrete channel through Ross, local opposition stopped construction. The bulkhead and Denil fish ladder were originally intended to be in service for only one season; unfortunately, their flood-damaged remnants are still in place, about 50 years later.

With a grant from the National Fish and Wildlife Foundation, Friends hired Michael Love & Associates and Jeff Anderson and Associates (MLAJAA) to conduct a detailed passage assessment for

steelhead in the upper part of the concrete channel. The Marin County Flood Control and Water Conservation District and the USACE made in-kind contributions.

As part of this effort, volunteers with Friends, directed by MLAJAA, made videos at several locations during the fall of 2005 and winter of 2006. The videos showed what appeared to be a Chinook salmon (likely a stray from the Sacramento River system) in early December attempting to pass through the Denil fish ladder. Two steelhead were attempting to enter the fish ladder and one was resting in one of the resting pools in the concrete channel.

In addition to these four salmonids observed in 2005–2006, several steelhead kelts (fish that had spawned and were returning to the ocean) were observed together in a pool immediately upstream of the fish ladder in February 2006, reluctant to move down the ladder. These sightings confirmed that steelhead can occasionally ascend the Denil fish ladder.

The assessment (MLAJAA 2007) used detailed modeling that covered variable water depths and velocities and how far fish can swim before becoming exhausted. Passage conditions were evaluated for six flows from 14 cfs (cubic feet per second) to 177 cfs. Each flow was analyzed for three tidal conditions: mean low low water (MLLW), mean tide level (MTL), and mean high high water (MHHW). The table below shows the results from the channel modeling.

	Percent Successful					
Tide	14 cfs	23 cfs	40 cfs	77 cfs	113 cfs	177 cfs
MLLW	7	2	2	2	2	1
MTL	98	85	51	13	7	1
MHHW	99	92	97	73	54	4

Generally, satisfactory fish passage means that more than 90–95% of fish can move through the area during flows considered appropriate for spawning. The assessment found that during most of this period the proportion of fish able to pass through the concrete channel ranges from low to negligible. Because the lower portion of the concrete channel does not include any resting pools, at low tide nearly all the fish become exhausted attempting to swim through this lower reach.

Even for the fish who succeed in swimming the length of the concrete channel, the fish ladder at the bulkhead lacks an entrance pool downstream, so steelhead struggle to swim through a fast and shallow jet of water just to reach the entrance. The fish ladder often catches debris, creating yet another barrier to fish trying to reach upstream spawning grounds.

Are There Solutions? As part of their 2007 study, MLAJAA also evaluated the use of new larger resting pools to improve passage success within the concrete channel. The analysis focused on three different pool shapes, to identify a configuration that would provide low velocity zones suitable for steelhead to rest at all fish passage flows. An additional objective was to develop a pool shape that would minimize sedimentation. They developed three designs, with one better for straight reaches of the channel and another in curved reaches. Now, an additional complication has been added: more water needs to be accommodated in the concrete channel to reduce flooding. Unfortunately, features to aid fish passage often reduce the channel's water capacity.

MLA and engineers from GHD, consultants working with the Flood Control District on the project, are designing measures to meet all three objectives. Alternatives being evaluated include:

- installing much larger pools in the bottom of the channel;
- total or partial removal of the concrete channel upstream of the Kentfield Rehabilitation Hospital;
- raising channel walls;
- lowering part of the channel, and/or
- installing setback walls.

One size does not fit all. Each section of the creek requires a different combination of measures. But whatever project is implemented, it will include removal of the bulkhead and fish ladder. There are alternative

means to handle the elevation change between the bottom of the concrete channel and the natural creek bottom upstream of the bulkhead.

The Flood Control District has begun preparation of an Environmental Impact Report (EIR) that will cover proposed changes to the concrete channel. The public scoping meeting for the EIR is tentatively scheduled for August 2020. Check the Ross Valley Watershed website for more information as work proceeds. We are confident that a project that meets with public approval will be developed and that it will include improvements to fish passage—everyone can agree on that.