

Radiocarbon-dating Floodplain Deposits in Bull Creek, Humboldt Redwoods State Park, NW California

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Boring, test pit, and stream bank sediment descriptions, radiocarbon dates (reported here at 2 sigma calibration using 1950 A.D. as year 0) and LiDAR imagery along middle and lower Bull Creek help characterize the Holocene alluvial sedimentation history of the old-growth, redwood-dominated Rockefeller Forest and the downstream reach of the cutover floodplain to the west. These data provide an opportunity for preliminary examination of the plan view relationship among redwood dimension, particle size and sedimentation in Bull Creek. As expected, sediments fine in the downstream direction and are particularly finer-grained where Bull Creek backwaters during large floods at its confluence with the South Fork of the Eel River. The density of redwoods over 300 feet tall also generally increases in the downstream direction.

Much coarser historic and pre-historic alluvium occurs upstream from the Rockefeller Forest, where more proximal debris flow sources and comparatively less stable sub-watersheds provide a ready source of cobble and gravel, though pre-historic sediments also have some finer beds. In the middle reach of Bull Creek road asphalt that predates the 1955 flood has about 6 feet of coarse alluvial cover. Other evidence suggests post-1954 sediments could have attained a thickness of more than 8 feet where the basal limits of these flood deposits are less well defined. Sites between the mouth of Bull Creek and its middle reach have interfingering coarse and fine or more gradational bedding. Radiocarbon dating of interior rings and preliminary tree ring counts of a now in-channel redwood stump at an intermediate site (Tall Trees) suggest the tree had rapid growth on the channel margin over the last 400 \pm 50/-110 radiocarbon years. Here the channel has incised through the mid-20th Century flood deposits to the elevation it had when the tree sprouted.

Radiocarbon dates from the Cuneo Creek sub-watershed, a significant sediment source to Bull Creek, revealed rapid and extensive sedimentation about 9500 radiocarbon years ago (Stone and Vasey 1968) formed an extensive terrace surface that projects toward potentially correlatable remnant surfaces on the mid-slope valley walls of middle Bull Creek. Dates from the more elevated but still rarely inundated 100 year+ floodplain terraces of Bull Creek, below the rooting depths for old growth redwood, yield minimum sedimentation rates that diminish in the downstream direction, from about 0.013 foot per year (cutover site) over the last ~ 905 years, to about 0.006 foot per year (intermediate site [Tall Trees] in the upper- middle Rockefeller Forest) over the last ~ 1875 years, to about 0.003 foot per year (lower Rockefeller Forest [Rockefeller Loop]) over the last ~ 9395 years. The age and coarseness of the oldest basal deposits in the most downstream terrace in the Rockefeller Forest suggest linkage to the early Holocene, Cuneo Creek sedimentation event. Zinke (1966) reported a rate of about 0.03 foot per year over the last ~1000 radiocarbon years for sediments dated in the stream bank of the lower Rockefeller Forest; this is an order of magnitude higher than the rate reported here for the more elevated floodplain surface nearby. The difference is likely a function of vertical and horizontal proximity to the current channel thalweg and/or could be a function of changes in rates over time.