Historical Distribution and Current Status of Steelhead/Rainbow Trout *(Oncorhynchus mykiss)* in Streams of the San Francisco Estuary, California

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Center for Ecosystem Management and Restoration

CONTRA COSTA COUNTY

Marsh Creek Watershed

Marsh Creek flows approximately 30 miles from the eastern slopes of Mt. Diablo to Suisun Bay in the northern San Francisco Estuary. Its watershed consists of about 100 square miles. The headwaters of Marsh Creek consist of numerous small, intermittent and perennial tributaries within the Black Hills. The creek drains to the northwest before abruptly turning east near Marsh Creek Springs. From Marsh Creek Springs, Marsh Creek flows in an easterly direction entering Marsh Creek Reservoir, constructed in the 1960s. The creek is largely channelized in the lower watershed, and includes a drop structure near the city of Brentwood that appears to be a complete passage barrier. Marsh Creek enters the Big Break area of the Sacramento-San Joaquin River Delta northeast of the city of Oakley.

Marsh Creek

No salmonids were observed by DFG during an April 1942 visual survey of Marsh Creek at two locations: 0.25 miles upstream from the mouth in a tidal reach, and in close proximity to a bridge four miles east of Byron (Curtis 1942). In August 1975 DFG again surveyed the creek from Marsh Creek Reservoir upstream to the headwaters adjacent to Morgan Territory Road and did not observe salmonids (Curtis and Anderson 1975). In a 1978 memorandum, DFG characterized Marsh Creek as seasonal and probably lacking any significant fishery resource (Anderson 1978).

In May 1981, Marsh Creek was sampled by seine and gill net at ten locations between the mouth and mid-elevation sites adjacent to Marsh Creek Road. No salmonids were collected (Leidy 1984).

EBRPD electrofished two Marsh Creek sites upstream and downstream from the Round Valley Creek confluence in July 1996. No *O. mykiss* were found (EBRPD 1996-1999).

Several intermittent headwater tributaries to Marsh Creek, including Curry Canyon, Perkins Canyon, and Dunn creeks were surveyed within Mt. Diablo State Park by California Department of Parks and Recreation biologists during 1985, and were found to contain no fish (Taylor 1985). Curry Canyon and Perkins Canyon were noted as intermittent streams, while Dunn Creek receives permanent flow from springs at the headwaters of Horse Creek adjacent to the Mount Diablo Mercury Mine.

Assessment: Construction of the drop structure near Brentwood and the Marsh Creek Reservoir blocked any existing runs of *O. mykiss* from reaching suitable habitat in the headwaters of Marsh Creek. We could not find evidence of the presence of historical *O. mykiss* in the headwaters of Marsh Creek. However, *O. mykiss* runs may have occured prior to the construction of Marsh Creek Reservoir.

Mt. Diablo Creek Watershed

The headwaters of Mt. Diablo Creek consist of approximately 12 small, intermittent and perennial streams originating on the north slope of Mt. Diablo. From its headwaters, Mt. Diablo Creek flows in a northwest direction for 15.5 miles to its confluence with Suisun Bay. The watershed of Mt. Diablo Creek comprises about 56 square miles.

Mt. Diablo Creek

In 1855, Ayres presented specimens to the California Academy of Natural Sciences including a species he designated *Salmo rivularis.* According to Ayres, this form was "distinct" from *S. iridea*, the species described by Gibbons in 1855 from San Leandro Creek in Alameda County. Ayres' specimens were taken a few miles south of Martinez, toward the foot of Mount Diablo, and are believed to have been collected from either the Mt. Diablo Creek watershed or the Walnut Creek watershed. Ayres observed that the largest specimen was about 200 mm in length (Ayres 1855). The small maximum length is consistent with that of *O. mykiss* sampled in the headwaters of Mt. Diablo Creek (see discussion under Mitchell Creek, below).

According to staff at the Mt. Diablo Country Club golf course near Concord Naval Weapons Station, *O. mykiss* spawning migrations were observed during the1960s and 1970s (Leidy 2002). A November 1977 DFG visual survey of five sites along Mt. Diablo Creek between RM 7.6 and RM 11.5 concluded that although the reach was dry at the time of the survey, Mt. Diablo Creek had good potential for anadromous fish due largely to the presence of springs feeding portions of the mainstem and some tributaries (Reineck and Paulsen 1977). Management as an anadromous fishery was recommended. According to the survey report, the major limiting factor of the stream's productivity is its intermittent nature (Reineck and Paulsen 1977). The survey also noted that, according to the Contra Costa Flood Control and Water Conservation District and the city of Concord, Mt. Diablo Creek contained no downstream barriers to fish migration.

During September 1981, Mt. Diablo Creek was seined at the Kirker Pass Road crossing and immediately upstream of the tidally influenced portions of the stream in a large pool upstream from the Port Chicago Highway crossings. Neither site contained *O. mykiss* (Leidy 1984).

In August 1988, EBRPD and Mt. Diablo State Park staff noted surface flow in approximately 400 yards of Mount Diablo Creek near the confluence with Mitchell Creek, but did not find *O. mykiss* (Alexander 1988). EBRPD staff noted that this section of creek with its perennial flow was the most promising area for creek enhancement and the introduction of native rainbow trout (Alexander 1988). EBRPD staff further concluded that flows downstream of the perennial reach to at least Concord Naval Weapons Station were insufficient to provide salmonid habitat in normal water years.

Leidy sampled seven sites between the tidal portion of Mt. Diablo Creek and its headwaters near Clayton by electrofishing in June 1998. No *O. mykiss* were collected. (Leidy 2002).

Mitchell Creek (Mitchell Canyon Creek)

Mitchell Creek is an intermittent stream draining the northwest slopes of Mt. Diablo. It flows four miles from the Eagle Peak area generally north before entering Mt. Diablo Creek near the town of Clayton.

A 1977 DFG visual survey of Mitchell Creek immediately upstream from its confluence with Mt. Diablo Creek (near Clayton Road, Clayton) noted that the stream channel was dry, and rated Mitchell Creek as having "poor-fair" anadromous fishery value due in part to grazing and housing development (Reineck and Paulsen 1977).

In April 1985, the California Department of Parks and Recreation collected 13 *O. mykiss* from a 73-meter reach of Mitchell Creek located at about the 920-foot contour line in Mt. Diablo State Park (Taylor 1985). The sampled fish were age 1+ and ranged between 108-200 mm FL. It was concluded that YOY fish were not collected because they had yet to emerge from the gravels. The entire population of *O. mykiss* within the sampled area was estimated at approximately 190 individuals, with probably less than 500 fish for all of Mitchell Creek. An additional three *O. mykiss* were collected at a downstream pool where Mitchell Canyon Road crosses over the stream. The sampling report noted that the Mitchell Creek population was likely to be the only wild rainbow trout population in the San Ramon Valley and recommended monitoring and genetic studies (Taylor 1985). Park staff estimated that approximately 3,500 feet of stream channel maintained permanent flow.

During November of 1985, DFG electrofished pools in a 122-meter reach of Mitchell Creek approximately 1.5 miles upstream from the Mt. Diablo State Park ranger residence and collected six *O. mykiss* (75-198 mm FL) (Gray 1985). Three of the largest fish were found to be sexually mature (two males and one female), suggesting that these were resident fish.

In 1988, EBRPD staff estimated the *O. mykiss* population in Mitchell Creek at approximately 200 fish that were restricted during dry periods to a 0.25 mile reach of stream fed by springs in the upper canyon (Alexander 1988). Fish were reported to reach a maximum of about 200 mm TL, and EBRPD staff concluded that growth and size would be limited by the small volume of flow and useable habitat area. Riparian and substrate conditions were described as "good" to "very good" for salmonids from the headwaters to the confluence with Mt. Diablo Creek (Alexander 1988).

Leidy visually surveyed Mitchell Creek within Mt. Diablo State Park in December 1993, and observed *O. mykiss* (5-10: 50-100 mm FL) in small pools in a 30-meter reach (Leidy 2002). According to EBRPD staff, this population no longer persists (P. Alexander pers. comm.).

Irish Canyon

In November 1977, DFG conducted a visual survey of Irish Canyon Creek in the vicinity of an impassable drop structure at the crossing of Nortonville Road, approximately 1.25 miles upstream from its confluence with Mt. Diablo Creek (Reineck and Paulsen 1977). In the report, DFG noted that the stream channel was dry, and rated Irish Canyon Creek as having "poor" anadromous fishery value due to heavy grazing practices.

Donner Creek

In November 1977, DFG visually surveyed Donner Creek immediately upstream of Clayton Road. Anadromous fishery value was rated "fair," although past grazing and recent housing development were attributed as causing habitat degradation (Reineck and Paulsen 1977). Informal surveys of Donner Creek indicate that the watershed does not presently support an O. mykiss population (J. Hale pers. comm.).

Assessment: Anecdotal accounts of anadromous *O. mykiss* spawning migrations and the recent occurrence of *O. mykiss* in a headwater tributary, Mitchell Creek, is evidence for the historical use of Mt. Diablo Creek by anadromous *O. mykiss* as a migratory corridor. In addition to Mitchell Creek, suitable rearing habitat for *O. mykiss* also may be available within two perennial reaches of Mt. Diablo Creek and in the lower watershed near Concord Naval Weapons Station opposite the Mt. Diablo Country Club.

Walnut Creek Watershed

The Walnut Creek watershed is the largest within Contra Costa County, covering a total of 183 square miles. The creek itself is formed by the confluence of Las Trampas and San Ramon Creeks near the downtown district of the city of Walnut Creek. Other important tributaries include Pine and Galindo Creeks, which join Walnut Creek in the lower watershed. From the confluence with San Ramon Creek, Walnut Creek flows north for approximately ten miles to where it enters Suisun Bay east of the Carquinez Strait. This portion of the watershed consists of about 20 square miles. A flood control drop structure between the Willow Pass Road and Highway 242 crossings limits anadromous fish migration to all direct tributaries of Walnut Creek except Pacheco, Grayson and Pine Creeks. The drop structure is maintained by the Contra Costa County Public Works Agency.

Walnut Creek

As discussed previously in the Mt. Diablo Creek section, Ayres described specimens believed to be *O. mykiss* from either the Mt. Diablo Creek or Walnut Creek watershed Ayres in 1855. Anecdotal evidence concerning Walnut Creek watershed fish species indicates that O. *mykiss* migrated into Walnut Creek tributaries between the 1950s and the mid-1960s (Cogger and Reineck 1977c; Johnson 1957; Leidy 1983)(see also Pine Creek discussion in the following text).

In July 1977, DFG visually surveyed Walnut Creek from its mouth to the confluence of San Ramon Creek. The survey noted that about 95 percent of the channel had been altered by construction of levees or concrete channels (Gillespie and Richardson 1977c). No salmonids were found throughout the stream. The survey also identified two drop structures as potential migration barriers to anadromous fish. The first, 12 feet high, is located 0.5 miles upstream of Willow Pass Road and the second, 15 feet high, is located immediately downstream from the Bancroft Road crossing. The DFG survey report recommended the construction of fishways on the two existing drop structures if the headwater streams were found to contain significant potential anadromous salmonid habitat (Gillespie and Richardson 1977c). The survey identified low summer flows as limiting fish survival, concluding that water diversion during the summer and fall months should be curtailed.

In June 1978, DFG electrofished and seined a pool below the Bancroft Road drop structure and found no salmonids (Paulsen 1978c). In November 1978, USFWS reported on the results of a Walnut Creek habitat evaluation conducted in relation to the Walnut Creek Project, which was started in 1964. No salmonids were noted during associated biotic resources surveys (McKevitt 1978). As part of a fish distribution study, three Walnut Creek sites were sampled by electrofishing in October and November 1980, and no salmonids were found (Leidy 1983).

In 1983, the USFWS completed a study of the Walnut Creek watershed basin in relation to the Walnut Creek Project. The study noted that the steelhead population declined markedly about the late 1950s, as reported by local residents, but that a small number of steelhead still entered the Walnut Creek basin each year, except for the 1976-1977 drought period (Ging 1983). The

study also noted that between 1981 and 1983, both steelhead fishing effort and catch increased dramatically (Ging 1983). The USFWS observed steelhead redds downstream of the drop structure near the Willow Pass Bridge, but noted that the reach would likely have value only as a migratory corridor without the presence of barriers. Overall, the study rated existing steelhead habitat in the Walnut Creek basin as "fair to poor" (Ging 1983). In a planning aid letter associated with the study, USFWS stated the Walnut Creek Project had adversely affected habitat conditions for steelhead trout by reducing adult escapement by at least 100 fish (McKevitt 1983).

DFG conducted a pilot creel census in Walnut Creek from November, 1983 through February, 1984. During this period, four *O. mykiss* were observed downstream from the Willow Pass Road drop structure (Meyer 1984). The steelhead were deemed of hatchery origin. The report noted that steelhead do not spawn in Walnut Creek. Observations by anglers indicate that adult fish migrate to the reach below the first drop structure near Willow Pass Road, beginning with the first rains in October and continuing through early January. Adult fish then leave Walnut Creek after a few weeks (Meyer 1984). A September, 1984 electrofishing and seining survey at the Pine Creek confluence found no *O. mykiss* (Barlow 1984).

A 1990 fisheries enhancement study reviewed the historical and present distribution of salmonids in the Walnut Creek basin. The study concluded that steelhead historically used the entire Walnut Creek basin as spawning, nursery and rearing habitat (HRG 1990). The report noted that *O. mykiss* annually entered the lower reaches of Walnut Creek, and migrated upstream as far as the drop structure at Willow Pass Road (HRG 1990).

About 2,300 feet of Walnut Creek was studied for fish habitat potential in September, 1990 including electofishing at one location (HRG 1990). The study concluded that Walnut Creek provided little good habitat for salmonid fishes and noted that two drop structures downstream of the city of Walnut Creek probably allowed passage for few, if any, salmonid adults (HRG 1990). One *O. mykiss* (105 mm SL) was collected during the study upstream from the two drop structures, near the Lincoln Avenue Bridge proximate to downtown Walnut Creek. Observations reported in the study indicated that steelhead engaged in spawning activities downstream of the Willow Pass Road drop structure, including the building of about 25 redds in the winter of 1989-1990 (HRG 1990).

DFG *Scientific Collecting Permit Report Forms* and associated data sheets indicated that two *O. mykiss* fry were taken from Walnut Creek south of the Willow Pass Road crossing, downstream from the drop structures, in April 1990 (Williamson 1990-1993). Smolt trapping in May 1992 produced two *O. mykiss* (41 mm, 65 mm) at a site upstream of the Concord Ave. Bridge, which is below the drop structures.

Leidy electrofished seven sites in November-December 1993 and six sites in May-June 1997 throughout the reach between the mouth of Walnut Creek and the lower most drop structure. No *O. mykiss* were collected (Leidy 2002).

Staff of the city of Pleasant Hill and USFWS have observed adult migrant *O. mykiss* in Walnut Creek during the spring every year for the last ten years. These fish have been observed below the most downstream drop structure (J. Hale pers. comm.).

Grayson Creek

Grayson Creek is the only major tributary to lower Walnut Creek that flows from the west. The creek originates in the Briones Hills and runs through the highly urbanized city of Pleasant Hill to join Walnut Creek in its lower reach. Much of Grayson Creek is confined within a concrete or earthen flood control channel.

In 1978, an investigation of a fish kill caused by a chemical spill found no *O. mykiss* among the dead fish between Concord Avenue and Pacheco Avenue, in the city of Pleasant Hill (CDFG 1978). During October and November 1980, two sites were electrofished and seined on Grayson Creek as part of a fish distribution survey. No salmonids were found (Leidy 1983). A 1983 USFWS steelhead trout study concludes that the creek provides neither spawning nor rearing habitat due in part to channelization and channel clearing (Ging 1983).
Leidy sampled two reaches in August 1997 and June 1998, a 15 meter reach of Grayson Creek approximately 300 feet upstream from the confluence with Walnut Creek, and a 24 meter reach approximately 300 feet downstream from Interstate 680, respectively. Neither survey found *O. mykiss* (Leidy 2002).

Pine Creek

Pine Creek is formed by several small tributaries draining the northwest slopes of Mt. Diablo and flows through Ygnacio Valley, entering Walnut Creek in its lower reach. The lower portion of Pine Creek is largely channelized and contains several passage barriers. Access to anadromous fish is confined to the lowest 4.7 stream miles and Pine Creek Flood Control Dam, constructed in 1956 further upstream, also is a complete fish passage barrier.

Anecdotal evidence reported by DFG suggests that resident and anadromous *O. mykiss* were common in Pine Creek in the 1950s, but became rare in the late 1960s (Cogger and Reineck 1977c). A DFG survey of Pine Creek cited dam construction workers as reporting a few steelhead below the dam during January 1956 (Johnson 1957). *Oncorhynchus mykiss* were observed at Castle Rock Park in 1963 and 1964 (J. Hale pers. comm.).

In July 1977, DFG observed no salmonids during a visual survey of the seven miles of Pine Creek upstream of the Walnut Creek confluence. The report stated that channelization had eliminated suitable spawning and nursery habitat for salmonids, concluding that lower Pine Creek was essentially lost to anadromous salmonid use (Gillespie and Richardson 1977a). In August 1977, DFG surveyed the reach between RM 7.2 and RM 9.3, and again observed no salmonids. The report concluded that this reach of Pine Creek appeared to have limited value as a spawning and nursery stream for anadromous salmonids, but could provide access to Little Pine Creek and Arroyo Cerro, both of which provided fair to excellent steelhead salmonid habitat (Cogger and Reineck 1977c).

As part of a fish distribution study, one location on Pine Creek was sampled by pole seine in September 1981 and produced no *O. mykiss* (Leidy 1984). For a 1983 USFWS steelhead habitat study of the Walnut Creek basin, staff visually surveyed the lower four miles of Pine Creek. The USFWS found that all but 0.25 miles of the surveyed reach was channelized and confined with concrete or earthen sides, and concluded that Pine Creek had no steelhead habitat of any significance (Ging 1983).

A report concerning the aquatic resources of Mt. Diablo State Park stated that steelhead and silver salmon once ascended Pine Creek at least to the vicinity of Castle Rock Park, but that the construction of Pine Creek Flood Control Dam in 1956 closed off Pine Creek to anadromous fish (Taylor 1985).

Galindo Creek

Galindo Creek is the lowermost tributary of Pine Creek. It begins on the east slopes of Lime Ridge and west slopes of Mt. Zion, and flows north and west for 6.5 miles before joining Pine Creek approximately one mile above the confluence of Pine and Walnut Creeks.

In January 1976, an investigation of a fish kill found no *O. mykiss* among the dead fish between Treat Boulevard and Monument Boulevard in the city of Concord (Schmidt 1976). The downstream four miles of the Galindo Creek from the Pine Creek confluence to Wharton Way were assessed for steelhead habitat in January 1983. While no *O. mykiss* were observed, many pools suitable for steelhead rearing were noted (Ging 1983). The report concluded that channelization, low summer flows, lack of spawning gravel, and high water temperatures may preclude steelhead use of Galindo Creek (Ging 1983).

Little Pine Creek

Little Pine Creek drains an area of approximately 2.2 square miles. It flows from the northwest slopes of Mt. Diablo about three miles to the confluence with Pine Creek.

In August 1977, DFG visually surveyed a 2.4-mile reach of Little Pine Creek upstream of the confluence with Pine Creek. The survey noted that spawning potential was very good in the upper reach and fair to poor in the lower reach, and that the frequency of pools in the upper reach was excellent (Cogger and Reineck 1977b). The survey characterized Little Pine Creek as having good anadromous fishery potential limited by downstream urbanization and associated alterations to Pine and Walnut Creeks. An August 1977 DFG survey report for Pine Creek concluded that Little Pine Creek provided fair to excellent steelhead habitat (Cogger and Reineck 1977c). Informal surveys of Little Pine Creek indicate that the watershed does not presently support an O. mykiss population (J. Hale pers. comm.).

Arroyo del Cerro

Arroyo del Cerro drains an area of approximately 3.8 square miles. The creek originates on the north slope of Mt. Diablo and meets Pine Creek in the city of Walnut Creek.

DFG surveyed a 1.9-mile reach of Arroyo del Cerro in August 1977. The survey concluded that despite the creek's history as a steelhead stream, it did not appear to support an anadromous fishery at that time (Cogger and Reineck 1977a). The report cited barriers in Walnut Creek and lower Pine Creek, as well as the removal of riparian vegetation and the effects of grazing to Arroyo del Cerro, as potentially contributing to the decline of anadromous salmonids. The survey concluded that re-establishment of an anadromous fishery would require the removal of downstream barriers and the return of stream flow throughout the system (Cogger and Reineck 1977a). An August 1977 DFG survey report for Pine Creek concluded that Arroyo del Cerro provided fair to excellent steelhead habitat (Cogger and Reineck 1977c). Informal surveys of Arroyo del Cerro indicate that the watershed does not presently support an *O. mykiss* population (J. Hale pers. comm.).

Las Trampas Creek

Las Trampas Creek is formed from several intermittent tributaries near Las Trampas Peak and flows north and east to its confluence with San Ramon Creek. No salmonids were recorded in a 1978 report by DFG on a fish kill in Las Trampas Creek near Carol Road (Young 1978). No salmonids were collected at two sites that were seined in Las Trampas Creek as part of a study of fishes in the Walnut Creek basin in October-November, 1980 (Leidy 1983).

As part of a 1983 USFWS steelhead habitat study, staff visually surveyed the lower 2.1 miles of Las Trampas Creek. The report noted limited pool habitat, barriers to migration, sedimentation, and high water temperatures as potential limiting factors for steelhead (Ging 1983). However, the report concluded that upper Las Trampas Creek perhaps had the greatest potential for steelhead re-establishment because of good streamside shading and the availability of gravel (Ging 1983).

A September 1984 survey of Las Trampas Creek by seine and dip net at the Pleasant Hill Road Bridge found no *O. mykiss* (Barlow 1984). In April 1986, DFG noted 12-14 healthy looking rainbow trout in Las Trampas Creek and its tributary, Lafayette Creek (Gray 1987b).

A 1990 fisheries study reviewed the historical and present distribution of salmonids in the Walnut Creek basin. The study noted a 15-foot high drop structure on Las Trampas Creek between the Main Street and California Street bridges in the city of Walnut Creek that probably represented a complete barrier to upstream fish migration (HRG 1990). Electrofishing in a 35-meter reach of Las Trampas Creek near the Interstate 680 bridge did not produce salmonids (HRG 1990).

Leidy electrofished a 40 meter reach upstream from the Pheasant Hill Road Crossing in June 1998. No *O. mykiss* were collected (Leidy 2002).

Tice Creek

Tice Creek, tributary to Las Trampas Creek, drains an area of about 3.9 square miles between Las Trampas Creek to the west and San Ramon Creek to the east. It flows generally north through Tice Valley.

DFG visually surveyed about 4.6 miles of Tice Creek upstream from the Walnut Creek confluence in July 1976. No *O. mykiss* were observed, but the survey report concluded that the stream "probably" supported a steelhead population until the introduction of downstream barriers (Scoppettone and Curtis 1976). Two culverts (~750 feet and ~1,500 feet in length) occur in the watershed. Both structures serve as barriers to fish passage.

During October-November 1980, lower Tice Creek was seined and no salmonids were found (Leidy 1983). During January-March 1983, USFWS staff visually surveyed steelhead rearing and spawning habitat in the lower two miles of Tice Creek. The study described "little" fish habitat downstream of Orchard Lane, with some suitable rearing habitat between Orchard Lane and the Rossmor Parkway (Ging 1983).

Lafayette Creek

Lafayette Creek is formed from several tributaries near Happy Valley and Lafayette Reservoir. It flows east for approximately three miles to its confluence with Las Trampas Creek.

During October-November 1980, Lafayette Creek was sampled immediately upstream of the confluence with Las Trampas Creek and no salmonids were found (Leidy 1983). In April 1986, DFG noted that 12-14 "healthy looking" rainbow trout were found in Las Trampas Creek and Lafayette Creek (Gray 1987b).

Leidy found no *O. mykiss* when he electrofished at the confluence of Layfayette Creek and Oak Creek in April 1999 (Leidy 2002). According to DFG staff, *O. mykiss* have been seen in Lafayette Creek by construction crews as recently as 2002. These fish are believed to come from Lafayette Reservoir and to be transported by spill events during high winter flows (N. Kozicki pers. comm.).

Grizzly Creek

Grizzly Creek's headwaters are on the northeast slopes of Las Trampas Ridge. The creek flows northwest for approximately 2.5 miles before entering Las Trampas Creek in Burton Valley.

As part of a 1983 steelhead habitat study, USFWS staff visually surveyed 0.5 miles of Grizzly Creek upstream from its confluence with Las Trampas Creek. The study concluded that an abundance of fine sediments, shallow pools, lack of instream cover, and seven "major" passage barriers downstream in Las Trampas and Walnut creeks made Grizzly Creek of "little value" to steelhead (Ging 1983).

Reliez Creek

Reliez Creek flows southeast from Lafayette Ridge approximately 3.5 miles to its confluence with Las Trampas Creek. As part of a 1983 steelhead habitat study, USFWS staff visually surveyed 1.25 miles of Reliez Creek upstream from its confluence with Las Trampas Creek. The study concluded that the creek would provide "marginal" habitat for steelhead and noted 15 sites that could preclude fish passage at some or all stream flows (Ging 1983).

San Ramon Creek

San Ramon Creek drains an area of approximately 30 square miles, flowing generally north to its confluence with Las Trampas Creek, when it becomes Walnut Creek. Complete barriers to anadromous fish passage occur in the channel, the lowest being located about 2.7 miles above the Walnut Creek confluence. Primary tributaries to San Ramon Creek include Sycamore and Green Valley creeks, which drain the southwestern slopes of Mt. Diablo and join San Ramon Creek near Danville.

DFG visually surveyed San Ramon Creek in July 1977. The survey noted six concrete drop structures that were complete barriers to fish migration and rated spawning areas for salmonids as "poor throughout" (Gillespie and Richardson 1977b). During October-November 1980, nine reaches along the entire length of San Ramon Creek were seined as part of a fish distribution study. No salmonids were collected (Leidy 1983).

USFWS visually surveyed steelhead rearing and spawning habitat in San Ramon Creek in January-March 1983. The survey focused on the lower portion of the creek, where staff found an absence of suitable spawning habitat (Ging 1983). The report concluded that extensive channelization (*i.e.*, concrete-lined channels and drop structures), as well as insufficient spawning and rearing habitat preclude the restoration of steelhead in San Ramon Creek.

In February 1984, Leidy sampled San Ramon Creek by pole seine at the bedrock falls at 29 Palms Drive and caught two *O. mykiss* (198, 185mm FL) (Leidy 2002). A September 1984 survey including electrofishing, seining and dipnetting on San Ramon Creek at Livorna Road in the city of Walnut Creek found no *O. mykiss* (Barlow 1984). One *O. mykiss* was dipnetted at the 29 Palms Drive site in March 1985 (J. Hale pers. comm.).

As part of a 1990 fisheries enhancement study, six reaches along a total of approximately 0.8 miles of San Ramon Creek were visually surveyed in September 1990. One site was electrofished. *Oncorhynchus mykiss* was not recorded (HRG 1990). Within San Ramon Creek, the report noted "marginal" passage conditions attributed to the downstream concrete box channel, as well as limited spawning and rearing habitat (HRG 1990).

Sans Criante Creek

Sans Criante Creek is tributary to San Ramon Creek, entering from the east upstream from the Los Trancos Creek-San Ramon Creek confluence. It drains an area southeast of the city of Walnut Creek.

During January-March 1983, USFWS staff visually surveyed steelhead rearing and spawning habitat in Sans Criante Creek. The study concluded that Sans Criante Creek did not provide steelhead habitat because it lacked rearing pools of sufficient depth, suitable instream cover, spawning gravels, and streamside shading (Ging 1983).

Sycamore Creek

The West and East forks of Sycamore Creek join to form Sycamore Creek in the Black Hills on the southern slopes of Mt. Diablo. Sycamore Creek runs south then northwest six miles to join San Ramon Creek.

During October-November 1980, Sycamore Creek was sampled at two upstream locations and at the San Ramon Creek confluence. No O. mykiss were found (Leidy 1983).

Green Valley Creek

Green Valley Creek is formed by several intermittent tributaries on the southwest slopes of Mt. Diablo. The east branch joins Green Valley Creek near Green Valley School.

A long-time resident stated this currently intermittent stream once maintained perennial flow and supported trout (Banks and Fredrickson 1977). An unnamed tributary to upper Green Valley Creek near the Stone Valley Road crossing also was said to support "trout."

During October-November 1980, Green Valley Creek was seined at two sites. No *O. mykiss* were collected (Leidy 1983). An April 1985 visual survey of the portion of Green Valley Creek within Mt. Diablo State Park also recorded no *O. mykiss* (Taylor 1985).

San Catanio Creek

San Catanio Creek is a perennial headwater tributary to San Ramon Creek. It begins in Norris Canyon and flows north for approximately three miles before entering San Ramon Creek.

Leidy surveyed three locations on San Catanio Creek by seine and dip net during August 2002 but did not record *O. mykiss* (Leidy 2002). However, habitat for steelhead spawning and rearing (*i.e.*, well-shaded pools with adequate water temperatures and instream cover) was assessed as fair to good.

Bollinger Canyon Creek

Bollinger Canyon Creek is a headwater tributary to San Ramon Creek that flows southwest between Las Trampas Ridge and Rocky Ridge for approximately five miles before abruptly turning east at the mouth of Bollinger Canyon. Bollinger Canyon Creek becomes San Ramon Creek after leaving Bollinger Canyon.

EBRPD staff has observed *O. mykiss* in Bollinger Canyon Creek, and speculates that the fish may be of hatchery origin that escaped from a created pond (P. Alexander pers. comm.). The presence of fingerlings in sites adjacent to Bollinger Canyon Road indicates that reproduction likely is occurring.

Assessment: Development in the Walnut Creek watershed, in particular related to flood control, has resulted in the extirpation of self-sustaining anadromous salmonid populations in Walnut Creek and its tributaries. While the historical use by *O. mykiss* of individual tributaries is difficult to document due to a paucity of available information, we assume that the species was widely distributed in the basin. Currently, *O. mykiss* regularly enter the lower reaches of Walnut Creek and migrate as far as the drop structure at Willow Pass Road.

Efforts to restore *O. mykiss* to Walnut Creek watershed depend on providing passage through lower Walnut Creek and into tributaries with potential spawning and rearing habitat, several of which have additional barriers. Las Trampas Creek and its tributaries probably hold the greatest potential to serve as habitat for a restored *O. mykiss* population.

Alhambra Creek (Arroyo del Hambre) Watershed

Alhambra Creek is formed by several tributaries in the Briones Hills and Franklin Ridge areas. The creek flows east through Vaca Canyon and north through Alhambra Valley and the city of Martinez before entering the San Francisco Estuary at the Carquinez Straight.

Alhambra Creek

DFG visually surveyed Alhambra Creek in October 1946 from near Martinez upstream two miles. No fish were found and the survey report declared that Alhambra Creek had no importance as a fishing stream (Calhoun 1946). A 1946 DFG correspondence concluded that there was no salmon run in Alhambra Creek (Croker 1946).

In August 1981, three Alhambra Creek sites were sampled by dip net and pole seine as part of a fish distribution study. No *O. mykiss* were found (Leidy 1984). A 1983 DFG memo cited local newspaper reports of adult steelhead commonly encountered in winter and in the streets of Martinez after flooding (Emig 1983). A 1987 DFG memorandum noted that Alhambra Creek had a small annual run of steelhead (Gray 1987a).

Two to three adult *O. mykiss* were observed in Alhambra Creek near downtown Martinez in the early 1990s by staff of EBRPD (P. Alexander pers. comm.). Based on the size (>560 mm) and condition of the fish, they were assumed to be anadromous and to be of Central Valley hatchery origin.

Restoration project staff discovered *O. mykiss* on two occasions in mid-September 2004, while dewatering Alhambra Creek as part of a habitat improvement project. A total of eight *O. mykiss* (200-300mm) were captured adjacent to Martinez Adult School and transferred downstream. The project fisheries biologist stated that all fish were in excellent condition (Thomas 2004).

Assessment: Alhambra Creek historically supported a small run of steelhead. It continues to be visited by in-migrating *O. mykiss* in some years and may support a resident population. Barriers in the lower watershed and siltation may present limitations to the amount of salmonid habitat remaining in this system. However, the creek's major tributaries, Arroyo del Hambre and Franklin Creek, are perennial, which may help support steelhead restoration in the watershed.

Rodeo Creek Watershed

Rodeo Creek is a small, intermittent stream formed from the contributions of numerous tributaries originating on the south west slopes of Franklin Ridge. The creek flows in a generally north to northwesterly direction approximately seven miles to San Pablo Bay.

Rodeo Creek

In February 1974, DFG electrofished four sites on Rodeo Creek near Interstate 80 and Highway 4. Salmonids were not recorded during the survey and DFG concluded that Rodeo Creek did not support a viable steelhead population (Strohschein 1974a). Sampling was repeated at one location near Interstate 80 in March 1974, and at two additional sites upstream and downstream from Highway 4. *Oncorhynchus mykiss* were not recorded during the second survey and DFG concluded that Rodeo Creek did not appear suitable for supporting a steelhead population (Strohschein 1974b).

As part of a fish distribution study, 11 sites were seined on Rodeo Creek during June 1981(Leidy 1981-1984, 1984). No salmonids were collected. Leidy electrofished Rodeo Creek at 4th Street and at View Point Road in October 1994. No *O. mykiss* were found (Leidy 2002).

Assessment: We did not find evidence that the Rodeo Creek watershed has supported salmonids in the past, or is used currently by steelhead or salmon. The small relative size of the watershed and condition of salmonid habitat as assessed by DFG staff suggest that Rodeo Creek does not present a significant habitat resource for native *O. mykiss* populations.

Refugio Creek Watershed

The headwaters are of Refugio Creek are east of Pinole Ridge north of the Briones Hills. The creek flows northwest for approximately four miles to San Pablo Bay.

Refugio Creek

As part of a fish distribution study, Leidy sampled Refugio Creek during June 1981(Leidy 1981-1984, 1984). No salmonids were collected.

Assessment: We did not find evidence for historical or current use of the Refugio Creek watershed by steelhead or salmon. The small relative size of the watershed and condition as assessed by DFG staff indicate that it is not of regional significance to the native *O. mykiss* population.

Pinole Creek Watershed

Pinole Creek's watershed is about 35 square miles. The headwaters of Pinole Creek consist of numerous seeps and intermittent and perennial streams, in the Briones Hills. Pinole Creek is intermittent toward the headwaters but perennial upon reaching Pinole Valley, where it flows southeast to northwest for approximately nine miles into San Pablo Bay. The 1.6-mile reach below Interstate 80 is channelized. A natural bedrock falls downstream of the junction of Alhambra Valley and Bear Creek roads limits migration to the upper watershed under most flow conditions.

Pinole Creek

In April 1975, DFG documented fish mortality resulting from a chemical spill that caused a "complete" fish kill in the lower 1.5 miles of Pinole Creek. A total of 101 *O. mykiss* carcasses were collected (69 0+ and 1+: 38-65 mm FL; 29 "smolt steelhead": 130-208 mm FL; and 3 resident adults 274-305 mm FL)(Anderson 1975). A newspaper report from 1979 stated that many of the fish had been planted in Pinole Creek in March 1974 during an earlier re-stocking (Lattin 1979).

In May 1976, DFG surveyed 6.5 miles of Pinole Creek between the Simas Avenue Bridge and a headwater fork at RM 9.1. The survey report noted that Pinole Creek supported a small steelhead run and that fish passage was limited by a natural barrier 0.4 miles downstream from the intersection of Alhambra Valley and Bear Creek roads (Scoppettone 1976). Several juvenile steelhead were observed during the survey below the natural barrier.

During June 1976, DFG electrofished two reaches of Pinole Creek, one upstream and one downstream of the natural bedrock falls identified above. The downstream site yielded 14 "steelhead trout" (9 1+: 117-150 mm FL; 5 2+: 190-213 mm FL)

(Anderson et al. 1976). No fish were collected in the upstream sampling. The survey report cited the probability that the falls constituted an upstream migration barrier in most years.

In November 1978, DFG sampled Pinole Creek by electroshocking three sites to document steelhead spawning during the winter/spring of 1978. No *O. mykiss* were found. The survey report concluded that successful reproduction had not occurred the previous year (Paulsen 1978a). In April 1979, DFG stocked 3,152 YOY steelhead in Pinole Creek as part of a settlement related to the 1975 spill discussed above (Nagel 1979). Staff from DFG sampled Pinole Creek at three sites by electroshocking again in November 1979. No *O. mykiss* were collected, and the resulting report stated that steelhead had not successfully reproduced in Pinole Creek since 1976 (Paulsen 1979).

As part of a fish distribution study, Pinole Creek was sampled at 12 stations in June and August 1981. No *O. mykiss* were encountered in this effort (Leidy 1981-1984, 1984). The Department of Fish and Game surveyed a 3.7-mile reach of Pinole Creek upstream from the mouth in October 1982. Staff did not find *O. mykiss*, and stated that few *O. mykiss* were likely to use Pinole Creek due to low flow barriers and heavy siltation (Berthelsen 1982). According to DFG, the most substantial Pinole Creek barrier is the concrete box culvert under Interstate 80, which is over 100 feet in length (Berthelsen 1982). The report stated that Pinole Creek was the last stream in west Contra Costa County that could support a steelhead run (Berthelsen 1982).

In April 1984, 11,760 *O. mykiss* fingerlings were planted in Pinole Creek. (Gray 1988). Subsequent electrofishing by DFG near Alhambra Road in August 1988 was performed to determine if steelhead trout were found at the site. No *O. mykiss* were observed (Gray 1988).

Leidy electrofished five reaches of Pinole Creek in October-November 1994. *Oncorhynchus mykiss* (3: 65, 75, 135 mm FL) were collected in a 30 meter reach located 300 feet upstream of the Interstate 80 crossing (Leidy 2002).

EBMUD staff electrofished two areas of Pinole Creek in July 1996. *Oncorhynchus mykiss* (2 1+: 100, 110 mm; 1 3+: 300 mm) were found near "the old bridge" on EBMUD property and were deemed to be wild steelhead capable of anadromy (Nuzum 1996). Genetic analysis of *O. mykiss* from Pinole Creek indicated that fish sampled there are part of the Central California coast steelhead ESU (Nielsen 1999).

Three *O. mykiss* were seen in Pinole Creek immediately downstream of the Interstate 80 crossing in February 2001. These fish are believed to be native steelhead due to their size (>200 mm) and appearance (C. Arnold pers. comm.). EBMUD staff noted two *O. mykiss* (92, 102 mm) downstream from the Pinole Valley Road Bridge in March 2001 (Setka 2001).

Simas Creek

Simas Creek enters Pinole Creek from the north approximately 4.6 miles upstream of San Pablo Bay. A dead female *O. mykiss* (650 mm) was seen in April 2002 in Simas Creek 0.1 miles upstream of the confluence with Pinole Creek (Setka 2002).

Assessment: The Pinole Creek watershed historically supported *O. mykiss*. Steelhead continue to enter the Pinole Creek watershed, although the size of the run has not been documented. The limited development of the upper watershed and the presence of native trout in the creek indicate that Pinole Creek is a good candidate for additional restoration efforts, including addressing the impediment to passage posed by the culvert beneath Interstate 80 and sedimentation issues in the upper watershed.

Garrity Creek Watershed

Garrity Creek begins on the western slopes of Sobrante Ridge. It flows west, then north, for approximately three miles to San Pablo Bay.

Garrity Creek

As part of a fish distribution study, Garrity Creek was sampled at three stations in July 1981. No *O. mykiss* were encountered in this effort (Leidy 1984).

Assessment: We did not find evidence of historical or current use of the Garrity Creek watershed by steelhead or salmon. The small relative size of the watershed and condition as assessed by DFG staff indicate that Garrity Creek does not have potential to support significant *O. mykiss* populations.

San Pablo Creek Watershed

San Pablo Creek originates as an intermittent stream in the coastal hills southeast of Orinda. The creek flows northwest for approximately 2.5 miles where it is joined by the west fork of San Pablo Creek near the town of Orinda. Another smaller perennial tributary that drains the east slope of the Berkeley Hills joins San Pablo Creek near the Moraga Road crossing. Further downstream, the West Fork of San Pablo Creek, a perennial spring-fed tributary originating in the Berkeley Hills, flows north for a distance of approximately one mile before entering a culvert under Highway 24. This fork flows 1.7 miles before joining San Pablo Creek. Bear Creek is San Pablo Reservoir's other major tributary.

Flows in the upper portion of San Pablo Creek are impounded in San Pablo Reservoir (between approximately RM 10 and RM 15) constructed in 1918 and managed by EBMUD. The drainage area above San Pablo Reservoir is about 32 square miles. A concrete drop structure is located on San Pablo Creek just upstream from Bear Creek Road (and upstream of San Pablo Reservoir) that is a barrier to fish migrating upstream from San Pablo Reservoir in most years.

Since the 1980s, EBMUD and DFG have planted large numbers of *O. mykiss* in San Pablo Reservoir for recreational fishing, totaling a contribution of approximately 400,000 fish per year. In 2001, EBMUD began planting only sterile, triploid *O. mykiss* to minimize potential genetic contribution to the Central California steelhead ESU from hatchery origin fish. However, elementary school programs continue to plant small numbers of fertile *O. mykiss* fry of American River steelhead origin in San Pablo Creek upstream of the reservoir (R. Hartwell pers. comm.).

San Pablo Creek

As part of a study of rainbow trout in Mexico and California, researchers collected *O. mykiss* in the upper West Fork of San Pablo Creek near the Highway 24 crossing in January 1953 (30: 96-217 mm) (Needham and Gard 1959). The study concluded that the sampled fish were ancestors of steelhead stocks that had not hybridized with introduced fish. The study also noted that steelhead were known to ascend San Pablo Creek during winter and spring, and that a steelhead fishery existed in the unblocked stream areas below San Pablo Dam (Needham and Gard 1959). In their classic study, Needham and Gard noted that "Formerly [San

Leandro Creek] flowed into San Francisco Bay near the City of Alameda and, like nearby San Pablo Creek, originally had runs of both steelhead and silver salmon" (Evans 1957). A long time resident of the City of El Sobrante provides anecdotal accounts of steelhead being caught downstream of San Pablo Dam in the late 1940s and early 1950s (C. Leggitt pers. comm.).

In June 1976, DFG visually surveyed 2.1 miles of San Pablo Creek from the Bear Creek confluence above San Pablo Reservoir, upstream to the Lauterwasser Creek confluence. The survey report found "good" to "excellent" spawning gravel, but no *O. mykiss* were observed (Curtis and Scoppettone 1976). The Department of Fish and Game noted that the EBMUD filtration plant's operational procedures and the large drop structure upstream from Bear Creek Road as limiting the potential for a substantial reproductive population of *O. mykiss* using San Pablo Reservoir and spawning in San Pablo Creek (Curtis and Scoppettone 1976). The Department of Fish and Game electroshocked three sites in this study reach later in June 1976 and did not encounter *O. mykiss* (Scoppettone et al. 1976).

DFG revisited the 1.3-mile section of San Pablo Creek between the Bear Creek confluence and the EBMUD filtration plant in July 1981. Staff observed one *O. mykiss* (254 mm) in the reach beginning at the reservoir and extending upstream 0.35 miles. The survey report concluded that this fish presumably migrated from the reservoir (Jong 1981). The survey report included recommendations for removing the 15-foot drop structure upstream from San Pablo Reservoir and changing filtration plant operations to allow use of the habitat by fish migrating out of the reservoir. In November 1981, an EBMUD-commissioned reconnaissance survey of San Pablo Creek above San Pablo Reservoir was performed. The resulting report stated that no juvenile *O. mykiss* were observed, but surveyors noted about ten large trout from the Bear Creek Road barrier downstream to the reservoir (Kelly 1981).

EBMUD conducted approximately bimonthly *O. mykiss* spawning surveys from the winter of 1989/90 to the winter of 1994/95. Surveys were limited to the approximately 0.5 miles of stream between San Pablo Reservoir and the drop structure at the Bear Creek Road Bridge. Large numbers of adult *O. mykiss* and redds were observed regularly over the course of each spawning season, with the 1990/91 season totaling 288 observed adults and 365 redds. Investigators noted that surveys did not necessarily count all redds each season because scour and deposition associated with frequent high flow events tended to destroy all or most redds constructed since the previous high flow event (EBMUD 1989-1995).

In the EBMUD surveys, adult *O. mykiss* occasionally were measured with sizes up to 477 mm FL. On two occasions (1989/90 and 1993/94), water clarity allowed identification of all observed adults as hatchery fish. Electrofishing in August 1993 and February 1994, and visual observations in April 1995, identified juvenile *O. mykiss*. These survey efforts verified successful natural propagation, although EBMUD fisheries biologists speculated that these juveniles may have migrated from upstream reaches, since all observed redds in this reach were destroyed by high flow events. The August 1993 electrofishing survey yielded 17 *O. mykiss* (66-108 mm) from 60 meters of stream. The February 1994 electrofishing study observed YOY averaging 40 mm, but recorded only two YOY (29 mm) in addition to about 20 unmeasured adults. Visual observations in April 1995 estimated at least 25 YOY to be 21-25 mm FL (EBMUD 1989-1995). EBMUD believed *Oncorhynchus mykiss* occurring in tributaries may contain a hatchery-strain genetic component from fish planted into San Pablo Reservoir (Hartwell 2002).

Leidy sampled San Pablo Creek in October 1993, upstream from the Avenida de Orinda crossing, and did not find *O. mykiss* (Leidy 2002). In April 1999, he electrofished San Pablo Creek at three locations below San Pablo Reservoir: at the EBMUD water treatment plant, at Via Verde and Minuet Way, and at a location just above Interstate 80. This latter station produced a single *O. mykiss* (175 mm) that was silver with no parr marks and little pink coloration (Leidy 2002).

Bear Creek

Bear Creek, the largest tributary to San Pablo Creek, begins in the Briones Hills as several intermittent tributaries that join and flow west to enter Briones Reservoir. Bear Creek flows from Briones Reservoir for 0.5 miles before entering San Pablo Reservoir. A natural, bedrock barrier is located about 0.5 miles upstream of Briones Reservoir preventing fish migration to upstream portions of Bear Creek.

DFG visually surveyed five miles of Bear Creek upstream of the mouth at San Pablo Reservoir in September 1960, before filling of Briones Reservoir. The survey report indicated finding "a few" *O. mykiss* in pools in the lower stream areas, and deemed Bear Creek to be of minor value in contributing to a sport fishery (Hayden and Morehouse 1960).

Lauterwasser Creek

As part of a fish distribution study, three sites were seined on Lauterwasser Creek during July 1981. No salmonids were collected (Leidy 1984, Leidy, 1981-1984).

Assessment: Habitat for *O. mykiss* using the San Pablo Creek watershed was limited severely by construction of San Pablo Dam in 1960. The historical steelhead run was extirpated from above the reservoir as a result of its construction. Existing spawning runs in streams tributary to San Pablo Reservoir consist of *O. mykiss* of hatchery and possibly wild origin.

Wildcat Creek Watershed

Wildcat Creek flows generally northwest through the valley between the Berkeley Hills and San Pablo Ridge. The lower portion of the creek passes through the city of San Pablo to enter the San Francisco Estuary at San Pablo Bay. Passage barriers in lower Wildcat Creek consist of a concrete-lined culvert beneath the K-mart parking lot and a drop structure at Interstate 80, maintained by CalTrans. These barriers may be passable at some flows. Two dams, both managed by EBRPD, are present in the upper watershed, forming Jewel Lake and Lake Anza (~RM 10). These dams block all upstream fish migration.

Wildcat Creek

DFG sampled Wildcat Creek by electrofishing in November 1978 but did not find *O. mykiss* (Paulsen 1978b). In July 1981, another fish distribution study sampled six Wildcat Creek locations below San Pablo Dam Road. No *O. mykiss* were found (Leidy 1984).

In September 1983, EBRPD planted 615 native, coastal *O. mykiss* from Redwood Creek (tributary to San Leandro Creek) into Wildcat Creek between Alvarado Park and the University of California, Berkley, Botanic Gardens (Alexander 1984). EBRPD reported that no trout were present in Wildcat Creek prior to this stocking, so that the newly established population would provide a second and separate source for a "precarious" and "unique" genetic stock (Alexander 1990b). In July 1985, DFG and EBRPD electrofished Wildcat Creek for evidence of spawning of the stocked fish. A total of 51 *O. mykiss* were caught, ranging in size from 37-222 mm FL, which suggested that successful reproduction was occurring (Gray 1986b).

In May 1986, DFG and EBRPD electrofished Wildcat Creek at three locations: upstream from Lake Anza, just downstream from Lake Anza, and upstream from Lake Jewel at the Orchard Campground. Each site had *O. mykiss*, with a total of 12 individuals. Fish caught ranged in size from 27-465 mm FL (Gray 1986b). Numerous YOY were observed at the uppermost station, but not at other stations (Gray 1986b). Also in May 1986, five Wildcat Creek locations were electrofished, with two *O. mykiss* (195, 175 mm) collected upstream from Jewel Lake, five *O. mykiss* (50-70 mm) downstream from Jewel Lake, six *O. mykiss* (153-271 mm) at Alvarado Park, and 14 *O. mykiss* (9: 130-140 mm; 5: 51-71 mm) at the northwestern boundary of Wildcat Canyon Park. The remaining site was near the Rifle Range Road Bridge, where no *O. mykiss* were observed (Gray 1986a).
To determine the downstream-most distribution of *O. mykiss* in Wildcat Creek, a follow-up electrofishing survey was conducted in June 1986 at three sites between Davis Park in Richmond and the 29th Street Bridge. *Oncorhynchus mykiss* were found only at the 29th Street Bridge location (6: 2 YOY, ~45mm; 4 188-250 mm). The survey report cited the presence of YOY as evidence of successful spawning, despite degraded habitat due to urbanization (Alexander 1986).

In May 1987, EBRPD visually surveyed Wildcat Creek from Alvarado Park upstream to the Botanic Garden. YOY were abundant throughout the survey area. Twelve "larger rainbow trout" were observed between Alvarado Park and Jewel Lake, while above Jewel Lake "several" larger trout were also seen (Alexander 1992).

In August 1988, EBRPD electrofishing documented 23 YOY and 11 "larger" *O. mykiss* below the Botanical Garden, and no *O. mykiss* below Jewel Lake (Alexander 1992). Electrofishing at the site below Jewel Lake in October 1989 found three YOY *O. mykiss* and 15 "larger" rainbow trout. Between Lake Anza and Jewel Lake, two "larger" *O. mykiss* were found, while 59 YOY and 14 "larger" *O. mykiss* were collected below the Botanical Garden (Alexander 1992). In July 1990, EBRPD electrofished five Wildcat Creek locations and obtained 50 *O. mykiss* (42-209 mm FL) (Alexander 1990a).

In April 1991, a student at the University California, Berkeley electrofished the two perennial reaches of Wildcat Creek to determine the condition of *O. mykiss* populations. The upper reach was located above Lake Anza, while the lower reach was at the northwest edge of Wildcat Canyon Regional Park. The upper reach produced 46 *O. mykiss* (86-283 mm FL). In the lower reach, 71 *O. mykiss* were caught (71-194 mm). The resulting study reported that the presence of multiple age classes in both the upper and lower reaches indicated successful spawning in the two areas (Cohen 1991). The study also noted age 3+ *O. mykiss* from Lake Anza spawning in upper reaches of Wildcat Creek.

Leidy electrofished several ten-meter reaches of Wildcat Creek at the lower end of Wildcat Regional Park in July 1992. One station yielded four *O. mykiss* (188-224 mm FL), while a second station yielded 11 *O. mykiss* (66-210 mm) plus 31 unmeasured YOY (Leidy 2002). Leidy also electrofished a 30 meter reach immediately downstream of the Verde Avenue Bridge in North Richmond in June 1993, but did not find *O. mykiss* (Leidy 2002).

EBRPD conducted a study of Wildcat Creek *O. mykiss* populations in summer 2001. Six sites were sampled by electrofishing between the most downstream, "Alvarado," and the most upstream, "Upper," inclusive. *Oncorhynchus mykiss* was present at all locations, with densities ranging from less than 0.05 per square meter to over 0.4 per square meter (Alexander et al. 2002). The study report concludes that Wildcat Creek appears to have "ample" over-summering habitat for trout, although sedimentation was noted as a limiting factor (Alexander et al. 2002).

EBRPD again electrofished multiple Wildcat Creek sites in 2002. The resulting report notes low numbers of *O. mykiss* YOY in relation to previous years (Alexander et al. 2002). Total YOY (<100 mm) collected varied from five at the most downstream site

("Alvarado") to 35-45 at the "Lower," "Middle," and "Upper" locations (Alexander et al. 2002). Staff cited an established native *O. mykiss* population in the drainage that may be experiencing negative effects from human activities in the riparian corridor (Alexander et al. 2002).

Assessment: Wildcat Creek supported a steelhead run historically, but the introduction of passage barriers and habitat destruction have limited substantially the ability of the watershed to sustain a viable population. *Oncorhynchus mykiss* (probably derived from plantings of coastal anadromous stock in 1983) successfully reproduces in the portion of Wildcat Creek below Jewel Lake. *Oncorhynchus mykiss* are known to reproduce successfully in the area above Lake Anza. Passage improvements in lower Wildcat Creek that ensure sufficient, available habitat are necessary for a self-sustaining anadromous population of steelhead to persist in the drainage.

Cerrito Creek Watershed

Cerrito Creek drains a portion of the East Bay hills with high levels of residential and commercial development, and large sections of the creek are channelized or underground. The creek consists of approximately two miles of channel between the headwaters and the mouth at the north side of Albany Hill.

Cerrito Creek

As part of a fish distribution study, Cerrito Creek was sampled at five locations in July 1981. No *O. mykiss* were found (Leidy 1984). Leidy sampled Cerrito Creek just upstream from Interstate 80 in December 1993. *Oncorhynchus mykiss* was not found (Leidy 2002).

Assessment: While anadromous salmonids may have used Cerrito Creek historically, no direct evidence of a viable run occurring in the watershed exists. The system has been altered severely by development and flood control facilities, and appears incapable of supporting a viable *O. mykiss* population.

Table III-1. Distribution status of O. mykiss in San Francisco Estuary streams of Contra Costa County, California[a]

Watershed	Stream/ Tributary	Yrs. Surveyed/ Quant. Data	Max. Period of Record	Data Type	Life Hist. Stage/ No. Yrs. Data	Anad. Life-Cycle Possible	O. mykiss		Evidence of Pop. Decline	Current Pop. Status	References (Pers. Comm.)
							Hist.	Current			
Marsh Creek	Marsh	5/0	0 **2001**	1, 2	-	N	DF	DF	Y	0	9, 22, 23, 26, 48, 70
Mt. Diablo Creek	Mt. Diablo	6/0	1855-1970s **1998**	0, 1, 2, 3	R1; M/1	UNK	DF	PS	Y	0	3, 11, 48, 49, 61
	Mitchell	4/1	1985-1998	1, 2	J/1; R/1	N	DF	NP	Y	0	3, 33, 49, 61, 70 (1)
	Irish Canyon	1/0	0 **1977**	1	-	N	UNK	NP	-	0	61
	Donner	1/0	0 **1977**	1	-	N	PB	NP	-	0	61 (5)
Walnut Creek	Walnut	16/1	1950s-2002	0, 1, 2, 3	J/1; M/14	N	DF	DF	Y	1	13, 19, 31, 32, 41, 42, 47, 49-52, 59, 72 (4)
	Grayson	5/0	0 **1998**	1, 2, 3	-	N	PS	NP	-	0	16, 32, 47, 49
	Pine	6/0	1956-1964 **1983**	0, 1, 3	M/1	N	DF	NP	Y	0	19, 29, 32, 42, 48, 70 (5)
	Galindo	2/0	0 **1983**	1, 3	-	N	PS	NP	-	0	32, 62
	Little Pine	1/0	0 **1977**	1	-	N	DF	NP	Y	0	18, 19 (5)
	Arroyo del Cerro	1/0	0 **1977**	1	-	N	DF	NP	Y	0	17, 19 (5)

Watershed	Stream/ Tributary	Yrs. Surveyed/ Quant. Data	Max. Period of Record	Data Type	Life Hist. Stage/ No. Yrs. Data	Anad. Life-Cycle Possible	O. mykiss		Evidence of Pop. Decline	Current Pop. Status	References (Pers. Comm.)
							Hist.	Current			
	Las Trampas	7/0	1986 **1998**	1, 2, 3	-	N	PB	NP	-	0	13, 32, 37, 41, 47, 49, 73
	Tice	3/0	0 **1983**	1, 2, 3	-	N	PB	NP	Y	0	32, 47, 64
	Lafayette	4/0	1986-2002	1, 2	-	N	PB	NP	Y	0	37, 47, 49 (7)
	Grizzly	1/0	0 **1983**	1	-	N	UNK	NP	-	0	32
	Reliez	1/0	0 **1983**	1	-	N	UNK	NP	-	0	32
	San Ramon	5/1	1984-1985 **1990**	1, 2, 3	R/1	N	DF	UNK	Y	0	13, 30, 32, 41, 47, 49 (5)
	Sans Criante	1/0	1983	1	-	N	UNK	NP	-	0	32
	Sycamore	1/0	0 **1980**	3	-	N	UNK	NP	-	0	47
	Green Valley	2/0	0 **1985**	0, 1, 3	-	N	DF	NP	Y	0	12, 47, 70
	San Catanio	2/0	0 **2002**	1, 3	-	N	PB	NP	Y	0	49
	Bollinger Canyon	0	0	-	-	N	DF	DF	Y	1	(1)
Alhambra Creek	Alhambra	4/1	1983-2004	0, 1, 3	M/2; R/1	UNK	DF	DF	Y	1	15, 21, 27, 36, 48, 71 (1)

Watershed	Stream/ Tributary	Yrs. Surveyed/ Quant. Data	Max. Period of Record	Data Type	Life Hist. Stage/ No. Yrs. Data	Anad. Life-Cycle Possible	O. mykiss		Evidence of Pop. Decline	Current Pop. Status	References (Pers. Comm.)
							Hist.	Current			
Rodeo Creek	Rodeo	3/0	0 **1994**	2, 3	-	N	UNK	NP	-	0	46, 48, 49, 68, 69
Refugio Creek	Refugio	1/0	0 **1984**	3	-	N	UNK	NP	-	0	46, 48
Pinole Creek	Pinole	8/4	1975-2001	0 , 1, 2, 3	J/4; S/1; R/3	Y	DF	DF	Y	1, 2, 3	8, 10, 14, 38, 45, 46, 48, 49, 53, 55-57, 60, 63, 66 (2)
	Simas	1/1	1999	3	M/1	Y	PB	DF	-	1	67
Garrity Creek	Garrity	1/0	0 **1981**	3	-	UNK	UNK	UNK	-	0	48
San Pablo Creek	San Pablo	10/6	1959-99	1, 2, 3	J/4; S/1; R/8	UNK	DF	DF	Y	1, 2, 3	24, 25, 39, 43, 44, 49, 54, 65 (6)
	Bear	1/0	1960	1	-	N	DF	NP	Y	0	40
	Lauter-wasser	1/0	0 **1981**	3	-	N	PS	NP	Y	0	46, 48
Wildcat Creek	Wildcat	13/7	1978-2002	1, 2	J/10; R/10	Y	DF	DF	Y	1, 2, 3	1, 2, 4-7, 20, 34, 35, 48, 49, 58
Cerrito Creek	Cerrito	2/0	0 **1993**	2, 3	-	N	PS	NP	Y	0	48, 49

[a] Table headings and codes are defined in the Methods section of this report.

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CONTRA COSTA COUNTY MAPS

Historical status of *Oncorhynchus mykiss* in streams of Contra Costa County, Caliornia.

Current status of *Oncorhynchus mykiss* in streams of Contra Costa County, Caliornia.