

Rodeo Creek Watershed Assessment for Bankfull Channel Geometry Cross-Section Analysis

For
Contra Costa Resource Conservation District
And USDA Natural Resource Conservation Service



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Watershed Overview

The Rodeo Creek Watershed drains approximately 10 square miles of northwestern Contra Costa County. The creek enters San Pablo Bay two miles west of the Carquinez Bridge. The main stem of Rodeo Creek extends over 8 miles into the hills to the southeast and reaches an elevation of 1,100 feet above sea level. Average annual rainfall for the watershed is approximately 21 inches (CCC watershed atlas).

Land use in the watershed is primarily agricultural ranch land. Approximately 20% of the lower watershed is developed with residential, commercial and light industrial uses.

Most of Rodeo Creek remains in a natural condition although significant portions in the upper watershed are degraded and experiencing excessive erosion and channel incision. Only about 10% of Rodeo Creek and its tributaries have been altered for flood conveyance purposes. The flood control reaches are located in the lower watershed between San Pablo Bay and the ATSF Railroad corridor.

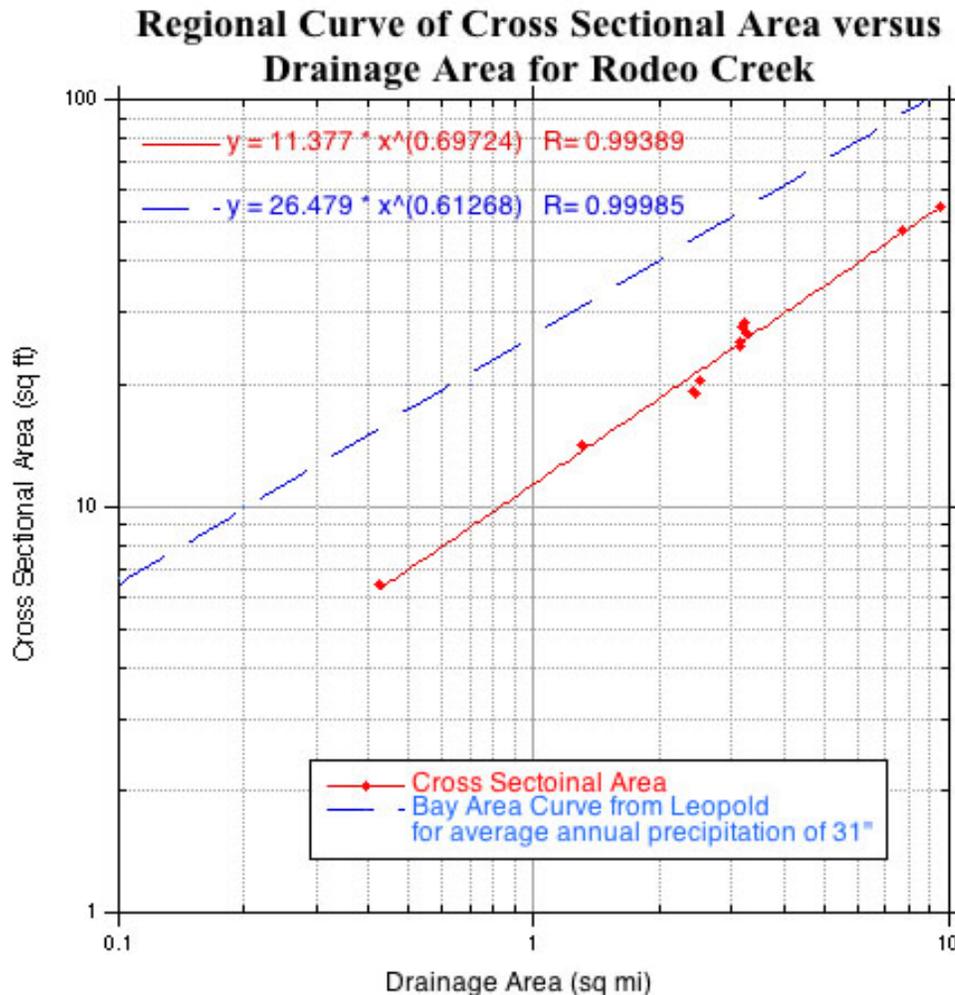
Purpose of the study

This field study has been conducted for the purpose of assessing the bankfull channel geometry of Rodeo Creek at various locations within the watershed. The bankfull channel is the stable channel cross-section (width and depth) and is identified in the field as a geomorphic feature that defines the elevation of the channel floodplain. The bankfull elevation is associated with storm events with recurrence intervals typically in the range of 1.5 to 2 years. These relatively small storm events are responsible for transporting the majority of sediment due to their frequency and their ability to entrain sediment. Bankfull geometry is the starting point for developing restoration plans for degraded channel reaches and conducting channel assessments.

The 14 channel cross-section surveys obtained for this assessment have been conducted at locations where field indicators for bankfull channel were observed. Cross-section surveys conducted at each location and then plotted and the cross-sectional areas were calculated. Data was then plotted on a log/log graph along with the curve developed by

Luna Leopold for channel cross-sectional area for the greater San Francisco Bay Area. The curve developed by Leopold is higher than the local Rodeo Creek curve because of the higher average rainfall of the Bay Area than the project site (see figure below).

Additional analysis using XChannelPro to estimate flow rates at different elevations in the channel cross-section. This work was conducted as a check on the field identification of the bankfull elevation geomorphic work by calculating the bankfull elevation associated with the 1.5 to 2 year flow discharge. In the case of multiple potential bankfull field indicators, the one that most closely matched the calculated elevation of the bankfull flow was selected as the actual bankfull elevation and included in the regional curve.



Reach 1 Open Box Concrete Culvert

Rodeo Creek is contained in an open concrete box culvert in the lowest reach. The right-of-way is extremely limited due to adjacent development. The Contra Costa County Flood Control and Water Conservation District (CCCFCD) is the owner of the flood control channel and retain maintenance access roads along both banks of the channel. No cross-sectional survey has been conducted on this reach.



Reach 2: Earthen Bank Flood Control Channel

The creek transitions into a trapezoidal flood control channel with earthen banks approximately ¼ mile upstream from the mouth. Although the CCCFCD has performed sediment removal projects on this reach in the past, bankfull channel indicators were observed and a cross-sectional survey was conducted in this reach (*see cross-section 14*).



Reach 3: Concrete Trapezoidal Channel

This reach is located immediately upstream of the freeway and connects two earthen channel reaches of the CCCFCD flood control channel project channel. No cross-sectional survey was conducted in this reach.



Reach 4: Earthen Bank Channels

This reach begins at the upstream end of the concrete channel and continues upstream to the BNSF railroad crossing. This reach contains numerous concrete grade control structures. A cross-sectional survey was conducted in this reach (*see cross-section 13*).



Reach 5: Vegetated Earthen Bank

Upstream of the Burlington Northern Santa Fe Railroad, Rodeo Creek returns to an unimproved earthen bank channel with a moderate riparian corridor. A cross-sectional survey was conducted in this reach (*see cross-section 12*).



Reach 6 Earthen Bank & Dense Riparian Corridor (Franklin Canyon Golf Course)

Rodeo Creek within the Franklin Canyon Golf Course may represent the most healthy reach of the creek. Although the channel appears to have become significantly incised from its pre-European condition, the channel has achieved a state of equilibrium with associated floodplain and a dense riparian corridor. Cattle are excluded from this reach of the channel. Two cross-sectional survey were conducted in this reach (*see cross-section 10 and 11*).



Reach 7: Actively Incising Earthen Channel (Fernandez Ranch)

The Rodeo Creek channel, upstream of the Franklin Canyon Golf Course, is actively incising and initiating massive bank failures. The incision has occurred at various periods over the past century with the most recent event having occurred during the winter of 2005/2006. The lowering of the Rodeo Creek bed elevation has initiated channel incision on all of the tributaries within this reach. Five cross-sectional surveys were conducted in this reach (*see cross-sections 5-9*).



Reach 8: Highly Incised Earthen Channel (Burlington Northern & Santa Fe)

There are two headcuts with a total elevation change of over 15' at the upstream boundary of the Fernandez Ranch. These headcuts are moving upstream into channel reaches that are largely owned by the BNSF Railroad and that are experiencing massive bank failures due to previous channel incision. Two cross-sectional surveys were conducted in this reach (*see cross-sections 3 and 4*).



Reach 9: Pre-incision Condition with Active Floodplain.

Upstream of the Christie Road crossing, Rodeo Creek has remained non-incised, with vegetated banks and associated floodplain. The creek is owned by numerous private property owners and access was limited to one reach. Two cross-sectional surveys were conducted in this reach (*see cross-sections 1 and 2*).

