

San Leandro Creek Watershed
Focusing on the Lower Watershed beyond the Chabot Reservoir

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This paper is submitted as part one of four on the San Leandro Creek watershed. Particular focus is placed on the following aspects of the watershed, particularly on the segment below Chabot Reservoir: physical geography, current and historical land use, and past and future proposals. In addition to the reference pages is a listing of additional publications pertaining to the creek, for those interested in pursuing further research.

PHYSICAL GEOGRAPHY

San Leandro Creek, a drainage basin of 46.5 square miles, has its headwaters near Sibley Park's Round Top Peak in Rocky Ridge, and terminates at the shores of Arrowhead Marsh in San Leandro Bay, which connects to San Francisco Bay (SWAMP 2002) (Figure 1). The creek runs through Alameda and Contra Costa Counties, and the watershed's landscape "...varies from gently rolling hills to steep canyons," and lush forests to urban environments (SWAMP 2002, p. 26). The towns of Rheem Valley and Moraga are located above the Upper San Leandro Reservoir. Closer to the reservoir are approximately 18 acres of freshwater marsh. The creek has a number of tributaries that drain into the Upper San Leandro Reservoir in the upper watershed, including Redwood, Indian, Moraga, Buckhorn, and Kaiser Creeks (SWAMP 2002) (Figures 2 and 3). Redwood Creek passes through Redwood Regional Park, which consists mostly of second and third growth redwoods. Grass Valley Creek enters Lake Chabot just downstream. Below the dam, the portion of the watershed focused on in this project, the creek travels approximately six miles through Oakland and San Leandro's residential and urban industrial areas (Figure 4). San Leandro Creek is one of the only unculverted East Bay creeks, although sections of the lower watershed are channelized with and without concrete (SWAMP 2002) (Figures 5 and 6). Figure 7 illustrates San Leandro Creek's longitudinal profile.

Geologic History

The City of San Leandro is largely composed of sandstone, shale, serpentine outcrops (found underneath Lake Chabot), rhyolite, and conglomerate from the Cretaceous period (EBRPD 1982). The city of Oakland sits on a base of Franciscan Formation, a sedimentary rock formation composed of sandstone, black shale, red chert, gray limestone, and greenstone, a volcanic rock (Weber 1981). The Hayward Fault intersects San Leandro Creek directly below Lake Chabot (SWAMP 2002). In the Sibley Park portion of the watershed volcanics are present. Loam and loam/clay loams are the characteristic soils of the basin, and can erode quite easily (EBRPD 1982; SWAMP 2002). In the undeveloped land surrounding the watershed the dominant vegetation is grassland, with oak woodlands and coastal chaparral scattered throughout (EBRPD 1982; SWAMP 2002). Along other parts of the watershed one finds eucalyptus and Monterey pine trees, as well leftover orchards (SWAMP 2002).

Rainbow Trout and Other Wildlife along San Leandro Creek

San Leandro Creek is home to rainbow trout. In 1855 Dr. Gibbons, founder of the California Academy of Sciences, identified the rainbow trout (*Salmo iridia*) found in San Leandro Creek to be the first of such a species (California Resources Agency 1996). Redwood Regional Park, where the fish was removed from the water for identification, has a plaque proclaiming that portion of San Leandro Creek as California State Historic Landmark #970 (California Resources Agency 1996) (Figure 8).¹ Trout historically were present along the stream, but are now limited by Chabot Dam in the lower watershed, and landlocked by the Upper San Leandro Reservoir in the upper watershed (EBRPD 1975).

¹ It was later realized that the rainbow trout had been previously identified in Astoria, Oregon, along the Columbia River in 1836 (Fiorillo 1994).

The San Leandro Creek watershed is also home to a variety of mammal, bird, insect, reptile, and amphibian species. Mammals commonly found along the creek basin include raccoons, California ground squirrels, pocket gophers, deer mice, black-tailed jackrabbits and deer, domestic horses, and long-tailed weasels (EBRPD 1982). Walking along the creek one might see a variety of bird species including raptors such as red-tailed and sparrow hawks and golden eagles, and other birds such as canvasback and mallard ducks, American coots, osprey, great blue herons, and egrets. Not uncommon to a watershed are insects and invertebrates, and San Leandro Creek has no shortage of ants, yellow jackets, bees, ladybugs, and worms, among others. Reptile and amphibian species such as the Western fence lizard, the Northern alligator lizard, gopher snake, striped racer snake, the Pacific rattlesnake and treefrog, and the occasional Western pond turtle can also occasionally be seen near San Leandro Creek (EBRPD 1982).

Water Quality

Water diversion, pathogens, toxicity, and urban runoff may affect water quality along San Leandro Creek (SWAMP 2002). The water in the Upper San Leandro Reservoir is for domestic use, and must meet regulated standards. The presence of horse stables in the upper watershed may lead to increased pathogens in the water. The water from Lake Chabot is mainly an emergency supply, and is also used for recreation and as a water supply for the local golf course. The presence of a golf course may indicate usage of pesticides or herbicides. The only water exiting Lake Chabot into the lower watershed is that released due to excess winter rainfall, or what seeps from the dam itself. Therefore lower San Leandro Creek has a very low or no flow during the summer. The water the creek does contain during the summer is largely urban and industrial runoff from storm drains. This water usually has a high temperature, low dissolved oxygen, and pollutants including pesticides and industrial runoff (SWAMP 2002). San Leandro

Creek is on the State of California's 1998 Clean Water Act 303d list of impaired waterbodies for diazinon, a pesticide most commonly used by homeowners for lawn care, which reaches creeks via urban runoff and storm sewers (SFBRWQCB 1998).

Varying land uses affected temperature, pH, dissolved oxygen, and conductivity measurements along the San Leandro Creek watershed in the years 2001 and 2002 (SWAMP 2003). Water temperature along the watershed varied daily and seasonally during the study timeline, with a wintertime temperature range of 3.5°C to 12.1°C, and a summertime temperature range of 10.8°C to 19.6°C (SWAMP 2003). Water temperatures increased in urbanized and developed areas such as the lower watershed, and decreased in the less-developed upper watershed. Measurement results found that pH ranged from 7.19 to 8.49 along the watershed, and that between the spring and summer variations of up to one pH unit occurred. Dissolved oxygen, the amount of oxygen that the stream can absorb from the atmosphere, in the lower watershed ranged from a median of 5.1 to 5.3 mg/L during the spring and summer seasons, a minimum of 6.9 mg/L in the summer along Moraga Creek, and up to 8.1 to 13.3 mg/L all year long in other portions of the upper watershed. Conductivity, how much electrical current is carried by stream, ranged from 0.07 to 0.91 mS/cm all along the watershed (SWAMP 2003). Conductivity tended to increase in urbanized areas because of the increased amount and types of ions in the water in developed areas. Please refer to the SWAMP (2003) interpretive report for an in-depth discussion of the aquatic bioassessment (using benthic macroinvertebrates) results along San Leandro Creek. As will be discussed in a subsequent section of this project on San Leandro Creek, these varying measurements can affect the viability of the creek's aquatic habitats (SWAMP 2003).

Beneficial Uses

As listed in the *Water Quality Control Plan for the San Francisco Bay Basin* (SFBRWQCB 1995) and SWAMP (2002), the San Leandro Creek watershed has eight beneficial uses:

Cold Freshwater Habitat
Warm Freshwater Habitat
Wildlife Habitat
Freshwater Replenishment

Fish Spawning
Non-Contact Water Recreation
Municipal and Domestic Water Supply
Water Contact Recreation

Formation of Arrowhead Marsh: A Clearcut Forest, A Dam Breaks

San Leandro Creek was instrumental in the formation of one of the marshes in San Leandro Bay. San Leandro Creek enters San Leandro Bay at Arrowhead Marsh (Figure 9). Arrowhead Marsh is not a historic marsh. It did not exist prior to 1855 but did exist by 1895 (Gray 1855; Richard 1996a, pers. comm. 2002) (Figure 10). The belief is that flushing of large amounts of sediment down local creeks, most notably San Leandro Creek, due to two distinct events led to Arrowhead Marsh's formation. One of the two events was the logging of the San Antonio and Moraga redwoods in the East Bay hills in the late 1840's (Burgess 1840, 1951). The other event was a rainstorm in the winter of 1874 that caused the Chabot Dam to fail and inundate San Leandro Creek with sediment (Richard 1996b, pers. comm. 2002).

The logging of the East Bay's San Antonio and Moraga redwoods in the late 1840's to 1856 is credited with the initial formation of Arrowhead Marsh (Burgess 1992; Richard pers. comm. 2002). By 1856 no redwoods remained in this area (Burgess 1992). The area was not only clearcut but also grubbed out for shingles, and no tree stumps remained (Richard pers. comm. 2002). These activities probably led to extreme erosion of the hillsides (Richard pers. comm. 2002; Engebeck pers. comm. 2003). Because of this a large pulse of hillside sediment moved downstream through San Leandro and Sausal Creeks and helped to form Arrowhead Marsh at the mouth of San Leandro Creek in San Leandro Bay (Richard pers. comm. 2002).

In 1874 the California Water Company, under the direction of Oakland water giant Anthony Chabot, began construction of a dam on upper San Leandro Creek (Burgess 1940; Richard 1996b). The dam was meant to serve as the water supply for Oakland's population at that time. In November of 1874 a rainstorm hit and caused a flood of water larger than the stream bypass flume that was in place. The flood destroyed the beginnings of the dam, and approximately 20,000 or more yards of clay washed down San Leandro Creek and into San Leandro Bay (Burgess 1940; Richard 1996b, pers. comm. 2002). It is this clay that may have contributed to the formation of Arrowhead Marsh (Richard pers. comm. 2002). The builders successfully completed the dam in 1876, forming the reservoir now known as Lake Chabot.

Climate

Oakland and San Leandro, California, share the Mediterranean climate that characterizes the immediate San Francisco Bay Area (Weber 1981; Gilliam 2002). Mild, wet winters and dry, cool summers are typical of the weather of both cities (EBRPD 1982; Gilliam 2002). Daily and seasonal ranges of temperature average around 15 degrees Fahrenheit, with temperature averaging 56.7 degrees annually (Felton 1965). November through March is the primary rainy season for both cities, with annual rainfall averaging over twenty-three and a half inches from October 1998 to September 2002 (EBRPD 1982; California Department of Water Resources 2003). The watershed's average annual rainfall is approximately 26 inches, with a variation of 11-48 inches annually (SWAMP 2002). The mid-latitude Westerly winds bring moist air onshore from the Pacific Ocean (Gilliam 2002). The Pacific high-pressure zone, approximately 1,000 miles offshore, controls the entire process (Perkins, Potter, & Stone 1991). During El Nino years, storms increase in frequency and severity and cause the neighboring Pacific Ocean's to the west, as well as San Francisco Bay's, sea level to rise (Ryan et al. 1999).

CURRENT AND HISTORICAL LAND USE

The two cities, Oakland and San Leandro, surrounding San Leandro Creek have had varied land uses in proximity to the creek for the past century and a half. In 1883 Wood wrote of San Leandro Creek as being "...embowered with trees whose wide spreading branches make it one of the most sylvan retreats in the County." (Wood 1883, p. 445). San Leandro Creek also served as a route to get from San Leandro to the Morgan Valley (Wood 1883). The Rancho San Leandro, owned by the Estudillo family, was historically located south of the creek on the present West Estudillo Avenue in the city of San Leandro, near the San Leandro BART station (Lewis 1995). The Estudillo Home is now California State Historical Landmark #279 (California Resources Agency 1996). North of the creek, and extending through most of what is now Alameda and Contra Costa Counties, was the San Antonio Ranch owned by the Peralta family, which is now California State Historical Landmark #246 (California Resources Agency 1996) (Figure 11). The Peralta family lived at the Peralta House, which is now a museum and California State Historical Landmark #285, until the 1930's (Lewis 1995; California Resources Agency 1996).

As San Leandro Creek travels up past the strip mall after West Estudillo Avenue ends, it arrives at East 14th Street. At this location the creek borders San Leandro's main commercial district. A bridge built in 1901 provides passage over the creek to the other side of East 14th Street (Lewis 1995). This bridge replaced an earlier covered wooden bridge over the creek, as evidenced by a painting on exhibition at the Peralta House. Root Park is located at the bridge's northeast corner, at East 14th Street and Hays (City of San Leandro 2002). This ¾ acre park is significant in that it marks the border of the historic Estudillo and Peralta Estates (Lewis 1995). The creek used to be blocked off from the public behind a fence until a 1995 park renovation

(Lewis 1995; City of San Leandro 2002). Now the public can access the creek at this location, and visit the beautiful mural of the San Leandro Creek watershed created by volunteers through The Friends of San Leandro Creek (FSLC) in 1998, which is located directly under the bridge (City of San Leandro 2002; FSLC 2003).

Continuing up the watershed one finds two reservoirs along the creek, the Chabot Reservoir and the Upper San Leandro Reservoir. The California Water Company completed the Chabot Dam in 1876 (Burgess 1940; Richard 1996b) (Figure 12). During dam construction hundreds of Chinese migrant workers helping to build the dam lived in a village just below the dam site (Owen 2003). In 1928 the East Bay Municipal Utility District (EBMUD) purchased the East Bay Water Company, also owned by Anthony Chabot (EBMUD 2002a). EBMUD ran the Chabot Reservoir until 1966 (EBMUD 2002a; Owen 2003). In 1966 EBMUD authorized a long-term contract with the East Bay Regional Park District (EBRPD) (EBMUD 2002b). Since then the EBRPD has run the land surrounding Chabot Reservoir for public recreational use (EBMUD 2002a). Anthony Chabot also built the Upper San Leandro Reservoir through his East Bay Water Company in 1926 (EBMUD 2002a) (Figure 13).

Local residents and educational institutions in the East Bay use San Leandro Creek. Lewis (1995) survey found that from a comparison of condominium and single home residents living alongside the creek, single home residents visited the creek much more often than condominium residents. The creek is now the focus of several local middle and high school science classes (Lewis 1995). In 1994 two classes, one in landscape architecture and one in citizen participation, from U.C. Berkeley also focused on San Leandro Creek.

PAST AND FUTURE PROPOSALS FOR SAN LEANDRO CREEK

Planning involving San Leandro Creek has been prevalent for over 50 years (Lewis 1995). In a 1947 proposal and several earlier proposals San Leandro Creek's bed was to be the focus of a central park for the city of San Leandro. These proposals were never implemented because of their large financial cost. In 1951 it was suggested that San Leandro Creek be turned into a street crossing the length of the city, which would be particularly valuable for evacuation purposes during a large emergency (Stuart 1951). Fortunately for the creek this proposal never became reality. In 1952 the city's Master Plan for Recreational Facilities slated San Leandro Creek as becoming a part of a linear recreation route from the Martin Luther King Jr. Regional Shoreline Park in San Leandro Bay through the city up to Lake Chabot (Lewis 1995). The San Leandro Creek channel was widened and maintained by the flood control district beginning in the mid-1970's (Lewis 1995).

San Leandro's Earth Day celebrations in 1990 stirred up organized participation in San Leandro Creek's future (Lewis 1995). Dennis Smith, San Leandro's Department of Community Services Director, was the main spearhead in interest in the creek. Smith organized several events involving the creek, and helped to form The Friends of San Leandro Creek (FSLC). This group sees the creek as an "urban amenity", and envisions many projects that will help integrate the creek into resident's lives, including one day having a creekside path that serves as a connector to the Bay and Ridge Trails (Lewis 1995, p. 18).

Several other organizations have also conducted studies or had involvement featuring the creek. The FSLC joined the San Francisco Bay Estuary Institute (SFEI) efforts implementing a non-point source pollution program and a regional monitoring campaign along San Leandro Creek in the years 1992 to 1993 (Lewis 1995). The Alameda County Flood Control District

provided funding for both of these projects in hopes of increasing awareness about the watershed. The FSLC have received technical support from the National Park Service and the Urban Creeks Council. The FSLC has also received a grant from the California Department of Water Resources for planting natives at Root Park. Beginning in 1995 assisted in a yearlong citizen-monitoring program of the creek in association with Coyote Creek Riparian Station and Woodward-Clyde Consultants. During the years 1995 to 1998, the FSLC has conducted volunteer water quality monitoring along the creek (SWAMP 2002). In the years 2000-2001 water quality monitoring was conducted along the San Leandro Creek watershed by the Surface Water Ambient Monitoring Program (SWAMP) of the San Francisco Bay Regional Water Quality Control Board. In conjunction with the Coastal Conservancy, Breaux (2001) analyzed water quality characteristics and benthic macroinvertebrates at six locations along the creek.

In 1995 a student from U.C. Berkeley did a perceptual survey of residents living near San Leandro Creek (Lewis 1995). Among those surveyed were 95 middle school students, 23 residents along Davis Street, and 30 household residences. Lewis (1995) also provided commentary from 20 narrators, consisting of childhood creek users, students, and city officials. This survey explored people's values in relation to the creek, and highlighted resident's goals for the creek. Results found that students tended to enjoy the privacy found along the creek, and household residents had the most positive overall feelings for the creek, when compared to condominium and apartment residents. The main objectives for all residents in regards to future creek related projects included trash removal along the creek and providing water for wildlife. All of the information gathered from the survey results was compiled to be integrated into future design and planning projects involving the creek. Lewis (1995) also offered several other recommendations based on the survey results: Give students some responsibility for the creek,

respond and decrease resident's creek safety and nuisance concerns, and provide water from Lake Chabot releases for fish, aesthetic value in places such as Root Park, and to reduce resident's fear of fire along the creek.

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