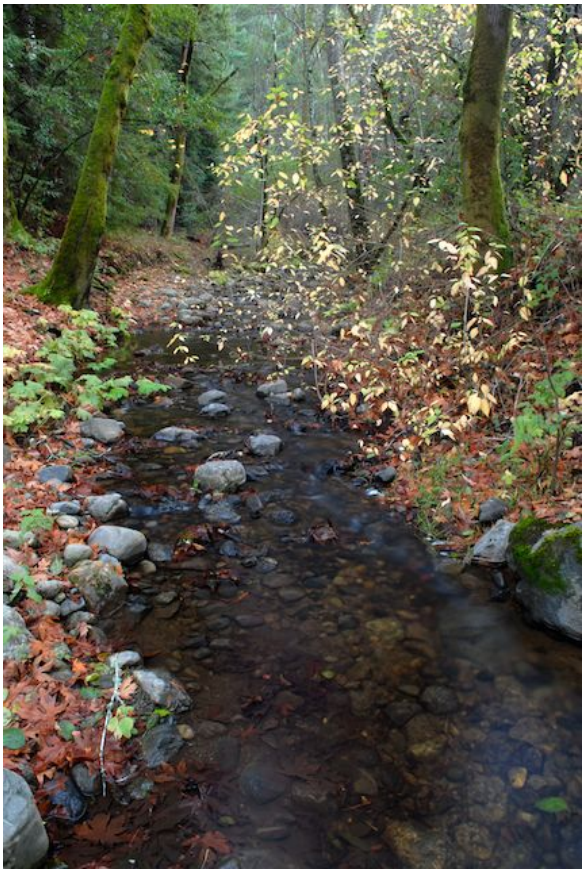
Habitat Quality, Rainbow Trout Occurrence, and Steelhead Recovery Potential Upstream of Searsville Dam



Prepared by:

Matt Stoecker
Principle Biologist | Owner
Stoecker Ecological

December 19, 2014

Table of Contents

I. Summary

This report was prepared in response to requests from San Francisquito Creek stakeholders asking for a compilation of observations and images describing steelhead trout (*Oncorhynchus mykiss*) habitat conditions, the occurrence of native rainbow trout (*O. mykiss*) in creeks upstream of Searsville Dam, and the potential for steelhead recovery upstream to historic habitat. Unless noted otherwise, habitat and fish observations, as well as photographs, are my own and represent over three decades of observing and studying the Corte Madera Creek subwatershed upstream of Searsville Dam and working as a consulting biologist focused on steelhead assessment and recovery projects within the San Francisquito Creek watershed and other California watersheds (Resume in Appendix 1).

As described in this report, and shown in the many photographs included, Corte Madera Creek and numerous tributaries contain a significant amount of suitable steelhead spawning and rearing habitat, abundant stream reaches with perennial flow, and a successfully reproducing *O. mykiss* population that currently occupies at least seven of the tributary creeks upstream of Searsville Dam. Due to shared juvenile life history needs, juvenile steelhead would be able to effectively utilize rearing habitat used by the current *O. mykiss* population. Adult steelhead would also be able to effectively spawn and incubate eggs in the suitable spawning habitat detailed in this report. Numerous observations, studies and reports have confirmed the historic and contemporary occurrence and importance of adult steelhead trout runs within the San Francisquito Creek watershed and native strain of these fish (Nielsen 2000, Appendix 2, Appendix 3, Appendix 4). State and federal resource agencies in charge of protecting and restoring the listed steelhead of San Francisquito Creek, as well as Stanford University experts, have noted the importance of this watershed's adult steelhead run as being one of the last in the south San Francisco Bay (Appendix 3, Appendix 4, Fee et al. 1996). Multiple pairs of adult steelhead have been documented spawning, digging redds (nests) and dying in lower San Francisquito Creek over the past two winters (Appendix 2). The Center for Ecosystem Management and Restoration has identified San Francisquito Creek as an essential "anchor watershed" for steelhead recovery efforts in the San Francisco Bay.

Local fisheries expert and professor Dr. Jerry Smith noted that Searsville Dam "blocks steelhead from accessing the watershed's largest tributary (Corte Madera Creek) and a large percentage of spawning and rearing habitat in the watershed. Upstream of Searsville Dam, Corte Madera Creek and its associated tributaries contain over 8 miles of spawning and rearing habitat and supply the watershed with the greatest amount of flow at 42%. The presence of a sustainable rainbow trout population in these upstream tributaries attests to the adequate spawning and rearing conditions and late summer flows that exist above Searsville Reservoir. Prior to construction of the Dam, this upstream habitat would have been accessible to steelhead" (Smith & Harden 2001). Other regional fisheries experts, resource agencies, and Stanford University experts have identified multiple miles of suitable steelhead habitat upstream of Searsville Dam with potentially more than 20 miles of total stream habitat historically available to steelhead (Appendix 3, Appendix 4, Stanford Habitat Conservation Plan EIS).

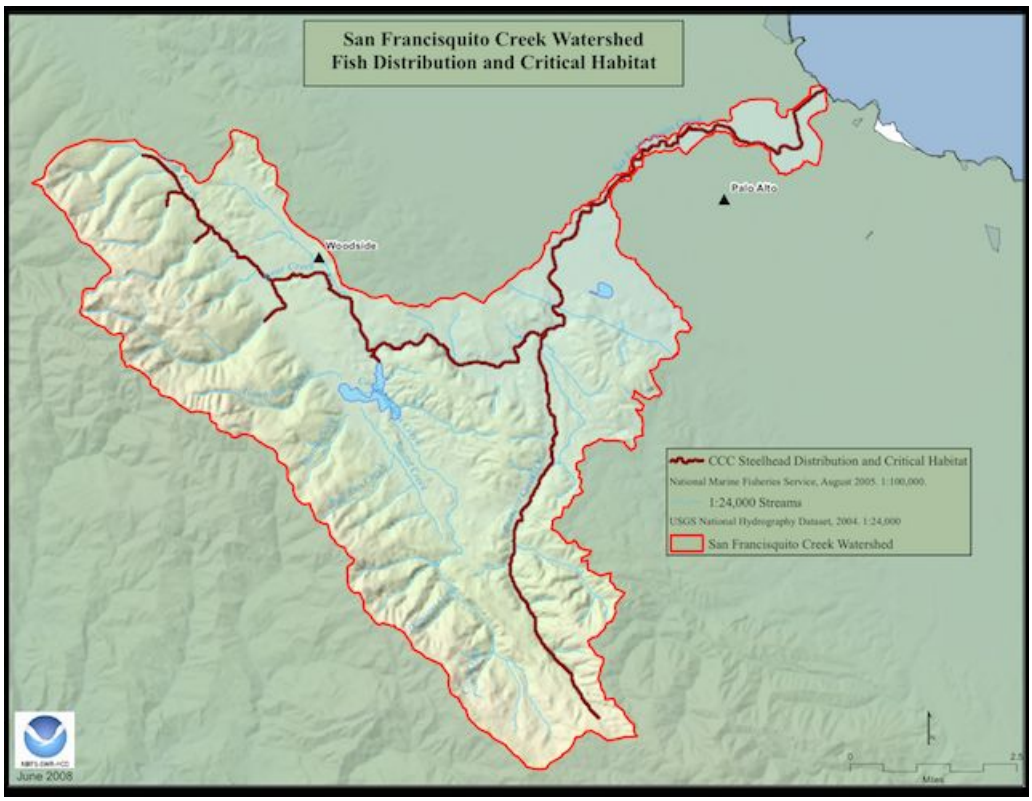
Historic and contemporary documentation of steelhead, and salmon, within Searsville Dam's scour pool immediately downstream, as well as further downstream, show the ongoing and direct blocking of steelhead migration by Searsville Dam (Appendix 3, Launer et al. 2013). Steelhead / rainbow trout are also documented to have occurred historically upstream of Searsville Dam prior to it being built (Appendix 3). Stanford biologists also acknowledge that "in the area that is now the highly modified reservoir and floodplain of the Searsville Lake/Family Farm Road study area, original native species likely included steelhead/rainbow trout (*Oncorhynchus mykiss*)…and coho salmon (*Oncorhynchus kisutch*)" (Fee et al. 1996).

Studies and recent examples of steelhead response to providing effective fish passage at a dam directly blocking upstream migration, or removing a dam, have shown that steelhead quickly return to habitat upstream. Steelhead have been documented migrating upstream of formerly impassable dams within weeks of dam removal (Elwha, Marmot dams) Hemlock dams), and in some cases during deconstruction (Condit, Hemlock dams). In addition to dramatically increasing available steelhead habitat upstream, dam removal or additional flows required to operate a fish passage facility are expected to increase steelhead habitat quality, flows, and migration effectiveness downstream of the dam along the entire San Francisquito Creek mainstem and lower Corte Madera Creek. Such benefits would improve conditions for current steelhead populations migrating between the San Francisco Bay and the Bear and Los Trancos creek tributaries. Fish passage options that would remove the dam and reservoir would provide additional benefits to steelhead including the reduction or elimination of non-native reservoir predators within and downstream from the reservoir, elimination of surface flow losses due to reservoir evaporation, improved water quality, unimpeded migration for steelhead and other wildlife along the creek, and addition of miles of steelhead habitat within creeks currently submerged or buried under the reservoir and sediment deposits.

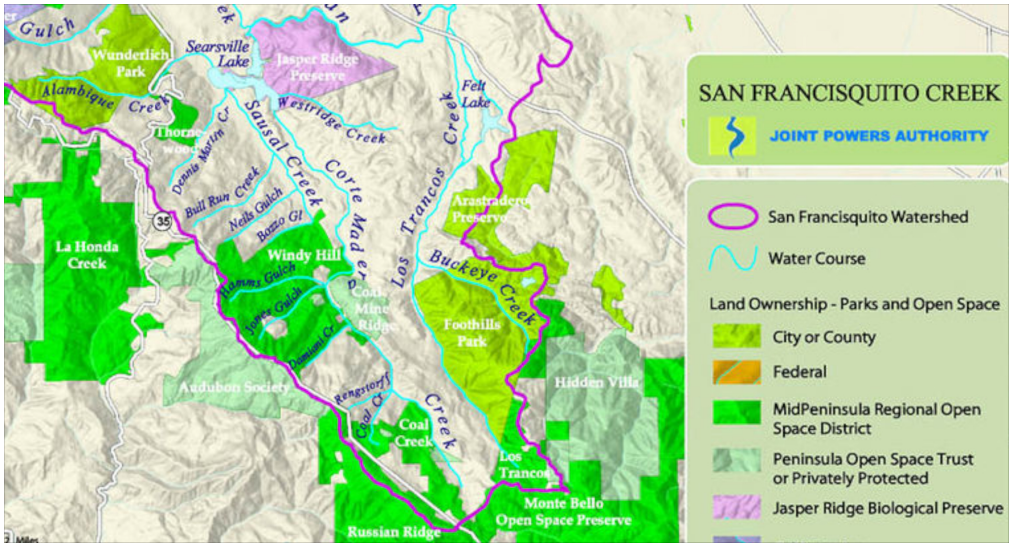
The presence of miles of suitable steelhead spawning and rearing habitat upstream of Searsville Dam, ongoing presence of reproducing *O. mykiss* upstream of Searsville Dam, historic and ongoing documentation of adult steelhead being directly blocked by Searsville Dam, and numerous studies showing the effective resumption of steelhead migration upstream of former migration barriers, all support the conclusion that providing effective access upstream and downstream at the current Searsville Dam and Reservoir site would restore steelhead runs to extensive upstream habitat and significantly benefit steelhead recovery throughout the watershed and region.

ALL FISHING WITHIN THE SAN FRANCISQUITO CREEK WATERSHED
IS PROHIBITED BY LAW

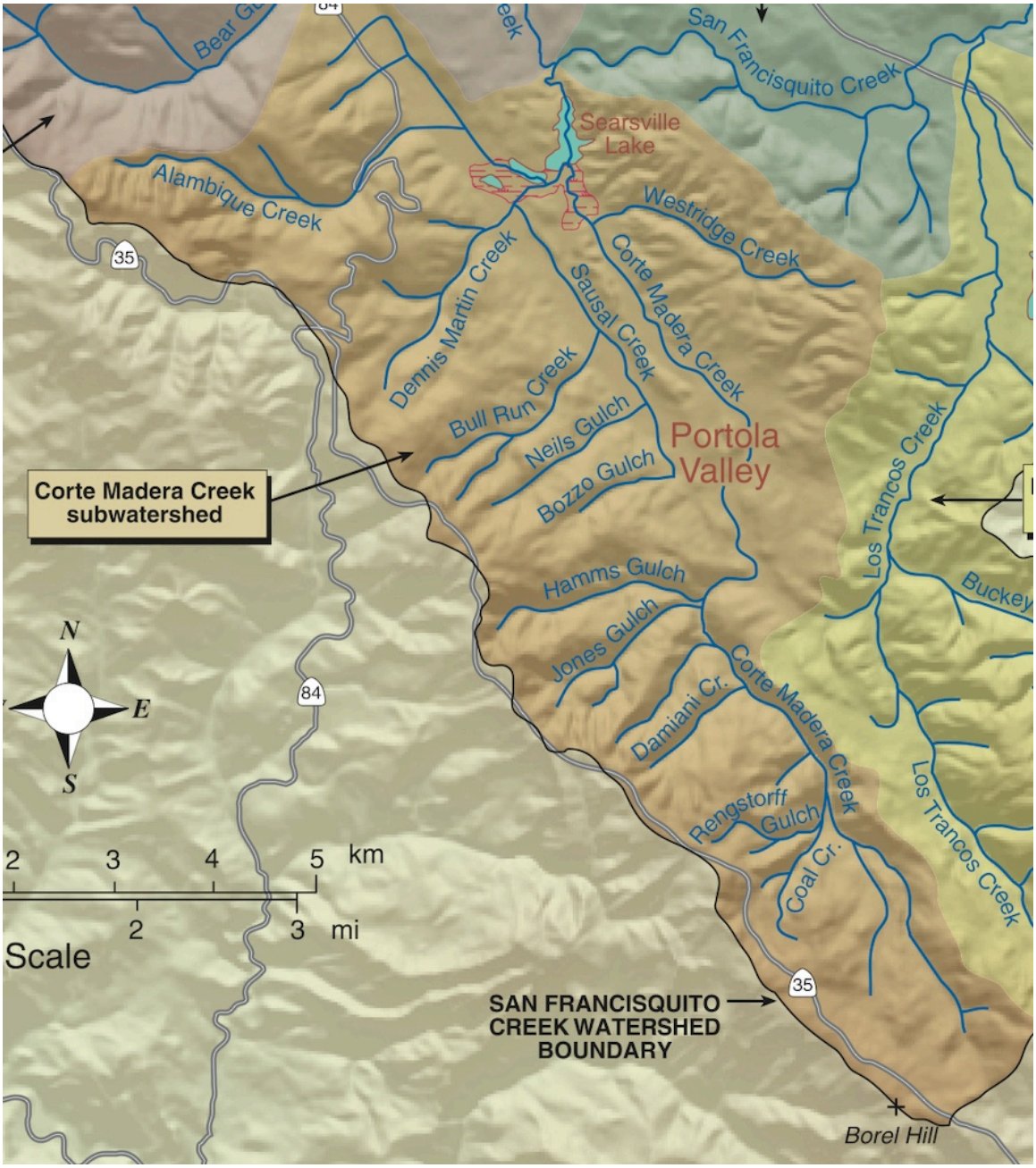
II. San Francisquito Creek and Corte Madera Creek Subwatershed Maps



National Marine Fisheries Service map showing "CCC Steelhead Distribution and Critical Habitat", in dark red, extending from the mouth of San Francisquito Creek, at the San Francisco Bay, to the base of Searsville Dam (blue reservoir at center-left) on Corte Madera Creek. Steelhead distribution and Critical Habitat are also shown along Los Trancos Creek to the south and Bear Creek tributaries to the north. National Marine Fisheries Service 2005.



Joint Powers Authority map showing primary protected lands within the Corte Madera Creek subwatershed: Wunderlich County Park, Thornewood / Windy Hill / Coal Creek Open Space Preserves, Coal Mine Ridge Preserve, and Jasper Ridge Biological Preserve.



Major tributaries upstream of Searsville Dam and Reservoir (top center) within the Corte Madera Creek subwatershed (shaded in orange). Map detail from the Oakland Museum's San Francisquito Creek map.

III. Steelhead Habitat & *O. mykiss* Occurrence Upstream of Searsville Dam

A. Corte Madera Creek

1. Middle Corte Madera Creek (upstream of Searsville Dam influence to Willowbrook Dr. crossing)

Surface Flow: While the majority of this reach of stream is perennial, there are two short exceptions. The very downstream end of this reach has been changing over time as reservoir-caused sedimentation continues to accumulate within, and upstream from, Searsville Reservoir. This extensive sediment deposition has been studied by Stanford University for decades and shown to fill in much of the original reservoir area and extend far upstream on Corte Madera Creek to near the public equestrian trail crossing upstream of the Jasper Ridge Biological Preserve boundary. The sediment deposit is porous and elevated above the historic streambed, promoting unnatural subsurface flows and dewatering of the elevated Corte Madera Creek channel. Additionally, the sediment deposit, and vegetation that has grown on it, has caused the creek to become highly braided into smaller channels, which further reduces water depth and flow duration. Removal of the dam and/or reservoir sediment deposits would be expected to increase the depth and duration of surface flows in a single, confined channel that receives additional flows from lower elevation groundwater sources. Upstream of this sediment deposit, towards the Westridge Drive bridge, the creek contains year-round flow and summer pools to over 3 feet in depth. A flow gage at the Westridge Drive bridge, maintained by Balance Hydrologics, has documented the year-round occurrence of surface water in the creek for over a decade.

Corte Madera Creek, immediately downstream of Westridge Drive bridge. Note the mid-July surface flow, pool habitat, and undercut banks during a drought year. July 16, 2013. Matt Stoecker.

For decades, perennial flow and pools to 4 feet in depth have been observed upstream to the Willowbrook Drive bridge. The only exception to this ongoing observation was this past year of record drought (2014) when a mix of dry streambed, trickling flows, and isolated pools were observed on a short reach from Willowbrook Drive downstream to the Grove Drive bridge.

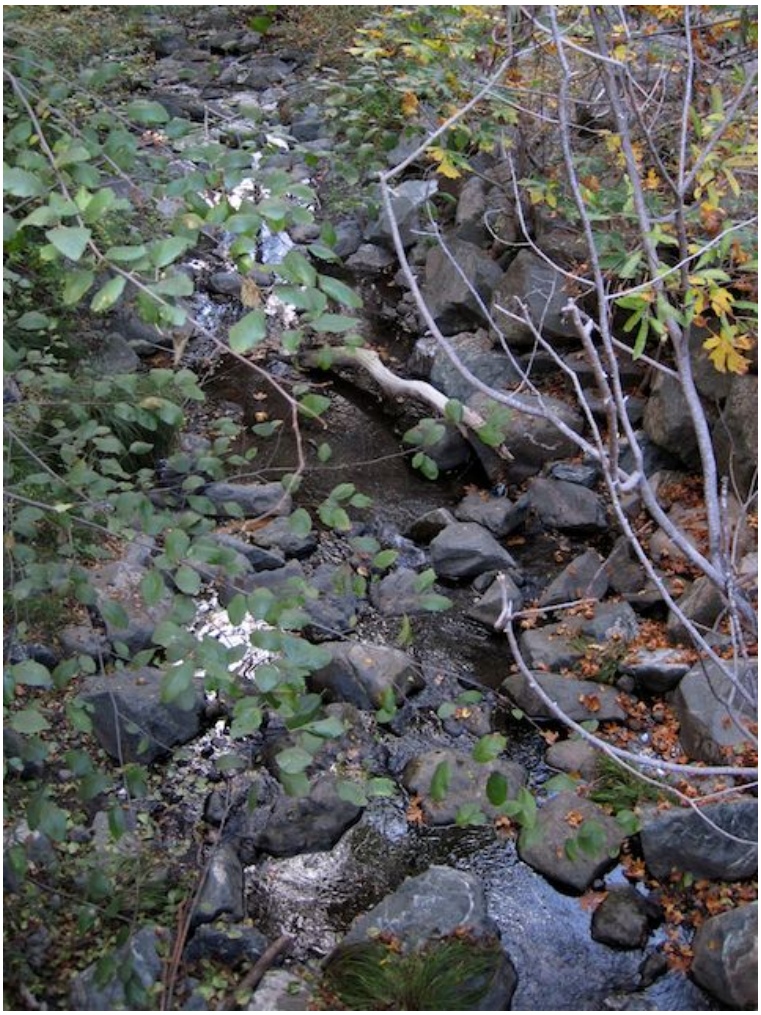
Corte Madera Creek, immediately upstream of Westridge Drive bridge (upper left). Note the moderate shading, wetted channel and July surface flow during drought conditions. July 16, 2013. Matt Stoecker.

Spawning Habitat: As shown in the images below, streambed substrate in this reach is primarily composed of a gravel and cobble. Sand and silt occur with moderate frequency in some deeper pools and slower moving sections, while boulders become more common upstream. As shown in images below from May 2012 and February 2013, cobble and gravel spawning substrate, with low substrate embeddedness, occurs during the steelhead spawning season and provides adequate spawning conditions and flow for adult steelhead just upstream from the Jasper Ridge Biological Preserve boundary. *O. mykiss* ranging from approximately 8 to 13 inches have been observed spawning within this reach multiple times over the past 35 years. Upstream from the braided and reservoir-influenced reach downstream, the confined channel in this reach regularly contains adequate winter and spring water depths for adult steelhead migration to the uppermost spawning tributaries and reaches of Corte Madera Creek.

Corte Madera Creek at the trail crossing upstream of Jasper Ridge Biological Preserve boundary. Note the relatively clean gravel and cobble dominated substrate within the pool tailout and riffle. Also note the adequate steelhead spawning and egg incubation flow and depth in mid-May within this gravel and cobble dominated pool tailout. May 19, 2012. Matt Stoecker.

Corte Madera Creek at the same trail crossing upstream of Jasper Ridge Biological Preserve boundary (looking downstream). Note the relatively clean gravel and cobble dominated riffle and downstream pool. February 17, 2013. Matt Stoecker.

Rearing Habitat: Fair to good steelhead rearing habitat occurs throughout this reach due to relatively abundant and diverse aquatic insects, extensive riparian shade, undercut banks, boulders, large woody debris features, and summer pools to 4 feet in depth. Diverse age-classes of *O. mykiss* have been consistently observed inhabiting this entire reach for over 35 years of observation. Steelhead spawning, rearing, and migration conditions within the Corte Madera Creek subwatershed have seen significant improvements in recent decades with the removal of two fish migration barriers (Grove Drive crossing and Sausal Creek culvert), extensive erosion and run-off reduction measures along Alpine Road, implementation of Portola Valley Creekside Ordinances to protect creeks and banks, protection of vast tracts of headwater lands and creeks within open space preserves, and the ongoing regrowth and stabilization of surrounding redwood and fir forests cut in the 1800's and early 1900's. Additional plans are underway to protect and restore more stream reaches within the Corte Madera Creek subwatershed. It is expected that these measures and forest regrowth within protected areas will continue to improve steelhead spawning and rearing habitat quality into the future.

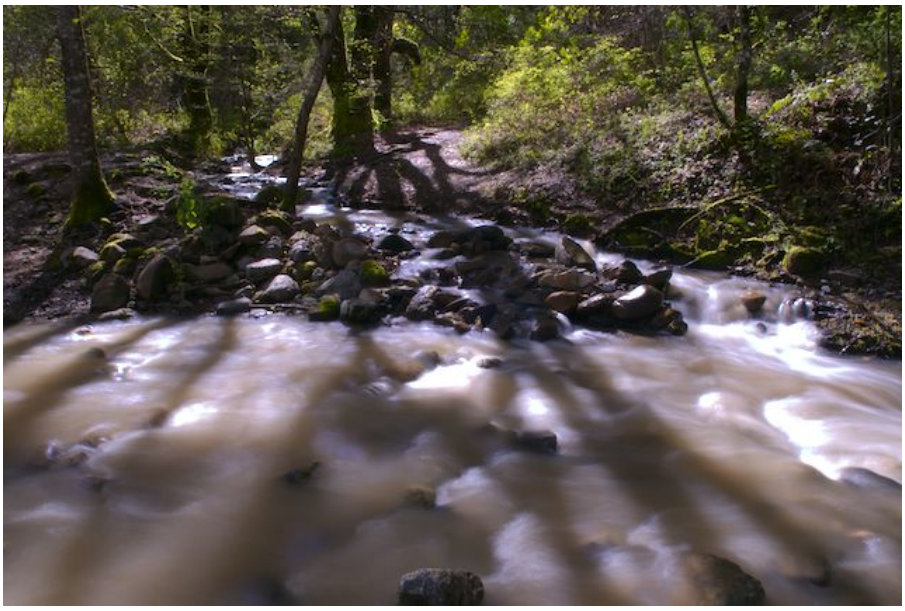


Corte Madera Creek, immediately downstream of Grove Drive bridge. Note the boulder-dominated substrate, abundant instream cover for juvenile steelhead, and November flows. November 5, 2010. Matt Stoecker.

O. mykiss Observation: *O. mykiss* were observed in this reach and found to be "present throughout, but most abundant in upper reach (u/s Westridge Bridge)" during surveys between 1999-2001 (Stoecker 2002). As noted above, *O. mykiss* have been consistently observed throughout this reach for the past 35 years. A neighbor, and resident of Portola Valley for over 50 years, reported that decades ago he used to catch "big rainbow trout" to approximately 20 inches that he believed lived most of the year in Searsville Reservoir and migrated out of the reservoir in the winter and spring to spawn within and upstream of this reach.

B. Upper Corte Madera Creek (Willowbrook Dr. bridge to 400 feet upstream of Coal Creek)

Surface Flow: Corte Madera Creek is perennial upstream of Willowbrook Drive bridge to 400 feet upstream of the Coal Creek tributary. Six perennial tributary streams feeding Corte Madera Creek consistent, cold summer and fall flows. "Good habitat conditions and late summer flow" were noted for this reach during *O. mykiss* distribution surveys between 1999-2001 (Stoecker 2002). In over 35 years of observations I have never observed this reach to contain dry streambed.



Corte Madera Creek, with Hamms Gulch entering at upper right, during moderate winter flow. Note the small boulder and cobble dominated substrate, and adequate depth and numerous migration pathways suitable for migrating adult steelhead. March 11, 2006. Matt Stoecker.

Spawning Habitat: As shown in images below, this reach is dominated by cobble, gravel, and boulder substrate, with lesser amounts of sand and silt in some slower reaches and deepest portions of pools. Despite significant suspended sediment transport during winter flows, substrate conditions are relatively clean, with low embeddedness in tailout gravels and cobble. Many of the ideal gravel and cobble spawning areas are associated with deep pools and runs making for high quality spawning habitat throughout this reach and especially in the middle and upper portions. The confined channel and diverse substrate

provides abundant depth and resting areas ideally suited for regular upstream adult steelhead migration during winter and spring flows. As the later tributary descriptions show, this reach provides access to the highest quality steelhead spawning and rearing habitat within the Corte Madera Creek subwatershed upstream of Searsville Dam. *O. mykiss* ranging from approximately 8 to 13 inches have been observed spawning within this reach multiple times over the past few decades, especially within the Windy Hill Open Space Preserve. Newly emerged young-of-year *O. mykiss* have also been observed through this reach during snorkel surveys in the late spring and early summer months, indicating successful *O. mykiss* spawning and emergence.

Corte Madera Creek, within the Windy Hill Open Space Preserve downstream from Hamms Gulch. Note the clean, high quality spawning gravels, excellent rearing habitat, and pool underneath a large woody debris feature. O. mykiss have been consistently observed in this reach; including pairs of O. mykiss digging redds and spawning. May 20, 2012. Matt Stoecker.

Corte Madera Creek, immediately upstream of Hamms Gulch. Note the clean, high quality spawning gravels and cobbles, and high quality rearing habitat (depth, undercut root mass). O. mykiss are consistently observed in this pool. December 7, 2007.

Rearing Habitat: Good to excellent steelhead rearing habitat occurs throughout this reach. A steeper gradient than the downstream reach creates high quality boulder step-pool habitat, bubble curtains, and shelter under banks, large logs, roots, and boulders. Bedrock substrate is also present within this reach. Frequent pools to over 4 feet deep occur in the summer months within the Windy Hill Open Space Preserve and upstream to Coal Creek. The upper reach becomes boulder-dominated with excellent scour pools and abundant shelter. A wild, self-sustaining, and relatively abundant *O. mykiss* population occurs through this reach and steelhead would similarly enjoy high quality rearing habitat within this reach.

Corte Madera Creek, downstream from Damiani Creek. This pool provides excellent steelhead rearing habitat, maintains a depth of greater than 3 feet throughout the year, is more than 30 feet wide, contains high quality spawning gravels in the tailout, and has been regularly observed with multiple age classes of O. mykiss. November 1, 2006. Matt Stoecker

Corte Madera Creek, downstream from Windy Hill Open Space Preserve bridge crossing. Note the boulder and cobble dominated substrate, pool and riffle habitat, abundant instream cover for insects and O. mykiss, and October surface flow. October 23, 2007. Matt Stoecker.

Corte Madera Creek, downstream of Jones Gulch, showing the cobble and small boulder dominated substrate, low substrate embeddedness, and abundant cover for aquatic insects and juvenile steelhead. December 7, 2007.

Corte Madera Creek, approximately 300 feet upstream of Rengstorff Gulch. Note the boulder-dominated substrate, high quality steelhead rearing habitat, and 2.5-foot deep pool. March 3, 2013.

Corte Madera Creek (upper middle to lower left) and Coal Creek (entering from upper right) confluence. Note the boulder-dominated step-pool habitat in all reaches, abundant instream shelter, and good juvenile steelhead rearing habitat. January 29, 2007. Matt Stoecker.

<u>*O. mykiss* Observation</u>: Corte Madera Creek *O. mykiss* were observed to be "most abundant" and "present consistently since late 1970's" in this reach during *O. mykiss* distribution surveys between 1999-2001 (Stoecker 2002). An *O. mykiss* population ranging from young-of-year to 13 inches in length have been observed multiple times throughout this reach over the past two decades, indicating the adequate spawning and rearing conditions present.

O. mykiss (approximately 6 inches in total length), in a Corte Madera Creek pool at Damiani Creek. July 20, 2006. Matt Stoecker.

Two O. mykiss (approximately 4 and 6 inches in total length), in a Corte Madera Creek pool approximately 500 feet downstream from Damiani Creek. July 20, 2006. Matt Stoecker.

C. Corte Madera Creek Headwaters (400 feet upstream of Coal Ck. to headwaters)

Surface Flow: Surface flows fluctuate from year to year starting approximately 400 feet upstream of Coal Creek (which is a primary source of summer and fall surface flow for Corte Madera Creek). Perennial conditions occur for approximately 400 feet upstream of Coal Creek, where "good habitat conditions and late summer flow" were noted during *O. mykiss* distribution surveys between 1999-2001 (Stoecker 2002). Upstream from this point, Corte Madera Creek becomes intermittent during the summer and fall months with a mix of mostly trickling flow and short stretches of dry streambed and isolated pools. The amount and extent of summer / fall surface flow appears to be tightly linked to the amount and timing of rainfall in previous wet years. Observations over the last few decades have found the intermittent pattern of surface flow in this reach to remain as described above.

Corte Madera Creek, approximately 1000 feet upstream of Coal Creek. Note the boulder, cobble, sand dominated substrate, small pools, undercut banks and instream cover. January 22, 2007. Matt Stoecker.

Spawning Habitat: As shown in the image above, this reach is dominated by boulders, sand, and gravels. Silt occurs in deeper pools and runs, while cobbles appear in low to moderate abundance. While some relatively clean gravel areas occur, they are less frequent than in the downstream reaches as the wetted channel has decreased in size above Coal Creek and fewer submerged cobble areas occur. More sand and silt appears to occur in this reach, possibly due to the high erosion rates noted upstream and due to the reduction of clear, flushing flows provided by Coal Creek and other downstream tributaries. Overall, spawning conditions range from poor to fair in this reach, with adequate, but infrequent spawning gravels occurring in low abundance. The best spawning habitat in this reach occurs downstream from, and within, the last sizable tributary, Steelhead Creek. Young-of-year *O. mykiss* have been observed downstream

from the upper Alpine Road culvert crossing, upstream from Steelhead Creek, so spawning is expected to be taking place.

Rearing Habitat: As with spawning habitat conditions, rearing habitat quantity is reduced and less productive in this reach that in the downstream reach. Compared to the downstream reach, this section has shallower pools, to 2 feet deep, occasional dry sections, and less instream cover. Large boulders and small pools due provide fair rearing habitat conditions, but limited flow and poor rearing conditions are equally common. However, *O. mykiss* are effectively using this reach to rear and the uppermost reach of a stream can provide important winter flow refugia and expanded distribution resiliency.

O. mykiss Observation: *O. mykiss* were not observed within a very small portion of this reach investigated during *O. mykiss* distribution surveys between 1999-2001 (Stoecker 2002). Since then, additional surveys have observed a small number of *O. mykiss* in this reach, downstream of the impassable upper Alpine Road culvert, as well as in the lower reaches of the Steelhead Creek tributary. *O. mykiss* have not been observed during limited surveys upstream of the upper Alpine Road culvert, but additional survey efforts should be carried out to determine whether they are present or not. I suspect that *O. mykiss* were present upstream of the upper Alpine Road culvert in the past, but the impassable barrier would prevent natural recolonization upstream if a severe erosion, drought, or flood event eliminated them at some point. The presence of *O. mykiss* immediately downstream from the upper Alpine Road culvert suggests that they are trying to migrate back upstream into the uppermost section of Corte Madera Creek.

B. Corte Madera Creek Tributaries (from Downstream to Upstream)

1. Skipper's Pond and Creek

Surface Flow: The creek leaving Skipper's Pond, and flowing into Corte Madera Creek near Searsville Reservoir, is intermittent. Creek flows typically occur only during the winter and spring months following storms, but flows can occur into the summer following wet years. The natural pond occurs near the headwaters of this tributary.

Skipper's Pond outlet and creek (lower left) and main body of open water (upper right, beyond the aquatic vegetation in the foreground). March 15, 2013. Matt Stoecker.

Spawning Habitat: The small creek channel, small substrate size, and limited flows result in poor spawning conditions for adult steelhead, but may provide a limited amount of fair spawning opportunities for smaller *O. mykiss* during wetter years.

Rearing Habitat: Due to the low summer flows, stream rearing habitat is poor during the drier season. However, this creek may provide important winter rearing habitat during high Corte Madera Creek flows and fine sediment transport events. Additionally, the sizable pond may have historically afforded adequate, and potentially high quality, steelhead rearing habitat. Additional studies should determine the steelhead rearing and winter refugia potential for Skipper's Pond and creek. This study should identify potential limiting factors, such as non-native species occurrence, and restoration opportunities.

O. mykiss Observation: The status of *O. mykiss* in Skipper's Pond and creek is unknown, but additional studies should determine what aquatic species are present and the potential for steelhead / *O. mykiss* rearing.

2. Westridge Creek

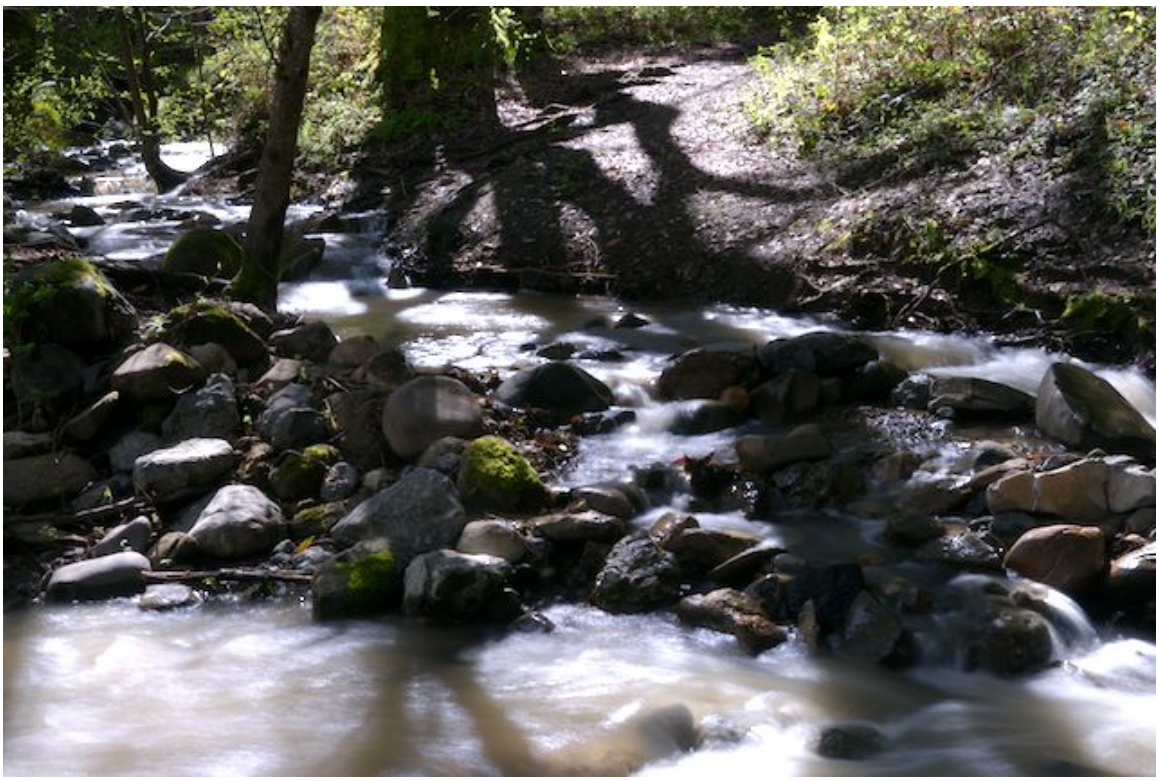
Surface Flow: Surface flow conditions in Westridge Creek are not known. Additional surveys are needed.

Spawning and Rearing Habitat: Additional surveys should determine if adequate steelhead spawning and rearing habitat occur in this creek. This tributary may provide important winter flow refugia for *O. mykiss* and potential steelhead.

O. mykiss Observation: *A*dditional studies should determine if *O. mykiss* are present (including during winter flows) and the potential for steelhead spawning and rearing.

3. Hamms Gulch

Surface Flow: This perennial stream contributes consistent, cold, flow to Corte Madera Creek throughout the year. Surveys between 1999-2001 note "good late summer flow and rainbow trout" in lower Hamms Gulch (Stoecker 2002). In over three decades of hiking the Windy Hill Open Space trail across lower Hamms Gulch, I have never observed it without surface flows.



Hamms Gulch (upper left to right) enters Corte Madera Creek (lower left to right) during a moderate flow event. March 11, 2006. Matt Stoecker.

Spawning Habitat: The lower Hamms Gulch channel substrate is dominated by small boulders, cobbles and gravels. Adequate spawning substrate occurs in low to moderate

abundance within runs and small pool tailouts. These conditions are suitable for steelhead spawning. This tributary clears quickly after high winter flow events and retains cold, clear flows throughout the rest of the year. Almost the entire Hamms Gulch basin is protected within the Windy Hill Open Space Preserve. During moderate to high winter flows, water depths regularly exceed the minimum depth needed for adult steelhead to migrate into and upstream on this creek. Hamms Gulch contains a moderate amount of fair to good quality spawning habitat for steelhead.

Rearing Habitat: Hamms Gulch's protected watershed contains riffles, runs, and occasional step-pool rearing habitat for the *O. mykiss* population present, as it would for juvenile steelhead. Small pools to 2 feet in depth and 6 feet in diameter occur in the lower 1000 feet of this tributary. Boulders, large and small woody debris, undercut banks, and occasional bubble curtains provide fair to good salmonid shelter conditions during summer low flows and refugia from high winter flow and sediment transport events in Corte Madera Creek. The native riparian and understory vegetation provide a high amount of canopy cover. Hamms Gulch contains consistent, cold flows and fair to good quality rearing habitat for the *O. mykiss* present, as it would for juvenile steelhead.

O. mykiss Observation: *O. mykiss* were documented within the lowest 150 feet of this creek during limited *O. mykiss* distribution surveys between 1999-2001 (Stoecker 2002). Subsequent observations within lower Hamms Gulch, between 2002 and 2013, show a relatively small, but persistent, *O. mykiss* population extending further upstream.

4. Jones Gulch

Surface Flow: This perennial stream contributes consistent, cold, flow to Corte Madera Creek throughout the year. Surveys between 1999-2001 describe a "small stream with late summer flow" in lower Jones Gulch (Stoecker 2002). In over three decades of hiking the Windy Hill Open Space trail across lower Jones Gulch, I have never observed it without surface flow. In many ways, Jones Gulch is a slightly smaller version of the nearby and parallel Hamms Gulch downstream.

Jones Gulch (middle left) enters Corte Madera Creek (lower left to right) during a moderate flow event. Note the clearer water conditions in Jones Gulch (and eddy below it against the far Corte Madera Creek bank) compared to the moderate, suspended sediment in Corte Madera Ck. March 11, 2006. Matt Stoecker.

Spawning Habitat: The lower Jones Gulch channel substrate is dominated by small boulders, cobbles and gravels. Upstream from Corte Madera Creek, sand and silt make up a small portion of the substrate composition. Adequate spawning substrate occurs in low abundance within runs and small pool tailouts. These conditions are adequate for a small number of *O. mykiss* or steelhead to spawn. This tributary clears quickly after high winter flow events and retains cold, clear flows throughout the rest of the year. Like Hamms Gulch, almost the entire Jones Gulch basin is protected within the Windy Hill Open Space Preserve. During moderate to high winter flows, water depths regularly exceed the minimum depth needed for adult steelhead to migrate into and upstream on this creek. Jones Gulch contains a low amount of fair to good quality spawning habitat for steelhead.

Rearing Habitat: Jones Gulch's protected watershed contains riffles, runs, and occasional step-pool rearing habitat condition for the small *O. mykiss* population observed, as it would for juvenile steelhead. Small pools to 2 feet in depth and 6 feet in diameter occur in the lower portion of this tributary. Boulders, large and small woody debris, undercut

banks, and occasional bubble curtains provide fair to good shelter conditions during summer low flows and refuge from high winter flow and sediment transport events in Corte Madera Creek. The thick redwood forest provides a very high amount of canopy cover. Jones Gulch contains consistent, cold flows and a limited amount of fair to good quality rearing habitat for the *O. mykiss* present, as it would for juvenile steelhead.

O. mykiss Observation: *O. mykiss* were not documented during limited *O. mykiss* distribution surveys of the lower couple hundred feet, between 1999-2001 (Stoecker 2002). Subsequent observations within lower Jones Gulch, between 2002 and 2013, have found a very small number of *O. mykiss* utilizing the lower reaches of this creek.

5. Unnamed Creek (Corte Madera Creek tributary)

Surface Flow: This western tributary enters Corte Madera Creek between Jones Gulch and Damiani Creek. While smaller than other nearby tributaries, this little creek has always been observed to supply a small amount of cold flow to Corte Madera Creek during summer and fall months. As seen in the image below, water in this tributary clears quickly following high winter flow events.

Unnamed Creek flowing into Corte Madera Creek during moderate winter flows. Note that the tributary is flowing clear while Corte Madera Creek continues to carry suspended sediment. Note the clean, cobble and gravel substrate and small pool. March 11, 2006. Matt Stoecker.

Spawning Habitat: A limited amount of adequate steelhead / *O. mykiss* spawning habitat occurs in this creek due to clean substrate conditions and small pockets of cobbles and gravels associated with small, step-pool tailouts.

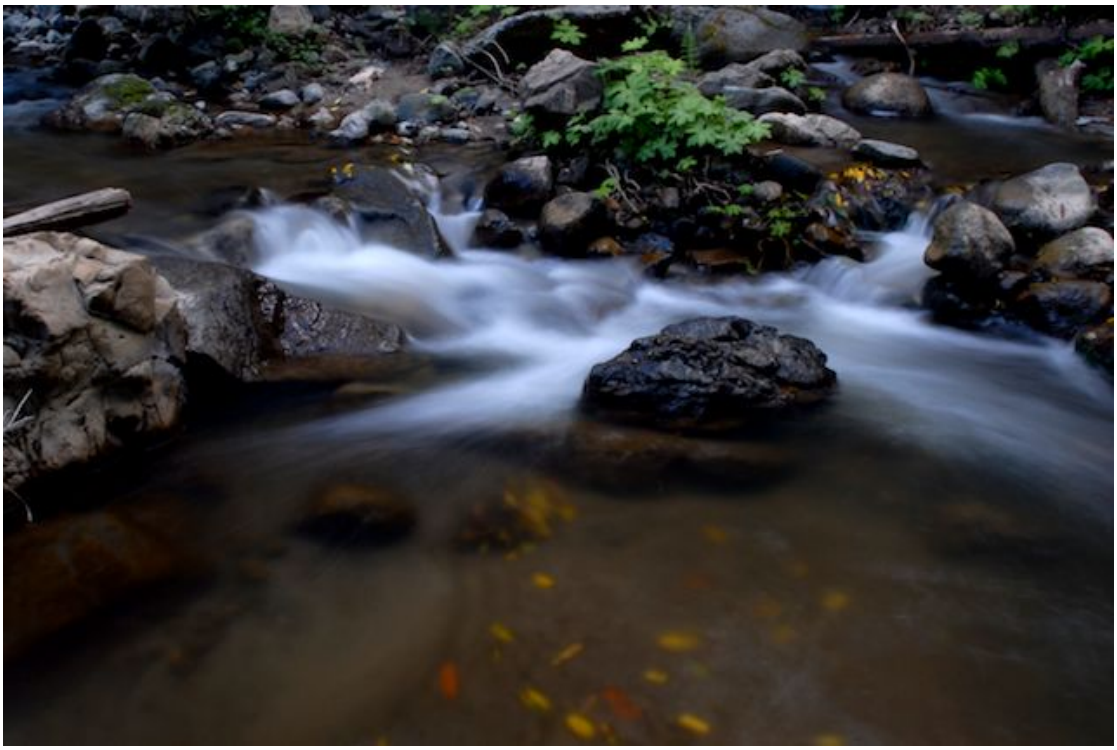
Rearing Habitat: Small step-pools to 2 feet in depth occur on this tributary along with undercut banks, boulders, and woody debris features that provide shelter. As with other tributaries, this creek provides important winter refugia habitat while Corte Madera Creek runs high with suspended sediment after big rain events.

Approximately 400 feet upstream from Corte Madera Creek, this unnamed tributary is observed to retain a small amount of cold, clear flows and small pool habitat throughout the summer and fall. November 17, 2007. Matt Stoecker.

O. mykiss Observation: No *O. mykiss* have been observed in the lower reaches of this creek during, however additional studies are needed to determine if fish are present (including during high flow events when trout may seek refuge in this smaller, clear creek).

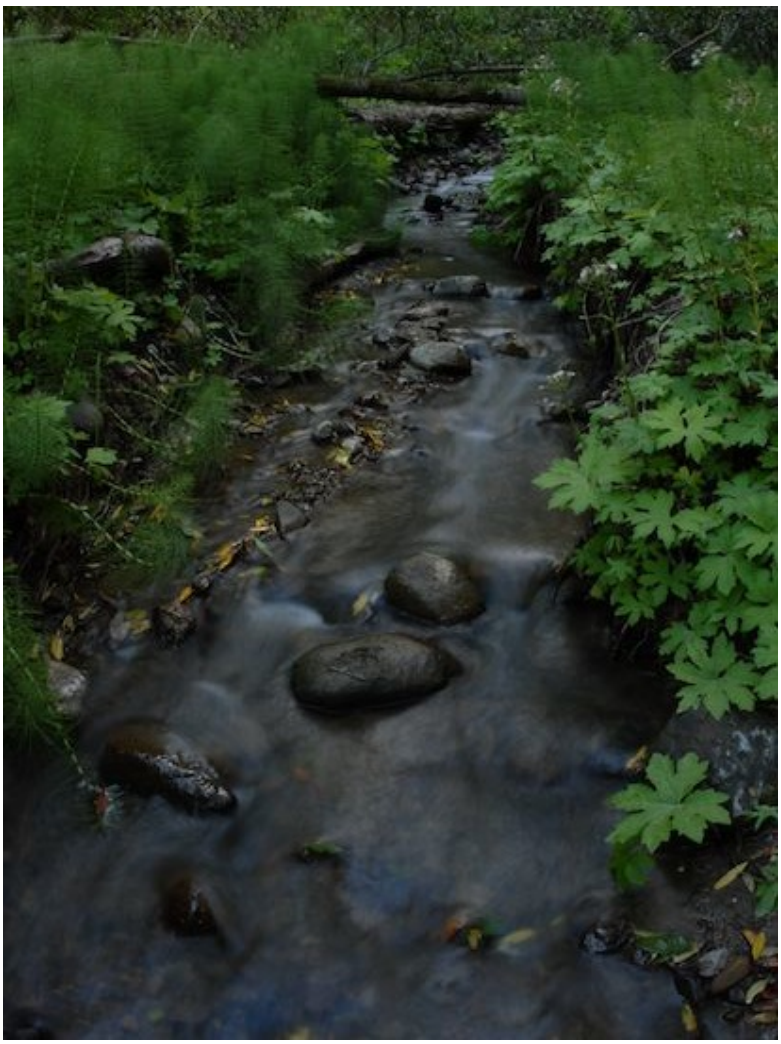
6. Damiani Creek

Surface Flow: This perennial stream contributes consistent, cold, flow to Corte Madera Creek throughout the year and has never been observed without surface flows throughout.



Damiani Creek (upper right) flows into Corte Madera Creek (upper left to lower right) creating high quality O. mykiss / steelhead pool and rearing habitat. May 5, 2006. Matt Stoecker.

Spawning Habitat: Channel substrate is dominated by cobbles and gravels that are well-sized for steelhead spawning. Small boulders are the third most common substrate. Sand and silt making up a small portion of the substrate composition. Substrate is relatively clean with low embeddedness that is suitable for steelhead egg incubation. This spring-fed stream clears quickly after high winter flow events and retains cold, clear flows throughout the rest of the year. Much of this sub-watershed is protected within the Windy Hill Open Space Preserve. During winter flows, water depths regularly exceed the minimum depth needed for adult steelhead to migrate into this creek. Damiani Creek contains a moderate amount of high quality steelhead spawning habitat.



Damiani Creek, approximately 75 feet upstream from Corte Madera Creek. Note the boulders, undercut banks, clean cobbles and gravels, and good spring flow. May 5, 2006. Matt Stoecker

Rearing Habitat: Damiani Creek consists primarily of riffles and runs, with occasional pools to 2-3 feet deep. Small boulders, woody debris, undercut banks, and bubble curtains provide good juvenile steelhead shelter conditions during summer and fall low flows and high winter flow conditions. Aquatic insects, including mayfly, caddis, midge, and dragonfly species, provide ample prey. The native riparian canopy becomes progressively denser as oaks, maples, and bay laurels near the Corte Madera Creek confluence transition to redwood forest in the middle and upper reaches. Damiani Creek contains good rearing habitat for the current trout population as it would for juvenile steelhead.

O. mykiss Observation: *O. mykiss* were documented within the lower 150 feet of this reach, downstream of a culvert road crossing impediment, during *O. mykiss* distribution surveys between 1999-2001 (Stoecker 2002). Subsequent *O. mykiss* observations in the lower 150 feet, between 2002 and 2013, confirm their ongoing occurrence in this tributary.

7. Rengstorff Creek

Surface Flow: This small, perennial stream contributes consistent, cold, flow to Corte Madera Creek throughout the year. My two brothers lived along the banks of Rengstorff (and Coal Creeks) for over a decade and during regular observations between 1999-2013 this creek has always contained surface flow.

Spawning Habitat: The lower Rengstorff Creek channel is dominated by small boulders, cobbles and gravels. Upstream from Corte Madera Creek, sand and silt make up a small portion of the substrate composition. Adequate spawning substrate occurs in low abundance within runs and small step-pool tailouts. Conditions are adequate for steelhead spawning. Rengstorff Creek clears quickly after high winter flow events and retains cold, clear flows throughout the rest of the year. Rengstorff Creek contains a small amount of fair to good quality spawning habitat for steelhead.

Rearing Habitat: Rengstorff Creek's moderate to high gradient contains good step-pool rearing habitat conditions with small pools to 2 feet in depth. Boulders, large and small woody debris, undercut banks, and occasional bubble curtains provide good juvenile steelhead shelter conditions during summer low flows and refuge from high winter flow and sediment transport events in Corte Madera Creek. The native riparian and understory vegetation provide a moderate to high amount of canopy cover. Rengstorff Creek contains consistent, cold flows and fair to good quality juvenile steelhead rearing habitat.

O. mykiss Observation: *O. mykiss* were not observed within the lower portion of this creek during limited *O. mykiss* distribution surveys between 1999-2001 (Stoecker 2002). Because adequate spawning and rearing conditions exists, additional surveys are needed to determine if *O. mykiss* are utilizing this tributary. Two impassable private driveway culverts occur within the lower 500 feet of the creek and may have led to the extirpation of, and ongoing prevention of access for, *O. mykiss* to the upper reaches.

8. Coal Creek

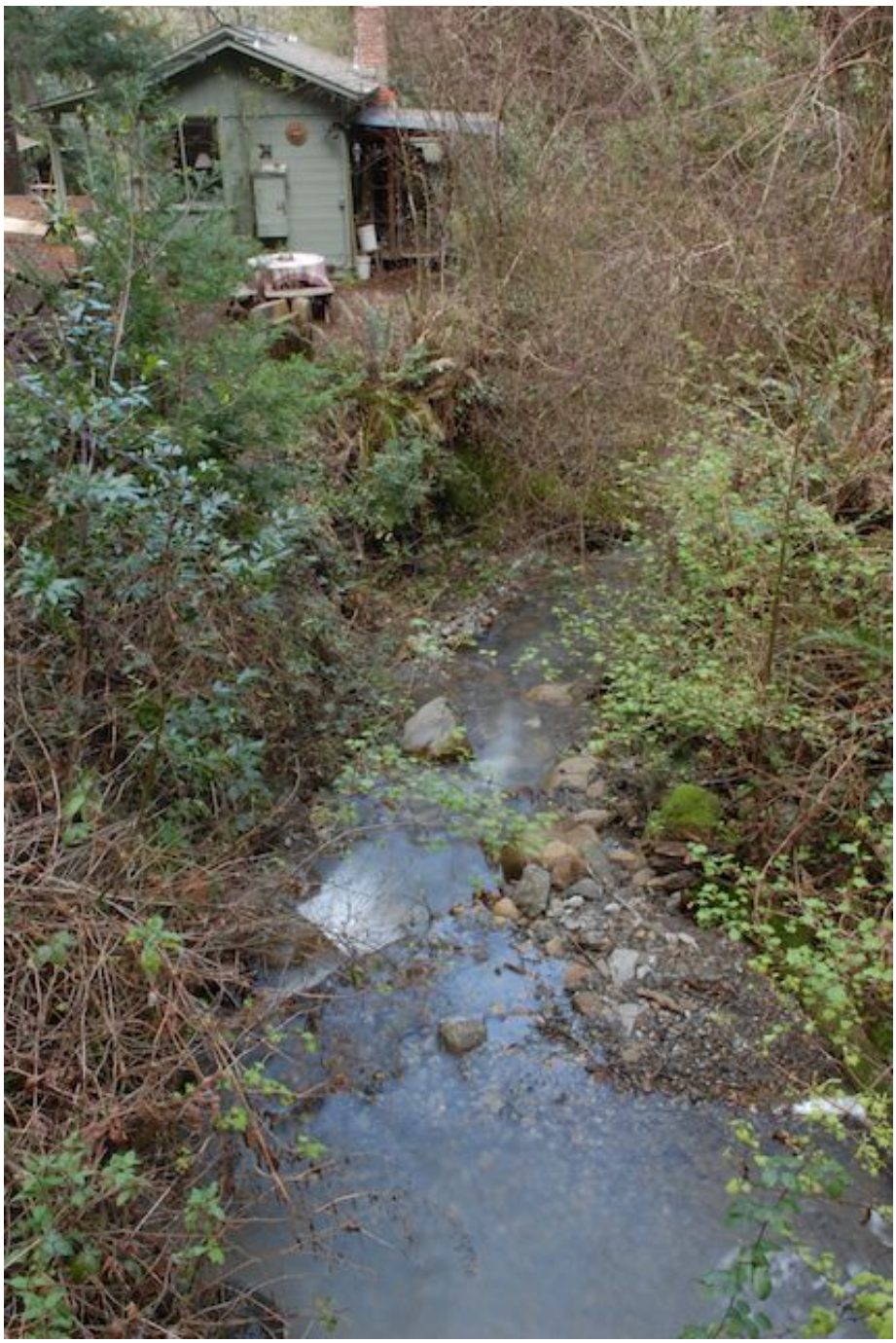
Surface Flow: Of all the upper Corte Madera Creek tributaries, this perennial stream contributes the most consistent, cold, flow to Corte Madera Creek throughout the year. It has never been observed without surface flows throughout the reach from Corte Madera Creek to the confluence with the North and South Fork.

Coal Creek (upper right) enters Corte Madera Creek (upper center). Note the boulder and step-pool dominated habitats of both creeks at this confluence, clear January flows, and abundant juvenile steelhead rearing habitat and shelter. January 29, 2007. Matt Stoecker

Spawning Habitat: Channel substrate is dominated by boulders and gravels /cobbles ideally sized for steelhead spawning. Large boulders and some bedrock are also present. Sand and silt make up a small portion of the substrate composition. Excellent spawning substrate, with low embeddedness, occurs at the tailout of several large pools. These conditions are ideally situated for spawning, steelhead egg incubation and juvenile development. This productive spring-fed tributary is one of the first in the Corte Madera Creek subwatershed to clear after high winter flow events and it retains cold, clear flows throughout the rest of the year. Much of the upper basin is protected within the Coal Creek Open Space Preserve. During winter flows, water depths regularly exceed the minimum depth needed for adult steelhead to migrate into and upstream on this creek. Coal Creek contains some of the highest quality steelhead spawning habitat in the entire Corte Madera Creek subwatershed.

Coal Creek, approximately 400 feet upstream from Corte Madera Creek. Note the excellent, clean spawning gravels and cobbles below the small pool and bubble curtain. March 24, 2006. Matt Stoecker

Rearing Habitat: Coal Creek's contains high quality step-pool rearing habitat for the *O. mykiss* population present as it would for juvenile steelhead. Numerous pools to over 4 feet in depth and over 20 feet in diameter occur in the lower 1000 feet of this tributary. Boulders (to over 6 feet in diameter), large and small woody debris, undercut banks, and abundant bubble curtains produce excellent steelhead shelter during summer low flows and refugia from high winter flow conditions. Aquatic insects, including mayfly, caddis, midge, stonefly, and dragonfly species, provide ample prey for the *O. mykiss present*, as they would for juvenile steelhead. The native riparian and understory vegetation provide moderate to high canopy cover. Coal Creek contains some of the highest quality *O. mykiss* rearing habitat in the entire Corte Madera Creek subwatershed, as it would for juvenile steelhead.



Coal Creek, approximately 700 feet upstream from Corte Madera Creek, showing excellent pool (4 feet deep) rearing habitat and excellent, clean, ideally sized and located steelhead spawning substrate in the pool tailout. March 11. 2006. Matt Stoecker

Coal Creek, approximately 900 feet upstream of Corte Madera Creek, showing step-pools, high quality steelhead rearing habitat (undercut banks and boulders),clear flows, and clean spawning gravels in the tailout of the upper pool. March 11, 2006. Matt Stoecker.

<u>*O. mykiss* Observation</u>: *O. mykiss* were documented within the lowest 250 feet of this creek during *O. mykiss* distribution surveys between 1999-2001 (Stoecker 2002). Subsequent, and more extensive *O. mykiss* observations within Coal Creek, between 2002 and 2013, show a relatively large *O. mykiss* population with multiple age classes (ranging between 1.5 - 9 inches in total length) and observed spawning. Note: My two brothers lived in houses on the banks of Coal Creek (and Rengstorff Creek) for over a decade

during this time period and *O. mykiss* were consistently observed throughout this reach. In the summer of 2007, a pool approximately 8 feet in diameter was snorkeled and observed to contain over 20 *O. mykiss* of multiple age classes. Coal Creek contains a relatively high abundance of *O. mykiss* and would provide excellent spawning and rearing habitat for steelhead.

O. mykiss in a Coal Creek pool, approximately 400 feet upstream from Corte Madera Creek. Note caddisfly larvae casings attached to the boulder at center left and mid-summer water depth. July 8, 2007. Matt Stoecker

9. Unnamed (Steelhead) Creek

Surface Flow: This unnamed perennial stream is the next tributary to enter Corte Madera Creek from the west, upstream from Coal Creek and downstream from the upper Alpine Road (decommissioned) crossing. This tributary contributes consistent, cold, flow to Corte Madera Creek throughout the year. In the early 2000's, myself and members of the San Francisquito Watershed Council began to refer to this unnamed creek as "Steelhead Creek".

Spawning Habitat: Channel substrate is similar to Coal Creek and is dominated by gravels and cobbles and small boulders. Very large boulders and some bedrock are also present. Sand and silt make up a small portion of the substrate composition. A limited amount of excellent, clean spawning substrate occurs at the tailout of several small pools. Steelhead Creek clears quickly after high winter flow events and retains cold, clear flows throughout the rest of the year. Almost the entire Steelhead Creek subwatershed is protected within the Coal Creek Open Space Preserve. During winter flows, water depths regularly exceed the minimum depth needed for adult steelhead to migrate into and upstream on this creek. This tributary contains a small amount of high quality steelhead spawning habitat. No anthropogenic migration barriers are known to exist on this protected creek.

Rearing Habitat: Steelhead Creek's moderate to steep gradient contains high quality step-pool rearing habitat conditions for the *O. mykiss* population present, as it would for juvenile steelhead. Pools to over 2.5 feet in depth and over 8 feet in diameter occur. Boulders (to over 6 feet in diameter), large and small woody debris, undercut banks, and abundant bubble curtains produce excellent juvenile steelhead shelter during summer low flows as well as refugia from high winter flow and sediment transport conditions in Corte Madera Creek. The native riparian and understory vegetation provide abundant canopy cover. Steelhead Creek contains good to excellent quality *O. mykiss* rearing habitat, as it would for juvenile steelhead.

O. mykiss Observation: *O. mykiss* have been observed within lower Steelhead Creek during observation between 2006 and 2012.

C. Sausal Creek

Surface Flow: Sausal Creek contains both intermittent and perennial reaches. Flow quantity and duration is variable from year to year. Following wet years, flow or wetted reaches persist along most of Sausal Creek. Prolonged drought, such as over the past few years, have seen flows disappear from significant portions of the creek during the summer and fall months. However, winter flows regularly raise the creek to several feet in height providing adequate adult steelhead migration conditions to suitable spawning and rearing habitat in portions of Sausal Creek and tributaries. Sausal Pond (reservoir) and the headwaters of Sausal Creek upstream were dammed and diverted into a culvert buried under the Sequoias retirement community that now discharges into Corte Madera Creek.

A recently daylighted and restored section of Sausal Creek flows through the newly constructed Portola Valley Town Center. Note the native vegetation plantings and late May surface flows. May 20, 2009. Matt Stoecker.

Sausal Creek, approximately 100 feet upstream from the Portola Valley Town Center culvert inlet. Note the summer surface flow, mature oak canopy and shade, and riffle / run habitat. July 19, 2005. Matt Stoecker.

Spawning Habitat: Substrate is dominated by sand, silt and gravels that are often moderately to highly embedded with fine sediment, resulting in spawning habitat conditions that are poor throughout most of Sausal Creek. However, infrequent cobbles and larger gravels occur in some locations where faster water provides cleaner substrate conditions providing a limited amount of suitable steelhead spawning habitat. Overall spawning conditions are poor to fair on the mainstem of Sausal Creek. During winter and spring flows, water depths in Sausal Creek regularly exceed the requirements for upstream adult steelhead migration and often exceed 3 feet.

Sausal Creek, immediately downstream from the Portola Valley Town Center. Note that adequate depth occurs for migrating adult steelhead throughout this reach during moderate flows. March 1, 2006. Matt Stoecker.

Rearing Habitat: Due to limited, and variable summer flows, shallow water depths, and relatively low amount of instream shelter, steelhead rearing conditions are poor to fair. However, following wet years and extended summer flows, Sausal Creek can provide some fair rearing habitat conditions for steelhead. This creek is important as a migration corridor that would enable adult steelhead to access suitable spawning and rearing habitat in the tributaries.

Sausal Creek, at the upstream end of the Portola Valley Town Center property. Note the gravel and sand dominated substrate and pool habitat, but also the undercut banks and water depths to over 1-foot along the edges. March 1, 2006. Matt Stoecker.

O. mykiss Observation: I have never observed *O. mykiss* in Sausal Creek, but historic and contemporary documentation occurs for this subwatershed and the Alambique Creek tributary (Appendix 3, Appendix 4, Fee et al. 1996). It is expected that a restored steelhead population upstream of Searsville Reservoir would primarily utilize the mainstem as a migration corridor between spawning and rearing locations in adequate Sausal Creek tributaries. However, a limited amount of suitable steelhead spawning and rearing habitat occurs on the mainstem, especially during wetter years, and would be expected.

Sausal Creek, downstream of Family Farm Road bridge, where it flows into, and is influenced by, Searsville Reservoir, Dam, and reservoir-caused sediment deposition. March 22, 2006. Matt Stoecker.

D. Sausal Creek Tributaries

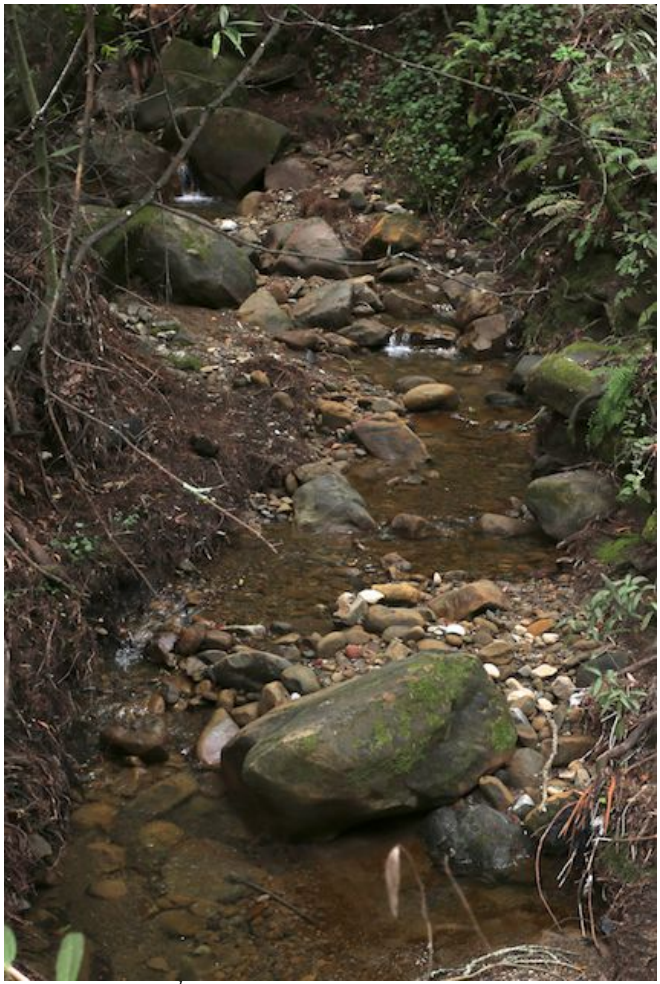
1. Alambique Creek and Lloyd's Pond

Surface Flow: Surface flows typically occur year-round throughout Alambique Creek. However, this past year (2014), following prolonged and record drought, I observed the creek dry out in reaches for the first time in over two decades of observation. During the summer and fall of 2014 the creek was observed to dry out below the outlet of Lloyd's Pond (also known as Upper Searsville Marsh) and upstream of the pond to the second upstream Portola Road crossing. As observed in previous years, surface flows remained throughout the exceptionally dry 2014 year upstream of the third Portola Road crossing.

Alambique Creek, downstream of Portola Road, and flowing from Lloyd's Pond (Upper Marsh) into Middle Searsville Reservoir, within Jasper Ridge Biological Preserve. Note the deep channel and adequate water depth for adult steelhead migration. March 22, 2006. Matt Stoecker.

Alambique Creek, upstream of Lloyd's Pond, and immediately downstream of the 2nd Portola Road crossing. Note the pool habitat, undercut banks, and cobble/gravel/sand dominated substrate. February 17, 2013. Matt Stoecker.

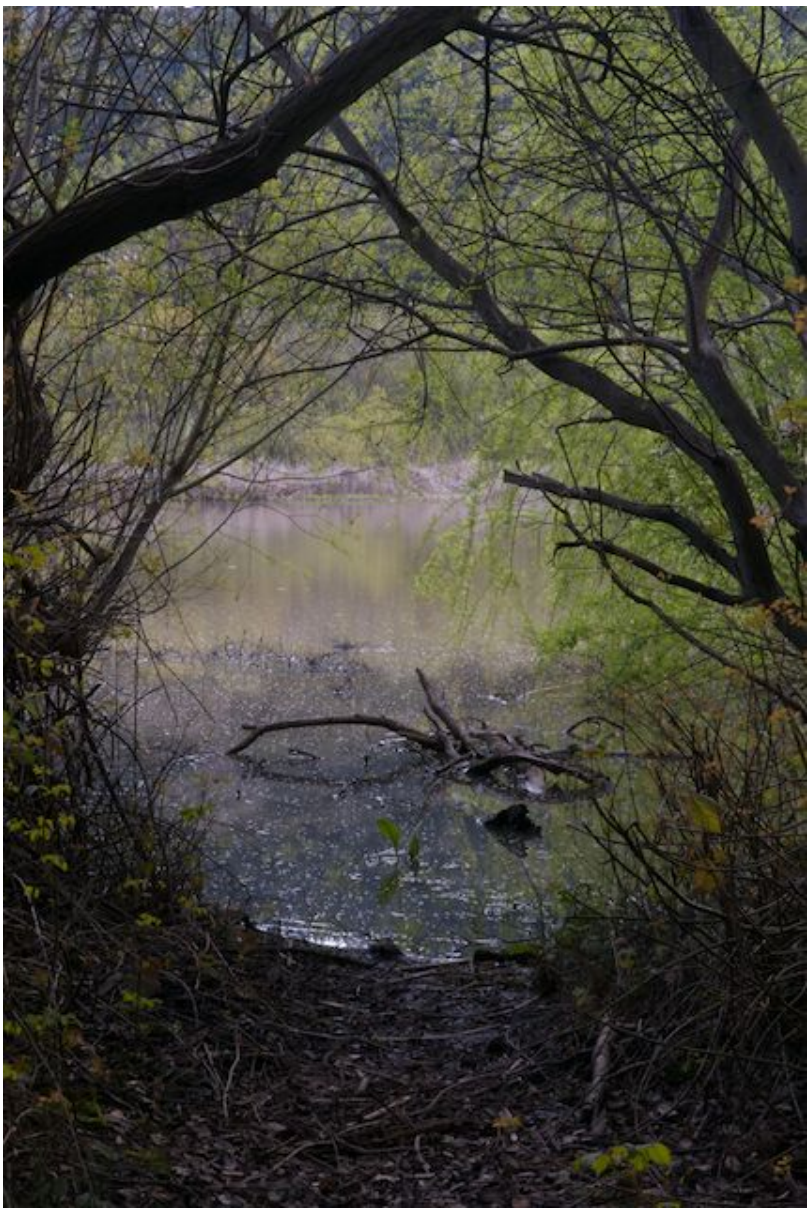
Spawning Habitat: Downstream of Lloyd's Pond, Alambique Creek flows through two culverts under Portola Road and into Middle Searsville Reservoir. Substrate conditions in this reach are dominated by silt and sand, providing no suitable steelhead spawning habitat. Upstream of Lloyd's Pond, the creek substrate is dominated by adequately-sized steelhead spawning cobbles and gravels. Moving upstream, a decreasing amount of sand and silt and increasing amount of boulders occur with these cobbles and gravels. Steelhead spawning conditions are fair between the second and third Portola Road crossings and good upstream of the third crossing as substrate embeddedness becomes low. A North Fork of the creek enters just upstream of the second Portola Road crossing and comes from an historic pond, which still exists in a modified state. The downstream end of this tributary contains gravels and cobbles of suitable size for steelhead spawning. Surveys of this private North Fork tributary and pond should be conducted to assess steelhead habitat conditions and restoration potential. As with other ponds in the region it is expected that the pond contains non-native fish species.



Alambique Creek, upstream of the 3rd Portola Road crossing. This perennial upper section of the creek contains good spawning and rearing habitat for O. mykiss and steelhead. March 15, 2013. Matt Stoecker.

Rearing Habitat: Rearing habitat is poor between Middle Reservoir and Lloyd's Pond due to shallow summer conditions and little shelter. Between Lloyd's Pond and the third Portola Road crossing, rearing habitat improves to fair as the channel substrate size increased, pools to 2 feet deep form, and a moderate amount of instream shelter is provided by undercut banks. Upstream of the third Portola Road crossing, steelhead rearing conditions become good to excellent with a clean gravel, cobble and boulder substrate, undercut bank shelter, shaded redwood forest, cold summer flows, and boulder produced step-pools to 3 feet deep. "Good salmonid habitat conditions and late summer flow in upper creek" was noted during *O. mykiss* distribution surveys between 1999-2001 (Stoecker 2002).

In addition to the steelhead rearing potential within Alambique Creek, Lloyd's Pond may have once been, and potentially could be restored to, a highly productive steelhead and coho salmon rearing pond (Appendix 3, Fee et al. 1996). The large pond was documented prior to the construction of Searsville Dam and the Portola Road culverts (which both currently impacted the pond). Historical and contemporary documentation of *O. mykiss* in Alambique Creek and downstream in Sausal Creek and the Searsville Reservoir area shows that Lloyd's Pond has been used by *O. mykiss* in the past (Appendix 3, Appendix 4, Fee et al. 1996). A perennial pond of this large size, and depths exceeding 8 feet, could have supported highly productive steelhead rearing and adult steelhead over-summering habitat, especially during low water years with limited out-migration opportunities. The pond's water quality appears to be negatively impacted by run-off and encroachment from the adjacent equestrian operation leased on Stanford land. A contemporary *O. mykiss* population in Alambique Creek may currently utilize this pond for some rearing. Future restoration, water quality improvements, and non-native fish eradication efforts could transform Lloyd's Pond into a highly productive steelhead (and potentially coho salmon) rearing habitat and important adult steelhead over-summering area. Migratory access to a restored pond could also result in additional life history strategies for San Francisquito Creek steelhead /*O. mykiss* that could improve the overall diversity and adaptability of the population regionally. Additionally, another natural pond that pre-dates Searsville Dam, is documented on the North Fork of Alambique Creek and may similarly provide steelhead rearing habitat benefits currently or in the future.



Lloyd's Pond, a unique and historic pond on lower Alambique Creek that pre-dates Searsville Dam, encompasses several acres of deep open water habitat. March 22, 2006. Matt Stoecker.

<u>*O. mykiss* Observation</u>: I have never observed *O. mykiss* in this pond, but non-native bass have been observed in abundance. See the above paragraph for documentation of *O. mykiss* within the Alambique Creek subwatershed.

2. Dennis Martin Creek

Surface Flow: Dennis Martin Creek flows into Sausal Creek immediately upstream from the Family Farm Road bridge, adjacent to the southern end of Middle Searsville Reservoir. A dam and small, private reservoir occur just upstream on the creek. A second dam and reservoir (Schilling) occur near the headwaters. Flows upstream of the private dam clear relatively quickly after high winter flow events. Potentially due to springs along the San Andreas Fault zone and/or groundwater recharge from the private pond, lower Dennis Martin Creek typically retains a small amount of summer and fall flow into Sausal Creek. Upstream from the private dam and Portola Road crossing, the creek contains variable flows depending on the amount of rainfall in the preceding winter(s). Following wet years, this section typically retains a small amount of summer and fall flow or isolated pools and short dry reaches. During dry years, larger portions of the middle reach will dry up while isolated pools and trickling flow persists in other reaches. Further upstream near the Old La Honda Road crossing the creek typically retains small summer and fall flows.

Dennis Martin Creek, flowing into the upstream end of the Portola Road crossing culvert (during replacement construction). Note the cobble and gravel substrate and relatively clear water flowing into the culvert inlet. January 3, 2013. Matt Stoecker.

Spawning Habitat: Channel substrate is dominated by silt downstream of the private dam providing little if any suitable spawning habitat for steelhead. Upstream of the private reservoir, and nearby Portola Road crossing, the stream channel is dominated by relatively clean cobbles and gravels, with larger boulders increasing upstream. This reach upstream from Portola Road provides fair steelhead spawning habitat overall with a limited amount of small, but good quality spawning locations further upstream.

Rearing Habitat: As with spawning habitat quality, rearing conditions in the silt-laden reach below the private dam are poor. Upstream of Portola Road, there is fair to good steelhead rearing habitat as the gradient, amount of summer flow, and boulder step-pools increase. Boulders, bedrock, and redwood root masses form pools to 3 feet deep in the upper reaches.

Dennis Martin Creek, upstream of Portola Road, within a redwood forest. Note the 3-foot deep pool formed by boulders, bedrock, and redwood root system. April 2007 slide scan. Matt Stoecker.

O. mykiss Observation: *O. mykiss* were not observed within the lower portion of this creek during limited *O. mykiss* distribution surveys between 1999-2001 (Stoecker 2002). Subsequent observations have not identified *O. mykiss* in this tributary, however non-native species in both upstream and downstream artificial ponds, and the presence of an impassable private dam near the mouth, would likely preclude recolonization following natural or human-caused extirpation.

Schilling Reservoir occurs in the upper reaches of Dennis Martin Creek. Non-native, and potentially native, fish species occur in this reservoir. April 2007 slide scan. Matt Stoecker.

3. Bull Run Creek

Surface Flow: This tributary contains similar habitat conditions to Dennis Martin, but there are no known dams. Small summer flows have always been observed in this creek.

Spawning Habitat: Cobbles and gravels dominate the substrate of this creek in the lower reaches with large boulders increasing upstream of Portola Road. Adequately-sized and relatively clean spawning substrate, associated with small pool tailouts and runs, provide fair spawning habitat for steelhead.

Rearing Habitat: Undercut banks, large redwood roots, and boulder step-pools provide mostly fair, and some good, steelhead rearing habitat.

O. mykiss Observation: *O. mykiss* were not observed within the lower portion of this creek during limited *O. mykiss* distribution surveys between 1999-2001 (Stoecker 2002). Because adequate spawning and rearing conditions exists, additional surveys are needed to determine if *O. mykiss* are utilizing this tributary.

4. Neils Gulch

Surface Flow: The lower portion of Neils Gulch retains very low summer flow or small, isolated pools during most years. The lower 300 feet has been observed to become completely dry during drought years. However, this lower section is artificially confined and straightened by an adjacent equestrian facility and parking area, which may influence substrate permeability and surface flows. Approximately 300 feet upstream from the Sausal Creek confluence, perennial flow conditions occur and extend upstream.

Neils Gulch (upper right) flows into Sausal Creek (lower left to lower right) during low flows. Note the relatively clear flows and cobble/gravel dominated substrate of Neils Gulch. March 3, 2006. Matt Stoecker.

Spawning Habitat: The confined lower creek channel is narrow, but contains cobbles and gravels with relatively low embeddedness. Very limited steelhead spawning may be possible in this lower reach depending on flows and water depth. Most of the tributary has not been surveyed. Additional surveys are needed to assess spawning and rearing conditions in the middle and upper reaches.

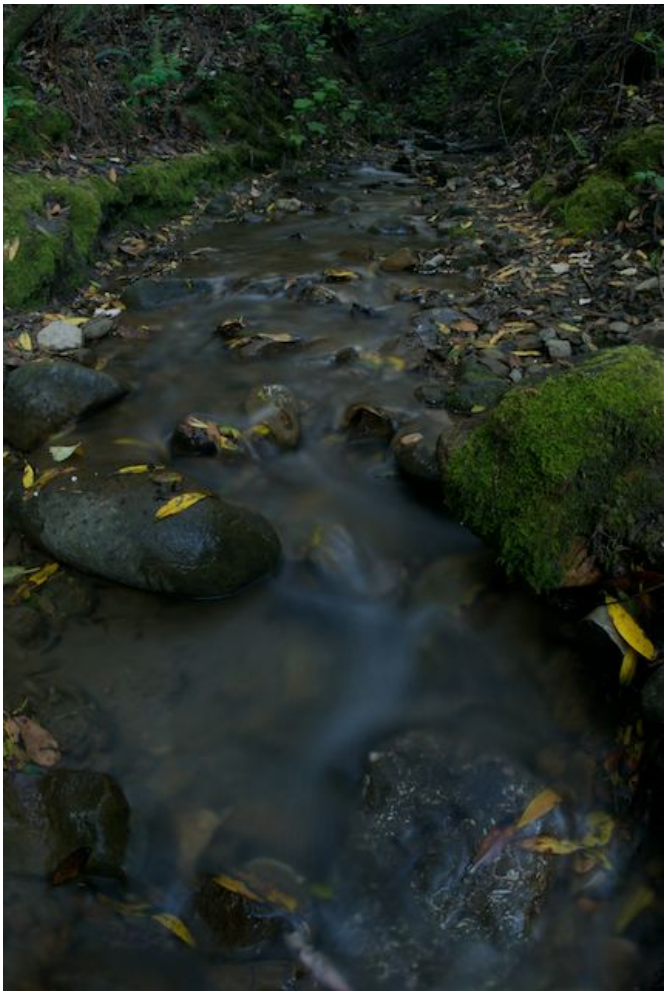
Rearing Habitat: As observed in the image below, perennial flow and pool habitat do occur in Neils Gulch, upstream of the confined lower channel, into the summer months providing limited but fair quality steelhead rearing habitat. Rearing habitat conditions appeared to be improving further upstream.

Neils Gulch, approximately 400 feet upstream of Sausal Creek. Note the approximately 2-foot deep pool with undercut banks and large boulders and the surface flow and rearing habitat persisting during the summer months. July 19, 2005. Matt Stoecker.

O. mykiss Observation: *O. mykiss* were not observed within the lower portion of this creek during limited *O. mykiss* distribution surveys between 1999-2001 (Stoecker 2002). Because adequate spawning and rearing conditions occur in the lower reach and habitat appeared to be improving upstream, additional surveys upstream are needed to determine if *O. mykiss* are utilizing this tributary.

5. Bozzo Gulch

Surface Flow: Bozzo Creek dries up near the lowest reaches downstream from a private driveway adjacent to the Windy Hill Open Space Preserve parking area on Alpine Road. Upstream from this driveway, perennial conditions occur with very small summer and fall flows of cool, clear water.



Bozzo Creek, approximately 200 feet upstream of the private driveway crossing, showing the cobble/boulder dominated substrate and low and clear spring flows. May 4, 2006. Matt Stoecker.

Spawning Habitat: The channel substrate is dominated by relatively clean gravel and cobble at the lower end and with an increased abundance of boulders and bedrock moving upstream. A low abundance of fair to good quality spawning substrate conditions occur along with pool tailouts and runs.

Rearing Habitat: Poor to fair quality steelhead rearing habitat occurs downstream from the private driveway crossing due to limited summer flow conditions and lack of water depth and shelter. Upstream from the driveway, rearing conditions become fair to good as large boulders, undercut banks, bedrock undercuts, large woody debris features, and pools to 3 feet deep occur.

Bozzo Creek, approximately 500 feet upstream of the private driveway crossing. Note the bedrock and large woody debris formed pools and instream shelter. May 4, 2006. Matt Stoecker.

O. mykiss Observation: *O. mykiss* were not observed within the lower portion of this creek during limited *O. mykiss* distribution surveys between 1999-2001 (Stoecker 2002). Because adequate spawning and rearing conditions exists, additional surveys are needed to determine if *O. mykiss* are utilizing this tributary.

Lower Bozzo Creek, immediately upstream from the private driveway crossing, with gravel/cobble substrate, small undercut bank pool, and summer surface flow. July 19, 2005. Matt Stoecker.

IV. Steelhead Habitat & *O. mykiss* Occurrence Within Searsville Influence

It is not known if effective upstream and downstream steelhead migration can be achieved over Searsville Dam, through the reservoir, and over the large sediment deposits caused by the reservoir at the mouth of inlet tributaries. Numerous studies over the past few decades have shown that poor water quality and non-native predators within the reservoir, dense vegetation on the sediment deltas, and subsurface creek flows under the porous, reservoir-caused sediment deposits pose significant challenges to steelhead migration options with the dam and reservoir left in place. Additional challenges occur related to upstream and downstream fish passage at the dam due to water availability, fluctuating reservoir levels, attraction flows, and spillway configuration. Remove the dam, reservoir, and accumulated sediment can provide effective, unimpeded steelhead and other wildlife migration to and from habitat upstream, improve water quality downstream, restore over 2.5 miles of currently submerged/buried stream and riparian habitat, and eliminate or dramatically reduce non-native species occurrence and downstream dispersal from the reservoir. The above fish passage options (retention or removal of the dam/reservoir) result in very different steelhead habitat quality and recovery outcomes both upstream and downstream from the current Searsville Dam location.

Surface Flow: The open water sections of the main Searsville Reservoir and Middle Reservoir are negatively impacted by summer algae blooms (eutrophication) and poor water quality for steelhead and other native aquatic species. Studies over the past few decades have shown that reservoir water temperature exceeds the lethal limit for steelhead. Tributary surface flow over the reservoir-caused sediment deposits is highly impacted by the dam and braided into undefined channels with dense vegetation extending along the lowest reaches and into the reservoirs. The porous, reservoir-caused

sediment deposits are exacerbating subsurface flows on lower Corte Madera Creek, and potentially Sausal Creeks, that are expected to be reducing the duration, depth, and amount of surface flows. Reduced surface flows and water depth across these sediment deposits would negatively impact steelhead migration conditions for both upstream and downstream migrating steelhead. Dam removal, and lack of these sediment deposits, can eliminate the above surface flow and steelhead migration depth problems. Maintaining the dam, reservoir, and sediment deposits will pose serious challenges to implementing adequate steelhead passage to and from upper Corte Madera Creek.

Corte Madera Creek, immediately upstream of the Searsville Causeway, as it flows over accumulated Searsville Dam / Reservoir sediment. Note the shallow, highly braided flows and lack of a defined creek channel. Matt Stoecker.

Spawning Habitat: Steelhead cannot spawn in the warm water environment of Searsville Reservoir. The reach of Corte Madera Creek impacted by the dam and reservoir extends upstream to beyond the boundary of Jasper Ridge Biological Preserve. The creek does not have a stable channel over much of this sediment deposit and contains braided and shallow channels with primarily silt, sand, and small gravel substrate. During steelhead migration flows some braided sections of the creek flow over submerged vegetation and topsoil. These poor substrate conditions, along with reduced flow duration caused by subsurface flows, result in poor to unsuitable steelhead spawning, and egg incubation, habitat is this reach. Additionally, the above conditions make for extremely problematic steelhead migration conditions due to shallow depths, attraction flows of braided channels, vegetation and debris blockage, and reduced or absent outmigration flows.

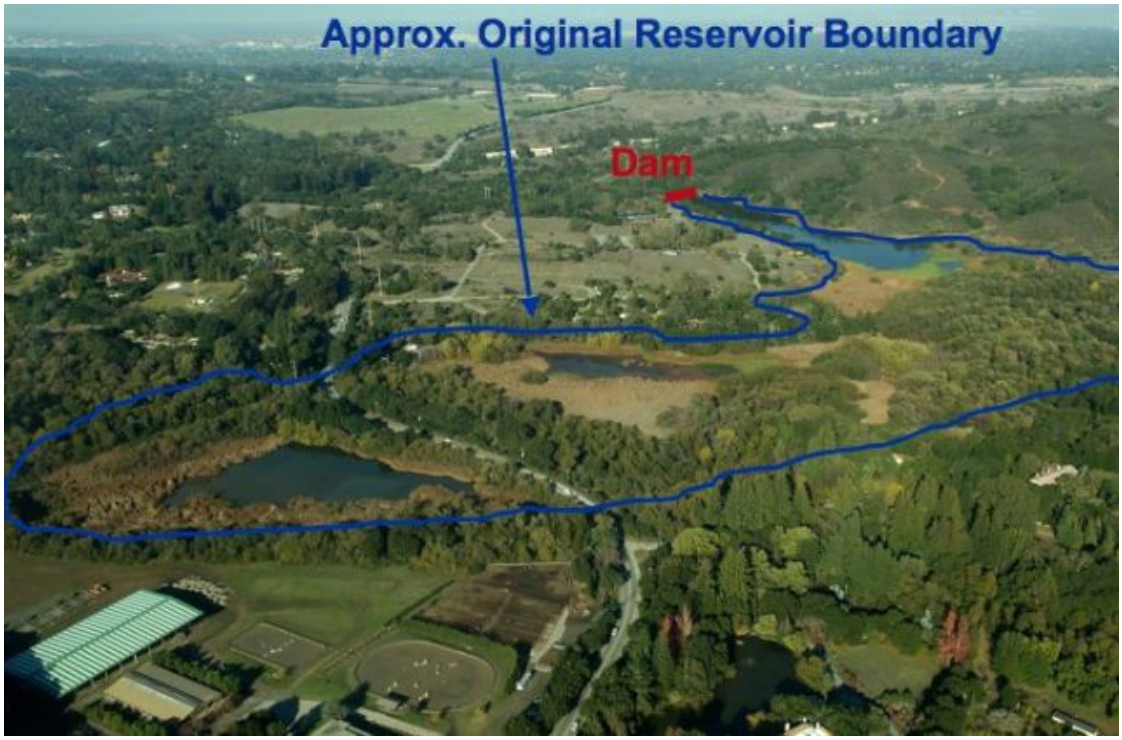
Searsville Reservoir showing the extremely dense vegetation growing up on the artificially accumulated reservoir sediment and deltas at the mouths of Corte Madera Creek (at lower left) and Sausal/Alambique Creeks (upper left). March 3, 2009. Matt Stoecker.

Rearing Habitat: Whether or not Searsville Reservoir could provide any rearing habitat potential for steelhead is not known. Historical documentation of rainbow trout occurrence in the reservoir does exist (Appendix 3, Fee et al. 1996). However there are no known recent observations of *O. mykiss* within the reservoir. It is expected that *O. mykiss* from upstream regularly migrate downstream into the reservoir, and that some migrate downstream over the dam or back up a tributary. It is not known if any *O. mykiss* attempt to stay within the reservoir for an extended amount of time. Poor water quality and non-native predators within the reservoir make survival for extended periods unlikely. Searsville is also reportedly treated with chemicals by County Vector Control for mosquito suppression. It is unknown what impact this operation is having on insect populations within, and downstream of the reservoir, and how that would impact steelhead prey abundance within the reservoir. Eliminating the reservoir and need for mosquito suppression may have steelhead prey abundance benefits within the Searsville area and downstream. Steelhead rearing habitat within the tributary reaches passing over the reservoir-caused sediment deposits is of poor quality due to the shallow, braided conditions, and reduced or absent summer and fall surface flows.

Searsville Reservoir with eutrophic conditions and extensive algae blooms. Such artificial, flat, warmwater habitats provide poor or inhospitable rearing habitat for steelhead and no spawning habitat. Searsville Reservoir supports multiple species of non-native, invasive, and predatory species of fish, amphibians, and crawfish as well as harmful non-native aquatic vegetation. Potential steelhead migration through the reservoir is limited by water quality conditions known to be lethal to steelhead. August 11, 2010. Matt Stoecker.

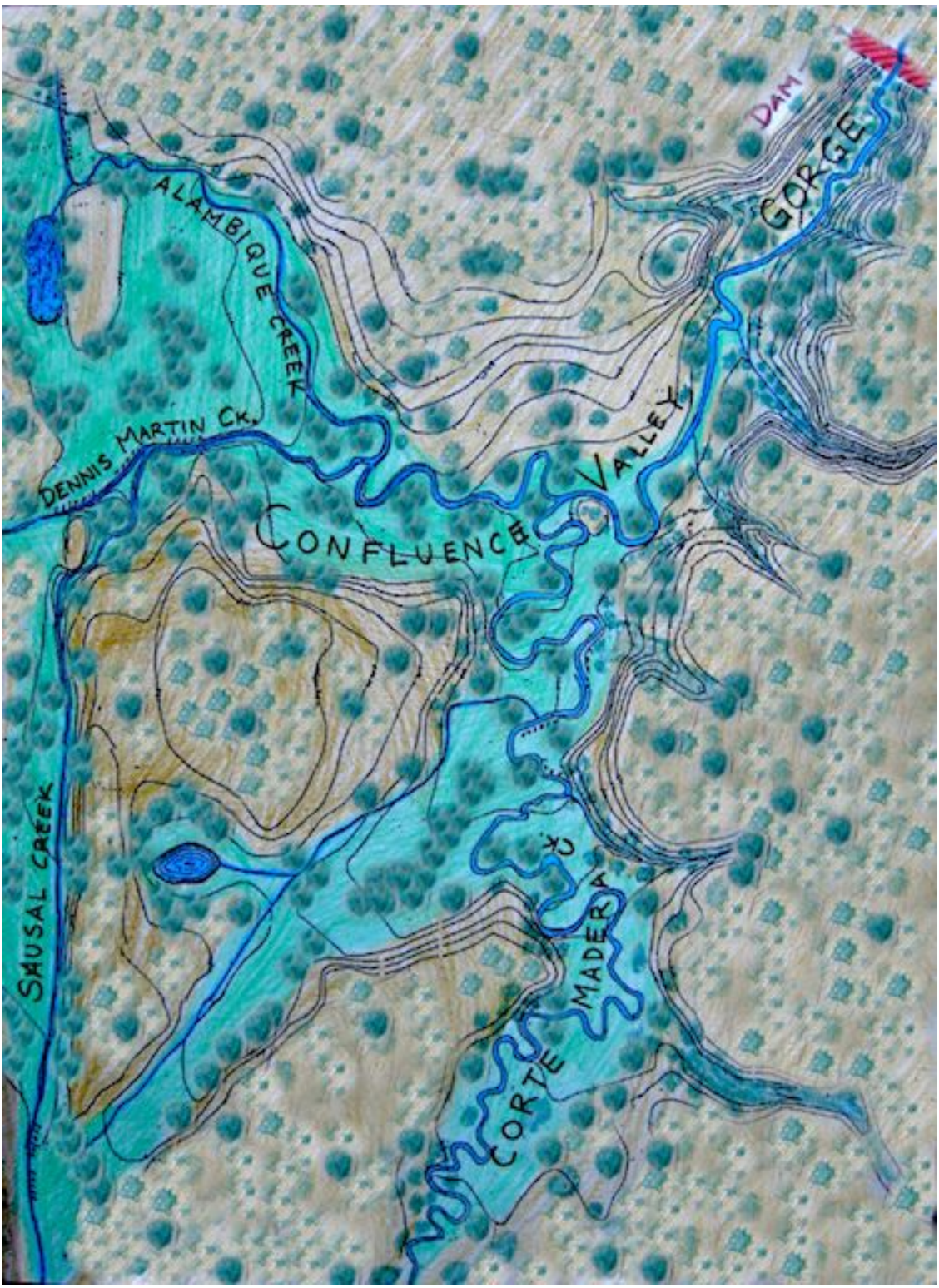
Searsville Reservoir and summer eutrophication. Note the algae mass covering the far southern (top) portion of the reservoir where Corte Madera and Sausal Creeks enter. Google Earth image from July 2007.

If steelhead access were restored to habitat upstream of Searsville Dam along with removal of the dam and reservoir, this would be expected to result in the significant increase in the amount of steelhead rearing habitat with an estimated additional of more than 2.5 miles of restored stream habitat in Corte Madera, Sausal, and Alambique Creeks. The pre-Searsville Dam topographical maps below show the highly meandering and extensive stream reaches submerged and buried by Searsville Dam, Reservoir and sediment deposits. Restoration of such single channel, coldwater stream reaches would be expected to result in suitable, and potentially high quality, rearing habitat and effective migration conditions for steelhead.



Aerial view of the shrinking Searsville Reservoir, with approximate original reservoir boundary and Searsville Dam identified. Note that Lloyd's Pond (at far left) occurred before the dam, but was impacted by the original (and later raised) reservoir, and by the construction of Portola Road (seen between Lloyd's Pond and Middle Reservoir, at center). April 25, 2008. Matt Stoecker.

1880's pre-Searsville Dam topographical map. Note the proposed "dam site" location at upper right, meandering creek habitat upstream of the dam, over 5 creeks impacted by the proposed reservoir, and two "natural" ponds identified; Skipper's Pond (lower left) and Lloyd's Pond / Upper Marsh (upper left). Map oriented with North at top. Photographed with permission at Jasper Ridge Biological Preserve. Matt Stoecker.



1880's pre-Searsville Dam topographical map from Jasper Ridge Biological Preserve, with main streams, valley and gorge named, blue color added to streams and ponds, and red added to the dam location. Note that green color added (estimating potential riparian forest and wetland habitat) and brown color/trees added (estimating potential upland habitat) are estimations indented to provide a potential visual of what pre-dam conditions looked like. Blue-line streams and ponds follow the pre-dam topographical lines. Color and text additions by Matt Stoecker.

Searsville Dam with moderate winter spill. Note turbid reservoir water quality, spill pouring onto concrete step face, and water free-falling approximately 50 feet. All downstream migrating O. mykiss and other fish species tumble down this dam face and/or drop. March 3, 2009. Matt Stoecker.

V. References

(See Appendix 3 and Appendix 4 for additional references)

Fee, C., A. Launer, and S. Rottenborn. 1996. Biotic assessment of upper Searsville Lake and the lower floodplain of Corte Madera Creek. Center for Conservation Biology Department of Biological Sciences, Stanford University. Submitted to Philippe Cohen, Jasper Ridge Biological Preserve. October 21, 1996.

Launer, A., C. Feng, A. Potvin. 2013. Report on the fish relocations associated with the Searsville Dam plunge pool dewatering. Conservation Program, Stanford University. November 15, 2013.

Nielsen J. 2000 Microsatellite Analyses of San Francisquito Creek Rainbow Trout. USGS/BRD. Submitted to: Alan Launer, Center for Conservation, Stanford University

Smith, J. J. and D. R. Harden. 2001. Adult Steelhead Passage in the Bear Creek Watershed. Report of Dept. of Biological Sciences and Dept. of Geology, San Jose State to San Francisquito Watershed Council, c / o Acterra. Supported by a grant from the California Department of Fish and Game.

Stoecker M. 2013. Salmonid Migration Barrier Spreadsheet For The San Francisquito Creek Watershed, San Francisco Bay, Ca. San Francisquito Watershed Council, Steelhead Task Force. Original version from 2000. Updated regularly following barrier removal or status change. Latest version 12-12-2013.

Stoecker M. 2002 San Francisquito Creek Watershed Steelhead/Rainbow Trout (*O. mykiss*) Observations and Distribution 1999-2001. For WMI Stream Reach Summaries" for San Francisquito Creek

Appendix 1. Resume for Matt Stoecker

I graduated from the University of California, Santa Barbara Biology Department in 1998 with a Biology degree in Ecology, Evolution, and Marine Biology. While at college I worked as a fisheries biology intern with the U. S. Forest Service, conducting stream surveys and habitat assessments for steelhead and coastal rainbow trout (*O. mykiss*) populations. My senior thesis resulted in authoring the report *How the Regional GIS Database can be useful to Southern California Steelhead Recovery and Watershed Analysis*. I am the principle biologist and owner of Stoecker Ecological, a consulting company that specializes in steelhead habitat assessment, population surveys and restoration planning and implementation. The California Department of Fish and Game (CDFG) funded me to manage and author the report for the *Southern Santa Barbara County Steelhead Assessment and Recovery Project*. I developed unique methodologies for assessing and prioritizing recovery efforts for steelhead watersheds and fish passage barriers, which have been utilized by the Department of Fish and Game, NOAA Fisheries, Coastal Conservancy, and regional watershed organizations. I managed and authored the California reports: *Sisquoc River Steelhead Assessment and Recovery Project* funded by the Coastal Conservancy, the *Steelhead Migration Barrier Inventory and Recovery Opportunities for the Santa Ynez River* funded by the Department of Fish and Game, and *Santa Clara River Steelhead Trout: Assessment and Recovery Opportunities* for The Nature Conservancy and U.S. Fish and Wildlife. I have been an invited presenter at numerous wildlife connectivity and steelhead migration barrier workshops and conferences including those by the Salmonid Restoration Federation. As a consultant, I have managed multiple steelhead barrier removal projects for the San Francisquito Watershed Council and founded and directed their Steelhead Task Force in 2000. I was hired by the Town of Portola Valley to help develop their Creekside Ordinance for Corte Madera Creek and tributaries and helped to implement their Sausal Creek daylighting and restoration project. I am the author of the *Salmonid Migration Barrier Spreadsheet for the San Francisquito Creek Watershed* (2000-2013) and *San Francisquito Creek Watershed Steelhead / Rainbow Trout (O. mykiss) Observations and Distribution* (2002). I managed the Horse Creek Dam Removal project with funding from the Department of Fish and Game and NOAA. I co-authored the NOAA Fisheries Technical Memorandum *Contraction of the Southern Range Limit for Anadromous Oncorhynchus mykiss*. I am a current member of the Matilija Dam Removal Technical Advisory Committee led by the U.S. Army Corps of Engineers and the Searsville Dam Advisory Group led by Stanford University. I received the 2009 Riparian Challenge Award from the American Fisheries Society, for steelhead recovery efforts in California. I grew up near Corte Madera Creek within the San Francisquito Creek watershed.

Appendix 2. Images of Adult Steelhead in San Francisquito Creek, Bear and Los Trancos Creek tributaries

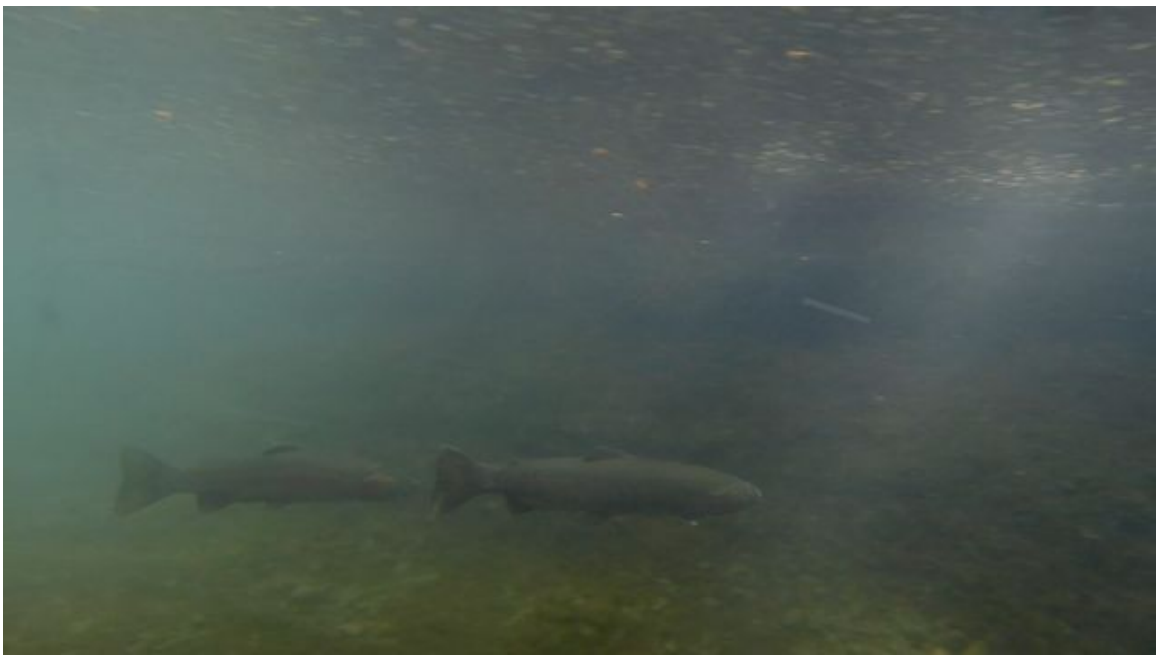
2013

Multiple adult steelhead were observed in 2013 by myself and creekside residents. Unfortunately, one 27-inch steelhead was reported to be illegally taken from the creek and it appears that at least three others were trapped as water levels dropped and migration was prevented. Resident Mike Lanza and his sons found two of the trapped steelhead dead and I found one additional dead steelhead shown below. NOAA Fisheries enforcement reportedly collected the two dead Lanza fish as part of an investigation into Stanford diversions and the third was delivered to the NOAA Science Center where it was confirmed to be a "steelhead carcass" (See e-mail from Heidi Fish, NOAA, 6-17-2013 at the end of this section).

Dead steelhead near the Stanford Shopping Center and El Camino Real in San Francisquito Creek. April 28, 2013. Photo- Mike Lanza.

Dead steelhead near the Stanford Shopping Center and El Camino Real in San Francisquito Creek. April 28, 2013. Photo- Mike Lanza.

Two dead steelhead (foreground and at edge of puddle in background) near the Stanford Shopping Center and El Camino Real in a dewatered San Francisquito Creek. April 28, 2013. Photo- Mike Lanza.



Two adult steelhead (approximately 26 inches in length) upstream of Middlefield Road, San Francisquito Creek. March 2, 2013. Screen grab from video. Matt Stoecker.

Two adult steelhead (approximately 26 inches in length) upstream of Middlefield Road, San Francisquito Creek. March 2, 2013. Matt Stoecker.

Two adult steelhead redds (above and below images) in San Francisquito Creek upstream of University Ave. March 2, 2013. Presumed to be redds from the two adult steelhead photographed above and observed nearby. Matt Stoecker.

2012

Adult steelhead spawning in San Francisquito Creek below Chaucer Street bridge. February 16, 2012. Photo Doug Rundle. See video of spawning: https://www.youtube.com/watch?v=B-JWIZP8rY0

Adult steelhead (documented with another steelhead) approximately 24 inches in length, in drying section of San Francisquito Creek upstream of the University Ave bridge. February 2012. Photo and video from Oliver Burke and Carrie Widener: https://www.youtube.com/watch?v=qQ2amTfdKNA

Dead adult steelhead in dry San Francisquito Creek upstream from University Ave. Carcass currently frozen at NOAA Science Center, Santa Cruz. February 29, 2012. Matt Stoecker.

2009

Los Trancos Creek steelhead approximately 21 inches in length, along with juvenile steelhead, near Highway 280 crossing. Screen grab from video available at: https://www.youtube.com/watch?v=QAazTZDsJSY May 2009. Matt Stoecker.

2000

Adult San Francisquito Creek steelhead rescued in a drying pool below California Water Company's Bear Gulch Diversion Dam. June 2000. Matt Stoecker, with Jim Johnson and staff from California Dept. of Fish and Game.

From: "Heidi Fish (NOAA Federal)" <heidi.fish@noaa.gov>
Subject: San Francisquito fish finally thawed...
Date: June 17, 2013 1:59:33 PM PDT
To: Matt Stoecker <matt@stoeckerecological.com>
Cc: "Eric C. Anderson" <eric.anderson@noaa.gov>

Hi Matt,

Remember that steelhead carcass you brought to the lab a few years ago? Well, I finally thawed that thing in an attempt to retrieve otoliths, scales and tissues. The fish was quite degraded. The head was so decomposed that the otoliths had already fallen out of it. It was suggested to me that the tissue was not viable for collection, so I did not save tissue. I did, however, retrieve scales from it.

I will let you know if we age that fish.

Hope all is well.

Heidi

Appendix 3.

San Francisquito Creek Salmonid Documentation Report and Comments Submitted for the Stanford Habitat Conservation Plan Draft EIS 9-30-2010 (Shortened)

Importance of San Francisquito Creek Steelhead DEIS p. 4-30 second paragraph
"The San Francisquito Creek watershed winter-run steelhead population represents one of only a few remaining runs in South San Francisco Bay." This is a very unique and critically important steelhead run for the entire Central California Coast steelhead population and we would like NMFS experts to include a comprehensive analysis of this current, historically consistent, native strain, run of steelhead.

San Francisquito Creek steelhead are native strain
Microsatellite analysis of San Francisquito Creek rainbow trout by Nielsen (2000) show this population to be of wild and non-hatchery origin. *Oncorhynchus mykiss* were collected from San Francisquito Creek in summer and fall 1996 for a genetics study. Samples from 47 *O. mykiss* were analyzed by Nielsen (2000), and the analysis indicated that the trout were of native strain separable from hatchery strains.

Importance to regional persistence and recovery efforts
The HCP (p.25) correctly states that: "San Francisquito Creek contains one of the few remaining steelhead runs in the San Francisquito Bay drainage."

Salmonid occurrence upstream before Searsville Dam
Regnery (1991) cites a San Mateo County Times-Gazette article from 1879, that states: "Gentleman seeking a pleasant resort within easy reach of the finest fishing and hunting in the country... should go to Searsville (the town)." This statement was made over a decade before Searsville Dam was built and when steelhead had migratory access upstream and through the town of Searsville and the many tributaries that came together there (Corte Madera, Alambique, Sausal, Dennis Martin). In March of 1890, before Searsville Dam was built downstream, the San Mateo County Times-Gazette reported that "a day or two afterwards they (someone's boots) were observed at the mouth of the creek (Alambique Creek) heavily laden with cargoes of fish" (Regnery 1991). Fishing in the streams at that time was almost surely for the native steelhead trout, and reported salmon, and reportedly there was fine fishing and an abundant population above the dam site before the dam was built.

Leidy et. al. (2005) states: "In a 1962 report, Skinner indicated that Corte Madera Creek was an historical migration route for steelhead" (Skinner 1962). This statement acknowledges the historic use of Corte Madera Creek for steelhead prior to construction of Searsville Dam.

Salmonid occurrence downstream of the Searsville Dam
Regnery (1991) states that after construction of Searsville Dam, the dam caretaker harvested salmon at the base of the dam where they were blocked. "When the dam was "wasting" (i.e. overflowing) in the winter, salmon would swim upstream as far as the

(Searsville) dam, Using a pitchfork, the caretaker could spear them to supplement the family's diet" (p.120). This statement shows the direct take of salmon, or adult steelhead identified as salmon. Either way, adult anadromous salmonids were observed blocked at the base of the dam and direct take of these salmonids was occurring and continues to occur today because of the dam.

The following notes are from Leidy et. al. 2005:
A 1905 report notes *O. mykiss* in San Francisquito Creek (Snyder 1905). A 1953 DFG correspondence states that steelhead in San Francisquito Creek persist in portions of the creek even when the stream becomes intermittent, and that young steelhead have been observed in Lake Lagunita on the Stanford University campus (CDFG 1953). This lake receives creek water diverted via a dam and diversion channel. A 1961 DFG letter regarding freeway construction notes a small run of steelhead most winters in San Francisquito Creek (Dillinger 1961). In March 1966, a DFG memorandum discussing a potential fish screen on the Lake Lagunita diversion channel noted reports that hundreds of small trout die there every year as it dries up (Strohschein 1966). In the spring of 1991, an adult steelhead (740 mm) was observed jumping at the base of Searsville Dam against the concrete. Corte Madera Creek below Searsville Dam currently supports an anadromous *O. mykiss* population, and observations of juvenile *O. mykiss* have been made as recently as September 2003.

Long-time San Francisquito Creek Streamkeeper, Jim Johnson, conducted years of steelhead monitoring and may have left extensive field notes. In his summary of observations in a 1996 document Johnson notes several observations of juvenile steelhead in the Bear Creek tributary as well a two adult steelhead in 1995 estimated at 30 and 40 inches in length. Johnson observed several other large adult steelhead in the watershed over his years of observations. Johnson once noted observing what he described as a "large salmon, not an adult steelhead" in the Bear Creek basin during the mid to late 1990's (pers. comm. Stoecker 1990's).

Darren Fong (2004), fisheries biologist with the National Park Service, conducted steelhead surveys for several years in the Golden Gate National Recreational Area property in the upper Bear Creek basin (West Union Creek) and documented numerous *O. mykiss*.

Steelhead Growth Table 1997-2000 Alan Launer, Stanford.
This table shows an extensive surveying and data collection effort involving hundreds of samples taken.

Notes on Salmonids upstream of Searsville Dam
The following notes are from Leidy et. al. 2005:
Leidy's e-fishing surveys from 1981 show steelhead age class, distribution, density information, and flow information. The 2005 report states: "Three Corte Madera Creek locations were sampled in September 1981 as part of a fish distribution study. Fifty-two *O. mykiss* (35-86 mm FL) were found in a ten-meter reach at Willowbrook Road." This documentation shows the presence of flow at that reach in September (dry month), *O.*

mykiss presence, adequate rearing habitat, multiple age classes, and a high density of 5.2 *O. mykiss* per meter.

This 2005 report goes on to note:
Three Corte Madera Creek locations were sampled in September 1981 as part of a fish distribution study. At the junction of Coal Creek, 26 *O. mykiss* (32-62 mm) were caught in a 25-meter meter reach along with two larger *O. mykiss* (98, 137 mm). A 15 meter isolated pool at Portola Valley Road produced no fish (Leidy 1984). One Alambique Creek site was sampled in August 1981 as part of a fish distribution study. Two *O. mykiss* (45, 52 mm FL) were collected where the creek crosses La Honda Road (Leidy 1984).

The above data above shows important information such as *O. mykiss* abundance, age classes, and occurrence in upper Corte Madera Creek and Sausal Creek tributaries, and adequate habitat and flow conditions in the drier months of August and September.

The HCP (p.58) states; "Native stock rainbow trout still, however, occupy many of the tributaries upstream from Searsville Dam."

Known *O. mykiss* distribution upstream of Searsville Dam.
The 2002 table produced by the San Francisquito Watershed Council's Steelhead Task Force describes the known *O. mykiss* distribution upstream of Searsville Dam at that time. Upstream of Searsville Dam, rainbow trout were observed "throughout" Corte Madera Creek between Searsville Reservoir and Hamms Gulch, but were "most abundant" upstream of the Westridge Drive bridge. Upstream of Hamms Gulch, rainbow trout were observed throughout Corte Madera Creek to upstream of Coal Creek near the Alpine Trail crossing and the table notes that this reach contains "good habitat conditions and late summer flow". The table also notes the presence of rainbow trout in the lower reaches of Hamms, Damiani, and Coal Creek tributaries which all maintain "late summer flow". The table also notes that "good salmonid habitat conditions and late summer flow" occur in the "upper" reaches of Alambique Creek although the tributary has not been extensively surveyed for rainbow trout presence. Since this 2002 document was produced, rainbow trout continue to be present in the same reaches and have also been observed in upper Corte Madera Creek in unincorporated San Mateo County, Jones Gulch Creek, and the unnamed (USGS) "Steelhead Creek" tributary upstream of Coal Creek (pers. comm. Stoecker 2010).

Upstream *O. mykiss* contribution to steelhead population
In addition to the spawning and rearing locations described, the DEIS must acknowledge that, within the San Francisquito Creek watershed, the species also spawns and rears as coastal rainbow trout upstream of Searsville Dam in Sausal Creek, Corte Madera Creek, and smaller tributaries identified elsewhere in this letter. While not federally listed upstream of the dam, the DEIS must acknowledge and discuss that recent scientific papers (some written by NOAA scientists) show that these above-barrier populations can and do migrate downstream of barriers that are impassable to upstream migration and that

these populations are considered part of, and may be integral too, the overall San Francisquito Creek steelhead/rainbow trout (*O. mykiss*) population. The DEIS should also discuss this above-barrier population, genetic make-up, historical steelhead context, genetic isolation caused by Searsville Dam, and susceptibility to the effects of inbreeding caused by such genetic isolation. The DEIS should also discuss mortality risks to these above barrier (*O. mykiss*) while attempting to migrate downstream and the resulting predation by invasive species in Searsville Reservoir.

Non-native species displaced trout from Searsville Reservoir

For some years after Searsville Dam was built, native trout reportedly occupied Searsville Reservoir and may still do so periodically. However, the occurrence and persistence of many non-native fish species likely results in heavy predation and exclusion of rainbow trout from the reservoir. As reported by Regnery (1991), "J.A. Folger built an earthen dam on a tributary of Alambique Creek and stocked it with carp. Pressure from a storm run-off caused the dam to wash out, and the carp were carried down into the (Searsville) reservoir. This accident dramatically eliminated native trout in the lake" (p. 137).

Coho salmon documentation in San Francisquito Creek

"Mr. Clyde L. Ritchie, 80-year-old resident, indicated his family came to the area from Italy and first lived in Woodside. He used to fish the area waters extensively and all of the area streams had steelhead and salmon runs. He used to catch steelhead and silver salmon in San Francisquito Creek and the Guadalupe River System in the 30's and 40's. (B12)" (pers. comm. Ritchie 2000).

References

Fong, D. 2004. Summer Stream Habitat and Fish Surveys for Upper West Union Creek (Draft), 1996-2001 Golden Gate National Recreation Area. Prepared for the National Park Service, Golden Gate National Recreation Area, Division of Natural Resource Management and Science. January 2004

Johnson J. 1996. A Brief Summary of Salmonid Observations on West Union Creek and Bear Gulch, Woodside, California 1992-1996

Nielsen J. 2000 Microsatellite Analyses of San Francisquito Creek Rainbow Trout. USGS/BRD. Submitted to: Alan Launer, Center for Conservation, Stanford University

NMFS 1996 Factors for Decline, A Supplement to the Notice of Determination for West Coast Steelhead Under the Endangered Species Act. August 1996

Ritchie, Clyde, personal conversation with L.M. Johmann (GCRCD), 2000.
This Anadromous Fish Supplementary Information (April 2002) amends the Watershed Characteristics Report (February 2001).

http://cf.valleywater.org/_wmi/_PDFs/Assessmentreport/FINAL%20Appendices/Anadromous%20Fish.doc.

Regnery D. 1991 The History of Jasper Ridge; From Searsville Pioneers to Stanford Scientists. Edited by Deane Haskin. Stanford Historical Society.

Smith J. and Harden D. 2001 Adult Steelhead Passage in the Bear Creek Watershed Prepared for the San Francisquito Watershed Council. Supported by a grant from the California Department of Fish and Game July 2001

Stoecker M. 2002 San Francisquito Creek Watershed Steelhead/Rainbow Trout (*O. mykiss*) Observations and Distribution 1999-2001. For WMI Stream Reach Summaries" for San Francisquito Creek

Watershed Management Initiative 2003 Volume One Unabridged Watershed Characteristics Report Chapter 7 Natural Settings Prepared for the Santa Clara Basin Watershed Management Initiative by Watershed Assessment Subgroup August 2003.

Appendix 4.

Native Fish of San Francisquito Creek Watershed- Notes and Referenced Reports
Compiled by Dr. Richard Lanman

San Francisquito Creek hosts the most viable remaining native steelhead (*Oncorhynchus mykiss irideus*) population in the South San Francisco Bay. Bear Creek and Los Trancos Creek and their respective tributaries support an observable steelhead population that is threatened by the effects of urbanization.[15] There is a steelhead trout specimen in the California Academy of Sciences that was collected by Edward Z. Hughes in the 1890s.[16] A May 2002 steelhead trout migration study reported Searsville Dam as the only complete barrier to migration on mainstem San Francisquito Creek (construction of a fishway in 1976 resolved passage at the Lake Lagunita diversion dam 2.5 miles (4.0 km) below Searsville Dam), and that elimination of the Searsville dam could restore ten miles (16 km) of anadromous steelhead habitat.[17] In 2014 a systematic study of 1,400 plus dams in California identified Searsville Dam as a high-priority candidate to improve environmental flows for native fish conservation.[18] A genetics study of San Francisquito Creek steelhead in 1996 found that the fish are native and not of hatchery stock.[17] In 2006, an Aquatic Habitat Assessment and Limiting Factors Analysis commissioned by the Santa Clara Valley Water District concluded that the key factor limiting smolt production within the study area (San Francisquito Creek mainstem and Los Trancos Creek) and potentially throughout the watershed, is a lack of suitable winter refuge in deep pools and large woody debris. Secondly, outgoing salmonid migration is inhibited by seasonal drying and passage impediments.[19]

Several lines of evidence support the historical presence of coho salmon (*Oncorhynchus kisutch*) in San Francisquito Creek. Archaeological remains of unspecified salmonids ("possibly Coho") were reported by Gobalet in the creek.[20] Leidy concluded that coho salmon were likely present and cited that the most suitable habitat for coho salmon was in perennial, well shaded reaches of mainstem San Francisquito Creek, and several small, perennial tributaries including Los Trancos, Corte Madera, Bear, and West Union creeks.[21] In addition, three independent oral history sources indicate that coho salmon were abundant in the creek through the first half of the twentieth century.[22][23] According to local historian Dorothy Regnery's notes from her 1966 interview with Edgar H. Batchelder, who was 2 years old when his father became caretaker of Searsville dam in 1897, "When the dam was "wasting", or overflowing, in the winter salmon would swim upstream as far as the base of the dam. Using a pitchfork Mr. Batchelder could spear them to supplement the family's menu." His "favorite place to fish for trout was in the Dennis Martin Creek".[24] A second source described catching "steelhead" and silver (coho) salmon in San Francisquito Creek and the Guadalupe River System in the 30's and 40's. He said that the Guadalupe River also had runs of chinook salmon (*Oncorhynchus tshawytscha*) that were very large in wet years."[23] Thirdly, Dennis L. Bark, a senior fellow at the Hoover Institution, recalls playing on San Francisquito Creek around 1947: "Salmon swam up it, and in winter it was a dangerous place."[25] The historical range of coho salmon overlapped geographically with San Francisquito Creek. It is definitely established that coho salmon were historically present in other San Francisco Bay streams

such as San Mateo Creek and Alameda Creek.[26] Also, the southern limit of Coho salmon in coastal California streams was recently confirmed to extend through Santa Cruz County based on both archaeological evidence and historically collected specimens.[27]

Besides salmonids, native fish found in the watershed are the California roach, Sacramento sucker, Hitch, Speckled dace, Three-spined stickleback, and Prickly sculpin. Seven nonnative species also exist in the watershed.[13] Three additional species of native fish were present historically: Sacramento perch, last collected in 1960; squawfish, last collected in 1905; and while prickly sculpin have not been collected recently, they may still be present in the upper tributaries.[23]

15. "California's Critical Coastal Areas: State of the CCAs Report — CCA #93 San Francisquito Creek". June 15, 2006. Retrieved November 4, 2009.

16. "Oncorhynchus mykiss gairdnerii". California Academy of Sciences. Retrieved March 2, 2012.

17. Leidy, R.A., G.S. Becker, B.N. Harvey (2005). "Historical distribution and current status of steelhead/rainbow trout (*Oncorhynchus mykiss*) in streams of the San Francisco Estuary, California.". Center for Ecosystem Management and Restoration, Oakland, California. Retrieved December 28, 2009.

18. T. E. Grantham, J. H. Viers, PB Moyle (2014). "Systematic Screening of Dams for Environmental Flow Assessment and Implementation". *BioScience*. Retrieved 2014-10-27.

19. Jones & Stokes (2006-06-12). San Francisquito Creek Aquatic Habitat Assessment: Limiting Factors Analysis (Report). San Jose, California: Santa Clara Valley Water District. pp. 1-2. Retrieved January 15, 2011.

20. Kenneth W. Gobalet, Peter D. Schulz, Thomas A. Wake, Nelson Siefkin (2004). "Archaeological Perspectives on Native American Fisheries of California, with Emphasis on Steelhead and Salmon". *Transactions of the American Fisheries Society*: 814. doi:10.1577/T02-084.1. Retrieved October 14, 2010.

21. "Historical Status of Coho Salmon in Streams of the Urbanized San Francisco Estuary, California". *California Fish and Game*. 2005. Retrieved October 14, 2010.

22. Dorothy F. Regnery (1991). *The History of Jasper Ridge- From Searsville Pioneers to Stanford Scientists*. Stanford Historical Society: Centennial Operating Committee. p. 120.

23. Watershed Assessment Subgroup, Santa Clara Basin Watershed Management Initiative (August 2003). Volume One Unabridged Watershed Characteristics Report, Chapter 7 "Natural Setting" (Report). Santa Clara Valley Urban Runoff Pollution Prevention Program. p. 7-xi. Retrieved October 14, 2010.