Aerial Survey of the Upper Alameda Creek Watershed to Assess Potential Rearing Habitat for Steelhead Fall 2002

Final Report

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1.0
INTRODUCTION

Historically, Alameda Creek and the tributary systems of San Antonio Creek and Arroyo Hondo provided important spawning and rearing habitat supporting steelhead in the upper Alameda Creek watershed (Alameda Creek upstream of the confluence with Arroyo de la Laguna). San Antonio Creek and Arroyo Hondo and their tributaries are now behind dams and unavailable for spawing and rearing.

Steelhead have been prevented from entering the entire Alameda Creek watershed since the 1950's when a flood control channel was constructed through Fremont. The flood control channel included a grade control structure that was a complete barrier to upstream migrating steelhead. The Alameda County Water District (ACWD) installed three inflatable dams in the flood control channel in the 60's and 70's that can be barriers to upstream migration. The City of San Francisco owns two unused dams in Niles Canyon dating from the late 1800's that are slated for removal. The most upstream barrier is a grade control structure installed by the Pacific Gas and Electric Company (PG&E) to protect a pipeline crossing under Alameda Creek in the Sunol Valley.

Once the barriers to migration are made passable between San Francisco Bay and the Sunol Valley Water Treatment Plant (SVWTP), migrating adult steelhead would be able to access only about seven miles of channel in upper Alameda Creek. This includes about four miles of channel between the SVWTP and the confluence of Alameda and Calaveras Creeks and three miles of channel between the confluence and the Alameda Creek Diversion Dam (ACDD). There is also about 0.3 mile of habitat in Calaveras Creek immediately upstream of the confluence. Also under consideration is providing fish passage over ACDD to open up the rest of upper Alameda Creek to migrating steelhead.

The aerial survey of the Upper Alameda Creek watershed was designed to answer two basic questions about rearing habitat for rainbow trout and steelhead: How much habitat is available in these stream channels and what is the habitat condition? The survey provided information about how much habitat is: 1) presently available in Alameda Creek; 2) potentially available in Alameda Creek upstream of ACDD; 2) presently available for spawning and rearing in Arroyo Hondo and its tributaries, (3) presently available for spawning and rearing in San Antonio Creek and its tributaries, and 4) of the habitat that is available how much of it provides potential rearing habitat in these stream systems during later summer flow conditions.

Surface flow in Alameda Creek is supported primarily by rainfall during winter and spring and base flow during summer and fall. Stream sections underlain by bedrock or in steep canyons usually do not go dry. The sections of streams with

deep alluvial deposits are most likely to exhibit surface flow loss under these conditions. As the channels dry back, surface flow is lost initially at the shallower habitats (riffles) with the drying progressively occurring in runs and finally in the pools. In Alameda Creek, stream channels dry out during later summer and fall even in years with average rainfall.

We mapped the extent of surface water found in the streams and classified the surface flow conditions into four categories: wet, intermittent, isolated pools and dry. For the purpose of this report we have assumed that all stream sections having surface water would support juvenile steelhead or rainbow trout. This assumption is probably not valid. A very limited amount of ground truthing did find salmonids in wet and intermittent stream sections but small isolated pools did not support salmonids.

This aerial habitat survey was conducted in mid October 2002 and documented conditions following the 2002 water year which was classified as dry. The previous three water years were either below normal or dry. The survey provides a perspective on the amount of habitat (length of channel containing surface flow) that would have been available to steelhead in the upper Alameda Creek watershed during below normal conditions.

The survey also provides some information on the amount of stream channel that could be made available to anadromous steelhead in Alameda Creek upstream of ACDD. The survey results also provide a perspective on the amount of stream channel presently available to support rainbow trout populations in the two reservoirs, and describe the amount of habitat that was available during fall 2002. The results of this survey indicate that the total amount of potential rearing habitat is about one third of what was once available for steelhead within the upper Alameda Creek watershed.

2.0
METHODS

On October 9, 2002, a fishery biologist from the San Francisco Public Utilities Commission and from ENTRIX, Inc. conducted an aerial survey of all major stream channels of the upper Alameda Creek watershed including Alameda Creek, Arroyo Hondo, Indian Creek, La Costa Creek, San Antonio Creek and Williams Gulch. The survey was conducted from a helicopter provided by the East Bay Regional Parks District.

The flight departed the East Bay Regional Parks Helicopter Unit, located at the Hayward Municipal Airport, at 10:30 AM and headed for Alameda Creek. The skies were clear, winds were calm and the visibility was excellent. The order of the flight was up Alameda Creek, down Arroyo Hondo, up Indian Creek, down La Costa Creek, up San Antonio Creek and down Williams Gulch. The return flight to the airport followed Alameda Creek down to San Francisco Bay. The flight concluded at 12:55 PM at the Hayward Airport.

Both biologists sat on the left side of the aircraft and the pilot flew the aircraft along the creeks sideways to provide the biologists with a commanding view of the channel bed. The helicopter flew along the streams at elevations of a few hundred feet above the channel while biologists looked for water in the channel. In open areas it was obvious whether water was present. Under sparse canopy, reflections of the sky or sunlight from the water surface would provide a signature to verify the wetted channel. Stream channels were sometimes blocked by dense riparian canopy, but such canopy conditions were indications of surface flow. The two biologists verified observations with each other prior to marking the observation on a map. If observations were in question, the helicopter pilot circled the area until observations were verified.

The aerial survey covered nearly the entire length of upper Alameda Creek from the downstream end of Sunol Regional Wilderness to its headwaters near the upper end of the watershed. The lower end of Valpe Creek, a tributary in the upper watershed was examined from the air near its' confluence with Alameda Creek. The entire length of Arroyo Hondo was surveyed. The survey also covered the lower 0.8 mile of Isabel Creek and a short reach of Smith Creek, both tributaries to Arroyo Hondo. The survey covered nearly the entire lengths of Indian Creek, La Costa Creek, San Antonio Creek and Williams Gulch, all tributaries to San Antonio Reservoir.

The amount of rearing habitat in late summer may be the limiting factor in these streams that determine the number of juvenile rainbow trout or steelhead that can be produced in these channels for that year. In order to evaluate how much late summer rearing habitat is available, the biologists categorized the flow conditions observed from the air into four "surface flow categories": wet,

intermittent, isolated pools or dry. Wet channels were continuously wetted with no interruptions in surface water. Intermittent channels contained water in most of the channel except riffles were often dry. At least two interruptions in surface flow had to occur before a channel segment was placed into this category. Channels that contained standing pools of water were classified as isolated pools. The nature of the channel predicated the distance between the pools. Channels with no surface water were classified as dry.

During the flight, the different surface flow categories were identified on USGS topographic maps for the surveyed streams. In addition to recording stream condition, aerial photographs were taken at various locations within the watershed to document stream conditions.

An on-the-ground survey was conducted on the afternoon of October 9 and on October 10 to verify if aerial observations were accurate. The biologists examined both large and small channels with a variety of flow and riparian conditions. The survey included about 2 miles of accessible channel in Alameda Creek downstream of ACDD and the lower mile of La Costa Creek. The survey in Alameda Creek included wet, intermittent, isolated pool and dry channels in Alameda Creek. It also included a short reach of channel with dense riparian canopy. The survey also included about a mile of La Costa Creek with wet and dry channels.

The stream channels and surface flow categories from the flight maps were measured with a map wheel to the nearest tenth of a mile and this information was compiled by stream. The length of stream channel supporting surface flow was estimated by multiplying the length of channel in each category by an estimate of the amount of channel that contained water. For the four categories, surface flow was considered to be present for the total distance of wet channels. A factor of 0.7 times the total distance of intermittent channels and a factor of 0.3 times the total distance of isolated pool channels were used to estimate the total length of the stream channel with surface flow. Dry channels provided no surface flow.

3.0
RESULTS-

The total length of stream channels examined during the survey is organized by tributary for the upper Alameda Creek watershed (Table 1). A total of 55.5 miles of channel was surveyed (Table 1). Wet channels comprised 12.9 miles (23.3%), intermittent channels comprised 2.9 miles (5.2%), isolated pools comprised 7.9 miles (14.2%), and dry channel comprised 31.8 miles (57.3%) of the total amount of channels surveyed (Table 1). Potential rearing habitat is present in about 17.3 miles (31%) of total channel distance surveyed (Table2.). For upper Alameda Creek, about 34% of the channel provided potential rearing habitat. This compares to about 84% in the Calaveras Reservoir watershed to about 9.0% in the San Antonio Reservoir watershed (Tables 1 and 2).

For the purpose of discussion, Alameda Creek was divided in two segments: from Calaveras Creek confluence to ACDD, and from ACDD to the headwaters. This grouping clarifies existing potential habitat available to anadromous steelhead if all downstream barriers are made passable compared to potential habitat upstream of ACDD that could be made available if ACDD is made passable. Arroyo Hondo was also divided into two segments, downstream and upstream of the suspected barrier in Arroyo Hondo.

Representative photographs of the stream channels in the upper Alameda Creek watershed and of Alameda Creek through Niles Canyon and the Fremont flood control channel have been annotated and provided along with a map key to show the location and direction of view of the each photograph (Appendix A.).

Table 1. Summary of Surface Flow Conditions from 2002 Aerial Surveys

	Length (Mi.)				
Stream	**Wet Channel**	**Intermittent Channel**	**Isolated Pool Channel**	**Dry Channel**	**Total Survey Length**
Alameda Creek (Calaveras Creek to ACDD)	1	0.1	0.1	1.8	3
Alameda Creek (ACDD to headwaters)	1.2	2.8	2.7	2.7	9.4
Valpe Creek *	0	0	0	2.5	2.5
Subtotal for Alameda Creek	**2.2**	**2.9**	**2.8**	**7**	**14.9**
Arroyo Hondo (d/s barrier)	1.8	0	0	0	1.8
Arroyo Hondo (u/s barrier)	5.9	0	0.4	1.6	7.9
Isabel Creek*	0.8	0	0	0	0.8
Smith Creek *	1	0	0	0	1
Subtotal for Calaveras Reservoir Watershed	**9.5**	**0**	**0.4**	**1.6**	**11.5**
San Antonio Creek	0	0	0	6.2	6.2
La Costa Creek	1.2.	0	1.2	4.9	7.3
Williams Gulch	0	0	0	6.5	6.5
Indian Creek	0	0	3.5	5.6	9.1
Subtotal for San Antonio Reservoir Watershed	**1.2**	**0**	**4.7**	**23.2**	**29.1**
All Streams	**12.9**	**2.9**	**7.9**	**31.8**	**55.5**

d/s = downstream
u/s = upstream
* only a portion of the stream was surveyed

Table 2. Potential Rearing Habitat in the Upper Alameda Creek Watershed

	Length (Mi.)				
Stream	**Wet Channel**	**Intermittent Channel**	**Isolated Pool Channel**	**Dry Channel**	**Potential Rearing Habitat Total Length**
Alameda Creek (Calaveras Creek to ACDD)	1.0	0.07	0.03	0	1.1
Alameda Creek (ACDD to headwaters)	1.2	1.96	0.81	0	3.97
Valpe Creek *	0	0	0	0	0
Subtotal for Alameda Creek	**2.2**	**2.03**	**0.84**	**0**	**5.07**
Arroyo Hondo (d/s falls)	1.8	0	0	0	1.8
Arroyo Hondo (u/s falls)	5.9	0	0.12	0	6.02
Isabel Creek*	.8	0	0	0	0.8
Smith Creek *	1	0	0	0	1
Subtotal for Calaveras Reservoir Watershed	**9.5**	**0**	**0.12**	**0**	**9.62**
San Antonio Creek	0	0	0	0	1.8
La Costa Creek	1.2	0	0.36	0	1.56
Williams Gulch	0	0	0	0	0
Indian Creek	0	0	1.05	0	1.05
Subtotal for San Antonio Reservoir Watershed	**1.2**	**0**	**1.41**	**0**	**2.61**
All Streams	**12.9**	**2.03**	**2.37**	**0**	**17.3**

d/s = downstream
u/s = upstream
* only a portion of the stream was surveyed

The survey results are discussed in terms of the existing dams and reservoirs in the upper Alameda Creek watershed. There are about 4 miles of channel downstream of the confluence of Alameda and Calaveras Creeks that could support steelhead if flows to support steelhead rearing are released from Calaveras Reservoir. In addition, there is about 0.3 mile of channel in Calaveras Creek that would support steelhead. If barriers are removed or made passable in Sunol Valley, Niles Canyon and the flood control channel. This would allow access in Alameda Creek up to the ACDD. For the purposed of this discussion we have assumed that the 4.3 miles of channel is sustained by releases from Calaveras Dam and are therefore not subjected to the effects of late summer flow conditions. This survey indicates that for surface flow conditions similar to fall 2002, about 1.1 mile of rearing habitat would be made available to anadromous steelhead upstream of the confluence for a total of about 5.4 miles. Getting fish past ACDD would add about another 4 miles in Table 2 for a total of

about 9.4 miles of potential rearing habitat. The following discussion provides a perspective of the attributes observed during the survey.

Alameda Creek

Alameda Creek (Calaveras Creek to ACDD) – Photos 1-3
A total of 3 miles were surveyed in Alameda Creek between the confluence with Calaveras Creek and the ACDD. Of the 3 miles surveyed, 1.0 mile was wet, 0.1 mile was intermittent, 0.1 mile was isolated pool and 1.8 mile was dry. Wet channels were present in Little Yosemite and in 2,500 feet of channel immediately downstream of the ACDD. The dry channel occurs between the upstream end of Little Yosemite and the flowing reach of channel downstream of ACDD. The intermittent and isolated pool sections were located at the downstream end of wet channel reach below the ACDD.

Alameda Creek (ACDD to headwaters) – Photos 4-10
Approximately 9.4 miles of channel exists in Alameda Creek between the ACDD and the headwaters. Wet channel comprised 1.2 miles, and intermittent channel comprised 2.8 miles. There were 2.7 miles of channel with isolated pools and 2.7 miles of dry channel (Table 1). Wet channel reaches were located in the two canyons between ACDD and Camp Ohlone and in the more confined canyon sections between Camp Ohlone and Valpe Creek. Except for a few isolated pools, Alameda Creek was dry upstream of Valpe Creek. The dense riparian canopy and uplands of dense oak woodland was associated with wet and intermittent channel segments downstream of the Valpe Creek confluence. Near Valpe Creek, the riparian vegetation becomes scarce to non-existent and the upland vegetation transitions to sparse oaks and open grassland. These watershed conditions were typically associated with a dry channel and they persisted in Alameda Creek from near Valpe Creek up to the headwaters.

Valpe Creek – Photo 9
Valpe Creek is the only tributary of any size in Alameda Creek upstream of Little Yosemite. Only the lower portion of the 2.5-mile-long Valpe Creek was examined during the aerial survey, but from this observation it was clear that the channel was dry. The photograph of Valpe Creek shows the sparse oak-open grassland and limited riparian vegetation associated with dry channels of upper Alameda Creek.

Calaveras Reservoir Watershed

Arroyo Hondo (between Calaveras Reservoir and the barrier) – Photos 18-24
The reach of Arroyo Hondo between the barrier falls and the inundation zone of the reservoir, a total of 1.8 miles, was wet through the entire length. This reach includes the USGS gage site near the Marsh Road Bridge.

Arroyo Hondo (between the barrier and the confluence with Smith and Isabel Creeks) – Photos 13-17

There are approximately 7.9 miles of channel upstream of the barrier to the confluence of Smith and Isabel Creeks. Wet channel comprised 5.9 miles, isolated pool channel comprised 0.4 miles, and dry channels comprised 1.6 miles. Arroyo Hondo was typically confined in a deep bedrock-controlled canyon. The dry portion was located in an alluvial reach immediately upstream of the barrier. The isolated pool section occurred where the canyon opened into the alluvial reach.

Isabel Creek – Photo 11

Isabel Creek is one of the two tributaries to Arroyo Hondo that drains the north slope of Mount Hamilton. Isabel Creek was surveyed from the transmission line crossing downstream to the confluence with Smith Creek. This 0.8-mile section was wet.

Smith Creek – Photo 12

Only a short segment of Smith Creek, immediately upstream of the confluence with Isabel Creek was examined. Its steep, narrow canyon was similar to the conditions found in Isabel Creek and surface flow was present. Based upon similar characteristics of this stream to Isabel Creek, surface flow was estimated to be present for at least 1.0 mile.

San Antonio Reservoir Watershed

San Antonio Creek – Photos 30,32

San Antonio Creek was dry throughout its 6.2 mile length from the reservoir up to the headwaters.

Williams Gulch

Williams Gulch was completely dry for 6.5 miles.

La Costa Creek – Photo 29

La Costa Creek joins San Antonio Creek approximately 1.9 miles upstream of San Antonio Reservoir. La Costa Creek has about 7.3 miles of channel. Approximately 1.2 miles were wet, 1.2 miles were isolated pools and 4.9 miles were dry. Surface flow was present about one mile upstream of the confluence with San Antonio Creek where the creek is on private property. The only flowing water was present in a canyon reach, similar to what was found in other streams during this survey. Isolated pools were found at upstream of the wet section.

On La Costa Creek the extent of surface flow mapped from the air was underestimated by about a hundred feet compared to what would have been mapped from the ground. The surface water signature in the downstream flowing channel of La Costa creek was obscured because the pools were completely covered with alder leaves.

Indian Creek

Indian Creek contains about 9.1 miles of stream channel. About 3.5 miles of channel contained isolated pools and 5.6 miles were dry. The lower and upper most portions of the creek were dry, while the isolated pool habitat was present within a canyon.

4.0
CONCLUSIONS

There are 12.4 miles of channel in the main stem of Alameda Creek upstream of Calaveras Creek (Table 1). For the conditions found in late summer, 2002, about 1.1 miles of potential rearing habitat exists in Alameda Creek downstream of ACDD through Little Yosemite (Table 2). Upstream of ACDD, there are about 5.1 miles of potential rearing habitat contained within about 11.9 miles of channel examined in Alameda and Valpe Creeks.

The amount of channel supporting surface flow is probably underestimated for intermittent channels by this method because surface water was found to occur in about 70-90% of the intermittent channels. The amount of isolated pool channel habitat is probably over estimated because this category typically had surface water in 5-30% of its channel length.

The amount of stream channel with surface flow is assumed to represent the potential rearing habitat available for steelhead or rainbow trout at the end of summer. The biologists did not verify that all stream sections with water supported or could support juvenile steelhead or rainbow trout. Wet and intermittent channels probably would support juvenile salmonids. Isolated pools habitat may or may not support salmonids depending on site specific conditions. For these reasons, the estimates of potential rearing habitat are very likely an over estimate of the actual habitat available in these streams for the flow conditions observed during the survey.

There are 11.5 miles of channel in Arroyo Hondo including the lower reaches of Isabel and Smith Creeks. Potential rearing habitat exists in 1.8 miles of channel downstream of the barrier and in 7.9 miles upstream of the possible fish barrier. The previously undocumented barrier in Arroyo Hondo is located approximately 1.5 miles upstream of the Marsh Road Bridge. The barrier is formed from slide material that has entered the channel resulting in a debris field of boulders. An on-the-ground survey would be necessary to determine whether it is truly a barrier. The barrier location means that the access to spawning habitat for rainbow trout from Calaveras Reservoir rainbow trout may be limited to about 1.8 miles of Arroyo Hondo. Arroyo Hondo potential rearing habitat totals 9.6 miles (including the lower sections of Isabel and Smith Creek but not including Calaveras Reservoir or Calaveras Creek downstream of the dam).

For late summer, 2002 conditions, potential rearing habitat for all streams tributary to San Antonio Reservoir totaled only 2.6 miles. Most of this habitat is located within the middle section of La Costa Creek and only a small amount of habitat was identified in Indian Creek. There is probably much more potential spawning habitat available in these streams than there is summer rearing habitat to support all the rainbow trout that would hatch.

The amount of potential rearing habitat present in the potentially restorable portions of Alameda Creek (upstream of the ACDD) is fairly limited. Even with restored access to and from the ocean, the amount of potential rearing habitat available in any given year may seriously impair the ability of the watershed to produce sufficient numbers of juveniles to support a steelhead run of any size. This assessment must be qualified by recognizing that the potential rearing habitat was determined from an aerial survey completed at the end of the summer following three consecutive dry or below normal water years. Therefore, the conditions observed during this survey most likely represent minimal habitat conditions in the watershed There are other areas in the Alameda Creek watershed that may support summer rearing habitat for steelhead (i.e., Arroyo Mocho, Arroyo del Valle) that were not assessed during this survey.