THE LIFE OF CARPINTERIA CREEK IS IN THE FLOW
By Tim Robinson

For most of the year, Carpinteria Creek is a quiet, tranquil stream known for its beautiful riparian corridor, excellent birding and potential for steelhead trout runs. On occasion, the stream comes to life and can be a roaring torrent of chocolate brown water carrying boulders, brush and trees to the sea. It is that flow of water that rejuvenates and maintains a healthy stream for all forms of aquatic life and the ecosystems along its banks. It is important to learn about the patterns of flow in our local stream. To understand the rainfall and stream flow pattern in our area, we need to look at the historical record.

Carpinteria Creek Watershed is just under 15.4 mi^2 (40 km^2) long, and is one of the larger watersheds on the South Coast. Our Mediterranean climate, characterized by warm dry summers and cool rainy winters, brings highly seasonal rainfall that can vary significantly from year to year, with a long term average of 20 inches. The mountains help to catch the clouds (orographic effect) and can approximately double the annual precipitation in the upper watershed (Figure 1). Noteworthy months of record precipitation since monitoring began in 1949 were January 1969 (18.3 inches), January 1995 (21.4 inches), and February 1998 (23.5 inches); all were accompanied by heavy flooding events.

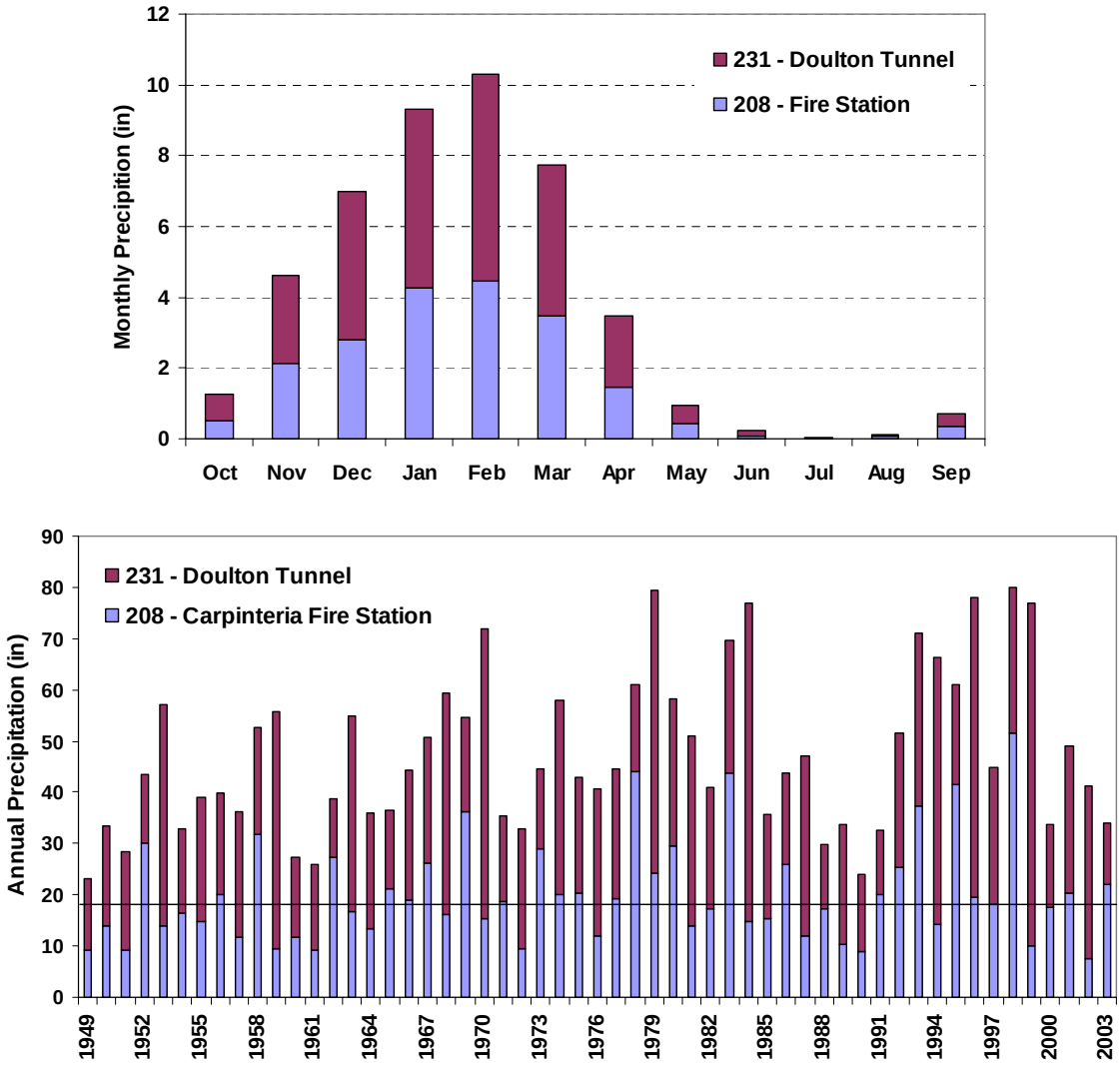

Figure 1: Rainfall patterns on the coastal plain (208-Carpinteria Fire Station) and at mid elevation (231-Doulton Tunnel at 1775 ft) sites, demonstrating orographic effects; a) average monthly precipitation showing the seasonality, and b) total annual precipitation for the same sites during common years of record (1949-2003). The line at 17.5 inches represents the median value at the Carpinteria Fire station, 20 inches is the average.

There are four stream gauging stations that measure flow on Carpinteria Creek (Figure 2). They are operated by the US Geological Survey, U.C. Santa Barbara (SBC-LTER), and the County of Santa Barbara. The USGS facility located near the Hwy 192 Bridge has the longest recorded discharge record (1941 to the present) and is a low-profile constructed weir with a bubbler and telemetry system for online/real-time data access. The County shares that infrastructure for their flood management studies. Gauging stations in the upper watershed and at the outlet are maintained by SBC-LTER

Figure 2: Two of the four gauging locations on Carpinteria Creek, 8th Street Footbridge and the USGS station near Hwy 192 Bridge. Both have staff gauges at the deepest point of the channel at a determined cross-section.

Stream discharge follows the seasonal rainfall pattern (Figure 3), during the water year, October 1st through September 30th, stream levels rise and fall relatively quickly. Often, several rainstorms in sequence are needed before soils are sufficiently saturated to produce run off in the upper watershed following the six to nine month dry season. Although large rainfall events often occur at the beginning of the water year, the extended preceding dry weather enables soils to absorb the majority of what falls and very little runoff is generated. A storm of similar magnitude that occurs in February or March, on the other hand, can produce high runoff as the highly saturated conditions are favorable for increased runoff. In contrast, the urban area, and to some degree the agricultural area with greenhouses, contain a large percentage of impervious surfaces which inhibit infiltration and enhance rapid runoff even during minor rainfall events. Hence, discharge from impervious surfaces in the lower urbanized reaches of the watershed can be seen in most all rainfall events regardless of preceding moisture conditions.

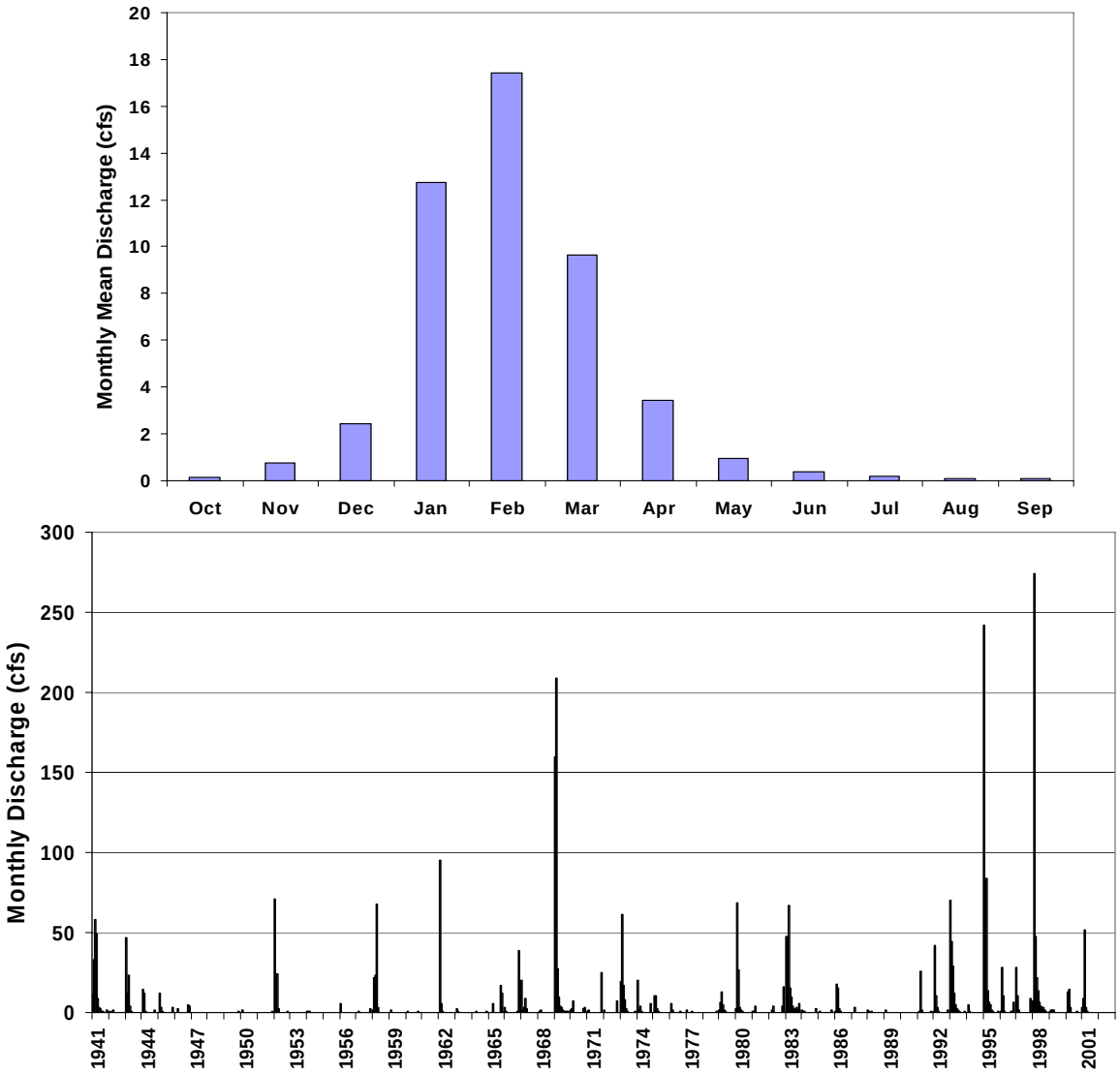

Figure 3: Carpinteria Creek monthly stream discharge characteristics at the USGS 11119500 gauge (Hwy 154 and the creek), a) average monthly discharge and b) annual totals from 1941 to the present.

The region is subject to irregular periods of drought and flooding mostly associated with El Niño / La Niña events. Figure 4 illustrates the variability in year to year instantaneous maximum peak flow over the period of record with a minimum of 0.8 and a maximum of 8880 cubic feet per second (cfs) recorded on December 27th, 1971. This extreme flow event may have been augmented by large debris flows from a wildfire that occurred during the previous summer.

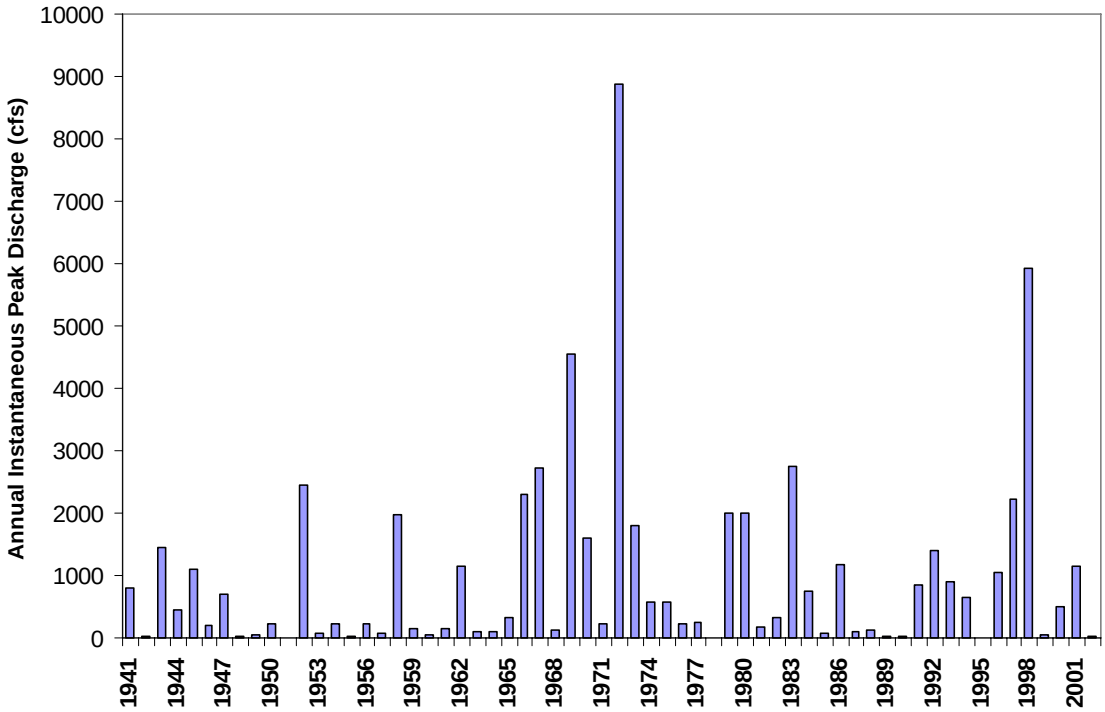

Figure 4: Annual instantaneous maximum peak discharge on Carpinteria Creek at the USGS Gauging Station for the available data record from the USGS (1941-2001).

Irregular flooding in the Carpinteria Valley occurs during extreme peak flow events. Areas impacted by high flows are usually restricted to the low lying regions that fall inside the 100-year floodplain (defined as the area that would typically be inundated by flood waters once in 100 years) or are just above constriction points along channel networks, for example just north of U.S. 101. The first documented flood in the Santa Barbara area was described by Franciscan Friars in 1832. The 1914 and 1916 floods caused appreciable damage, particularly at the outlet of Carpinteria Creek. Significant flooding events since the installation of the USGS gauging station include 1952 (2440 cfs), 1967 (2720), 1969 (4560 cfs), 1972 (8880 cfs), 1983 (2750 cfs), and 1998 (5930 cfs).

High stream flow events are an important part of maintaining a healthy stream ecosystem. Next time it rains, take a stroll down to Carpinteria creek and observe the dynamic nature of hydrology and biology working together on our creek. Who knows, you might even see a migrating steelhead trout.