SANTA CLARA VALLEY URBAN RUNOFF POLLUTION PREVENTION PROGRAM

IDENTIFICATION OF CREEKS POTENTIALLY IMPAIRED BY SEDIMENT FROM ANTHROGENIC ACTVITIES
(Permit Provision C.9.f.iii)

ABSTRACT

The Santa Clara Valley Urban Runoff Pollution Prevention Program is required under its NPDES permit to identify creeks other than San Francisquito Creek "that may be impaired by excessive sediment production from erosion due to anthropogenic activities". The purposes of this report are to: 1) collect reasonably available existing data on the SCVURPPP area creeks (except San Francisquito) associated with key factors related to sediment and erosion, 2) develop a methodology to summarize and analyze available data to identify creeks with potential water quality impacts associated with sediment from erosion due to human activities, and 3) prioritize the potentially impacted creeks for future investigations and/or assessments. Where enough data are available the analysis of that data distinguishes between natural erosion and erosion due to anthropogenic activities. In addition, where possible, the analysis attempts to distinguish between urban anthropogenic activities (i.e., development) and non-urban anthropogenic activities (e.g. grazing or logging). Data gaps are also identified. Please note that the analysis contained in this report is not a creek assessment.

Analysis of potential sediment impairment to streams in SCVURPPP jurisdiction was conducted using existing data, which was collected primarily from the SCVWD and USGS. Stream reaches were identified to facilitate data analysis, interpretation and prioritization for further study. Reaches were created in a GIS using existing information on potential fish communities, land use and channel modifications. Reaches for some streams occurring in rural areas were not identified due to a lack of existing information.

Beneficial uses suggested to be sensitive to sedimentation include spawning (SPWN), (MIGR) migration, cold water habitat (COLD) and preservation of rare and endangered species (RARE). Potential impacts of sediment to flood protection were not evaluated in this study because it is not currently listed as a beneficial use in the 1995 Basin Plan. SCVURPPP will work with the SCVWD, and seek WMI input, to further evaluate potential impacts of sediment to flood conveyance prior to the submittal of work plan to the Regional Board on September 1, 2002.

Stream reaches were prioritized into high, medium and low categories for potential impairment due to excessive sediment production resulting from anthropogenic activities. The prioritization was based on a number of key factors and available data. The primary level of prioritization for potential impairment was based on the type of fish community present in a study reach. Stream reaches that support salmonid fish communities were given the highest priority and further analyzed for potential impairment due to other factors. Any stream that was not designated with a beneficial use associated with cold water fish and was not identified as potentially supporting steelhead, trout or salmon were automatically designated as low priority.

Several key factors were used in this study to further evaluate potential impacts of sediment to reaches that potentially support salmonid fish. Factors that were considered direct measures of sediment impairment included fish habitat survey data characterizing amount of fine sediment in streambed at spawning sites and in pools, as well as benthic macroinvertebrate community structure data. Factors that were considered indirect measures of potential sediment

impairment included evidence of bed and bank erosion, sediment accumulation areas, land use, channel modifications, and other information indicating anthropogenic sources of sediment. Anthropogenic sources of sediment in rural areas, such as rural roads, grazing and forestry practices, were not evaluated in this study because of the lack of available information that quantifies these sources in non-urban areas.

Each of the key factors was assigned a score to prioritize stream reaches that are potentially impaired by sediment. Salmonid fish community type was given the greatest relative weight (25%), three factors derived from the salmonid habitat survey and one factor from benthic macroinvertebrate survey were each assigned a lower relative weight (12.5%), and the remaining factors that were considered indirect measures were assigned the lowest relative weight (4.2%)

Two reaches on Steven Creek below Stevens Reservoir had the highest cumulative scores of the key factors. Reaches in Coyote Creek, Alamitos Creek, Arroyo Calero Creek, Guadalupe Creek, Upper Penitencia Creek and Los Gatos Creek also received high scores. Based on these ratings and best professional judgment, Stevens Creek (Reaches 3 and 4) and Coyote Creek (Reaches 4 and 5) were identified as highest priority to conduct a watershed analysis and assess existing management practices for sediment and erosion control and prevention. Some reaches, such as Alamitos (3), Permanente (5), and Saratoga (2 and 3) were given a higher priority than the cumulative scores indicated because of the limited data available to conduct a full analysis.

A work plan and schedule for conducting a watershed analysis and management practice assessment on the streams identified in this report, will be submitted to the Regional Board on September 1, 2002.

INTRODUCTION

This report is submitted in fulfillment of the Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP) NPDES Permit Order No. 01-024 Provision C.9.f.iii paragraph 1. This provision requires a report that identifies creeks other than San Francisquito Creek “that may be impaired by excessive sediment production from erosion due to anthropogenic activities”.

A plan and time schedule for conducting a watershed analysis and management practice assessment on the creeks identified in this report, which may be impaired by excessive sediment production from erosion due to anthropogenic activities, is required in Permit Provision C.9.f.iii paragraph 2. The plan and time schedule will be submitted to the Regional Board by September 1, 2002.

The purposes of this report are to: 1) collect reasonably available existing data on the SCVURPPP area creeks (except San Francisquito) associated with key factors related to sediment and erosion, 2) develop a methodology to summarize and analyze available data to identify creeks with potential water quality impacts associated with sediment from erosion due to human activities, and 3) prioritize the potentially impacted creeks for future investigations and/or assessments. Where enough data are available the analysis of that data distinguishes between natural erosion and erosion due to anthropogenic activities. In addition, where possible, the analysis attempts to distinguish between urban anthropogenic activities (i.e., development) and non-urban anthropogenic activities (e.g. grazing or logging). Data gaps are also identified. Please note that the analysis contained in this report is not a creek assessment.

BACKGROUND

The Regional Board's Draft Staff Report, *Proposed Revisions to Section 303(d) List and Priorities for Development of Total Maximum Daily Loads (TMDLs) for the San Francisco Bay Region* (August 24, 2001), acknowledges that sediment impairment assessment is complex. Defining the approach to assess water quality impairment is an issue the Santa Clara Basin Watershed Management Initiative (WMI) is addressing as part of three ongoing pilot watershed assessments. In addition, the SCVURPPP is conducting a pilot evaluation of the Regional Board's RMAS and WMI assessment techniques as part of the follow-up work in the Coyote Watershed.

The Regional Board's Draft Staff Report lists a number of factors that have to be assessed to determine sediment impairment: predominant watershed geology, dynamics of sediment delivery to the stream, and beneficial uses sensitive to siltation, such as steelhead spawning. The Draft Report identifies all larger streams in the San Francisco Bay Area as having sediment related impacts such as downcutting, bank erosion and sediment delivery from the hill slopes and all urban streams exhibit characteristics of entrenchment and bank erosion associated with increased imperviousness. An increase in sediment in creeks does not directly lead to a finding of sediment impairment and a 303(d) listing. There must be "an analysis that demonstrates a departure from an expected condition for beneficial uses support".

San Francisquito Creek has been listed as impaired by sedimentation under section 303(d) of the Clean Water Act. The two major issues of concern in development of a sediment TMDL for the watershed are increased flooding and degradation of fisheries and aquatic habitat. In support of the TMDL and in fulfillment of permit requirements the SCVURPPP and San Mateo Countywide Stormwater Pollution Prevention Program (SM-STOPPP) submitted the *San Francisquito Creek Watershed Sediment Assessment Workplan* (August 31, 2001).

The Workplan identified the watershed processes, such as infiltration of rainfall, soil erosion, channel morphology, and riparian habitat, and their importance in determining sediment impacts. Anthropogenic activities that can result in increased erosion and sedimentation beyond the natural occurring processes are agriculture, timber harvesting, livestock and ranching, urbanization, residential development, road development, recreation, and water resources operations. As seen in this list, there are anthropogenic impacts that occur in urban areas and anthropogenic activities that occur in undeveloped areas. Whenever possible, the distinction between urban anthropogenic activities and other anthropogenic activities will be made.

This report uses some of these identified watershed processes and anthropogenic activities as indications that a creek may be impacted by sediment. This information will be coupled with potential beneficial uses for creeks (flood protection and fish habitat) to determine if there is a possibility of sediment impairment. Individual characteristics will not be used, but rather all of the watershed characteristics, potential beneficial uses and data will be reviewed together for each creek or stream reach. This report is not a watershed assessment and will not identify sediment impairment. However, if enough data is available on the above factors, the creek will be identified for further study.

INFORMATION RESOURCES

SCVURPPP has previously collected watershed information on the streams in the Santa Clara Basin (Basin) from a variety of sources. The Santa Clara Basin Watershed Management

Initiative (WMI), which SCVURPPP is a stakeholder, provided several resources of watershed information. The WMI Watershed Characteristic Report (SCBWMI 2001) contains general information on creek locations, channel type, riparian vegetation, land use, imperviousness and other watershed characteristics for streams in the Basin. The WMI metadata database (MDDB), which contains descriptive information on watershed studies in the Basin, was developed to catalogue information that is relevant for the WMI's Pilot Watershed Assessments of San Francisquito, Guadalupe and Upper Penitencia Creeks. The MDDB was used in this analysis by querying key fields such as data type (e.g., sediment, bank erosion) and contact information to identify past studies and potential data sources that may be relevant to sedimentation in watersheds. In addition, the WMI's Inventory of Santa Clara Basin Streams Report (SCVURPPP 2001a) was reviewed to identify recently completed or ongoing watershed studies that may be contain information related to sedimentation in Basin streams.

Using sources described above, the SCVURPPP contacted Co-permittees and other agencies to identify and, if possible, collect existing data relevant to sedimentation of streams in the Basin. The information and data collected was not reviewed for quality control or quality assurance. There were no determinations made regarding "good" or "bad" data. The SCVURPPP concentrated on collecting recent information and data on the creeks. The list of references and data sources compiled for this analysis is shown in Table 1.

Table 1. Data sources compiled for analysis of potential sediment problems in streams within the Santa Clara Basin.

Data Sources	**Organization**	**Data format**
1999 FAHCE Salmonid Habitat Survey	SCVWD	Database
Distribution and Abundance of Lotic Macroinvertebrates during Spring 1997 in Seven Streams of the Santra Clara Valley Area, California	USGS	Report/GIS
Potential Fisheries in Selected Santa Clara Streams	SCVWD Jerry Smith (SJSU)	Map
Sediment Removal and Erosion Repair Projects – 2001 Stream Maintenance Project May 2001 Mitigated Negative Declaration	SCVWD	Report
Sediment Removal Projects - Sediment Characterization Plan for S.F. Bay Region Multi-year Stream Maintenance Program, December 2001	SCVWD	Report
Sediment, Mines and Watersheds - Sediment Problem Areas	SCVWD	Map
Stormwater Environmental Indicators Demonstration Project Final Report	SCVURPPP	Report/ Database
SCVWD Waterways Management Model	SCVWD	GIS
ABAG Land Use	ABAG	GIS
Resource allocations and estimated budgets for sediment source reduction programs for implementation in FY 2001	SCVWD	Memorandum
Storm Damage Sites near Santa Clara Waterways	SCCounty, Dept. Roads & Airports	DSR Reports
USGS Annual Sediment Discharge measured at designated CA water monitoring stations	USGS, Dept. of Water Resources	Pdf file Online
Los Gatos Creek Stream Restoration	WGNA	Report
California Department of Forestry and Fire Protection, erosion potential study	Cal-Dept. of Conservation	Report
Alum Rock Park Riparian Management Plan	Biotic Resources Group (For San Jose)	Report
Report of Sedimentation in Lands of Mid-peninsula regional open space district, Santa Clara County	UPP Geotechnology, Inc.	Memorandum
Effects of Limestone Quarrying and Cement-Plant Operations on Runoff and Sediment Yields in the Upper Permanente Creek Basin	USGS	Report
Interim Report on Steamflow, Sediment Discharge, and Water Quality in the Calabazas Creek Basin	USGS	Report
SCVWD Urgent Sediment Removal Project Compensatory Wetlands Mitigation and Monitoring Plan	SCVWD	Report
Preliminary Environmental Assessment of Sediments on Calabazas Creek	TerraSearch Inc	Report

There are currently a number of ongoing or planned watershed studies in the Santa Clara Basin that will contribute information on how sediment influences the physical processes and biological health of streams. The San Francisquito Creek Watershed Sediment Assessment (described above) will identify and quantify sources of sediment loadings and land use contributions, as well as assess the impact of sedimentation on aquatic habitat and flood flow conveyance. The assessment report is scheduled for completion in September 2003. The Guadalupe River is on the impaired waterbodies 303(d) list for mercury. A TMDL report is due to EPA in 2004. Preliminary studies supporting the TMDL report are schedule to begin in 2002. Although this study will focus on a mercury assessment, compiling sediment loading and transport is an identified task. The SCVURPPP's Pilot Watershed Assessment of Coyote Creek is utilizing existing data to characterize and assess the physical and biological condition of the watershed. The assessment will evaluate stream functions, such as maintenance of aquatic habitat and hydrological regime and channel dynamics. Evaluating sediment impacts to fish habitat and aquatic health of stream are one component of the assessment. The Pilot Coyote Watershed Assessment Report is scheduled for completion in June 2002. These projects are not directly related to assessing impairment of beneficial uses from excessive sediment. However, the data collected in support of these studies will provide more insight and evidence in determining how creeks may be impaired due to sediment.

WMI pilot watershed assessments in the San Francisquito Creek, Guadalupe River and Upper Penitencia Creek watersheds may also provide useful information for determining how creeks may be impaired by excessive sediment. The WMI pilot assessments are utilizing existing data to assess if primary uses (COLD, MUN, RARE, REC1 and Protection from flooding) are being attained. The Fisheries and Aquatic Habitat Collaborative Effort (FAHCE) has been collecting fish habitat information for streams in the Basin since 1998 and is expected to release a report on the status of fisheries and habitat condition for Coyote, Guadalupe and Stevens Creeks. The FAHCE salmonid habitat survey data was used in this study. Ongoing SCVWD projects will also be useful in understanding the geomorphic processes and identifying sediment problem areas for Basin streams. The SCVWD's Capital Improvement Projects in Guadalupe River Watershed are currently investigating channel morphology and bank condition as it relates to fish habitat as well as flood conveyance. The SCVWD's Stream Maintenance Program documents volume of sediment removed from locations throughout the Basin and identifies areas that require stream bank repair work. Information from the SCVWD's sediment removal and bank repair projects were used in this study.

METHODOLOGY

A list of streams in the SCVURPPP jurisdiction was compiled from the WMI Watershed Characteristic Report and is presented in Table 2. Where data are available, streams were classified into reaches to facilitate prioritization of the large number of stream areas in the Basin and to enhance the interpretation of data relevant to sediment. Reaches were identified for all streams included in SCVWD's stream network, except for San Francisquito Creek Watershed, which is not analyzed in this study. Reach breaks were identified using several data sources that were compiled in a GIS, including a map that identifies potential fish communities (Appendix B)(SCVWD 2001a), land use (ABAG 1995), and channel modification attributes that are identified in the SCVWD's Waterways Management Model database. The study's reaches are shown in Figure 1 and their attributes are listed in Appendix A. In subsequent text numbers in parentheses after stream names refer to reaches listed in Appendix A.

Stream reaches were prioritized into high, medium and low categories for potential impairment due to excessive sediment production resulting from anthropogenic activities. The prioritization

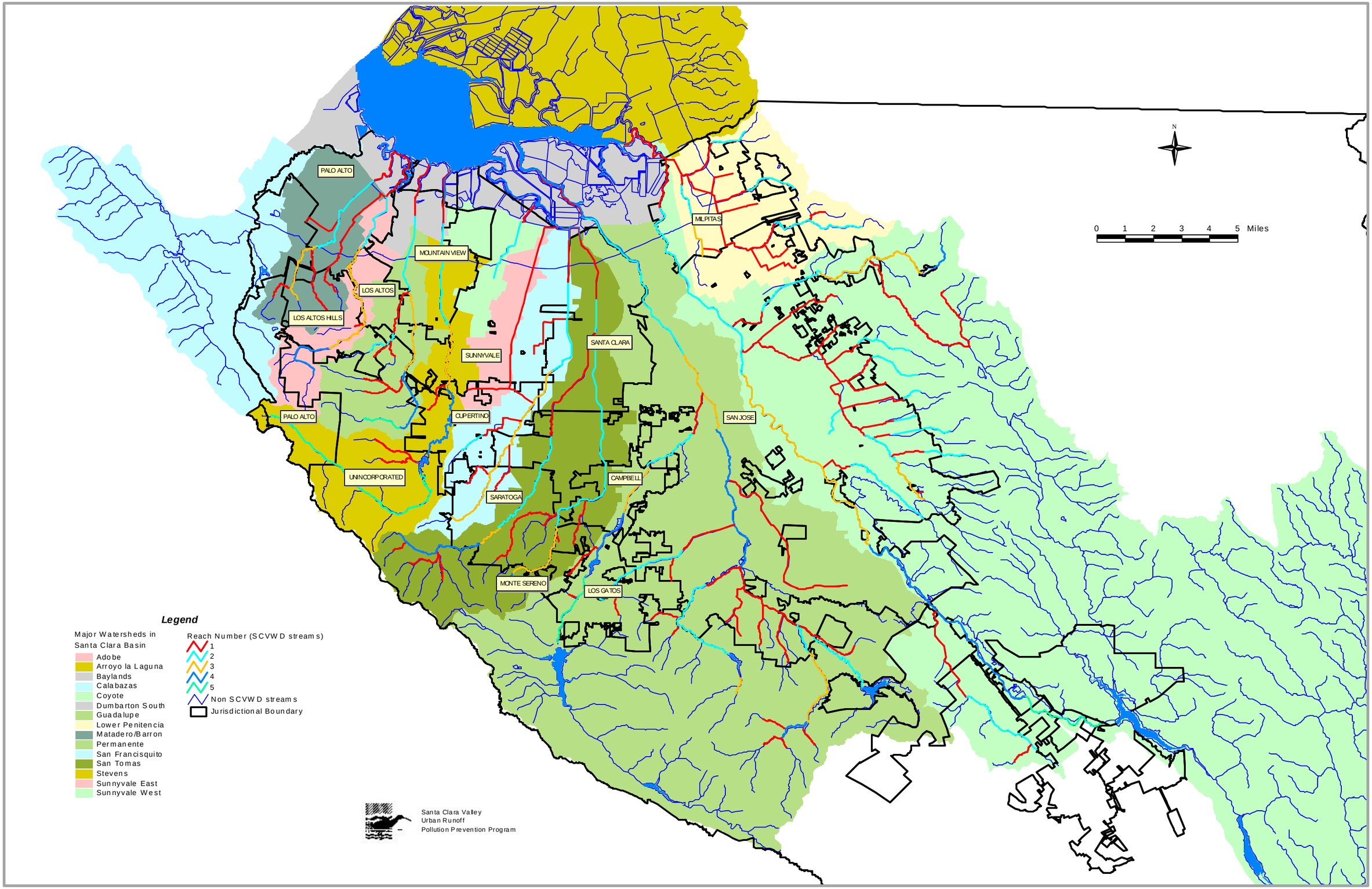


Figure 1. Assessment reaches for Santa Clara Basin streams.

was based on a number of factors and available data. The primary level of prioritization for potential impairment was based on the type of fish community present in study reach. Any stream that was not designated with a beneficial use associated with cold water fish and was not identified as potentially supporting steelhead, trout or salmon were automatically designated as low priority. Type of cold water fish community was used to further prioritize reaches. Additional factors used to prioritize reaches included habitat survey data (substrate embeddedness and amount of fine substrate) and benthic macroinvertebrate community data.

These factors were considered direct measures for analyzing the potential impact of sediment to the aquatic health of the stream. Other factors used were considered indirect measures. Examples of indirect measures included potential bed and bank erosion, sediment removal locations, sediment problem areas (identified by SCVWD), other known sources of sediment supply from urban areas, land use and watershed imperviousness. Analyses of the indirect measures do not individually show potential impairment from sediment but used in combination may provide supporting data or indications of possible conditions of the stream reach. Data availability was another factor that was considered. If a stream reach is designated low priority primarily because there is no or little data available this is noted. In addition, professional judgment or additional information (not an identified key factor) was also considered in the prioritization.

Not all factors were given the same weight in the analysis. Factors that were deemed more important in the analysis were given greater weight. Beneficial use and potential salmonid fish occurrence were given the greatest weight in the analysis because it indicated type of fish community and where sediment can potentially have the greatest impact. This information was rated on a scale of 1-6, with one representing least impacted and six most impacted by sediment. The key factors that were considered to be direct measures of sediment impacts to aquatic health were rated on a scale of 1-3, with one representing least impacted and three most impacted by sediment. Rating of zero indicated there was no available data. The key factors that were considered indirect measures were rated on a scale of 0-1, with zero representing least impacted or no data and one most impacted by sediment. Key factors used in the analysis are discussed below.

Beneficial Uses

Designated beneficial uses for Santa Clara Basin (Basin) streams are shown in Appendix A. Beneficial uses suggested to be sensitive to sedimentation include spawning (SPWN), cold water habitat (COLD) and preservation of rare and endangered species (RARE) (RWQCB 2001). Migration (MIGR) use was also considered since excessive sediment can fill in pools below drop structures or within fish ladder structures and potentially impede fish passage. The1995 Basin Plan has designated SPWN, COLD, RARE or MIGR uses for eight streams and five reservoirs in the Santa Clara Valley (Appendix A).

Information describing the condition of cold water fishes, such as California steelhead, resident rainbow trout and Pacific salmon (collectively referred to as salmonids), and aquatic habitat used by salmonids can be used as direct measurements for determining attainment for these beneficial uses. Salmonid fishes have been documented in several streams of the Basin over the last 20 years (Leidy 1984, SFEI 2001). Selected Basin streams that potentially support steelhead, rainbow trout (cold and warm water conditions) and salmon have been mapped by local fish experts (SCVWD 2001a)(Appendix C). Some Basin streams that potentially support salmonids, but occurred outside of SCVWD jurisdiction, mainly in the upland reaches of the watersheds, were not identified on this map. The fish map was used to identify reach breaks

that represented areas that potentially support steelhead, trout and salmon fish communities. Excessive sedimentation in these reaches can degrade habitat and water quality that is necessary to support cold water fishes, resulting in potential impairment to these beneficial uses.

The quality of streambed habitat at critical life cycle stages of salmonids can be diminished by the influx of fine sediments. Excessive deposition of fine sediment can fill the interstitial spaces of spawning gravels, reduce water circulation and oxygenation of salmon eggs and decrease chances of survival for young emerging salmon (SH&G 2001). Fine sediments can also reduce the amount of rearing habitat and escape cover by filling in pools and burying coarser materials along the streambed. In addition, fine sediment can impair feeding ability of salmonids, and reduce habitat suitability and survival of key benthic macroinvertebrate taxa that are an important food source for salmonids.

The key factor of beneficial uses related to fish habitat or potential fish community was given the greatest weight for ranking the potential impairment of sediment to the aquatic health of each study reach. Stream reaches potentially supporting steelhead and trout in cold water conditions were given the greatest consideration (rating of 6) for this analysis because these fish communities are most affected by excessive sediment in the stream and steelhead are Federally listed as threatened. Reaches identified as potentially supporting potential trout in warm conditions were given a lower ranking (rating of 3) since other parameters such as water temperature may be more of a limiting factor for fish productivity than excessive sediment. Reaches potentially supporting salmon were assigned the lowest rating (ranking of 1) because additional limiting factors are present in larger streams. For example, in low gradient, larger streams, water velocities are lower and greater amounts of fine sediment will naturally be deposited on the stream bottom. Throughout the rest of this report the analysis of sediment information and other key factors will focus on streams that support potential salmonid fish communities.

Direct Measurements

Direct measurements used for this analysis include salmonid habitat survey data and benthic macroinvertebrate survey data collected in several streams in the Basin. Salmonid habitat survey data was obtained from the SCVWD's FAHCE study, which focused on Coyote, Guadalupe and Stevens Creek Watersheds. The benthic macroinvertebrate study was conducted by USGS at 84 locations in 14 streams in the Basin. Salmonid habitat data and benthic macroinvertebrate data were also collected in Coyote Creek Watershed as part of the SEIDP. Only the FAHCE salmonid habitat and USGS macroinvertebrate data, however, were used for this analysis because measurements were more extensive and contained data that was comparable across watersheds. The extent of the habitat and macroinvertebrate data used in this analysis is shown in Figure 2. Direct measurements received the highest ranking (rating from 1 to 3, with one the lowest rating) among the key factors used in this analysis. Reaches that had no available data to rank key factors were assigned a 0.

<u>Salmonid Habitat Survey</u>

Habitat information was spatially queried for all of the study reaches that were surveyed. Three measurements of the habitat data relevant to sedimentation were used for this analysis. These include percent of total habitat area containing greater then 30 percent fine substrate, percent of total pools that were 25 percent or higher in embeddedness and percent of total spawning gravel that were 25 percent or higher in embeddedness. Embeddedness is the percent of

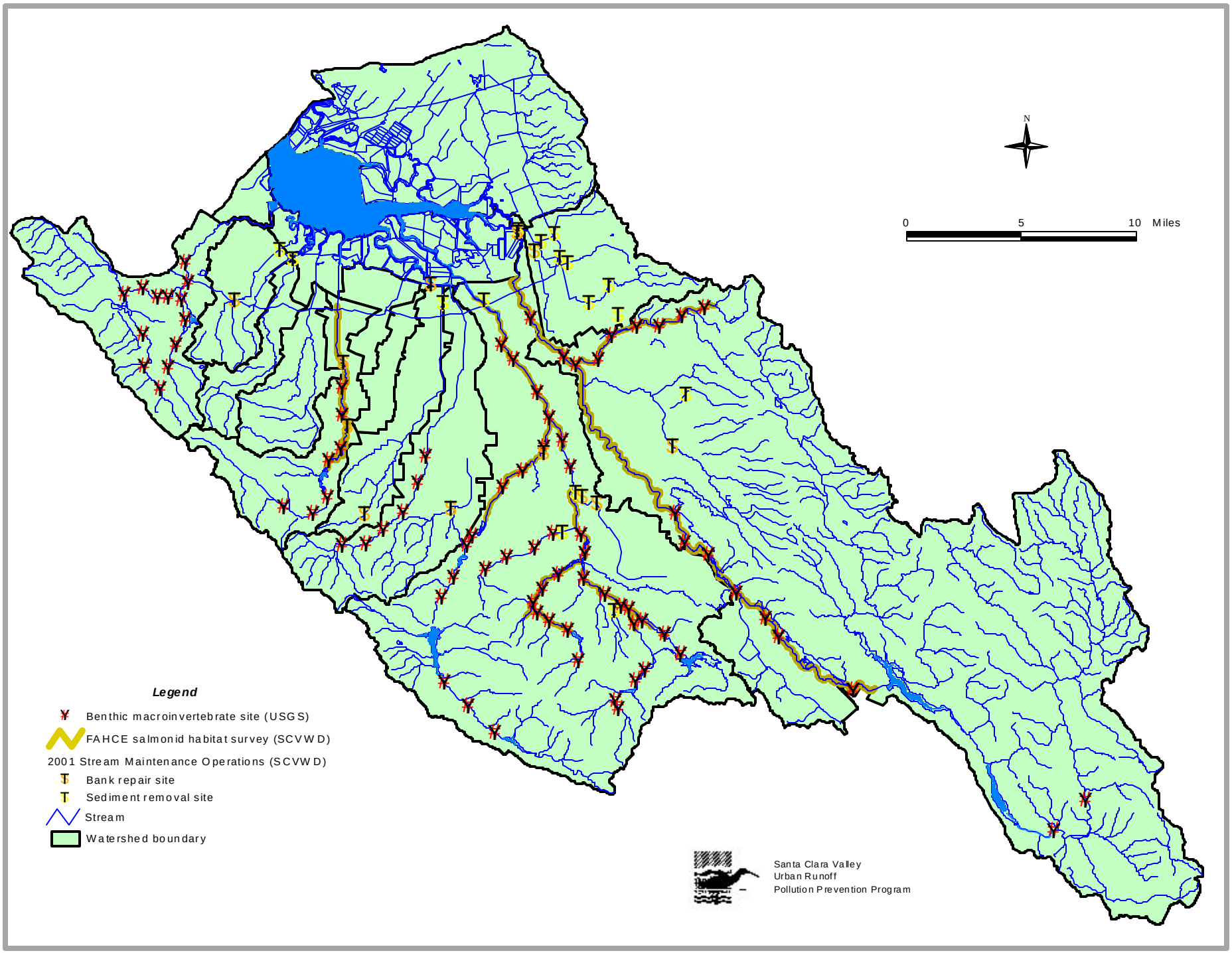


Figure 2. Data used for assessment of potential sediment impacts to Santa Clara Basin streams.

particles greater than 16 mm that are buried in fine sediments. Thirty percent fines was recommended as a numerical target in a Sediment Source Study (SH&G 2001) for the San Lorenzo River TMDL and has been identified as the upper end of the range for Bay Area streams that contain viable populations of salmonids (Laura Collins, personal communication, 2001). Twenty-five percent embeddedness was also recommended as a numerical target in the Sediment Source Study for the San Lorenzo River TMDL.

Rankings were assigned for this key factor based on whether the percent fines and embeddedness are over these numerical targets and on professional judgment of data interpretation. Rankings for percent fine substrate of total habitat area of reach were as follows: greater than 30 percent were highest priority (rated a 3), 10 to 30 percent were rated a 2, and Insert less than 10 percent were assigned a 1. Rankings for percent of pools that were embedded and percent of embedded spawning gravel (defined above) were as follows: greater than 40 percent were assigned a 3, 20 to 40 percent pools were given a 2 and less than 20 percent were given a 1. The ranges for percent pool and spawning gravel embeddedness rankings were arbitrarily chosen to help prioritize the degree of impairment caused by sediment. For example, it was assumed that if greater than 40 percent of available habitat (pools and spawning gravel) in a reach was impaired, then it should receive the highest priority. It was assumed that percent fines and pool and spawning gravel embeddedness has the same impacts to salmonids in larger streams (Guadalupe River and Coyote Creek) than the smaller streams, even though greater percent of fines may be naturally expected in the larger streams.

Benthic Macroinvertebrate Community Structure

Benthic macroinvertebrate community structure can also be used to measure the condition of habitat and water quality of stream. Macroinvertebrate taxa such as Ephemeroptera, Plecoptera, and Tricoptera (referred to as EPT), can be used as indicators for cold, clean and highly oxygenated waters, which are typically also favored by salmonids. EPT taxa or richness (total number of taxa in all three orders) is one commonly used metric to evaluate condition of aquatic biota and physical habitat in the California Stream Bioassessment Procedure (CSBP) (Harrington and Born 1999).

Average values for EPT richness were calculated for each of the study reaches that were surveyed in the USGS macroinvertebrate study (USGS 2000). For this analysis, average EPT richness values were ranked for two different stream types: reaches that potentially support steelhead and trout (warm and cold conditions), and reaches that potentially support salmon. The assumption was made that the physical conditions (e.g. elevation, water temperature) for each salmonid group was similar enough to compare EPT richness values. For example, most of the steelhead and trout streams are found in the middle and upper reaches of smaller streams, which are typically cooler, more oxygenated and contain larger substrate. Salmon typically occur in the larger stream reaches, such as Guadalupe River and Coyote Creek, which are typically warmer, less oxygenated and contain finer substrate. Average EPT richness ratings for reaches potentially supporting steelhead and trout were as follows: less than 12 were given a 3, 12 to 20 were given a 2 and greater than 20 were given a 1. Average EPT richness ratings for salmon reaches were as follows: less than 5 were given a 3, 5 to 10 were given a 2 and greater than 10 were given a 1.

Indirect Measurements

Indirect measures of sediment impacts to aquatic health include information that documents existing or potential anthropogenic sediment sources in both urban and rural areas. Streams in

urbanized areas exhibit characteristics of entrenchment and bank erosion as the result of increased imperviousness and altered hydrologic regimes. Basin streams in rural areas may have increased sediment loads that are caused by road construction or land use changes related to development, ranching or mining. Sediment and streamflow from rural areas of the Basin are significantly impacted by the presence of large dams and reservoirs. Evidence that higher sediment yields than pre-European settlement conditions in streams, however, does not warrant a regulatory finding of impairment and sediment TMDL process (CRWQCB 2001). Sediment data analysis must demonstrate that sediment discharges threaten sensitive or important aquatic life sources. For the purposes of this report however, stream segments that have evidence of excessive sediment yields or potential sediment supply will be identified to help determine if it potentially impacts existing uses. Indirect measurements were given a lower ranking (rating of 0 to 1, with zero the lowest rating or representing no data) than direct measurements for this analysis.

Bank Erosion

Highly erodible stream banks and Rosgen channel type[1] was queried from the FAHCE salmonid habitat data for each of the study reaches that were surveyed. For this analysis, erosion areas were defined by querying the FAHCE habitat data for highly erodible right and left side stream banks. Percent of total bank that were highly erodible was calculated for each reach. The percent of Rosgen channel type G was also calculated for each reach. G channels represent entrenched channels, which are formed by continued erosion of streambed until the channel no longer has access to its flood plain. Other Rosgen channel types identified in the FAHCE study were assumed not to contribute excessive sediment to the channel. Rankings for *combined* percent length of left and right bank that is highly erodible are as follows: greater or equal to 20 percent was given a 1, and less than twenty was given 0. Rankings for percent of entrenched channel are as follows: greater or equal to 50 percent was given a 1, and less than 50 were assigned a 0. Stream reaches not surveyed in the FAHCE study, which may be entrenched and contribute sediment to the channel, were assigned a 0 because there was not existing data available to evaluate for this study.

Information on modification of channel was used to determine relative susceptibility of channel to erosion. Four channel type categories were used to classify reaches. These included concrete-lined, earth-lined (includes earth excavated and earth levee), natural modified (relatively natural channels but also contain retaining walls, gabions, or other engineering structures) and natural unmodified (relatively few if any engineered structures). Reaches classified by channel type will indicate relative potential for stream erosion (e.g., concrete-lined channel will typically not contain highly erosive stream banks). Rankings for channel condition are as follows: earth-lined, natural modified and unmodified were assigned a 1, and concrete-line channel was given a 0.

Sediment removal information was used as an indicator of where bank erosion is occurring. This information was available from SCVWD's sediment removal and erosion repair projects, which are identified in their 2001 Stream Maintenance Project (Figure 2) (SCVWD 2001b). Sediment removal locations were digitized in a GIS to determine spatial relationship to reaches containing salmonid habitat survey data. The report identifies the volume of sediment removed from each of these sites in the previous 20 years. Additional sediment removal sites and estimated

[1] Rosgen channel types are based on a geomorphic classification system that takes into account the shape and form of the channel that corresponds to predicted channel responses to flow and sediment transport.

sediment volumes were identified in the SCVWD's Sediment Characterization Plan for the Multi-year Stream Maintenance Program (SCVWD 2001c). The multi-year plan identifies a total of 70 sediment removal sites for 36 different streams in the Basin. The estimated amount and frequency of sediment removal is identified for each site. These sites were evaluated for potential impacts to salmonid habitat. Rankings for sediment removal sites are as follows: when sediment removal sites occurred within reach or directly upstream or downstream of a reach it was given a 1. Exceptions to these cases were when a reach occurred above a dam and sediment removal sites occurred below dam or when sediment removal sites occur in tidal area. For all other cases the reach was assigned a 0.

Sediment problem areas for the Basin were identified by the SCVWD (SCVWD 2001d) (Appendix D). Sediment problem areas were defined as sites that contain bank erosion which is threatening property and has reaches where excessive sediment accumulation is decreasing channel capacity and increasing flood potential (Dave Drury, SCVWD, personal communication, 2001). Locations of sediment removal sites and sediment problem areas were identified for each of the study reaches. Rankings for sediment removal sites are as follows: when sediment removal sites occurred within a reach it was given a 1, and for all other cases the reach was assigned a 0.

Land Use

The land use data were used to further classify reaches based on urban (containing residential, industrial and commercial areas) and open land use types. These land use categories were developed in the SCVURPPP's Watershed Management and Urban Runoff Management Integration Report (SCVURPPP 2001b). Urban and open land uses were distinguished because they typically exhibit different types of anthropogenic sediment sources. Reaches were rated for land use as follows: urban or mixed land use type was given a one, and open land use was given a zero.

The extent of urbanization for each watershed was also considered for the land use key factor. Development increases the surface area that is impermeable to rainwater infiltration resulting in higher overland flow. Increased impervious area results in higher and more rapid peak flows, which potentially results in streamflows that exceeds channel capacity and subsequent bed and bank erosion. A previous study identified the percent of developed land uses in the watershed and riparian corridor region, as well as percent watershed imperviousness for each of the major watersheds (SCVURPPP 2001b) (Appendix D). In addition, for each watershed, the percent protected area and percent of developed land projected in year 2020 was estimated. Because imperviousness data was available only for the major watersheds and not subwatersheds, it was not possible to rank the reaches for this factor. Instead best professional judgement was used to interpret watershed imperviousness data for the final prioritization of reaches.

Other Information

Existing reports documenting increased sediment supply from urban impacts were reviewed for this analysis. These included a USGS study examining sediment loads resulting from operations of a cement-plant and limestone quarry in the upper reaches of Permanente Creek (USGS 1989). Professional judgement was used to determine if these information sources were useful in determining the priority of reaches potentially impacted by sediment caused from anthropogenic activities.

Some information was not compiled for this analysis. This included channel cross sections, longitudinal profiles or aerial photos of stream reaches over time. Previous studies in Coyote Creek demonstrated that existing baseline data and repeated measurements of channel morphology at monumented locations over time were not available to relate changes in channel geometry to land use (SCVURPPP 2001c). Stream hydrographs were not evaluated in this analysis as well. Although changes in flow and sediment over time are very important for determining how the channel has changed over time and investigating potential impacts, the results do not provide information that is useful for assessing impacts of sediment to aquatic and habitat condition. In addition, sediment sources in upland areas due to unstable geological formations were not evaluated in this study. Although geology is a critical factor in determining natural sources of sediment, as well as identifying areas that are susceptible to erosion from anthropogenic activities, it is not in the scope of this study to identify the relative potential of natural or anthropogenic sediment sources to occur in a watershed. Furthermore, there is a paucity of data that identifies anthropogenic sources of sediment in rural areas. As part of developing the workplan under Permit Provision C.9.f.iii, a watershed assessment that identifies natural versus anthropogenic sources of sediment will be considered for those areas that are identified in this report as highest priority for potential impairment due to sediment.

A summary of the key factors, with descriptions, ranking methodology, relative weight of each factor, data sources are listed in Table 2.

Table 2. Summary of key factors, methodology of ranking, relative weight of factor and data sources used to prioritize reaches for their potential impacts of sediment to aquatic health.

Key Factors	**Description**	**Ranking Methodology**	**Relative Weight**	**Data Source**
Salmonid Fish Community	Distribution of potential salmonid fish communities in Santa Clara Basin	Steelhead/Trout(cold) (6) Trout(warm) (3) Mixed Salmon (1)	25%	SCVWD Map
Direct Measurements				
Percent pool embeddedness	Defined >25% embedded	Percent Total Pools Embedded >40%(3), 20-40%(2), <20%(1) No data (0)	12.5%	FAHCE Salmonid Habitat Survey
Percent spawning gravel embeddedness	Defined >25% embedded	Percent Area Gravel Embedded >40%(3), 20-40%(2), <20%(1) No data (0)	12.5%	FAHCE Salmonid Habitat Survey
Percent Fines	Percent of bedload	Percent Area Fines >30%(3), 10-30%(2), <10%(1) No data (0)	12.5%	FAHCE Salmonid Habitat Survey
Benthic Macroinvertebrate Community Structure	Average EPT richness (Number of Ephemoptera, Plecoptera, Trichoptera taxa)	EPT Richness – Small Streams <12(3), 12-20(2), >20(1) EPT Richness – Large Streams <5(3), 5-10(2), >10(1) No data (0)	12.5%	USGS Reports and database
Indirect Measurements				
Highly erodible bank	Percent combined left and right bank identified as highly erodible	Percent highly erodible bank >20% (1), <20%, no data (0)	4.2%	FAHCE Salmonid Habitat Survey
Entrenched channel	Percent channel identified as Rosgen G channel	Percent entrenched channel >50% (1), <50%, no data(0)	4.2%	FAHCE Salmonid Habitat Survey

Key Factors	Description	Ranking Methodology	Relative Weight	Data Source
Channel Modification	Four classes of channel types for SCVWD streams	Earth-lined, natural modified or unmodified channel (1); concrete-lined channel (0)	4.2%	SCVWD WWMM
Sediment Removal Sites	Location of SCVWD FY 2001 sediment removal sites	Area occurs within reach or directly upstream or downstream (1); All other cases (0)	4.2%	SCVWD 2001 Stream Maint. Projects
Sediment Problem Area	Areas with bank erosion or excessive sediment accumulation	Area occurs within reach or directly upstream or downstream (1); All other cases (0)	4.2%	SCVWD Map
Land Use	Land use categorizes include urban, mixed and open space	Urban and mixed land use (1); open land use (0)	4.2%	ABAG 1995
Other Information	Existing reports indicating excessive sediment from anthropogenic activities	Not rated; used professional judgement to determine prioritization of reaches	NA	USGS Open file reports

DISCUSSION OF KEY FACTOR RATINGS

As stated in the above section, some key factors were given greater weight than others, some of the indirect measures were used as supporting data for stream reach rankings, and professional judgment was used to interpret data and combine information. All of the streams in the SCVURPPP area are listed in Appendix A table with the available data for analysis.

Available Data

The table in Appendix A also contains streams that are found in the SCVURPPP jurisdiction, but data is very limited. Designated beneficial uses and land use information is indicated, but potential fish communities and channel modification information were not available. The streams with limited data primarily occur in non-urban areas, upstream of reservoirs and dams. It was assumed a majority of these streams are intermittent, high gradient channels that do not support cold water fishes. In addition, it is assumed that anthropogenic sources of sediment causing excessive erosion are less likely in these streams. These additional indirect measurement factors support a low priority ranking for these streams.

Beneficial Uses

The streams in Table 2 that have no beneficial use designation or identified as potential salmonid fish community were given the lowest priority. Some additional data is available for some of the streams, however, the beneficial uses factor is given the greatest weight in this analysis.

Matadero and Calabazas watersheds are designated as cold water habitat in the 1995 Basin Plan but are not shown to contain potential cold water fish communities (Appendix C) or were identified from previous studies as streams containing steelhead, trout or salmon (Leidy 1984, SFEI 2000). These watersheds were also not surveyed as part of the FAHCE project or the USGS macroinvertebrate study. Therefore, reaches in these watersheds were considered not to support salmonid fish and were not analyzed further to determine potential sediment

impairment in this report. San Felipe Creek, located above Anderson Dam in the Coyote Creek watershed, was also designated for cold water habitat. Previous studies (SFEI 2000) confirm that this watershed contains rainbow trout. This trout stream was not analyzed for potential impacts of sediment, however, because no existing data was available and it occurs exclusively in open space area, which is less likely to contain anthropogenic activities causing erosion.

There are 26 study reaches that contain potential salmonid fish communities (Table 3). Thirteen of these reaches contain cold water steelhead or resident rainbow trout; these reaches were given a ranking of 6. Eight reaches potentially supporting trout in warm water conditions (ranked as 3) and five reaches potential support salmon (ranked as 1). Table 3 presents the stream reaches that were identified for further analysis based on the weighted key factors of beneficial uses and available data. These streams were then analyzed using the direct and indirect measurement factors.

Table 3. Land use type, jurisdictional boundaries and potential salmonid community to stream reaches in the Santa Clara Basin.

Stream	Reach	Potential Fish Community	Major Land Use Characterization	Jurisdiction
Permanente Creek	5	Cold: Trout	Open	SC County
Stevens Creek	3	Warm: Potential Trout	Urban	Sunnyvale, Los Altos
Stevens Creek	4	Cold: Steelhead	Mixed	Cupertino
Stevens Creek	5	Cold: Trout	Open	SC County
Saratoga Creek	2	Warm: Potential Trout	Urban	San Jose, Saratoga
Saratoga Creek	3	Cold: Trout	Urban	Saratoga
Saratoga Creek	4	Cold: Trout	Open	SC County
Guadalupe River	2	Mixed Salmon	Urban	San Jose
Guadalupe River	3	Mixed Salmon	Urban	San Jose
Guadalupe River	4	Mixed Salmon	Urban	San Jose
Los Gatos	2	Mixed Salmon	Urban	San Jose
Los Gatos	3	Warm: Potential Trout	Urban	Campbell
Guadalupe Creek	1	Warm: Potential Trout	Urban	San Jose
Guadalupe Creek	2	Cold: Steelhead	Open	San Jose, SC County
Guadalupe Creek	3	Cold: Trout	Open	SC County
Alamitos Creek	1	Warm: Potential Trout	Mixed	San Jose
Alamitos Creek	3	Cold: Steelhead	Mixed	SC County
Alamitos Creek	4	Cold: Trout	Open	SC County
Barrett Canyon	1	Cold: Trout	Open	SC County
Arroyo Calero	1	Warm: Potential Trout	Urban	San Jose
Arroyo Calero	2	Cold: Steelhead	Open	SC County
Coyote Creek	2	Mixed Salmon	Urban	Milpitas, San Jose
Coyote Creek	4	Mixed Salmon Warm:Potential Trout	Urban	San Jose, SC County
Coyote Creek	5	Cold: Steelhead	Open	San Jose, SC County
Upper Penitencia Creek	2	Warm: Potential Trout	Urban	San Jose
Upper Penitencia Creek	3	Cold: Steelhead, Trout	Open	San Jose, SC County
Arroyo Aguague	1	Cold: Steelhead, Trout	Open	San Jose, SC County

Direct Measurements

Salmonid Habitat Survey and Benthic Macroinvertebrate Community Structure

The average embeddedness and percent fine values categorized by type of salmonid community are shown for each of the study reaches that were surveyed in the FAHCE study (Table 4). The EPT richness values are also shown for the reaches that were surveyed in the USGS study. The reaches are sorted in descending order by percent of pool embeddedness.

For reaches containing steelhead or trout in cold water, Guadalupe Creek (2), Stevens (4), Coyote (5) and Arroyo Calero (2), had the highest ranking for percent pool embeddedness, ranging in values from 61 to 41 percent. Guadalupe Creek (2) and Coyote (5) had the highest ranking for percent spawning gravel embeddedness, ranging from 77 to 61 percent. Stevens (4), Coyote (5) and Arroyo Calero (2) had the highest ranking for percent fines, ranging from 83 to 40, as well as EPT richness, which ranged from 7-10. Alamitos (3) had a low EPT richness value of 10, which may indicate low habitat quality, however there was no habitat data to identify excessive sedimentation.

Each of these reaches occurs directly downstream of a large dam and reservoir. Further study should be directed at determining the source of fine sediment in these reaches. It is possible that sediment is supplied by bed and bank erosion caused by sediment starved water released from the dam. Most sediment transported from headwater reaches in watershed will be trapped in reservoirs behind dam, however, fine sediment may be transported below dams from overflows or possibly releases that occur from the bottom of dams. High levels of turbidity were observed below Stevens Creek Reservoir in late spring and fall, indicating that fine sediment sources might originate from dam releases rather then from overflow events (Jim Carter, personal communication, 2001).

Table 4. Sediment measurements derived from FAHCE habitat data and benthic macroinvertebrate metric derived from USGS study for three types of salmonid fish communities that occur in Basin streams.

Creek	Reach Number	% Total Pools > 25% Embedded	% Spawning Gravel > 25% Embedded	% Habitat Area Fines > 30%	EPT Richness	Below Dam
Stream reaches identified as potential steelhead or resident trout						
Guadalupe Creek	2	61	77	28	22	x
Stevens Creek	4	56	37	46	10	x
Coyote Creek	5	51	61	40	7	x
Arroyo Calero	2	41	18	83	7	x
Upper Penitencia Creek	3	33	15	8	20	x
Pheasant Creek	1	6	15	18		
Alamitos Creek	3				10	x
Saratoga Creek	4				25	
Stevens Creek	5		No Data		25	
Alamitos Creek	4				27	
Barrett Canyon Creek	1				27	
Stream reaches identified as warm potential trout						
Stevens Creek	3	96	96	62	5	x
Alamitos Creek	1	63	45	71	11	x
Los Gatos Creek	3	62	23	42	6	x
Coyote Creek	4	48	85	77	7	x
Guadalupe Creek	1	35	45	56	22	x
Arroyo Calero	1	32	41	70	13	x
Upper Penitencia Creek	2	19	35	11	16	x
Saratoga Creek	2		No Data		16	
Stream reaches identified as potential mixed salmon						
Coyote Creek	2	49	41	95	5	x
Coyote Creek	4	48	85	77	7	x
Guadalupe River	3	39	0	36	6	x
Los Gatos Creek	2	32	25	35	7	x
Guadalupe River	2	29	6	91	4	x
Guadalupe River	4	25	1	70	9	x

For reaches potentially supporting trout in warm water conditions, Stevens (3), Alamitos (1), Los Gatos (3) and Coyote (4), had the highest ranking for embedded values for pools, ranging from

96 to 48. These reaches also contained the lowest EPT richness values (5-11) and highest ranking. Stevens (3), Coyote Creek (4), Alamitos (1), and Guadalupe Creek (1) had highest ranking for percent spawning gravel embeddedness, ranging from 96 to 45. All of these reaches, with the exception of Los Gatos, occur downstream of the impacted steelhead reaches described above. This relationship may indicate that fine sediment sources affecting the upper reaches may also be affecting the lower reaches that support warm/trout communities. Guadalupe Creek reaches 1 and 2 appear to have very high EPT richness despite having high levels of embeddedness.

The reaches containing salmon that had the highest embedded values for pools and spawning gravel are reaches 2 and 4 in Coyote Creek, with values ranging from 49 to 48 and 85 to 42, respectively. All of these reaches were assigned the highest ranking for percent fines. EPT richness values were ranked low for Guadalupe River (2) and Los Gatos Creek (2). The other reaches had moderately low EPT richness, which might be expected for reaches that occur in the lower sections of the watershed, which exhibit warmer and less oxygenated water and finer sediment substrate. Coyote (4) has relatively high values of embeddedness and percent fines for a reach that flows primarily through alluvial deposits.

Indirect Measurements

As described in the Methodology section, these indirect measures are used as supporting evidence for possible sediment problems. Where additional analysis was needed to determine prioritization the indirect measurement factors were ranked.

Table 5. Bank erosion and entrenched channel values derived from FAHCE habitat data for three types of salmonid fish communities that occur in Basin streams.

Creek	Reach	% Length Right Bank Erodibility High	% Length Left Bank Erodibility High	Combined % Left and Right Bank	% Entrenched Channel (Rosgen G)	Sediment Problem Areas
Stream reaches identified as potential steelhead or resident trout						
Pheasant Creek	1	39	7	46	0	
Stevens Creek	4	17	29	46	25	
Upper Penitencia Creek	3	11	11	22	60	
Coyote Creek	5	8	13	21	0	
Guadalupe Creek	2	4	8	12	0	X
Arroyo Calero	2	6	5	11	15	X
Stream reaches identified as warm potential trout						
Stevens Creek	3	31	19	50	100	
Arroyo Calero	1	6	21	28	100	X
Guadalupe Creek	1	3	22	25	0	X
Coyote Creek	4	5	6	11	0	
Los Gatos Creek	3	10	0	10	0	
Alamitos Creek	1	5	3	9	0	X
Upper Penitencia Creek	2	3	4	7	23	X
Stream reaches identified as potential mixed salmon						
Coyote Creek	2	4	18	22	90	
Los Gatos Creek	2	7	8	15	0	
Coyote Creek	4	5	6	11	0	
Guadalupe River	3	3	4	7	100	
Guadalupe River	2	2	1	3	0	X
Guadalupe River	4	0	0	0	80	X

Bank Erosion

Stream bank condition taken from the FAHCE salmonid habitat survey show eight reaches that have over 20% of their combined left and right side stream banks in highly erodible condition (Table 5). These include Steven Creek (3 and 4), Pheasant Creek (tributary to Guadalupe Creek), Guadalupe Creek (1), Arroyo Calero (1), Upper Penitencia (3) and Coyote (2), Stevens Creek (3), Arroyo Calero (1), Upper Penitencia (3), Coyote (2) and Guadalupe River (3 and 4). These were highest priority for channel entrenchment.

Sediment problem areas identified by SCVWD 1998 (Appendix D) map are also indicated in Table 5. These include the Guadalupe Creek (1 and 2), Arroyo Calero (1 and 2), Alamitos (1), Guadalupe River (2 and 4) and Upper Penitencia (2). Guadalupe River (2) reach however has tidal influence and therefore is given less weight. The lower reaches of Basin streams are affected by tidal action and as a result, sediment sources can be from the South Bay as well as from upstream areas in the watershed.

The volume of sediment removed from the 16 sites listed in SCVWD's 2001 Stream Maintenance Project over a twenty-year period is shown in Figure 3. The reaches containing sites that record the highest levels of sediment removal include Berryessa (1), Flint (1), Calabazas(1), and Guadalupe River (2). These sites do not affect any of the salmonid streams, with the exception of Guadalupe River (2), which occurs in the tidal zone.

Sediment removal sites described in the SCVWD's 2001 Stream Maintenance Project that occur upstream of reaches that support salmonid fish communities, includes Randol, Ross and Canoas Creeks. These sites show that relatively low volumes of sediment have been removed over time. Bank erosion sites in Stevens Creek and Los Gatos Creek may have some influence on sediment impacts to salmonid habitat in those reaches.

Sediment removal sites listed in the SCVWD's multi-year plan estimates total volume of sediment (number in parentheses indicates cubic yards) in a ten-year period for several sites occurring in watersheds that support salmonid fish communities. These include Stevens Creek (60,000), Saratoga Creek (35,000), Canoas Creek (48,000), Guadalupe River (94,000), Ross Creek (8000), Guadalupe Creek (1500), Randol Creek (3000) and Upper Penitencia Creek (1200). These volumes give a relative idea of the volume of sediment deposited for various watersheds over time but they give no indication regarding the location of sediment supply or impacts sediment has on the aquatic biota or habitat. Sediment accumulation in these reaches do impact the ability of the channel to convey streamflow, however these impacts were not incorporated in this analysis because SCVWD channel maintenance operations already manage for flood protection.

Land Use

Stevens (4), Saratoga (3) and Alamitos (3) were reaches that support steelhead or trout in cold water conditions and occurred in urban or mixed land uses. All eight reaches containing trout in warm water conditions and five salmon reaches occurred in urban land use. All reaches in urban land use received a ranking of one. The remaining steelhead/trout reaches occurred in open land use and were given a rating of 0.

Total imperviousness for the major watersheds that support salmonids (Coyote, Stevens, Guadalupe, Permanente and San Thomas) were relatively low compared to watersheds that do not support salmonids (Appendix D). Reaches containing trout in San Thomas (Upper

Saratoga) and Upper Permanente occur in open land uses with minimal impacts from impervious surfaces. Stevens (4), Saratoga (3) and Alamitos (3) are steelhead/trout reaches that flow through some areas of high density residential land use. The potential trout in warm water and salmon reaches are all in urban areas and are probably affected to some degree from increased runoff caused by impervious surfaces. Fine sediment sources related to urban runoff are more likely from bed and bank erosion during storm events, rather than outfalls or canals draining urbanized catchments.

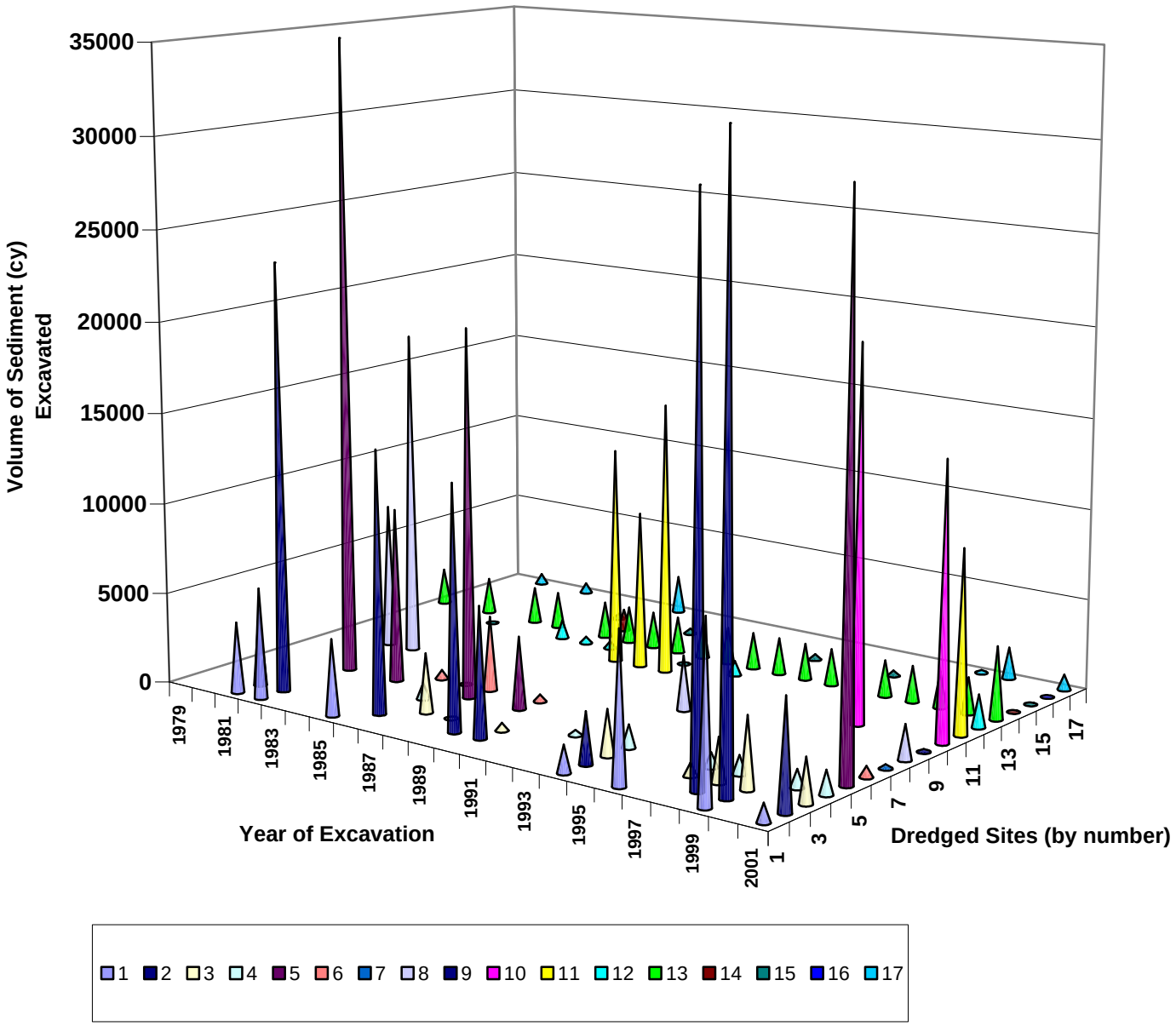
Other Information

Sediment yields in Upper Permanent Creek (reach 5) was 3.5 times higher than the neighboring West Fork Permanente watershed as the result of cement-plant and quarry operations (USGS 1989). Permanente (5) supports a cold water trout population. Since FAHCE habitat survey and USGS macroinvertebrate data is not available for this creek, no analysis of sediment impacts to habitat and biotic condition was possible.

DATA GAPS

Reaches listed in Table 3 that were not surveyed by FAHCE for salmonid habitat includes Saratoga (2-4), Permanente (5), Stevens (5), Alamitos (3-4) and Arroyo Aguague (1). Reaches not surveyed by USGS for benthic macroinvertebrates includes Permanente (5) and Arroyo Aguague (1). All of these reaches, with the exception of Saratoga (2) and Alamitos (3) potentially support steelhead or trout in cold water conditions. Because data were not available to analyze for potential impacts to sediment, they were ranked lower than if data were available. As resources warrant, these reaches should be surveyed in the future to determine potential impacts of sediment on the habitat and biotic condition of stream.

Figure 3. Volume of Sediment Excavated in 17 Streams from 1979 - 2001



Explanation of Site Numbers **1**-**17** in Legend: **1**=Adobe Creek at Highway 101, Palo Alto, **2**=Berryessa at Milpitas Blvd to Calaveras, Milpitas, **3**=Berryessa at Cropley to Sierra Creek, San Jose, **4**=Berryessa u/s & d/s of Piedmont, San Jose, **5**=Calabazas Creek d/s Hwy. 101, Santa Clara/Sunnyvale, **6**=Calera Creek u/s UPRR, Milpitas, **7**=Calera Creek u/s Escuela Parkway, Milpitas, **8**=Canoas Creek Guadalupe Confluence to Cattle Road, **9**=Coyote Creek u/s Lower Penitencia Confluence, Milpitas, **10**=Flint Debris Basin u/s Mt. Pleasant Road, San Jose, **11**=Guadalupe River u/s Tasman to Montague, San Jose/Santa Clara, **12**=Los Coches creek d/s Interstate 680 to Dempsey, Milpitas, **13**=Matadero creek u/s Hwy. 101 to Louis, Palo Alto, **14**=Randol Creek u/s & d/s of Bret Harte, San Jose, **15**=Ross Creek u/s & d/s of Cherry Ave., San Jose, **16**=Rucker Creek d/s of Guibal Ave., Gilroy, and **17**=Sierra Creek d/s of Mauna Kea, San Jose.

STREAM PRIORITIZATION

A sum total of the rankings given for each of the key factors are shown in Table 6.

Table 6. Rankings assigned for each key factor and total ranking score for each of the reaches that potentially support salmonid fish comunities.

Stream	Reach Number	Potential Salmonid	Percent Pool Embeddedness	Percent Spawning Embeddedness	Percent Fines	EPT Richness	Bank Erosion Potential	Channel Entrenchment	Sediment Removal Site	Sediment Problem Area	Major Land Use	Channel Modification	Total Score
Stevens Creek	4	6	3	2	3	3	1	0	1	0	1	1	21
Stevens Creek	3	3	3	3	3	3	1	1	1	0	1	1	20
Alamitos Creek	1	3	3	3	3	3	0	0	1	1	1	1	19
Coyote Creek	5	6	3	3	3	2	1	0	0	0	0	1	19
Arroyo Calero	1	3	2	3	3	2	1	1	0	1	1	1	18
Guadalupe Creek	2	6	3	3	2	1	0	0	1	1	0	1	18
Arroyo Calero	2	6	3	1	3	3	0	0	0	1	0	1	18
Guadalupe Creek	1	3	2	3	3	1	1	0	1	1	1	1	17
Coyote Creek	2	1	3	3	3	2	1	1	0	0	1	1	16
Los Gatos	3	3	3	2	3	3	0	0	0	0	1	1	16
Coyote Creek	4	3	3	3	3	2	0	0	0	0	1	1	16
Upper Penitencia	3	6	2	1	1	2	1	1	0	0	0	1	15
Guadalupe River	4	1	2	1	3	2	0	1	1	1	1	1	14
Los Gatos	2	1	2	2	3	3	0	0	0	0	1	1	13
Guadalupe River	3	1	2	1	3	2	0	1	1	0	1	1	13
Upper Penitencia	2	2	1	2	2	2	0	0	0	1	1	1	12
Guadalupe River	2	1	2	1	3	3	0	0	0	0	1	1	12
Pheasant Creek	1	6	1	1	2	0	1	0	0	0	0	1	12
Alamitos Creek	3	6	0	0	0	3	0	0	0	0	1	1	11
Saratoga Creek	3	6	0	0	0	1	0	0	1	0	1	1	10
Saratoga Creek	4	6	0	0	0	1	0	0	1	0	0	1	9
Saratoga Creek	2	3	0	0	0	2	0	0	1	0	1	1	8
Stevens Creek	5	6	0	0	0	1	0	0	0	0	0	1	8
Barrett Canyon	1	6	0	0	0	1	0	0	0	0	0	1	8
Alamitos Creek	4	6	0	0	0	1	0	0	0	0	0	1	8
Permanente Creek	5	6	0	0	0	0	0	0	0	0	0	1	7
Guadalupe Creek	3	6	0	0	0	0	0	0	0	0	0	1	7
Arroyo Aguague	1	6	0	0	0	0	0	0	0	0	0	1	7

The reaches were evaluated using best professional judgement for final prioritization (see Table 7). In some cases it was decided to increase or decrease prioritization of some reaches. For example, some warm:trout reaches were listed as higher priority because they occurred directly downstream of steelhead trout reaches and may have sediment sources from the same origin. Some reaches that potentially support steelhead or trout, but did not have existing direct measures, were given a higher priority to ensure that these resources are protected. For example, Permanente (5) and Saratoga (2 and 3) were given higher priority because they contain trout and indirect measures show they may have a sediment problem.

Steven Creek (reaches 4 and 5) had the two highest cumulative scores from the key factors used to rank streams for potential impairment due to sediment. Individual reaches in Coyote Creek, Alamitos Creek, Arroyo Calero Creek, Guadalupe Creek, Upper Penitencia and Los Gatos also received high scores (only 1-4 points lower than the Stevens Creek reaches). Coyote Creek had three reaches, Arroyo Calero and Guadalupe Creek had two reaches and the remaining streams had one reach within this group.

Because of the greater number of reaches with high scores, Coyote Creek (4 and 5) was included with Stevens Creek (3 and 4) for highest priority to conduct a watershed analysis and assess sediment management practices. (Coyote Reach 2 was not included because it did not support steelhead or trout in warm water conditions). The remaining reaches with high scores were selected as medium priority.

Some reaches, such as Alamitos (3), Permanente (5), and Saratoga (2 and 3) were given a higher priority than the cumulative scores indicated because of the limited data available to conduct a full analysis.

CONCLUSIONS

The final list of reaches that were analyzed and rationale used to prioritize them are shown in Table 7.

Stream reaches were prioritized using a number of key factors and available data. The primary level of prioritization for potential impairment was based on if the stream reach had a beneficial use designation and the type of fish community present in a study reach. Key factors used in this study that were considered direct measures of sediment impairment included fish habitat survey data characterizing amount of fine sediment in streambed at spawning sites and in pools, as well as benthic macroinvertebrate community structure data. Factors that were considered indirect measures of potential sediment impairment included evidence of bed and bank erosion, sediment accumulation areas, land use, channel modifications, and other information indicating anthropogenic sources of sediment. These factors were weighted differently as described above. In addition, best professional judgment was used in the final determination of how the priority rankings were designated high, medium or low priority.

A plan and schedule for conducting a watershed analysis and management practice assessment for the high priority stream reaches listed in Table 7 will be submitted to the Regional Board by September 1, 2002.

Table 7. Prioritization and rationale used in selecting stream reaches potentially impacted by sediment and requiring further study.

Stream	Reach	Rationale
High Priority		
Stevens Creek	4	High % embedded pools and low EPT richness for steelhead reach. Evidence of bank erosion and sediment removal downstream. Occurs in urban area.
Stevens Creek	3	Highest % embedded pools and spawning gravel for all warm:trout reaches. Evidence of bank erosion, entrenchment and high volumes of sediment removed downstream. Occurs in urban area. Incorporate with Reach 4 for further study.
Coyote Creek	5	High % embedded pools, spawning gravels and fines. Moderately low EPT richness for steelhead reach. Evidence of bank erosion.
Coyote Creek	4	High % embedded pools, spawning gravels and fines. Moderately low EPT richness for warm:trout reach. Occurs in urban area. Incorporate with Reach 5 for further study.

Medium Priority		
Alamitos Creek	1	High % embedded pools and spawning gravel and fines. Relatively low EPT richness for warm:trout reach. Identified as a sediment problem area and contains sediment removal site upstream. Occurs in urban area.
Alamitos Creek	3	Low EPT richness for steelhead stream, but no habitat data available to assess sediment impacts. Incorporate with Reach 1 for further study.
Arroyo Calero	2	High % embedded pools and fines. Low EPT richness for steelhead reach. Identified as a sediment problem area.
Arroyo Calero	1	High % spawning gravel and fines. Moderate EPT richness. Evidence of bank erosion, channel entrenchment and identified as a sediment problem area. Occurs in urban area. Incorporate with Reach 2 for further study.
Guadalupe Creek	2	Highest % embedded pools and spawning gravel for all steelhead/trout reaches. Evidence of bank erosion in tributary (Pheasant Creek) and sediment removal site below reach. Identified as a sediment problem area.
Guadalupe Creek	1	High % spawning gravel and fines for warm:trout stream. Evidence of bank erosion. Sediment removal history and identified as a sediment problem area. Occurs in urban area. Incorporate with Reach 2 for further study.
Upper Penitencia Creek	3	Moderate amount of % pools embedded for steelhead/trout stream. Evidence of bank erosion and entrenchment.
Permanente Creek	5	No information available on habitat or macroinvertebrates. Evidence of high sediment yields resulting from cement-plant and quarry operations. Habitat and biota should be surveyed to determine potential sediment impacts.
Lower Priority		
Saratoga Creek	3	High EPT richness, but no habitat data available for trout stream. Sediment removed downstream. Occurs in urban area. Habitat should be surveyed to determine potential sediment impacts.
Saratoga Creek	2	High EPT richness, but no habitat data available for trout stream. Sediment removed downstream. Habitat should be surveyed to determine potential sediment impacts. Incorporate with Reach 3 for further study.
Los Gatos Creek	3	High % embedded pools and fines. Low EPT richness for warm:trout stream. Occurs in urban area.
Los Gatos Creek	2	Moderate % embedded pools and spawning gravel and high % fines. Low EPT richness. Occurs in urban area. Incorporate with Reach 3 for further study.
Coyote Creek	2	High % embedded pools, spawning gravels for salmon reach and highest % fines of all reaches. Evidence of bank erosion potential, entrenched channel. Occurs in urban area.
Guadalupe River	4	Moderate % embedded pools and high % fines in salmon reach. Entrenched channel. Sediment removal downstream of reach. Sediment problem area and occurs in urban area.
Guadalupe River	3	High pecent fines, moderate EPT. Entrenched channel with sediment removal sites downstream. In urban area.
Upper Penitencia Creek	2	Moderate habitat and EPT richness ratings. Sediment problem area and occurs in urban area. Consider incorporating with Reach 3 for further study..
Guadalupe River	2	High pecent fines, low EPT. In urban area.
Saratoga Creek	4	High EPT richness, but no habitat data available for trout stream. Sediment removed downstream. Occurs in open area.
Stevens Creek	5	High EPT richness, but no habitat data available for trout stream. Above Dam and occurs in open area.
Barrett Canyon	1	High EPT richness, but no habitat data available for trout stream. Above Dam and occurs in open area.
Alamitos Creek	4	High EPT richness, but no habitat data available for trout stream. Above Dam and occurs in open area.
Guadalupe Creek	3	No habitat data or macroinvertebrate data available for trout stream. Above Dam and occurs in open area.
Arroyo Aguague	1	No habitat data or macroinvertebrate data available for trout stream. Above Dam and occurs in open area.
Lower Priority		**Rationale:** No beneficial use or potential salmonid habitat
Matadero Creek Arastradero Creek	1- 3	

Adobe Creek	1- 4
San Tomas Aquino Creek	1- 4
Los Gatos Creek	4
Alamitos Creek	2
Coyote Creek	1, 3
Lower Silver Creek	1-2
Upper Silver Creek	1-2
Stevens Creek	2
Calabazas Creek	2
Lower Penitencia Creek	1-3
Berryessa Creek	1-2
Upper Penitencia Creek	1
Thompson Creek	1-3

Lower Priority

Rationale: Little or no data available in open space area above reservoirs and dams

Stream	Reach	Stream	Reach	Stream	Reach
Stanford Channel		Guadalupe Reservoir		Upper Penitencia Creek	
Deer Creek		*Shannon Creek*		Cherry Flat Reservoir	
Barron Creek		*Pheasant Creek*		Lower Silver Creek	
Purissima Creek		*Golf Creek*		Miguelita Creek	
Moody Creek		*McAbee Creek*		*North Babb Creek*	
North Fork		*Greystone Creek*		*South Babb Creek*	
West Fork		*Randol Creek*		*Flint Creek*	1-2
Middle Fork		*Santa Teresa Creek*		*Ruby Creek*	1-2
Robleda Drain		*Larabee Gulch*		*Norwood Creek*	
Hale Creek	1-2	*Jacques Gulch*		*Quimby Creek*	1-2
Loyola Creek		*Herbert Creek*		*Fowler Creek*	1-2
Magdalena Creek		Trout Creek		*Evergreen Creek*	1-2
West Branch Permanente		Limekiln Canyon Creek		Yerba Buena Creek	
Ohlone Creek		Lydon Canyon Creek		Cribari Creek	
Heney Creek		Lake Ranch Reservoir		Fisher Creek	
Swiss Creek		Soda Springs Creek		Papa Saca Creek	1-2
Montebello Creek		Aldercroft Creek		Shingle Valley Creek	
North Swiss Creek		Dyer Canyon Creek		Las Animas Creek	
Gold Mine Creek		Black Creek		Packwood Creek	
Indian Cabin Creek		Briggs Creek		Otis Creek	
Bay Creek		Hendrys Creek		Coyote Reservoir	
Indian Creek		Los Gatos Creek (above Lex. Res)			
Sunnyvale West Channel	1-2	Moody Gulch		Dry Creek	
Sunnyvale East Channel		Hooker Gulch Creek		Hawk Creek	
Prospect Creek		Austrian Gulch		Willow Springs Creek	
Rodeo Creek		Lake Williams			
Regnart Creek	1-2	Guadalupe Creek Watershed		Lower Coyote Creek	
Junipero Serra Channel		Los Capitancillos Creek			
El Camino Storm Drain		Rincon Creek	1-2		
Wildcat Creek		Alamitos Creek Watershed			
Vasona Creek		West Branch Randol Creek			
Mistletoe Creek		Cherry Canyon Creek	1-2		
Smith Creek		*East Penitencia Creek*			
Page Ditch		*Calera Creek*			
Congress Springs Canyon		Tularcitos Creek			
McElroy Creek		Arroyo de los Coches			

Todd Creek		Piedmont Creek
Daves Creek		*North Branch*
Vasona Reservoir	5	Sierra Creek
Almedra Creek		Crosley Creek
Canoas Creek		East Penitencia Creek
Ross Creek		Sweigert Creek
Lone Hill Creek	1-2	Los Buellis Creek
East Ross Creek		Coyote Reservoir
Guadalupe Creek		Coyote Creek (above Coyote Res.)

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APPENDIX A:
INFORMATION USED TO CREATE STUDY REACHES AND DATA SOURCES USED IN ANALYSIS

Appendix A. Physical and biological information used by SCVURPPP to identify potential sediment problem areas for major streams in the Santa Clara Basin.

Major Tributaries and Reservoirs[1]	Channel Length (mile)	Channel Type[2] (Greater than 60% Total Length)	Land Use[3]	Upstream Reservoirs	Designated Beneficial Uses Potentially Threatened by Sediment[4]	Potential Fisheries in Santa Clara Streams[5]	Data Sources Used in Assessment
Matadero Creek					COLD, SPWN, MIGR		
Reach 1	1.7	Earth levee	Open			Mixed Native/Introduced	
Reach 2	3.7	Concrete-lined	Urban			Mixed Native/Introduced	c,d
Reach 3	2.6	Natural Unmodified	Mixed			Warm Native	e
Stanford Channel	1.6	Concrete-lined	Urban				
Deer Creek	2.6	Natural Unmodified	Mixed				
Arastradero Creek	1.0	Natural Unmodified	Open			Warm Native	
Adobe Creek							
Reach 1	2.5	Earth levee	Open			Mixed Native/Introduced	d
Reach 2	2.3	Concrete-lined	Urban			Fish Scarce	c
Reach 3	5.7	Natural Unmodified	Urban			Mixed Native/Introduced	c
Reach 4	2.6	Natural Unmodified	Open			Warm Native	
Barron Creek	5.0	Concrete-lined	Urban				c
*Robleda Drain			Urban				
Purissima Creek	0.4	Natural unmodified	Urban				
*Moody Creek			Open				
*North Fork			Open				
*West Fork			Open				
*Middle Fork			Open				
Permanente Creek					COLD, SPWN		
Reach 1	2.1	Earth levee	Open			Mixed Native/Introduced	c
Reach 2	2.8	Concrete-lined	Urban			Fish Scarce	c
Reach 3	3.2	Natural Unmodified	Urban			Fish Scarce Warm Native	
Reach 4	2.6	Natural Unmodified	Open			Warm Native	
Reach 5	1.5	Natural Unmodified	Open			Cold Trout	
Hale Creek							
Reach 1	1.8	Concrete-lined	Urban				
Reach 2	1.4	Unmodified	Urban				
Loyola Creek	0.7	Natural Unmodified	Urban				
Magdalena Creek	0.6	Concrete-lined	Urban				
West Branch Permanente	2.0	Natural Unmodified	Open				
Ohlone Creek	1.0	Natural Unmodified	Open				
Stevens Creek					COLD, MIGR, SPWN (Potential)		
Reach 1	2.1	Earth levee	Open	x		Mixed Native/Introduced	c

Major Tributaries and Reservoirs[1]	Channel Length (mile)	Channel Type[2] (Greater than 60% Total Length)	Land Use[3]	Upstream Reservoirs	Designated Beneficial Uses Potentially Threatened by Sediment[4]	Potential Fisheries in Santa Clara Streams[5]	Data Sources Used in Assessment
Reach 2	3.8	Earth levee	Urban	x		Fish Scarce	a,c,e
Reach 3	2.8	Earth levee	Urban	x		Potential Trout	a,b
Reach 4	3.9	Natural Unmodified	Mixed	x		Cold Steelhead	a,b,e
Reach 5	9.1	Natural Unmodified	Open			Cold Trout	b
Stevens Creek Reservoir					COLD, MIGR, SPWN		
Heney Creek (Tribs to Stevens Res.)	1.3	Concrete-lined	Mixed				
Swiss Creek	1.7	Natural Unmodified	Open				
Montebello Creek	1.6	Natural Unmodified	Open				
*North Swiss Creek			Open				
*(Upper Stevens)			Open				
*Gold Mine Creek			Open				
*Indian Cabin Creek			Open				
*Bay Creek			Open				
*Indian Creek			Open				
Sunnyvale West Channel							
Reach 1	0.8	Earth levee	Open				
Reach 2	2.4	Earth levee	Urban				
Sunnyvale East Channel	6.4	Earth levee/Concrete	Urban				c
Calabazas Creek					COLD		
Reach 1	1.9	Earth levee	Urban			Mixed Native/Introduced	c,d
Reach 2	3.6	Concrete-lined	Urban			Fish Scarce	
Reach 3	7.4	Natural Unmodified	Urban			Mixed Native/Introduced	c,d
Prospect Creek	1.3	Earth levee/Unmodified	Mixed				
Rodeo Creek	1.9	Earth levee, concrete	Urban				
Regnart Creek							
Reach 1	2.0	Earth levee	Urban				
Reach 2	0.9	Natural Unmodified	Urban				
Junipero Serra Channel	2.5	Concrete-lined	Urban				
El Camino Storm Drain	2.3	Concrete-lined	Urban				
San Tomas Aquino Creek							
Reach 1	3.1	Earth levee	Urban			No Fish Value	c
Reach 2	9.6	Concrete-lined	Urban			Fish Scarce	c,e
Reach 3	2.9	Natural Unmodified	Urban			Warm Native	
Reach 4	0.6	Natural Unmodified	Open			Warm Native	

Major Tributaries and Reservoirs[1]	Channel Length (mile)	Channel Type[2] (Greater than 60% Total Length)	Land Use[3]	Upstream Reservoirs	Designated Beneficial Uses Potentially Threatened by Sediment[4]	Potential Fisheries in Santa Clara Streams[5]	Data Sources Used in Assessment
Vasona Creek	0.5	Natural Unmodified	Urban				
Wildcat Creek	3.6	Natural Unmodified	Urban				
*Soby Creek			Open				
Mistletoe Creek	0.3	Natural Unmodified	Urban				
Smith Creek	1.8	Concrete-lined	Urban				
Page Ditch	1.1	Earth levee	Urban				
Saratoga Creek					COLD		
Reach 1	4.5	Natural Modified	Urban				c
Reach 2	4.3	Natural Unmodified	Urban			Potential Trout	b
Reach 3	1.0	Natural Unmodified	Urban			Trout	
Reach 4	3.6	Natural Unmodified	Open			Trout	b
San Andreas Creek	0.6	Natural Unmodified	Open				
Sanborn Creek	0.4	Natural Unmodified	Open				
Booker Creek	0.6	Natural Unmodified	Open				
*Congress Springs Canyon			Open				
*McElroy Creek			Open				
Bonjetti Creek	1.5	Natural Unmodified	Open				
*Todd Creek			Open				
Guadalupe River					SPWN (Potential), MIGR (Potential)		
Reach 1	3.4	Natural Unmodified	Open	x			c
Reach 2	6.5	Earth levee	Urban	x		Mixed Salmon	a,b,c,d
Reach 3	3.2	Natural Unmodified	Urban	x		Mixed Salmon	a,b
Reach 4	5.6	Earth levee	Urban	x		Mixed Salmon	a,b,c
Los Gatos Creek					COLD, SPWN (Potential), MIGR (Potential)		
Reach 1	1.6	Natural Unmodified	Urban	x			a,b,e
Reach 2	2.2	Earth levee/Concrete	Urban	x		Mixed Salmon	a,b
Reach 3	1.9	Earth levee	Urban	x		Potential Trout	a,b
Reach 4	2.1	Earth levee/Concrete	Urban	x		Mixed Native/Introduced	
Daves Creek	1.6	Concrete-lined	Urban				
Vasona Reservoir							
Reach 5	2.9	Earth levee/Concrete	Mixed	x			b
Almedra Creek	0.3	Concrete-lined	Urban				
*Trout Creek			Open				
Lexington Reservoir			Open		COLD, SPWN		
(Tribs to Lexington)			Open				

Major Tributaries and Reservoirs[1]	Channel Length (mile)	Channel Type[2] (Greater than 60% Total Length)	Land Use[3]	Upstream Reservoirs	Designated Beneficial Uses Potentially Threatened by Sediment[4]	Potential Fisheries in Santa Clara Streams[5]	Data Sources Used in Assessment
*Limekiln Canlyon Creek			Open				
*Lydon Canyon Creek			Open				
*Lake Ranch Reservoir			Open				
*Soda Springs Creek			Open				
*Aldercroft Creek			Open				
*Dyer Canyon Creek			Open				
*Black Creek			Open				
*Briggs Creek			Open				
*Hendrys Creek			Open				
*Los Gatos Creek(above Lex. Res)			Open				
*Moody Gulch			Open				
*Hooker Gulch Creek			Open				
<u>*Lake Elsman</u>			Open		COLD		
*Austrian Gulch			Open				
<u>*Lake Williams</u>			Open				
Canoas Creek	7.4	Concrete-lined	Urban				d,e
Ross Creek							
Reach 1	2.2	Earth levee	Urban				b,d
Reach 2	3.9	Concrete-lined	Urban				b
Lone Hill Creek	0.9	Concrete-lined	Urban				
East Ross Creek	1.1	Natural Unmodified	Urban				
Guadalupe Creek							
Reach 1	1.5	Earth levee	Urban	x		Potential Trout	a,b,c
Reach 2	4.4	Natural Unmodified	Open	x		Steelhead	a,b,c
<u>Guadalupe Reservoir</u>					COLD, SPWN		
Reach 3	0.6	Natural Unmodified	Open			Trout	b
Shannon Creek	1.1	Natural Unmodified	Open				
Pheasant Creek	0.4	Natural Unmodified	Open				a
*Los Capitancillos Creek			Open				
*Rincon Creek			Open				
Alamitos Creek							
Reach 1	3.3	Earth levee	Mixed	x		Potential Trout	a,b,c
Reach 2	1.2	Natural Unmodified	Mixed	x		Warm Native	a,b,c
Reach 3	3.2	Natural Unmodified	Mixed	x		Steelhead	
Reach 4	1.1	Natural Unmodified	Open			Trout	b
<u>Almaden Reservoir</u>					COLD, SPWN		
(Tribs to Almaden)							
Larabee Gulch	0.9	Natural Unmodified	Open				
*Cherry Canyon Creek			Open				

Major Tributaries and Reservoirs[1]	Channel Length (mile)	Channel Type[2] (Greater than 60% Total Length)	Land Use[3]	Upstream Reservoirs	Designated Beneficial Uses Potentially Threatened by Sediment[4]	Potential Fisheries in Santa Clara Streams[5]	Data Sources Used in Assessment
Jacques Gulch	0.9	Natural Unmodified	Open				
Barrett Canyon Creek	0.4	Natural Unmodified	Open			Trout	
Herbert Creek	0.8	Natural Unmodified	Open				
Golf Creek	2.2	Earth/Concrete	Urban				c
McAbee Creek	0.4	Concrete-lined	Urban				
Greystone Creek	1.5	Earth/Concrete	Urban				
Randol Creek	1.9	Earth/Concrete	Urban				d
*West Branch Randol Creek			Open				
Arroyo Calero Creek							
Reach 1	0.7	Natural Unmodified	Urban	x		Potential Trout	a,b,c
Reach 2	3.3	Natural Unmodified	Open	x		Steelhead	a,b,c
Santa Teresa Creek	1.9	Natural Unmodified	Open				
Calero Reservoir					SPWN		
Lower Penitencia Creek							
Reach 1	1.3	Earth-lined	Urban			Fish Scarce	c,e
Reach 2	1.3	Natural Modified	Urban			Fish Scarce	c
Reach 3	1.5	Earth-lined	Urban			Fish Scarce	c
East Penitencia Creek	0.7	Earth-lined	Urban				
Calera Creek							
Reach 1	1.6	Earth-lined	Urban				c,d
Reach 2	1.4	Natural Unmodified	Open				c
Berryessa Creek							
Reach 1	5.9	Earth-lined	Urban			Fish Scarce	c,d
Reach 2	3.7	Natural Unmodified	Open			Fish Scarce	
Tularcitos Creek	1.3	Earth-lined	Urban				c,d
Arroyo de los Coches							
Reach 1	1.2	Concrete-lined	Urban				
Reach 2	2.0	Natural Unmodified	Open				
Piedmont Creek	1.5	Concrete-lined	Urban				c
North Branch							
Sierra Creek	2.3	Earth-lined	Urban				d
Crosley Creek	1.3	Natural Unmodified	Urban				
*East Penitencia Creek							
*Sweigert Creek							
Los Buellis Creek	0.7	Natural Unmodified	Open				
Coyote Creek					COLD, SPWN, MIGR, RARE		
Reach 1	5.7	Natural Unmodified	Open	x		Mixed Native/Introduced	d,e

Major Tributaries and Reservoirs[1]	Channel Length (mile)	Channel Type[2] (Greater than 60% Total Length)	Land Use[3]	Upstream Reservoirs	Designated Beneficial Uses Potentially Threatened by Sediment[4]	Potential Fisheries in Santa Clara Streams[5]	Data Sources Used in Assessment
Reach 2	7.9	Earth levee	Urban	x		Mixed Salmon Native/Introduced Mixed	a,b
Reach 3	9.9	Natural Unmodified	Urban	x		Fish Scarce	a,b
Reach 4	6.8	Natural Unmodified	Urban	x		Mixed Salmon Potential Trout	a,b
Reach 5	3.7	Natural Unmodified	Open	x		Steelhead	a,b
Cottonwood Lake					COLD, SPWN		
Anderson Reservoir					COLD, SPWN		
*Coyote Creek (above Anderson Res.)			Open				
(Tribs to Anderson)							
*Shingle Valley Creek			Open				
*Las Animas Creek			Open				
***San Felipe Creek**			Open		COLD (Potential), SPWN	Steelhead/Trout	
*Packwood Creek			Open				
*Hoover Creek			Open			Steelhead/Trout	
*Cow Creek			Open			Steelhead/Trout	
*Coyote Creek (above Anderson Res.)							
*Otis Creek			Open				
***Coyote Reservoir**			Open		COLD, SPWN		
*Coyote Creek (above Coyote Res.)			Open				
Upper Penitencia Creek							
Reach 1	1.6	Earth levee	Urban	x		Fish Scarce	a,b,c
Reach 2	2.9	Natural Unmodified	Urban	x		Potential Trout	a,b,c
Reach 3	4.9	Natural Unmodified	Open	x		Steelhead/Trout	a,b
Reach 4	1.0	Natural Unmodified	Open				
Cherry Flat Reservoir					SPWN		
*(Upper Penitencia Watershed)			Open				
Arroyo Aguague	8.2	Natural Unmodified	Open			Steelhead/Trout	
*Papa Saca Creek			Open				
Lower Silver Creek							
Reach 1	6.0	Earth levee	Urban			Mixed Native/Introduced	c
Reach 2	1.2	Concrete-lined	Urban			Mixed Native/Introduced	
Miguelita Creek	3.6	Concrete-lined	Urban				
North Babb Creek	1.2	Concrete-lined	Urban				
South Babb Creek							
Reach 1	1.5	Concrete-lined	Urban				
Reach 2	2.1	Natural Unmodified	Open				
Flint Creek							

Major Tributaries and Reservoirs[1]	Channel Length (mile)	Channel Type[2] (Greater than 60% Total Length)	Land Use[3]	Upstream Reservoirs	Designated Beneficial Uses Potentially Threatened by Sediment[4]	Potential Fisheries in Santa Clara Streams[5]	Data Sources Used in Assessment
Reach 1	1.6	Concrete-lined	Urban				d
Reach 2	1.9	Natural Unmodified	Open				
Ruby Creek	1.6	Concrete-lined	Urban				
Norwood Creek							
Reach 1	2.4	Concrete-lined	Urban				
Reach 2	0.7	Natural Unmodified	Open				
Thompson Creek							
Reach 1	1.4	Earth levee	Urban			Fish Scarce	c,e
Reach 2	1.8	Natural Unmodified	Urban			Fish Scarce	
Reach 3	2.0	Natural Unmodified	Open			Fish Scarce	
*Dry Creek			Open				
*Hawk Creek			Open				
Quimby Creek							
Reach 1	1.3	Earth levee	Urban				c
Reach 2	0.8	Natural Unmodified	Urban				
Fowler Creek							
Reach 1	0.6	Concrete-lined	Urban				
Reach 2	2.1	Natural Unmodified	Open				
Evergreen Creek							
Reach 1	1.2	Concrete-lined	Mixed				
Reach 2	1.5	Concrete-lined	Open				
Yerba Buena Creek	1.8	Natural Unmodified	Mixed				
Cribari Creek	0.2	Concrete-lined	Mixed				
Upper Silver Creek							
Reach 1	1.3	Concrete-lined	Urban			Mixed Native/Introduced	
Reach 2	3.7	Natural Unmodified	Open			Warm Native	
Fisher Creek							
Reach 1	3.7	Earth levee	Open				
Reach 2	3.5	Natural Unmodified	Open				
Willow Springs Creek	0.9	Natural Unmodified	Open				

[1]Only creeks in bold are specifically listed in San Francisco Basin Plan.

[2] SCVWD Waterways Management Model

[3] Land Use, AGAB 1995

[4] San Francisco Bay Basin Plan, RWQCB 1995

[5] Potential Fisheries in Selected Santa Clara County Streams, Jerry Smith (SJSU) and SCVWD 2001

*These reaches had little or no available data for analysis

a - Fisheries and Aquatic Habitat Collaborative Effort, Salmonid Habitat Survey Database, SCVWD 2001

b - Distribution and Abundance of Lotic Macroinvertebrates during Spring 1997 in Seven Streams of the Santa Clara Valley, SCVURPPP 2000

c - Sediment, Mines and Watersheds Map, SCVWD 1998

d - Sediment Removal Sites, 2001 Stream Maintenance Project, SCVWD 2001

e - Erosion Repair Sites, 2001 Stream Maintenance Project, SCVWD 2001

APPENDIX B:
SANTA CLARA COUNTY STREAMS
BENEFICIAL USES FROM 1995 BASIN PLAN

TABLE 2-5 BASIN 5 - SANTA CLARA BASIN

BASIN	WATERBODY	AGR	COLD	COMM	EST	FRSH	GWR	IND	MAR	MIGR	MUN	NAV	PROC	RARE	REC-1	REC-2	SHELL	SPWN	WARM	WILD
San Francisco Bay South				E	E			E		E		E		E	E	E	E	P		E
Matadero Creek			E							E					E	E		E	E	E
Permanente Creek			E												E	E		E		E
Saratoga Creek		E	E			E	E								E	E			E	E
Calabazas Creek		E	E				E					E			E	E			E	E
San Francisquito Creek			E							E					P	P		E	E	E
	Los Trancos Creek																			
	West Union Creek																			
	Felt Lake	E													E	E		E	E	E
Stevens Creek			E			E				E					E	E		P	E	E
	Stevens Creek Reservoir		E				E			E	E					E		E	E	E
Searsville Lake		E	E												E	E		E	E	E
Coyote Creek			E							E				E	P	E		E	E	E
	Elizabeth Lake		E													E		E	E	E
	Fremont Lagoon																			
	Sandy Wool Lake			E						E					E				E	
	Cotton Wood Lake		E												E	E		E	E	E
	Guadalupe Reservoir		E				E				E				E	E		E	E	E
	Coyote Lake	E	E								E				E	E		E	E	E
	Upper Penitencia Creek																			
	Cherry Flat Reservoir	E									E				L	E		E	E	E
	Penitentia Creek																			
	Silver Creek																			
	Soda Springs Canyon Creek																			
	Otis Canyon Creek																			
	San Felipe Creek		P												P	P		P	E	E
	Halls Valley Reservoir														E	E			E	E
	Arroyo Aquague Creek																			
	Berryessa Creek																			
Guadalupe River										P					P	E		P	E	E
	Campbell Percolation Pond																			
	Lexington Reservoir		E								E				E	E		E	E	E
	Los Gatos Creek		E			E	E			P	E					P		P	E	E
	Vasona Lake		E				E								E	E		E	E	E
	Los Gatos Creek																			
	Alamitos Creek																			
	Guadalupe Creek																			
	Herbert Creek																			
	Calero Reservoir						E				E				E	E		E	E	E
	Almaden Reservoir		E				E				E				E	E		E	E	E
	Lake Elsman		E								E									E
	Anderson Lake		E				E				E				L	E		E	E	E
	Barrett Canyon Creek																			
	Herbert Creek																			

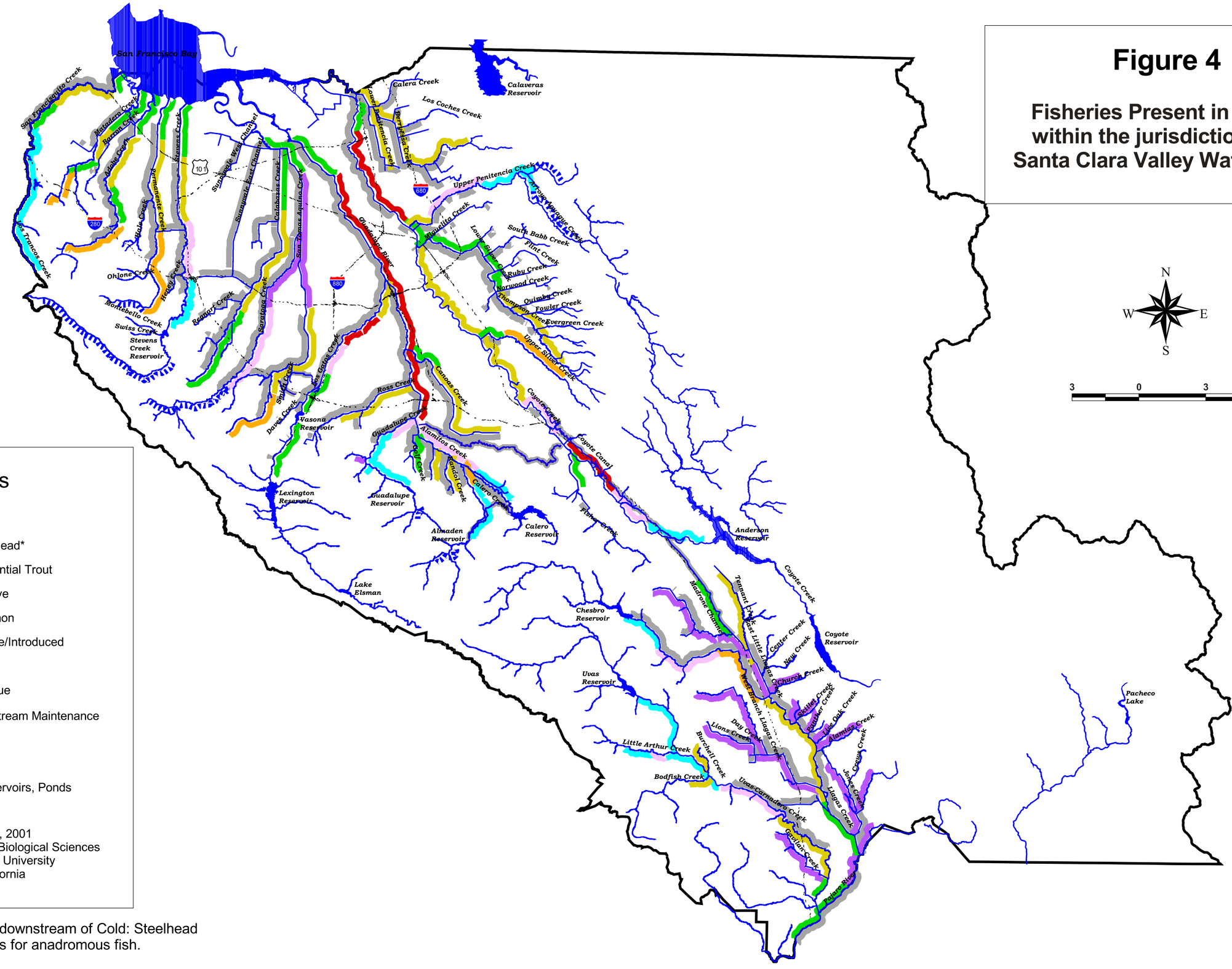
E: Existing Beneficial Use P: Potential Beneficial Use L: Limited Beneficial Use

Water bodies listed here may not correspond exactly to those that appear on Figure 2-7.

APPENDIX C
FISHERIES PRESENT IN STREAMS WITHIN JURISDICTION OF THE SANTA CLARA VALLEY WATER DISTRICT

Figure 4

Fisheries Present in Streams within the jurisdiction of the Santa Clara Valley Water District



Features

- Cold: Trout
- Cold: Steelhead*
- Warm: Potential Trout
- Warm: Native
- Mixed /Salmon
- Mixed Native/Introduced
- Fish Scarce
- No Fish Value
- Proposed Stream Maintenance Work Areas
- Highways
- Lakes, Reservoirs, Ponds

Source: Dr. Jerry Smith, 2001
Department of Biological Sciences
San Jose State University
San Jose, California

*Any stream reaches downstream of Cold: Steelhead are migratory corridors for anadromous fish.

Santa Clara Valley Water District

APPENDIX D
SEDIMENT PROBLEM AREAS

(SCVWD Map original size too large to include in document at this time)

APPENDIX E
WATERSHED IMPERVIOUSNESS OF MAJOR WATERSHEDS IN SANTA CLARA BASIN

Appendix E: Santa Clara Basin Watershed Characteristics Related to Urban Runoff

	Area (acres)[1]	Developed Land Uses[2]		Developed Land Within Riparian Corridor[3]		Impervious Land Within Watershed[4]		Protected Area[5]		Projected Development[6]	
		% of Watershed	Acres	% of Riparian Corridor	Acres	% of Watershed	Acres	% of Watershed	Acres	% Developed Land (2020)	Acres
Sunnyvale East	4,556	97.10	4,430	96.93	158	82.2	3,700	2.6	118	99	4,490
Sunnyvale West	4,857	86.10	4,190	55.27	215	72.4	3,500	5.9	285	90	4,327
Calabazas	13,366	83.90	11,210	92.28	717	69.7	9,300	4.9	653	86	11,420
Matadero/Barron	10,864	80.60	8,750	44.7	531	60.3	6,500	5.7	620	81	8,841
San Tomas	28,681	72.70	20,840	55.68	1,020	60.1	17,200	13.9	3,998	74	21,193
Adobe	7,242	58.30	4,240	57.43	352	44.7	3,200	34.2	2,473	59	4,300
Permanente	11,096	59.40	6,600	40.31	333	43.9	4,900	19.7	2,180	60	6,645
Lower Penitencia	18,279	49.70	9,090	74.75	450	42.9	7,800	8.8	1,606	55	10,042
Guadalupe	108,912	43.20	47,080	23.81	2,139	37.1	40,400	28.2	30,682	45	48,609
Arroyo la Laguna	47,636	40.70	19,420	20.3	1,237	34.9	16,600	30.2	14,392	50	23,133
Stevens	18,686	33.50	6,270	21.93	398	28.6	5,300	35.4	6,619	34	6,353
Baylands	20,965	25.90	5,350	35.61	1,770	25.4	5,200	31.4	6,584	31	6,159
San Francisquito	27,417	34.80	9,570	32.48	619	20.8	5,700	32.1	8,798	41	11,271
Coyote	205,145	12.30	25,370	16.58	2,788	11.1	22,700	28.3	58,031	15	29,037

Notes

[1] Watershed area data is from the Watershed Characteristics Report (February 2001), Table 4-4, p. 4-30

[2] Developed Land Use data is the calculated sum of residential, commercial and industrial values from each of Tables 4-2 (p. 4-28) and Table 4-3 (p. 4-29) of the Watershed Characteristics Report (February 2001)

[3] Developed Land Within the Riparian Corridor data is from the Watershed Characteristics Report (February 2001), Table 4-13, p. 4-94; 4-95

[4] Impervious Land Within Watershed data is from the Watershed Characteristics Report (February 2001), Table 4-10, p. 4-84

[5] Protected Area data fis from the Watershed Characteristics Report (February 2001), Table 4-4, p. 4-30

[6] Projected Development data is the calculated sum of residential, commercial and industrial values for the year 2020 and are taken from the Watershed Characteristics Report (February 2001), Table 4-7, p. 4-43