## The Twists and Turns of History

*An edited excerpt from Geomorphic Assessment of the Corte Madera Creek Watershed*
*by Stetson Engineers*
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Corte Madera Creek and its tributaries have changed greatly in the last 180 years. Changes first occurred when ranchers brought cattle to share meadows with meandering streams. Next our ancestors urbanized and altered the shape of creeks along with the landscape. We developed homes and businesses near the water's edge and with concrete structures slowed the stream channel's natural progression.

Prior to the early 1800s the creek meandered in a shallow channel eroding soil from channel banks and depositing gravel on inside bends, building areas that provided new locations for pioneer plants. Rapid shifts in the channel, also eroded habitat-forming woody debris into the creek and helped establish and maintain a wide and diverse creekside habitat. Frequent flooding deposited fine sediment over a wide area of the valley floor. Tributaries, and a shallow ground water table supported a wide riparian forest, and seasonal wetlands and vernal pools along the floodplain.


*Postcard mailed in 1910. Card courtesy Jim Staley*

Today creeks in the lower portion of the Corte Madera Creek basin (from Fairfax to Kentfield) are deeply cut into soft sediments. Between the 1880s and early 1900s there was a period of rapid channel deepening throughout Marin County which many researchers attribute to increasingly intense cattle grazing which began in the 1820s and peaked between the 1880s and early 1900s.

Channel deepening is a progressive, self-reinforcing process. As channels cut deeply into the valley, they are able to carry more water during storms. With more water in the channel during storms, it has more erosive power, and accelerates channel erosion. A deeper main creek channel causes further erosion in upstream tributaries and on adjacent hillsides. Gullies form at higher elevations and this expanded channel network increases the speed with which runoff is delivered to the channel during storms.

Entrenchment (channel deepening) reduced the active channel width throughout the lower portion of the basin. As the channel cut deeper and deeper into the valley, larger and larger floods became entirely contained in the channel. The 100 year flood is presently contained in the active channel throughout most of the channel network. Thus, entrenchment dramatically reduced the frequency of flooding and sediment deposition in the valley. Entrenchment also drew down the shallow ground water table, further reducing riparian seasonal wetland and vernal pool habitat on the valley floor. In summary, unnaturally narrow entrenched channels provide relatively poor aquatic and riparian habitat supporting smaller and less diverse populations of fish and wildlife.

Downcutting decreases when the creek bed drops to a solid base. Deepening has slowed since the 1910s because numerous outcrops of bedrock and stiff clay on the creek bottom, failed rip-rap boulders that washed into the creek, and box culverts and bridge foundations prevent continuing erosion in the creek bed. Local channel downcutting may still be occurring in upland tributaries, and in isolated locations in the lower basin.

With channel downcutting effectively impeded, channels have been gradually widening since about the 1910s. But the rate of channel widening and bank erosion is limited by naturally resistant channel banks and artificial structures. Channel widening occurs at the outside of turns or meanders, and where bank protection projects deflect water into opposite channel banks, or by local bank failure.

Widening can be expected to continue at its present rate for at least several more decades or hundreds of years, until the entrenched channel's active channel width approaches the width prior to the arrival here of *Bos taurus*, the cow.

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