



Mark West Creek Flow Study Report

Biology and Geology of Mark West Creek

The headwaters of Mark West Creek are located in the Mayacamas Mountain range, which border Napa and Sonoma County, where it then meanders south west until it merges with the Laguna De Santa Rosa. There it heads north and spills into the Russian River; the main channel of a watershed that provides drinking water to 600,000 residents in nine cities and special districts in Sonoma and Marin counties.

The Laguna-Mark West drainage is the largest catchment area contributing to the Russian River, making up approximately 21% of the total Russian River basin. Before MWC reaches the Laguna, it flows through residential areas of North West Santa Rosa and is an important water source for these communities.

The geology of the Mayacamas is mainly Pliocene volcanics, which contains rhyolite, andesite, basalt and other pyroclastics. This mountain range also contains Franciscan complex, which is an accretionary wedge complex, and contains sandstone, chert, metabasalt, and gray wacke. The Franciscan complex was created in a high pressure, low temperature environment and has aluminum rich pelitic shale.

Serpentine is present on the slopes and ridges of the Mayacamas and these outcrops create habitats that promote chaparral plant communities specialized in living in soil made up of fine-grained, magnesium-rich igneous rocks. Chaparral shrub land is the dominant plant community in the Mayacamas Mountain range. Chaparral plant species thrive here because of their ability to resist drought during the summer and to survive wet and cold winters.

The banks of Mark West Creek have fertile soil and the vegetation is usually diverse and abundant, with many of the same riparian plants occurring throughout its stretch. The surrounding lands and hills within the watershed are where the biggest plant community changes occur. As this tributary follows the downward slope of the mountains, drought tolerant plants become less abundant as moisture becomes more available. Chaparral tree

species, such as California Scrub Oak *Quercus dumosa*, begin to replace shrubs and dominate the landscape.

The upper reaches of Mark West Creek have spring-run steelhead and other anadromous fish rearing during the summer months. Steelhead Trout are salmonids and they often spawn in tributary systems like Mark West Creek between the months of December and May.

As Mark West Creek flows through the lower slopes of the Mayacamas, the climate becomes more favorable for a mixed hardwood forest and herbaceous chaparrals and scrub oaks become scarcer. Deciduous trees, including black oaks *Quercus Keloggi* and coniferous species, such Douglas Fir *Psuedotsuga menziesii* and redwoods hills and valleys south of the Mayacamas. These upland headland portions of the Russian River drainage basin are where we conducted our instream flow study.

In this report we included a map that shows the sub watershed of each site we monitored for this project. Understanding the geology of each of these individual sub watersheds, and how these factors effect water availability and instream would be beneficial. This would give us greater insight into the geological and hydrological processes occurring within the Russian River watershed basin.

Need for Study

Community Clean Water Institute received funding from America Water to conduct water quality and instream flows monitoring of Mark West Creek (MWC) during the summer and fall months of 2008. This study came out of local concerns for low summer and fall instream flow, decreased water levels, and the resulting poor water quality of the Mark West Creek watershed.

Mark West Creek is on the federal 303 (d) list for impaired waterways and the watershed has been deemed a Priority Conservation Area by the San Francisco Bay area joint agency coalition FOCUS, as well as by the Association of Bay Area Governments (ABAG) because of its decreasing instream flows and degraded water quality. This growing interest in conserving MWC is not only due to its contribution of drinking water to the Russian River watershed, but also because of the historical presence of Coho Salmon in this creek. Coho are a federally endangered salmonid species, which require extremely cold flowing water for their habitat, and are currently vanishing from local waterways.

Mark West Creek is also an important spawning area for Steelhead, another federally listed fish species found in this watershed. Since mid-July of this year, the people who live along Mark West Creek have been reporting the lowest creek flow levels in decades, and the lower portions of MWC is currently suffering extremely low dissolved oxygen readings. These low DO levels are partially caused by excessive vegetative growth in the creek

(native and non-native plants, and algae), which can be connected to MWC's high nutrient levels caused by fertilizer runoff.

Creeks experiencing low flow are more susceptible to increased water temperatures, and warmer water has a lower holding capacity for oxygen than cold water. This situation can be detrimental for fish since their metabolic rates speed up as the water warms, which means they require more available oxygen to stay alive. These low stream flow levels, elevated water temperatures, and decreased dissolved oxygen, can lead to a dramatic increase in fish mortality.

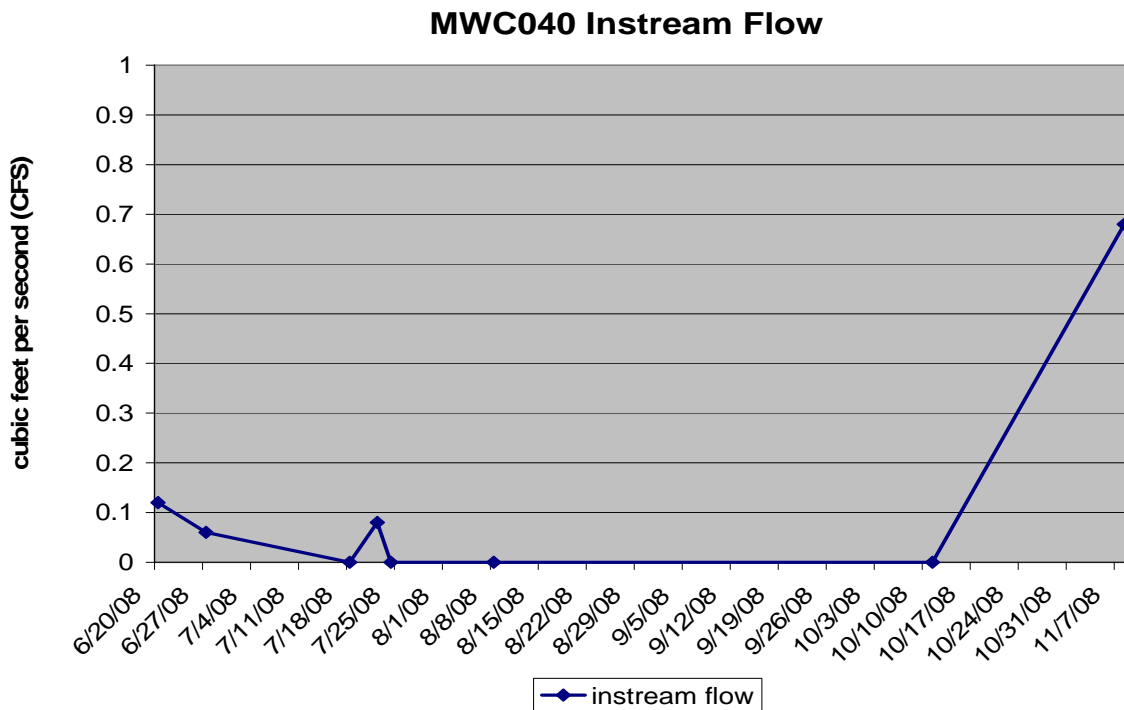
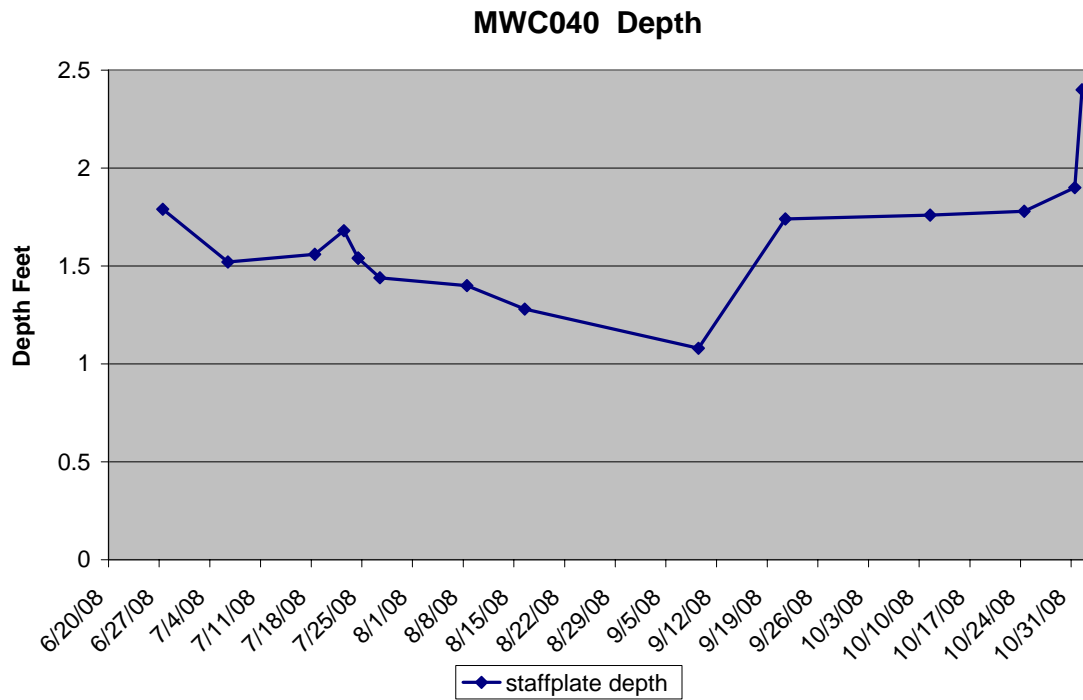
Methods and Results of Project

The methods involved in the Mark West Creek Water Quality and Instream Flows project were the construction of semi-permanent water level gauges (staff plates) at five locations along Mark West Creek and significant tributaries, and collect flow and water quality data at these monitoring stations over the course of the summer and fall. A Global Water Flow Probe was used to make flow measurements. We were not able to construct a staff plate at HHC020 because of the boulder substrate.

MWC040:



Located on Mark West Creek in Larkfield about 1000 feet downstream of the crossing of Old Redwood Highway and Mark West Creek. The staff plate is mounted on the bridge abutment of Old Redwood Highway (river right). The contributing watershed area to this point is 26.8 square miles.



HHC020:



Located on Horse Hill Creek about 300 ft upstream of the confluence with Mark West Creek. The stage will be measured relative a specified point in a bedrock outcrop within the creek. The boulder substrate indicates that no staff plate could possibly withstand winter flows. The contributing watershed area to this point is 2.8 square miles.

We couldn't get measurable flow reading for the duration of this project. There were a few small pools in which we were able to get some width, length, and depth measurements.

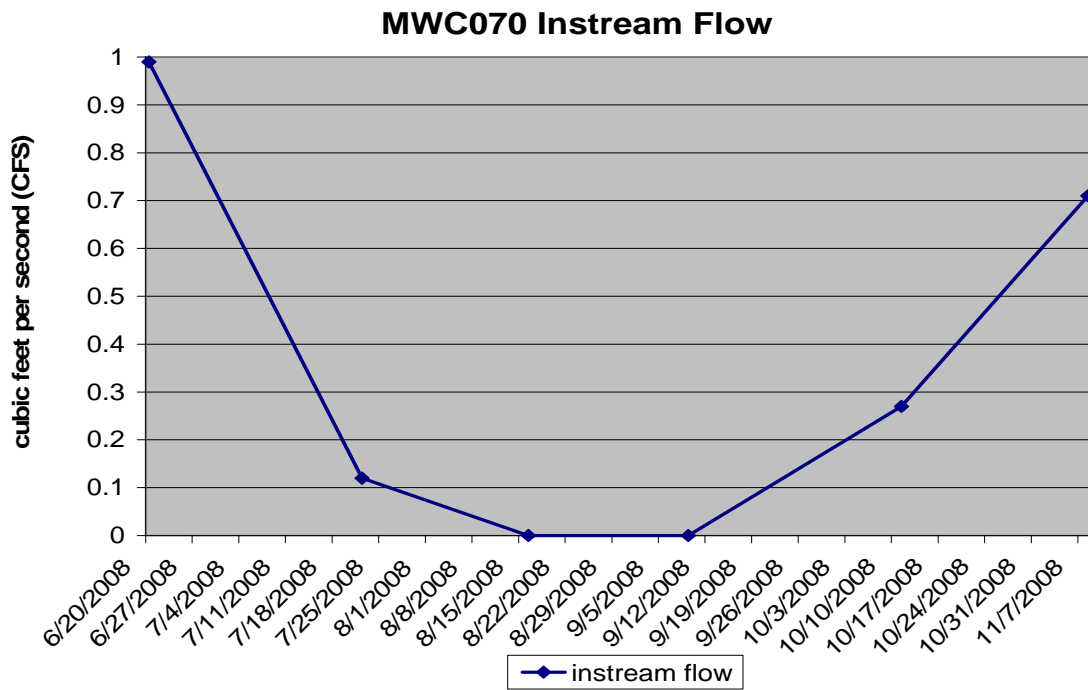
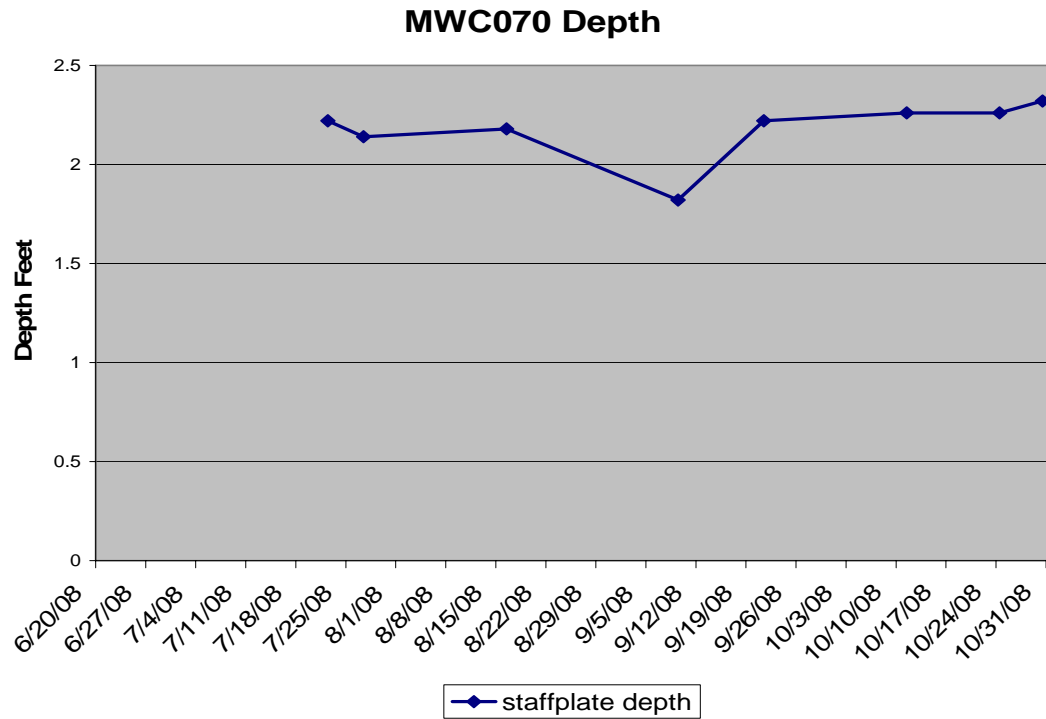
POR030:

Located under bridge where Porter Creek Rd meets Porter Creek. The site is adjacent to Safari West. The contributing watershed area to this point is 7.0 square miles.

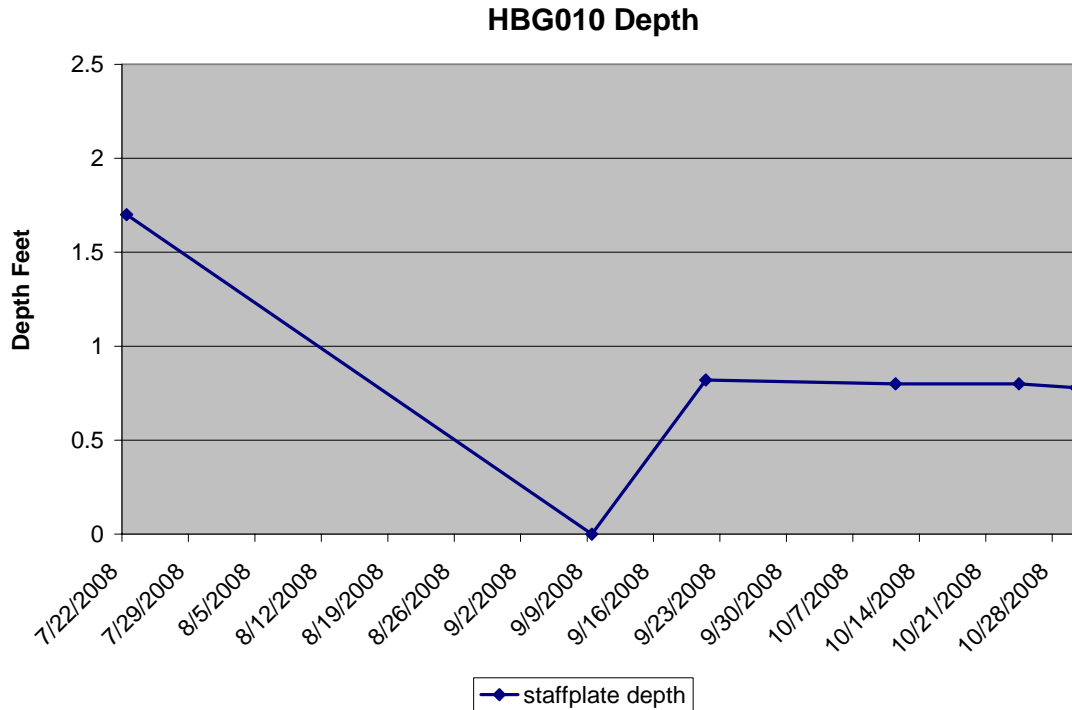
This site never had enough water to get a depth or flow reading. The creek bed was usually completely dry, with only small, separated pools present during one site visit.



MWC070: Located on Mark West Creek about 100 feet upstream of the bridge that accesses 5400 Alpine Road.



HBG010: Located on Humbug Creek at the crossing of Alpine Road and Humbug Creek. The contributing watershed area to this point is 2.8 square miles.



HBG010 did not have measurable flow for the duration of this project.

MWC095: Located at 5515 St. Helena Road; 1/4 mile up from Calistoga Road. Sample taken upstream of the vehicular bridge near the main house. The contributing watershed area to this point is 8.7 square miles.

This site only had measurable flow and/or surface water during two flow tests;

| Sampled | Depth | Flow (CFS) |
|----------|-------|------------|
| 9-3-08 | 0.2 | 4.42 |
| 10-29-08 | 1.0 | .06 |
| | | |