CHAPTER 3.0

WATERCOURSE AND WETLAND SETBACK ANALYSIS

This chapter describes the evaluation process that was used to rank watercourses and wetlands, which was then used to recommend appropriate development setbacks for each watercourse, consistent with physical features, habitat conditions and land uses. As a result of this evaluation, setback areas are identified and described. Existing watercourse and wetland conditions are then described, and recommended setbacks are presented.

IN THIS SECTION

3.1 SETBACK AND LAND USE ANALYSIS

3.1.1 Existing Setback Requirements

As discussed in Chapter 1.0, the City of Santa Cruz General Plan/LCP guiding riparian and wetland habitat policy (EQ 4.2) seeks to "preserve and enhance the character and quality" of the habitat, and specifies a 100-foot setback from the centerline of all riparian watercourses and from the edge of wetlands. Additionally, all riparian vegetation is included in the setback area, even if it extends beyond 100 feet (Policy EQ 4.2.2).

The locations of the existing 100-foot setback line along mapped watercourses or wetlands within City limits are depicted on the separate aerial maps available at the City Planning Department office and on the City's website under the Planning Department's webpage (www.ci.santa-cruz.ca.us).

Under the current regulations, approximately 1,818 parcels are located within the existing 100-foot setback area. As depicted on aerial maps, the 100-foot setback typically encompasses the majority of riparian vegetation along the watercourses and, in many instances, encompasses areas adjacent to the riparian vegetation where no riparian vegetation is present. These adjacent areas are either undeveloped or developed with residential, commercial or industrial land uses. For some parcels, the 100-foot setback encompasses most of the parcel or even adjacent parcels.

For parcels with wetlands subject to a 100-foot wetland setback, the setback area can encompass undeveloped lands, such as the seasonal wetlands in Moore Creek Preserve. Some of the wetland setbacks, however, such as along Westlake Pond and Neary Lagoon encompass residentially developed areas, City streets and other infrastructure facilities. These parcels have been delineated on the separate aerial maps as areas that may require further biotic review if the proposed development has the potential of impacting existing resources.

3.1.2 Existing and Anticipated Land Use Activities Adjacent to Watercourses and Wetlands

Existing land uses adjacent to watercourses and wetlands were initially determined by a review of land use data supplied by the County of Santa Cruz Assessor's Office. A field reconnaissance was later conducted by city staff to field check existing land uses abutting City watercourses and wetlands. Land use categories that are recorded by the Assessor's Office include:

- Residential (single and multi-family)
- Commercial (retail, services, etc.)
- Industrial
- Institutional (e.g., government buildings, schools, churches, public facilities, UCSC lands, etc.)
- Parks/Open Space (including cemeteries)
- Vacant Land

In residentially zoned areas, residential yards typically abut the riparian woodland edge. While these urban-influenced riparian habitats provide important habitat features as well as aesthetic qualities, their value to riparian-dependent biotic resources is moderated by the close proximity of existing developments. Most of the vacant residential parcels within the City occur as infill parcels (i.e., one or two vacant parcels amid an otherwise developed area) such that only a few residential development projects, with significant riparian linear-foot frontage, are anticipated. The major land use activities anticipated to occur in residentially zoned areas are listed in Table 3-1.

In commercial and industrial zoned areas, parking lots and loading docks typically abut the watercourse or edge of riparian vegetation. In some areas, the watercourse supports only herbaceous vegetation and is confined between industrial or commercial buildings (e.g., portions of lower Arroyo Seco Creek). While most of the vacant commercial and/or industrial parcels occur as infill parcels (i.e., one or two vacant parcels amid an otherwise developed area) there are some large vacant parcels, particularly in the western portion of the City. The major land use activities anticipated to occur in commercial and industrial areas include remodeling and expansion of existing commercial or industrial structures; construction of parking lots, service entrances, loading docks or other paved or impervious surfaces; and lighting and landscaping of front, side and rear of buildings, as listed on Table 3-1. Existing and anticipated land use activities within institutionally zoned areas are expected to be similar to commercial and industrial areas.

Parcels that are zoned parks and open space are expected to have less intensive land use activities adjacent to watercourses and wetlands. The major activities anticipated to occur include construction of recreational or maintenance facilities; construction of trails and overlooks; and construction of playfields, ball fields, and lighted facilities. There are few agricultural zoned parcels adjacent to watercourses and wetlands. The major activities anticipated to occur include row crops and nurseries or uses related to animal activities.

In addition to activities related to land use, public works and infrastructure improvement projects also occur in or adjacent to watercourses and wetlands. The majority of these activities are related to construction or repair of the City's storm drain system (i.e., culvert replacement, repair, cleaning) or to roadway improvements (i.e., street widening, bridge re-construction),

typically conducted by City staff. Table 3-1 lists the major types of public works activities that may occur within and adjacent to the City's watercourses and wetlands.

TABLE 3-1. ANTICIPATED LAND USE ACTIVITIES ADJACENT TO WATERCOURSES & WETLANDS

Land Use and Type of Activity Anticipated
Residential Zoned Parcels
• Remodeling and expansion of existing residential units • Construction of new units and accessory buildings, such as garages and accessory dwelling units • Construction of driveways or other paved or impervious surfaces • Landscaping of front, side and rear yards • Installation and replacement of fences, decks and recreational structures (e.g., gazebos, hot tubs, play structures)
Commercial and Industrial Zoned Parcels
• Remodeling and expansion of existing commercial or industrial structures • Construction of new commercial or industrial units • Construction of parking lots, service entrances, loading docks or other paved or impervious surfaces • Landscaping of front, side and rear of the buildings • Installation and replacement of lighting and fences
Parks and Open Space Zoned Parcels
• Construction of recreational or maintenance facilities • Construction of trails, bridges, overlooks • Construction of playfields, ball fields, lighted facilities • Installation and replacement of fences
Institutionally Zoned Lands (schools, cemetery, public buildings, etc.)
• Remodeling of existing structures • Expansion or construction of new structures • Construction of parking lots, service entrances, loading docks or other paved or impervious surfaces • Landscaping in front, side and rear of building • Construction of recreational or maintenance facilities • Installation and replacement of lighting and fences • Installation or maintenance of cemetery plots
Agricultural Zoned Parcels
• Construction of fences to control animals • Barns and animal pens • Row crops • Nurseries
Public Works Projects / Activities[1] That May Occur Within or Adjacent to Watercourses and Wetlands
• Replacement or repair of existing culverts • Maintenance of storm drains, culverts and emergency repairs • Bridge replacement, repair, or construction • Street improvements, including widening • Construction of new street drains or storm drains • Stream restoration • Marsh and wetland restoration • Construction of pedestrian and bicycle trails • Unearthing underground watercourses • Replacement or repair of utility boxes and utility lines • Replacement or repair of sewer lines • Flood control maintenance • Water production facilities • Vegetation and sediment management • Mosquito and vector control

[1] – projects typically conducted by City Public Works Department, but may be conducted by others

3.1.3 Watercourse and Wetland Ranking and Evaluation

In developing recommendations for setbacks for the *Management Plan*, several factors were evaluated based upon the initial resource inventory described in Chapter 2.0. For each watercourse and wetland, site features were ranked according to the level of the function provided. Where a watercourse was positive for a factor, such as the presence of special status species, that factor was ranked high (and given a numerical value of three). If the watercourse did not provide the feature, the factor was ranked low (and given a numerical value of one). A watercourse factor was scored medium (and given a numerical value of two) if it partially provided a site feature. The rankings were not weighted. The following factors and ranking criteria were used in recommending watercourse classifications and evaluating setbacks for watercourses and wetlands in the *Management Plan*. Table 3-3 at the end of this chapter identifies the rankings given to the features along each of the watercourses and known wetlands within the City.

Factor A - Primary Habitat Ranking: The biological function of the watercourse, based on the type of primary habitat and its continuity to upstream or downstream habitats.

Rankings:

3 – Habitat dominated by native riparian trees and shrubs (or for known wetlands, native wetland plant species); diverse habitat structure present.

2 – Habitat is a mixture of native and non-native plant species; less complex habitat structure of overstory and understory features than in 3, above.

1 – Habitat has low species diversity; herbaceous riparian vegetation is dominant in riparian areas. Habitat may be dominated by invasive, non-native plant species.

Factor B – Special Status Species Ranking: The presence or potential presence of special status species along a watercourse or wetland.

Rankings:

3 – Known presence of special status species, or high potential for presence due to habitat conditions or close proximity of a known occurrence.

2 – Potential presence of special status species due to positive habitat conditions and ability of species to colonize site from known occurrences.

1 – Habitat has low potential for special status species due to lack of suitable habitat.

Factor C – Average Width of Riparian Corridor Ranking: The average width of vegetated area, as measured from centerline of watercourse.

Rankings:

3 – Vegetated corridor is continuous with few gaps; vegetated corridor encompasses full extent of available riparian area (determined as the width of arroyo or channel which has suitable site conditions of riparian or wetland growth).

2 – Corridor is fragmented and narrower than environmental conditions could support.

1 – Corridor is significantly degraded or non-existent (e.g., in culvert).

Factor D – Open Areas and Dispersal Ranking: The opportunity of riparian vegetation to grow outward from its existing area (i.e., expansion of existing tree canopy as trees grow and mature), the presence of an open area between the tree canopy and structures and the ability of the corridor to provide avenues for wildlife dispersal.

Rankings:

3 – Corridor abuts undeveloped lands, enabling movement of animals to and from corridor and adjacent natural areas; open areas occur along the corridor to allow riparian or wetland vegetation to expand outward.

2 – Corridor abuts residential yards and landscaped areas that provide some ability for wildlife to utilize these adjacent areas; some available area for riparian vegetation to expand over time.

1 – Corridor or wetland abuts developed areas and vegetation is confined to narrow channel. Little or no ability for wildlife movement out of active channel or wetland feature.

Factor E – Enhancement and Restoration Potential Ranking: The opportunity for restoration and enhancement of the riparian corridor or wetland features, including unearthing underground segments, removal of invasive, non-native plant species and revegetation of a diverse native riparian or wetland resource.

Rankings:

3 – Corridor is in an open space area or is not confined, such that outward revegetation or restoration of the corridor is feasible (given appropriate site conditions), opportunity to remove invasive, non-native plant species and improve habitat structure occurs on site or restoration of resource feature would provide an important connection to adjacent resources areas.

2 – Corridor is confined by adjacent land uses which limits ability to expand, yet opportunities exist to improve habitat from removal of invasive, non-native plant species; erosion control or biotechnical streambank protection; restoration of resource feature would improve connection to adjacent resources areas or infill existing gaps in corridor; restoration may require land acquisition or easements.

1 – Watercourse is constrained by adjacent developments and there is little room for restoration without significant land acquisition or easements. Limited opportunity for establishment of native riparian (or wetland) resources and little continuity to adjacent resources areas or to infill existing gaps in corridor.

The consultant team proposed development setbacks for each watercourse and wetland based on the ranking of these factors. However, staff had recommended (and was directed by the Planning Commission and City Council in late 2002/early 2003) that Factors C and D be re-evaluated to adequately ensure that the recommended setbacks were appropriate and feasible. Staff utilized aerial photos enlarged to a greater scale (1 inch = 200 feet) than those utilized by the consultant team to accomplish this task as a detailed analysis of existing development had not been previously conducted. A field review of the reach areas followed, visiting as many private properties as possible to gain access to the reach areas since this was not previously conducted in any level of detail. In this manner, the existing average width of the riparian corridor (if any), as well as the average distance between the watercourse/wetland and existing development was better ascertained. This level of review was conducted to ensure that the setbacks recommended by the *Management Plan* would be realistic and feasible, given the location of existing development, as well as meeting General Plan/LCP and *Management Plan* goals. The recommended setbacks for each watercourse and wetland in the City are presented in subsection 3.3 below.

3.2 SETBACK AREAS

In developing recommended setbacks, a *management area*, *riparian corridor*, and *development setback areas* were established for each watercourse reach in the City (see Figure 3-1). Refer to the aerial photos under separate cover for the visual depiction of these areas.

Management Area. The designated ***management area*** is the area adjacent to all watercourses where any development or ground disturbance requires review to determine whether a Watercourse Development Permit is required. The *management area* includes a *riparian corridor*, a *development setback* area, and an additional 25 feet outward from the edge of the *development setback*. . The *management area* was determined based on the topography, resources and urban character of the specific watercourse. The 25 feet outward from the edge of the development setback is intended to provide an adequate area for permit review and be consistent with the *Management Plan* goals and General Plan/LCP policies to maintain or enhance water quality or riparian habitat values.

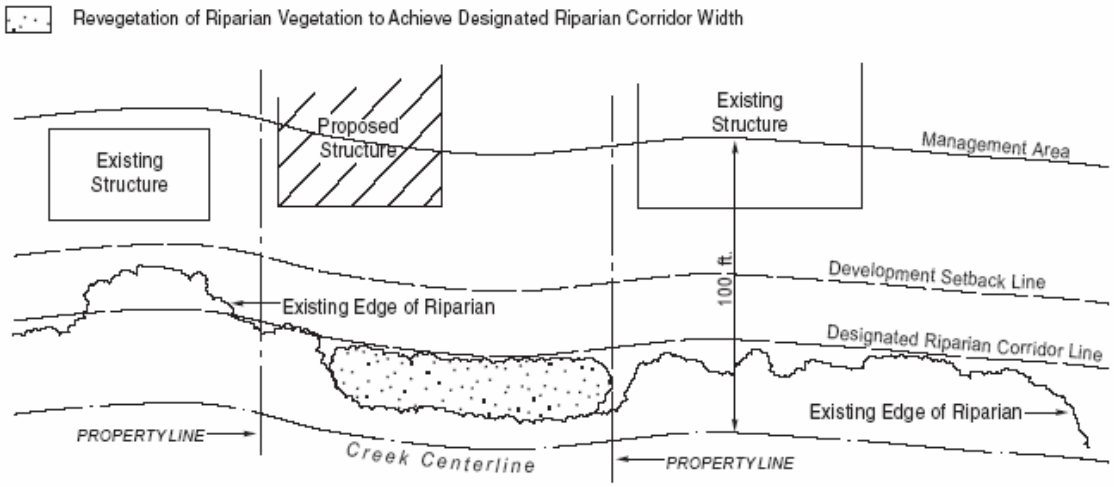
Specific limited activities are allowed within the *riparian corridor* and the *development setback* area as discussed below. New development would be allowed between the *management area* and the *development setback*; certain activities are allowed in the *management area* without a Watercourse Development Permit (discussed in Chapter 4.0).

Riparian Corridor. The ***riparian corridor*** is the width of riparian vegetation and/or immediate watercourse influence area, measured outward from the centerline of the watercourse. The recommended *riparian corridor* is the vegetated corridor that can be created or maintained along a given watercourse (or watercourse reach) taking into account current land uses and locations of existing structures, the existing width of the corridor, the topography of a given creek, and the restoration potential of the site. The *riparian corridor* is intended to provide an adequate riparian width to maintain or enhance habitat and water quality values. A healthy riparian corridor contains the trees and shrubs needed to provide shade, vegetative cover, and insect habitat for the watercourse food web, bank stability, and large woody debris for instream habitat. The complex root structures of woody plants are highly desirable for holding soil in place, and vegetative cover is critical to filter runoff and provide uptake of nutrients and pollutants. The riparian corridor provides area to contain storm water flows and provides a travel corridor and habitat for wildlife in addition to producing shelter and shade.

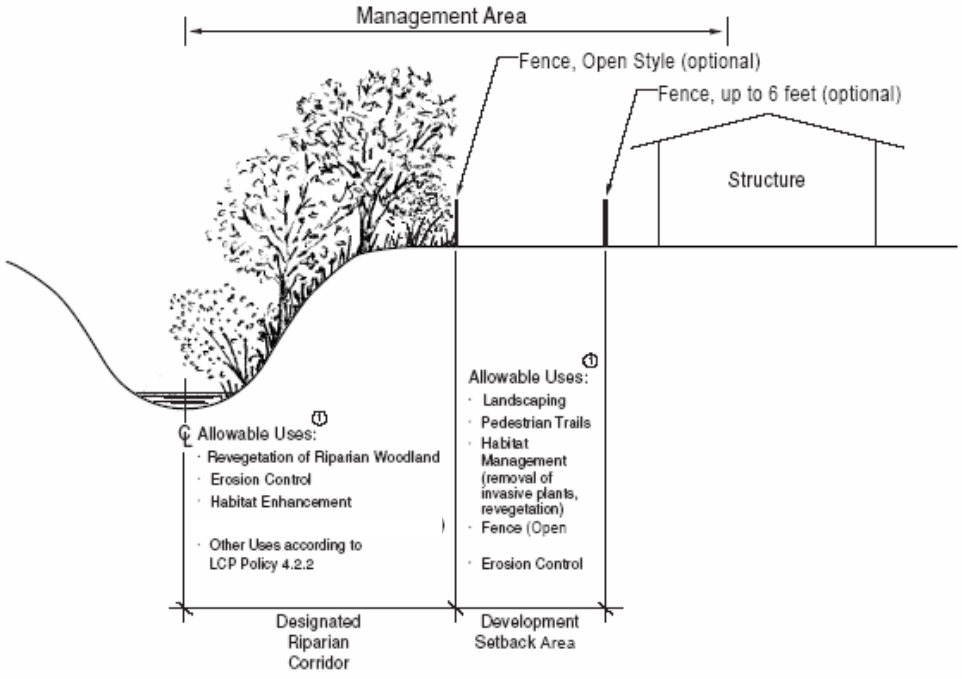
Within the *riparian corridor*, allowable uses are extremely limited. Habitat restoration and enhancement is encouraged (or required in certain instances), as discussed in Chapter 4.0. Development in this area may also be subject to regulatory review and approval by numerous agencies, including the U.S. Army Corps of Engineers, California Department of Fish and Game, Regional Water Quality Control Board, and others.

Development Setback Area. The ***development setback*** area is the area outward from the edge of the designated *riparian corridor* where development is restricted, and is measured from the centerline of the watercourse. The *development setback* width is intended to provide an appropriate water quality and habitat buffer between the *riparian corridor* and development. The width of the *development setback* area was determined to be adequate to maintain or enhance the values of the adjacent riparian and/or wetland habitat (if applicable), and if feasible given the topography and urban character of the specific watercourse (or watercourse reach). This area should consist of appropriate plantings to spread and filter runoff, which may be transporting sediment, nutrients, and pesticides toward the watercourse.

FIGURE 3-1. PROPOSED SETBACK AREAS



PLAN VIEW (Sample Development Plan Layout)



CROSS-SECTION

① See Restrictions in Chapter 4

SOURCE: Biotic Resource Group, 2001

3.3 EXISTING WATERCOURSES & WETLANDS AND RECOMMENDED SETBACKS

The environmental resources along the watercourses and wetlands within each watershed and subwatershed within the City, as well as the recommended setback areas, are described below. Table 3-2 identifies the watercourses and wetlands that are located within the watersheds discussed in this section. Refer to the aerial photos under separate cover for the location of these areas. It should be noted that historical watercourse names were utilized whenever possible. Appendix I provides more detailed information on historical names utilized.

Potential enhancement and/or restoration measures are also described for each watercourse and are summarized on Table 3-4 at the end of this chapter. These measures include planting riparian vegetation and removal of invasive, non-native plant species. Invasive plant species are recommended for removal based on observations during 2000 and 2003 surveys, although other invasive, non-native plant species may also be present that were not detected at the time. Opportunities to enhance wildlife habitat include preserving snags (i.e., dead trees, when they do not pose a public safety hazard) and installing bird and bat nest boxes to improve nesting sites, planting riparian trees and shrubs to improve habitat structure and diversity, maintaining vegetative cover over the water to benefit aquatic resources, and preserving large woody debris in the channel to benefit aquatic resources (including steelhead). In some areas bank erosion repair measures or removal of trash and debris also have been identified.

TABLE 3-2. CITY WATERCOURSES & WETLANDS ADDRESSED IN MANAGEMENT PLAN

Watershed	
San Lorenzo River Watershed	
• San Lorenzo River	• Tick Drainage
• Branciforte Creek	• Arroyo de San Pedro Regaldo
• Carbonera Creek	• Wagner Seep
• Glen Canyon Creek	• Pasatiempo Creek
• Redwood Creek	• Jessie Street Marsh & Jessie Street Channel
• Pogonip Creek / Salz Pond	• Ocean Villa Creek
Arana Gulch Creek Watershed	
• Arana Gulch Creek	
• Hagemann Gulch	
• Woods Creek	
Neary Lagoon Watershed	
• Neary Lagoon	• Chrystal Gulch
• Laurel Creek / Westlake Pond	• Dodero Spring Creek / Kalkar Quarry Spring
• Bay Avenue Creek	• Longview Creek
• Bayona Creek	• Ojos de Agua Creek
Arroyo Seco Watershed	
• Arroyo Seco Creek	
Moore Creek Watershed	
• Moore Creek / Antonelli Pond	
Other Watercourses	
• Natural Bridges Creek	
• Lighthouse Drainage	
• Pilkington Creek	
• Bethany Creek	

3.3.1 San Lorenzo River Watershed

The San Lorenzo River watershed, the largest watershed in the City, drains approximately 138 square miles, starting within the Santa Cruz Mountains, and includes the Branciforte Creek and Carbonera Creek sub-watersheds.

3.3.1.1 San Lorenzo River. This watershed drains much of the central area of Santa Cruz including Pogonip, Harvey West, Pasatiempo, the downtown area, the Ocean Street corridor and Beach Flats. The eastern boundary of this watershed abuts the western boundary of the Arana Gulch watershed. The western boundary trends from north to south from Pogonip and UCSC down along the hill behind the Westlake area, down Chestnut Street towards the wharf, skirting along the northern side of Beach Hill, bisecting Beach Hill at Cliff Street.

Within the City, the San Lorenzo River supports a wide variety of birds, animals and aquatic species. Fishery resources include steelhead trout, which use the lower river as a movement corridor to upstream spawning areas along the San Lorenzo River and Branciforte Creek, and the river's lagoon is used as a nursery for young fish. The San Lorenzo River has been designated by the U.S. Fish and Wildlife Service as critical habitat for steelhead trout. According to the National Marine Fisheries Service (NMFS), the San Lorenzo River supported coho salmon (a state- and federally-listed species) until the drought of 1976-77, although a study conducted in 1981 identified coho salmon in several tributaries in the upper watershed (outside the City). Coho salmon are found south of San Francisco in Waddell Creek, Scott Creek and Vicente Creek (northern Santa Cruz County).Accessible reaches of the San Lorenzo River are included in the critical habitat designation for the specie. Adults have been found in the San Lorenzo River during the last several winters, and limited spawning occurred in 2005. The area adjacent to the San Lorenzo River at Sycamore Grove (San Lorenzo River Upper West) has been identified as potential nesting habitat for the Yellow warbler and Yellow-breasted chat, and portions of the San Lorenzo River as potential habitat for Yuma myotis, Townsend's western big-eared bat, and San Francisco dusky-footed woodrat.

The City portion of the San Lorenzo River watershed includes the leveed lower portion of the river from the river mouth to Highway 1 and an approximate mile upstream from the Highway 1 bridge to the City limits near Sycamore Grove. San Lorenzo River south of Highway 1, identified as the L**ower San Lorenzo River**, supports riparian and wetland vegetation, including herbaceous riparian and mixed riparian habitats (City of Santa Cruz, 2001). The City's 1989 *San Lorenzo River Enhancement Plan* identified the restoration of biological resources on the lower San Lorenzo River including the San Lorenzo Lagoon and Jessie Street Marsh areas. In response to recent flood control improvements and regulatory changes, the City updated this plan through adoption of the *San Lorenzo Urban River Plan* (*Urban River Plan*) in 2003. The *Urban River Plan* provides recommendations for specific public improvements within the river channel and established design guidelines for redevelopment opportunity areas surrounding the river. ***New development proposed along* the lower San Lorenzo River *is subject to the guidelines of the Urban River Plan. Adjacent properties would be reviewed for their conformance to the Urban River Plan. Properties subject to review are delineated by the Management Area, as shown on the aerial maps.***

Lands upstream of Highway 1 are properties that are subject to the guidelines in this *Management Plan*. This area is designated as the **Upper San Lorenzo River**, differentiated by an East Bank Reach and a West Bank Reach. The riparian habitat along the Upper San Lorenzo River is generally considered mixed riparian woodland. Large-sized western sycamores are a

distinguishing habitat feature in Sycamore Grove, located on the west bank of the San Lorenzo River at the north edge of the City limits.

The average width of the existing riparian corridor is approximately 100 feet on the west bank and 120 feet on the east bank, as measured from the centerline of the watercourse. Land uses are primarily industrial and public facilities on the west bank, and residential, agricultural and commercial (cemeteries) on the east bank. Limited opportunities are available for riparian expansion and growth, or wildlife dispersal due to the developed nature of much of the area adjacent to the Upper San Lorenzo River. ***For the* Upper San Lorenzo River*, the Management Plan recommends that at least a 100-foot wide riparian corridor be maintained along the west bank and a 120-foot wide riparian corridor be maintained along the east bank. The recommended development setback is 120 feet on the west bank and 150 feet on the east bank.***

Enhancement and restoration opportunities include the control of invasive, non-native plant species, including observed pampas grass, cape ivy, English ivy and French broom. The existing riparian woodland also offers suitable nesting habitat for riparian dependent wildlife. Opportunities to enhance the habitat for wildlife include preserving snags and installing bird and bat nest boxes to improve nesting sites, planting riparian trees and shrubs to improve habitat structure and diversity, maintaining vegetative cover over the water, preserving large woody debris in the channel, recruitment of large woody debris, and measures to improve spawning/rearing of anadromous fish.

3.3.1.2 Branciforte Creek. Branciforte Creek is a tributary to the San Lorenzo River, entering the River just upstream from the Soquel Avenue bridge. Branciforte Creek flows year-round and is a significant source of summer baseflow for the lower San Lorenzo River. From the City limits, Branciforte Creek drains a mostly redwood-forested watershed, with predominantly rural residential land uses. Approximately 70 percent of the watercourses within the Branciforte Creek subwatershed (which includes its tributaries, Carbonera Creek and Glen Canyon Creek) are comprised of oak riparian woodland. Mixed riparian woodland and non-native riparian woodland are also primary habitats.

Like the San Lorenzo River, Branciforte Creek supports a wide variety of birds, animals and aquatic species, particularly upstream of the channelized reach. Fishery resources include steelhead trout, which use the lower portion of Branciforte Creek as a movement corridor to upstream spawning areas. Monarch butterflies are known to roost along lower Branciforte Creek and potential habitat exists in other portions of the creek (CDFG, 2001a). Potential nesting habitat for the yellow warbler and yellow-breasted chat is also present. In the upper portions of the creek exists potential habitat for several special status mammals, including San Francisco dusky-footed woodrat, Townsend's western big-eared bat, and yuma myotis.

For purposes of the *Management Plan*, Branciforte Creek has been divided into two reaches. **Reach 1** is channelized in an open concrete trapezoidal flood control channel designed and constructed by the U.S. Army Corps of Engineers (ACOE) and maintained by the City. The sides of the channel are vertical and comprised of concrete, and riparian vegetation is not present. To provide flood protection, the channel was designed to operate optimally when there is no sediment or trees.

Reach 1 supports pockets of herbaceous riparian and mixed riparian woodland, which grows within sediment deposits within the modified channel. The extent of vegetation is dependent on

the distribution of sediment deposits in the channel and the duration and frequency of the previous year's winter storm flows. High velocity stream flows during the winter months may scour the channel, removing sediment and vegetation. As stream flows decrease, new sediment deposits occur and riparian vegetation, such as willows and alders, re-colonize the streambed. Remnant riparian woodland occurs on the hillside east of the channelized creek in the Market Street area and between Water Street and Ocean Street, which is thought to have been part of the historic riparian woodland along the creek prior to channelization. The woodland, dominated by coast live oaks, is on slopes greater than 30 percent such that development is prohibited.

In 2003, the average width of the vegetated corridor in Reach 1 was 30 feet, with most vegetation occurring in the bed of the modified channel. Land uses along the creek in these areas are residential and commercial. In many instances, commercial parking areas and residential back yards abut the edge of the channel. A utility road parallels the modified channel in the Market Street area. Due to the channelized nature of Branciforte Creek in Reach 1, coupled with the close proximity of residential and commercial developments, there are currently few opportunities for riparian expansion and growth, or wildlife dispersal. ***For* Branciforte Creek Reach 1, *the Management Plan recommends a 30-foot wide riparian corridor and a development setback of 50 feet.***

Enhancement and restoration opportunities include primarily the control of invasive, non-native plant species, including observed pampas grass, English ivy, acacia and French broom. Opportunities to enhance wildlife habitat include installation of bird and bat nest boxes and maintaining vegetative cover over the water to benefit aquatic resources (including steelhead), if deemed compatible with flood control directives.

Reach 2 begins at the natural channel upstream of the Market Street area and extends upstream to the City limit, and is in a natural condition. Upstream of Highway 1, the creek skirts along the western boundary of DeLaveaga Park. The vegetation is characterized as oak riparian woodland, with coast live oak being the dominant tree species. Some areas are co-dominated by coast redwood. In 2003, the average width of the vegetated corridor in this upper reach was 50 feet with the vegetation occurring along the streambank, and in many areas, intermixed with landscaping occurring in residential backyards. Land uses along this reach of the creek are residential. Evidence of streambank erosion was noted in a few areas, wherein landowners have deposited concrete riprap and other materials on the streambank in an effort to reduce erosion. ***For* Branciforte Creek Reach 2, *the Management Plan recommends a 50-foot wide riparian corridor and a development setback of 70 feet.***

Many areas along Branciforte Creek Reach 2 offer potential areas for riparian growth and wildlife dispersal, as the steep sides of the canyon have precluded development. Enhancement and restoration opportunities throughout this reach include the control of invasive, non-native plant species, including the observed pampas grass, English ivy, cape ivy, periwinkle, acacia and French broom. The woodland also offers suitable nesting habitat for riparian dependent wildlife. Opportunities to enhance wildlife habitat include preserving snags, installing bird and bat nest boxes to improve nesting sites, planting native riparian trees and shrubs to improve habitat structure and diversity, maintaining vegetative cover over the water, preserving large woody debris in the channel, recruitment of large woody debris, and measures to improve spawning/rearing of anadromous fish.

3.3.1.3 Carbonera Creek. Carbonera Creek is the primary tributary to Branciforte Creek, entering just upstream from where Market Street crosses Branciforte Creek. Carbonera Creek flows year-round, though it can dry up in some reaches during drought years (Don Alley, pers. comm., 2001). Upstream from the City of Santa Cruz, Carbonera Creek drains much of the City of Scotts Valley and the mostly redwood-forested areas to the north and east of Scotts Valley.

Carbonera Creek provides potential habitat for several special status species including the San Francisco dusky-footed woodrat, Townsend's western big-eared bat, yuma myotis, and also monarch butterflies in the upper portion of the creek. Potential nesting habitat is also present for the yellow warbler and yellow-breasted chat.

Carbonera Creek is in a natural condition. The vegetation is characterized as mixed riparian, although some areas are co-dominated by coast redwoods and coast live oak. In 2003, the average width of the vegetated corridor was 50 feet (measured outward from the creek centerline) with the vegetation occurring along the streambank, and in some areas, intermixed with landscaping occurring in residential backyards. Land uses along this creek are residential. In some instances, residential back yards abut the edge of the riparian woodland, which limits opportunities for riparian expansion and growth, as well as wildlife dispersal in these areas. Evidence of streambank erosion was also noted in a few areas in the downstream portion of the creek, wherein landowners have deposited concrete riprap and other materials on the streambank in an effort to reduce erosion. ***For Carbonera Creek, the Management Plan recommends a 50-foot wide riparian corridor and a development setback of 70 feet.***

Some areas offer opportunities for streambank erosion repair, coupled with revegetation of native riparian woodland. Other enhancement and restoration opportunities include the control of invasive, non-native plant species, including observed pampas grass, English ivy, cape ivy, periwinkle, acacia and French broom. Many other areas along Carbonera Creek offer areas for riparian growth and wildlife dispersal, as the steep sides of the canyon have precluded development. Opportunities to enhance wildlife habitat for wildlife include preserving snags, installation of bird and bat nest boxes to improve nesting sites, plantings of native riparian trees and shrubs, maintaining vegetative cover over the water, preserving large woody debris in the channel, recruitment of large woody debris, and measures to improve spawning/rearing of anadromous fish.

3.3.1.4 Glen Canyon Creek. Glen Canyon Creek is a tributary to Branciforte Creek, entering east of the Carbonera Drive intersection with Vista Bella Drive in the Carbonera neighborhood. Glen Canyon Creek is in a natural condition. The vegetation is characterized as oak riparian woodland, though some areas are co-dominated by coast redwood. In 2003, the average width of the vegetated corridor was 50 feet. Land uses along this reach of the creek are primarily residential, though at the northern portion of the creek the area is listed as open space. ***For Glen Canyon Creek, the Management Plan recommends a 50-foot wide riparian corridor and a development setback of 70 feet.***

Many areas along Glen Canyon Creek offer areas for riparian growth and wildlife dispersal, as the steep sides of the canyon have precluded development. Throughout this reach, enhancement and restoration opportunities include the control of invasive, non-native plant species, including observed pampas grass, English ivy, cape ivy, periwinkle, acacia and French broom. The woodland also offers suitable nesting habitat for riparian dependent wildlife. Opportunities to enhance wildlife habitat include preserving snags, and installing bird and bat nest boxes, planting native

riparian trees and shrubs, maintaining vegetative cover over the water, and preserving large woody debris in the channel.

3.3.1.5 Redwood Creek. Redwood Creek is a direct tributary to the San Lorenzo River, entering via an underground culvert at the northern end of the City limits off of Highway 9. Redwood Creek drains a small watershed in Pogonip (City lands), which has mostly redwood forest and other natural vegetation cover. In 2003, the average width of the vegetated corridor was 60 feet. ***For* Redwood Creek, *the Management Plan recommends a 60-foot wide riparian corridor and a development setback of 90 feet.***

Opportunities for enhancement and restoration include the control of invasive, non-native plant species, including observed pampas grass, English ivy, cape ivy, periwinkle, acacia and French broom; other invasive, non-native plant species may also be present that were not detected during the 2003 field review. Opportunities to enhance wildlife habitat include preserving snags, and installing bird and bat nest boxes, planting native riparian trees and shrubs, maintaining vegetative cover over the water, and preserving large woody debris in the channel.

3.3.1.6 Pogonip Creek/Salz Pond. Pogonip Creek is a direct tributary to the San Lorenzo River, entering via an underground culvert in the Harvey West industrial area. Pogonip drains a small watershed in Pogonip (City lands), which has mostly redwood forest and other natural vegetation cover. Pogonip Creek has a consistent year-round baseflow due to the presence of springs emanating from the karst formation on the UCSC campus. The riparian vegetation downstream of the Pogonip open space lands is mixed riparian woodland, dominated by willows. This short reach of creek supports a wide variety of birds, animals, and aquatic species. In the 1990s, a commercial development on Pioneer Street established a riparian mitigation area at the junction of Pioneer Street and the railroad tracks, wherein riparian trees and shrubs were established as part of an approved development plan.

Pogonip Creek is a vegetated watercourse as it exits City lands on Pogonip and travels toward the Southern Pacific Railroad (SPRR) tracks near Pioneer Street. Just downstream of the railroad tracks the creek corridor enters Salz Pond, and then is underground until its junction with the San Lorenzo River. For purposes of the *Management Plan*, Reach 1 is the area which is underground, from Salz Pond to the San Lorenzo River. Reach 2 extends from the edge of City property (Pogonip) where it runs between existing farmland and industrial uses to Salz Pond. Reach 3 is the area within City property. Salz Pond has its own designation.

Pogonip **Reach 1** is located underground. It runs from Salz Pond to its exit point into the San Lorenzo River. ***For* Pogonip Creek Reach 1, *the Management Plan does not recommend maintaining a designated riparian corridor width or development setback for this reach since it is located in an underground culvert.***

Reach 2 is bordered by a mix of land uses. The City Corporation Yard is located to the north and east, a cement business to the south, and the SPRR railroad to the west. The riparian vegetation primarily consists of herbaceous plant species, and is constrained by adjacent industrial uses, although the pond was stocked with steelhead in the past. Salz Pond is a privately-owned property located between Reach 1 and 2. ***Adjacent properties and the parcel containing Salz Pond would be required to conduct site-specific review prior to development approval for activities that could impact potential wetland resources. These properties are designated as such on the aerial map pages.***

The average width of the vegetated corridor along Pogonip Creek Reach 2 in 2003 was 40 feet. Land uses along the north side of the creek are residential and agricultural; land uses on the south side of the creek are commercial and industrial. The commercial and industrial land uses abut the edge of the riparian woodland, which limits opportunities for riparian expansion and growth, as well as wildlife dispersal in these areas. ***For* Pogonip Creek Reach 2, *the Management Plan recommends a 40-foot wide riparian corridor and a development setback of 60 feet. A small pond exists on an adjacent residential property, which receives water from this reach. Site-specific review would be required for this property prior to development approval for activities that could impact potential resources.***

In 2003, the average width of the vegetated corridor along **Reach 3** was 70 feet. Since this reach is located on City property, opportunities are available to enhance the creek corridor. ***For* Pogonip Creek Reach 3, *the Management Plan recommends a 70-foot wide riparian corridor and a development setback of 100 feet.***

Opportunities for enhancement and restoration include the control of invasive, non-native plant species, including observed pampas grass, English ivy, cape ivy, periwinkle, acacia and French broom. Opportunities to enhance wildlife habitat include preserving snags, installing bird and bat nest boxes, planting native riparian trees and shrubs, maintaining vegetative cover over the water, and preserving large woody debris in the channel.

3.3.1.7 Tick Drainage. Tick Drainage is a direct tributary to the San Lorenzo River, entering via an underground culvert north of the Harvey West industrial area. Tick Drainage is a small swale located in Pogonip (City lands), which has mostly oak riparian and other natural vegetation cover. The reach originates on City lands east of Golf Club Drive and runs north of residential properties until it crosses the railroad tracks in a culvert, and then runs down under Highway 9 and down to the San Lorenzo River.

The average width of the vegetated corridor along Tick Drainage in 2003 was 5 feet. Land uses along the north side of the creek consists of open space; land uses on the south side of the creek are rural residential and agricultural, which limits opportunities for riparian expansion and growth, as well as wildlife dispersal in these areas. This creek has little value for habitat expansion as it is dry the majority of the year and only runs during major storm events. ***For* Tick Drainage, *the Management Plan recommends a 5-foot wide riparian corridor and a development setback of 10 feet.***

3.3.1.8 Arroyo de San Pedro Regaldo. This watercourse is a direct tributary to the San Lorenzo River entering just north of Highway 1. This drainage has been highly modified throughout the Harvey West area with a significant portion currently contained in culverts or roadside ditches. The headwaters occur within Pogonip, Harvey West Park and Evergreen Cemetery. Springs in the UCSC campus provide a small year-round baseflow to this stream channel. Historically, this creek was used by Mission fathers for pasture irrigation and was named by the Portola expedition of 1769 (Clark, 1986).

For purposes of the *Management Plan,* Arroyo de San Pedro Regaldo has been divided into four reaches. The downstream reach of (**Reach 1**) is a vegetated watercourse from Highway 9 to the outfall along the San Lorenzo River. Riparian vegetation in this reach includes non-native riparian woodland (an eucalyptus grove is located at the corner of Highway 9 and Highway 1) and riparian scrub (young willows and blackberry). In 2003, the average width of the vegetated corridor along Reach 1 was 10 feet. This short reach of creek supports a limited variety of

riparian wildlife due to proximity of Highway 1. The north side of the watercourse abuts industrial land uses; these land uses are directly adjacent to the vegetated watercourse. Due to the confined condition of the watercourse, this reach of Arroyo de San Pedro Regaldo has limited ability to expand or provide wildlife movement outside the active channel. ***For Arroyo de San Pedro Regaldo Reach 1, the Management Plan recommends a 10-foot wide riparian corridor and a development setback of 20 feet.***

Enhancement and restoration opportunities include establishment of mature trees within the riparian scrub, control of industrial drainage entering the watercourse and the control of invasive, non-native plant species. Non-native, invasive plant species observed within the corridor that are recommended for removal include pampas grass and acacia.

Reach 2a starts as a small drainage swale in a parking lot east of Dubois Street and passes through commercial and industrial uses in the Harvey West area to where it goes underground on the west side of Coral Street. The riparian vegetation along this reach is mixed riparian woodland, dominated by willows. A portion of this short reach of creek supports a variety of birds, animals and aquatic species, yet its narrow width and close proximity of adjacent land uses limits its ability to expand or provide wildlife movement outside the active channel. In the 1990s and early 2000s, commercial and residential developments were approved adjacent to the creek with mitigation that required planting riparian vegetation. Riparian plantings have been installed adjacent to the Costco development and adjacent to a residential development on Fern Street. Invasive, non-native plants have also been removed from these areas.

In 2003, the average width of the vegetated corridor along Arroyo de San Pedro Regaldo Reach 2a was 10 feet (measured outward from the creek centerline). Land uses are residential, commercial and industrial; these uses abut the edge of the riparian woodland. ***For Arroyo de San Pedro Regaldo Reach 2a, the Management Plan recommends a 10-foot wide riparian corridor and a development setback of 20 feet.***

Opportunities for enhancement and restoration include the control of invasive, non-native plant species, including observed pampas grass, English ivy, cape ivy, periwinkle, giant reed, acacia and French broom. Despite fences to deter unauthorized human activities within the riparian corridor, inorganic debris, human feces and other human uses were evident during field visits in 2003. These activities are degrading the quality of the riparian corridor for native wildlife and impairing the growth of native vegetation; enhancement opportunities include removal and revegetation of these degrade habitat areas.

Arroyo de San Pedro Regaldo **Reach 2b** runs primarily in an underground culvert from Harvey West Park between the park and Dubois Street, then it turns and runs underground along Sylvania Avenue where it joins Arroyo San Pedro Regaldo Reach 2a. ***For Arroyo de San Pedro Regaldo Reach 2b, the Management Plan does not recommend maintaining a designated riparian corridor width or development setback for this reach since it is almost all located below-ground and functions as a culvert.***

Arroyo de San Pedro Regaldo **Reach 3** drains portions of Pogonip and Harvey West Park and is located entirely on City-owned property. The riparian vegetation in this reach is mixed riparian woodland, interspersed with redwood woodland. In 2003, the average width of the vegetated corridor along Reach 3 was 40 feet. ***For Arroyo de San Pedro Regaldo Reach 3, the Management Plan recommends a 40-foot wide riparian corridor and a development setback of 60 feet.***

This reach has some ability to expand or provide wildlife movement outside the active channel since it is located on City property. Opportunities for enhancement mainly consist of control of invasive, non-native plant species, including observed English ivy and periwinkle.

3.3.1.9 Wagner Seep. Wagner Seep consists of two small separate reaches that drain a portion of Harvey West and the Evergreen Cemetery. **Reach 1** starts near Meadow Court and runs through Harvey West Park a short distance until it goes into an underground culvert before Evergreen Street. **Reach 2** starts near Highland Avenue and runs a short distance through Evergreen Cemetery until it goes into an underground culvert within the cemetery. The riparian vegetation along both reaches is oak riparian interspersed with adjacent redwood forest. In 2003, the average width of the vegetated corridor along both reaches was 50 feet (measured outward from the creek centerline). ***For* Wagner Seep Reach 1 and Reach 2, *the Management Plan recommends a 50-foot wide riparian corridor and a development setback of 70 feet.***

These reaches support a variety of bird and animal species since they connect with adjacent open space lands which provide opportunities for wildlife dispersal. Monarch butterflies have been known to roost in the area near Evergreen Cemetery (CDFG, 2001a). Opportunities for enhancement mainly consist of control of invasive, non-native plant species., including observed English ivy, cape ivy, and periwinkle.

3.3.1.10 Pasatiempo Creek. Pasatiempo Creek is a perennial drainage that drains the area between Highway 17 and the San Lorenzo River, north of Highway 1. The lower part of the drainage consists of culverts and concrete ditch reaches that were constructed during development of the Highway 17 and Highway 1 interchange. The upstream reach consists of a deep, heavily vegetated canyon with residential developments on the adjacent bluffs.

Pasatiempo Creek has been divided into three reaches for purposes of the *Management Plan*. The downstream reaches of Pasatiempo Creek (Reaches 1 and 2) are modified channels. **Reach 1** of Pasatiempo Creek is in an underground culvert. The culvert is located along the lot lines of residential properties between the San Lorenzo River and Ocean Street up to the Hwy 1 on-ramp. ***For* Pasatiempo Creek Reach 1, *the Management Plan does not recommend maintaining a designated riparian corridor or development setback for this watercourse reach since it is located underground.***

Reach 2 is an open, unvegetated concrete-lined channel that traverses the Highway 17 and Highway 1 interchange. There is no riparian vegetation in this reach, and this reach supports a minimal amount of riparian wildlife. Due to the confined condition of the watercourse, this reach of Pasatiempo Creek has very limited ability to expand or provide wildlife movement outside the active channel. The channel offers limited opportunities for enhancement and restoration. ***For* Pasatiempo Creek Reach 2, *the Management Plan does not recommend maintaining a designated riparian corridor or development setback for this watercourse reach since it essentially operates as a culvert.***

Reach 3 is the upstream reach that abuts the City limits. The riparian vegetation in this reach is oak riparian woodland, dominated by coast live oak. This reach of creek supports a wide variety of birds, animals and aquatic species, until it reaches Highway 17 (Reach 2), wherein it becomes a modified channel. In 2003, the average width of the vegetated corridor along the upper reach of Pasatiempo Creek was 80 feet (measured outward from the creek centerline). Land uses along the creek are residential. Due to steep slopes, the residential developments are situated greater than

100-feet from the centerline of the watercourse. ***For* Pasatiempo Creek Reach 3, *the Management Plan recommends a 80-foot wide riparian corridor and a development setback of 100 feet.***

Reach 3 offers wildlife dispersal corridors. Opportunities for enhancement mainly consist of control of invasive, non-native plant species, including observed pampas grass, English ivy, cape ivy, periwinkle, acacia and French broom. Opportunities to enhance wildlife habitat include preserving snags, installing of bird and bat nest boxes to improve nesting sites, planting of native riparian trees and shrubs, maintaining vegetative cover over the water, and preserving large woody debris in the channel.

3.3.1.11 Jessie Street Marsh/Jessie Street Channel. Jessie Street Marsh is located off Jessie Street. The **Jessie Street Channel**, which runs from the San Lorenzo River to its connection to Jessie Street Marsh east of Lemos Avenue, is modified and highly urbanized on the west side. East of the channel are open space lands owned by the City. Jessie Street Channel supports primarily modified vegetation. In 2003, the average width of the vegetated corridor was 10 feet (measured outward from the creek centerline). ***For* Jessie Street Channel, *the Management Plan recommends a 10-foot wide riparian corridor and a development setback of 15 feet.***

Jessie Street Marsh is a small wetland between Jessie Street and the San Lorenzo River upstream from the channel. ***Activities within and adjacent to the marsh are potentially subject to further biotic review to ensure adequate resource protection. The parcels that may require site-specific review have been designated on the aerial maps; however, further review would only be required if because of either the location of the proposed development or the type of development proposed, the development has the potential of impacting the wetland resource.***

3.3.1.12 Ocean Villa Creek. Ocean Villa Creek is a direct tributary to the San Lorenzo River. The watercourse originates near Seabright Avenue and traverses a small canyon to its exit to the San Lorenzo River at East Cliff Drive. This watercourse was named for the property above the creek that was the 1870 home of the Ocean Villa, a hotel and boarding house (Clark, 1986).

Ocean Villa Creek is a vegetated watercourse for most of its length. The riparian vegetation includes non-native riparian woodland (eucalyptus-dominated) in the upstream reach and mixed riparian woodland adjacent to Ocean View Park (dominated by willows). The eucalyptus grove is a potential over-wintering site for the monarch butterfly. This watercourse supports a variety of birds, animals and aquatic species, yet its narrow width and close proximity of adjacent residential land uses limits its ability to expand or provide wildlife movement outside the active channel. In 2003, the average width of the vegetated corridor along Ocean Villa Creek was 50 feet. ***For* Ocean Villa Creek, *the Management Plan recommends a 50-foot wide riparian corridor and a development setback of 70 feet.***

Opportunities for enhancement and restoration include the control of invasive, non-native plant species, where consistent with preservation of the woodland qualities required for the monarch butterfly, including observed pampas grass, English ivy, cape ivy, periwinkle, acacia and French broom. The riparian woodland has been degraded by the deposition of household debris in and adjacent to the riparian corridor, which impairs the habitat quality for wildlife and impairs the growth of native vegetation. Opportunities to remove organic and inorganic debris occur along this creek reach.

3.3.2 Arana Gulch Creek Watershed

The western boundary of this watershed extends from DeLaveaga Park south toward Branciforte and Seabright Avenues and discharges into the Santa Cruz Harbor. The eastern boundary of the watershed is to the east of the City limits (7th Avenue) in the unincorporated community of Live Oak. The watershed drains most of the eastern portion of the City (as well as much of western Live Oak), DeLaveaga Park, Paul Sweet Road and the neighborhoods below DeLaveaga Golf Course. For purposes of the *Management Plan,* the Arana Gulch Creek watershed includes the main stem of Arana Gulch Creek (within the City limits), several tributaries that originate in the DeLaveaga area and tributaries that originate in the Seabright neighborhood and enter into the upper Harbor (refer to the aerial map pages for the location of these watercourses).

3.3.2.1 Arana Gulch Creek. For purposes of the *Management Plan,* Arana Gulch Creek and its separate tributaries under the same name have been divided into 28 reaches. Arana Gulch Creek drains into Monterey Bay via the Santa Cruz Harbor. Its lower watershed is dominated by the City-owned Arana Gulch greenbelt property, where Arana Gulch Creek broadens out into a wetland area (Arana Wetland) before entering the upper Harbor (Arana Harbor). Upstream from the greenbelt property it crosses under Capitola Road and Soquel Avenue and passes by Harbor High School. The upper watershed is mostly residential. Arana Gulch Creek supports one special status species. Steelhead trout use the lower reach of the creek as a movement corridor to upstream spawning areas (spawning occurs outside of City limits). The tidewater goby historically occurred in Woods Lagoon and was last observed in 1984, but not observed in a 2005 survey. Portions of Arana Gulch Creek have potential habitat for monarch butterflies and the yellow-breasted chat, while upper portions of the creek have potential nesting habitat for Cooper's hawk. Potential habitat exists for other special status species including San Francisco dusky-footed woodrat, Townsend's western big-eared bat, and yuma myotis.

The main stem of Arana Gulch Creek supports riparian woodland, dominated by coast live oak. Near the upper harbor and the under-crossing at Highway 1, the creek supports dense stands of non-native riparian woodland (eucalyptus) and mixed riparian woodland (willow dominated). Where tidal inflows from Monterey Bay reach upstream, the creek also supports a salt-brackish water marsh. This marsh is contained within the Arana Gulch City-owned greenbelt property. In this area, Arana Gulch Creek supports a wide variety of birds, animals and aquatic species. The mosaic of marsh vegetation, tall roost trees (eucalyptus) and native oaks provide a diverse habitat structure and diverse food sources for wildlife. Herons have been documented to periodically roost in the eucalyptus trees near the harbor and the mixed riparian woodland may support nesting yellow warblers (Brady LSA, 1999). Surveys for the California red-legged frog have been conducted in the creek, yet none have been detected (Brady LSA, 1999). Upstream of the greenbelt property,, the riparian corridor has been affected by adjacent commercial and residential land uses. Near Soquel Avenue, the creek has been channelized and narrowed for approximately 200 feet. Recently, the riparian area at Harbor High School has been enhanced through the planting of native riparian trees and shrubs. Passage for steelhead through this reach was also improved through an improvement project funded by CDFG and the Coastal Watershed Council. Upstream of Highway 1, Arana Gulch Creek is bound by residential development to the boundary of DeLaveaga Park. Lands adjacent to the creek within DeLaveaga Park are undeveloped.

Portions of the Arana Watershed have either existing or pending management plans. The area where Arana Gulch Creek drains into Monterey Bay at the upper harbor, referred as **Arana Gulch Creek Harbor**, is located within the Santa Cruz Harbor. ***Any development within this area would be subject to the requirements of the Santa Cruz Harbor Development Plan. Properties including and adjacent to Arana Wetland would be required to conduct site-specific review prior to development approval for activities that could impact Arana Wetland's resources.*** These parcels that may require site-specific review have been designated as such on the aerial maps. The lower watershed where Arana Gulch Creek broadens into a wetland, **Arana Wetland**, is located within the Arana Greenbelt, and ***development within or adjacent to Arana Wetland would be subject to the Arana Gulch Management Plan (currently being prepared).***

Upstream of the greenbelt lands, the creek has been channelized and narrowed. Arana Gulch Creek **Reach 1a** (the main branch), runs from the edge of the City's greenbelt near the Capitola Road/Soquel Avenue intersection, behind a commercial strip mall near the intersection, and then crosses under Soquel Avenue east of Carl Avenue where it runs along the south and east side of the Harbor High School campus to Highway 1.

In 2003, the average width of the vegetated corridor along the main stem of Arana Gulch Creek (Reach 1a) was 60 feet. Land uses along this corridor include commercial and residential, as well as public facilities. ***For Arana Gulch Creek Reach 1a, the Management Plan recommends a 60-foot wide riparian corridor and a development setback of 80 feet.***

Opportunities for enhancement and restoration include the control of invasive, non-native plant species, including observed pampas grass, English ivy, cape ivy, periwinkle, acacia and French broom. Opportunities to enhance wildlife habitat include preserving snags, installing bird and bat nest boxes, planting native riparian trees and shrubs, maintaining vegetative cover over the water, and preserving large woody debris in the channel.

Arana Gulch Creek **Reach 1b** is a small tributary to Arana 1a that drains a small residential area west of La Fonda Avenue. Arana Gulch Creek 1b originates at a storm drain and primarily supports non native vegetation. It is a short reach constrained by adjacent residential development. In 2003, the average width of the vegetated corridor along Arana Gulch Creek 1b was 20 feet. ***For Arana Gulch Creek Reach 1b, the Management Plan recommends a 20-foot wide riparian corridor and a development setback of 25 feet.***

Arana Gulch Creek **Reach 1c** is a continuation of the main branch north of Highway 1 where it skirts the eastern City limits boundary adjacent to semi-rural residential development up into DeLaveaga Park. Lands adjacent to the creek within DeLaveaga Park are undeveloped. This main stem reach of Arana Gulch Creek supports riparian woodland, dominated by coast live oak. In 2003, the average width of the vegetated corridor along Arana Gulch Creek 1c was 100 feet. ***For Arana Gulch Creek Reach 1c, the Management Plan recommends a 100-foot wide riparian corridor and a development setback of 130 feet.*** Opportunities to restore and enhance this reach are similar to those described above for Arana Gulch Creek 1a.

Tributaries along the main branch of Arana Gulch Creek include Arana Gulch Creek **Reach 1d, 1e, 1f, 1g, and 1h** which are small watersheds that drain portions of DeLaveaga Park and adjacent residential areas. Arana Gulch Creek 1d is moderately constrained by residential development as it is located in a residential area near the eastern boundary of the City limits to its origination within DeLaveaga Park boundaries. Arana Gulch Creek 1e, 1f, 1g, and 1h are all located within DeLaveaga Park and are therefore unconstrained by development. These

reaches support riparian woodland, dominated by coast live oak. In 2003, the average width of the vegetated corridor along Arana Gulch Creek 1d, 1e, 1f, 1g, and 1h was 40 feet (measured outward from the creek centerline). ***For Arana Gulch Creek Reach 1d, the Management Plan recommends a 40-foot wide riparian corridor and a development setback of 60 feet. For Arana Gulch Creek Reach 1e, 1f, 1g, and 1h, the Management Plan recommends a 55-foot wide riparian corridor and a development setback of 75 feet.***

Arana Gulch **Reach 2** is a very short reach section that is above-ground for one parcel north of Oak Way, goes under the street, and then is above ground for one parcel to Highway 1, where it goes underground until it hooks into the main branch of Arana Gulch Creek. Although the reach supports oak riparian woodland, it is very constrained by residential development and has little habitat value due to its short length. In 2003, the average width of the vegetated corridor along Arana Gulch Creek 2 was 10 feet (measured outward from the creek centerline). ***For Arana Gulch Creek Reach 2, the Management Plan recommends a 10-foot wide riparian corridor and a development setback of 15 feet.***

Arana Gulch Creek **Reach 3a, 3b, 3c, and 3d** is a separate branch that drains a portion of DeLaveaga Park and the Prospect Heights residential neighborhood. This section of the creek originates within DeLaveaga Park within two small canyons west of the water tanks (Arana Gulch Creek 3d), then comes down in two branches on both sides of Prospect Court where it finally joins together near the intersection of Prospect Heights and Morrissey Boulevard (Arana Gulch Creek 3c), where it goes underground until it daylights under several homes north of Holway Drive. The creek goes back underground at Highway 1 (Arana Gulch Creek 3b). The creek daylights again south of Highway 1 where it runs through the Loma Prieta High School site until it goes underground at La Fonda Avenue (Arana Gulch Creek 3a). With the exception of Arana Gulch Creek 3d which is located on City property, these reaches are very constrained by residential development and public facilities. Although there is some habitat value along this branch of Arana, the majority of the existing vegetation consists of non-native or modified vegetation and is constrained by adjacent development. In 2003, the average width of the vegetated corridor along Arana Gulch Creek 3a, 3b, 3c, and 3d ranged from 5 to 40 feet. ***The Management Plan recommends the following setbacks:***

- ***For Arana Gulch Creek Reach 3a, a 20-foot wide riparian corridor and a development setback of 30 feet;***
- ***for Arana Gulch Creek 3b, a 5-foot wide riparian corridor with no additional development setback for structures;***
- ***for Arana Gulch Creek 3c, a 15-foot wide riparian corridor and a development setback of 20 feet; and***
- ***for Arana Gulch Creek 3d, a 55-foot wide riparian corridor and a development setback of 75 feet.***

Arana Gulch Creek **Reach 4a, 4b, 4c, 4d, and 4e,** similar to Arana Gulch Creek 3a-3d, is a separate branch that drains a portion of DeLaveaga Park and the Prospect Heights residential neighborhood. This section of Arana originates within DeLaveaga Park within two small canyons adjacent to and below the golf course driving range (Arana Gulch Creek 4e and 4d) where it comes down in one branch through the Prospect Heights neighborhood, east of Trevethan Avenue (Arana Gulch Creek 4c). Arana Gulch Creek 4b begins at the Park Way/Allerton Street intersection, where the creek interchanges above and below ground along the front and side yards of residential properties, until it goes underground again at Morrissey Boulevard and then under Highway 1. Arana Gulch Creek 4a parallels the south side of Highway 1 until it joins up with

Arana Gulch Creek 3a at the Loma Prieta High School site. Although there is some habitat value along this branch of Arana, the majority of the existing vegetation consists of non-native or modified vegetation and is constrained by adjacent development. In 2003, the average width of the vegetated corridor along Arana Gulch Creek 4a, 4b, 4c, 4d, and 4e ranged from 0 to 40 feet. ***The Management Plan recommends the following setbacks:***

- ***For* Arana Gulch Creek Reach 4a, *a 10-foot wide riparian corridor and a development setback of 15 feet;***
- ***for* Arana Gulch Creek 4b, *no setback is recommended since almost the entirety of this reach is located in a culvert;***
- ***for* Arana Gulch Creek 4c, *a 5-foot wide riparian corridor and a development setback of 10 feet; and***
- ***for* Arana Gulch Creek 4d and 4e, *a 55-foot wide riparian corridor and a development setback of 75 feet.***

Arana Gulch Creek **Reach 5a, 5b, 5c, 5d, and 5e,** similar to Arana Gulch Creek 3a-3d and 4a-e above, is a separate branch that drains a portion of DeLaveaga Park and the Prospect Heights residential neighborhood. This section of Arana originates within DeLaveaga Park within two small canyons west of the driving range (Arana Gulch Creek 5e and 5d) where it comes down in one branch through the Prospect Heights neighborhood, west of Pacheco Avenue (Arana Gulch Creek 5c). Arana Gulch Creek 5b begins at a church property, where the existing church and adjacent residential development constrain the ability for the creek to expand. Arana Gulch Creek 5a begins where the creek goes underground at a church parking lot and it stays in a culvert under the Highway 1/Morrissey Boulevard interchange and then heads east parallel to the south side of Highway 1 where it joins into Arana Gulch Creek 4a. Although there is some habitat value along this branch of Arana, the majority of the existing vegetation consists of non-native or modified vegetation and is constrained by adjacent development. In 2003, the average width of the vegetated corridor along Arana Gulch Creek 5a, 5b, 5c, 5d, and 5e ranged from 0 to 40 feet. ***The Management Plan recommends the following setbacks:***

- ***For* Arana Gulch Creek Reach 5a, *no setback is recommended since the reach is located in a culvert;***
- ***for* Arana Gulch Creek 5b, *a 10-foot wide riparian corridor and a development setback of 15 feet;***
- ***for* Arana Gulch Creek 5c, *a 20-foot wide riparian corridor and a development setback of 30 feet;***
- ***for* Arana Gulch Creek 5d, *a 40-foot wide riparian corridor and a development setback of 60 feet; and***
- ***for* Arana Gulch Creek 5e, *a 55-foot wide riparian corridor and a development setback of 75 feet.***

Arana Gulch Creek **Reach 6a, 6b, and 6c** is a separate branch that drains a portion of DeLaveaga Park and a small portion of the Prospect Heights residential neighborhood. This section of Arana originates within DeLaveaga Park east of the park entrance at Upper Park Road (Arana Gulch Creek 6c). The creek crosses under DeLaveaga Park Road and runs down a gulch between a residential neighborhood east of Carol Avenue (Arana Gulch Creek 6b). The creek then enters a culvert for almost 200 feet and then daylights for less than one parcel (Arana Gulch Creek 6a), where it then goes underground again for the length of the branch. Although there is some habitat value along this branch of Arana, the majority of the existing vegetation consists of non-native or modified vegetation and is greatly constrained by adjacent residential development.

In 2003, the average width of the vegetated corridor along Arana Gulch Creek 6a, 6b, and 6c ranged from 0 to 40 feet. ***The Management Plan recommends the following setbacks:***

- ***For* Arana Gulch Creek Reach 6a, *no setback is recommended since the reach is so short and is essentially an above-ground culvert;***
- ***for* Arana Gulch Creek 6b, *a 20-foot wide riparian corridor and a development setback of 30 feet; and***
- ***for* Arana Gulch Creek 6c, *a 55-foot wide riparian corridor and a development setback of 75 feet.***

The riparian vegetation along these tributaries has some habitat value, but is significantly constrained by existing residential land uses. However, these tributaries are important for terrestrial and aquatic species due to their close proximity to Arana Gulch Creek. The tributaries offer opportunities to enhance wildlife use and provide continuity to habitats within the main stem of Arana Gulch Creek. Within all theses reaches, the riparian habitat offers opportunities for enhancement and restoration, including planting riparian vegetation and removal of invasive, non-native plant species, including observed pampas grass, English ivy, cape ivy, periwinkle, acacia and French broom. Opportunities to enhance wildlife habitat include preserving snags, installing bird and bat nest boxes, planting native riparian trees and shrubs, maintaining vegetative cover over the water, and preserving large woody debris in the channel.

3.3.2.2 Hagemann Gulch. Hagemann Gulch is an intermittent drainage that is a tributary to Arana Gulch Creek; the gulch includes a main stem and a smaller side tributary, all of which empty into the upper harbor. The watercourse drains a residential area as well as the western portion of the Arana Gulch greenbelt property. The watercourse was named for Frederick Hagemann who owned 110 acres in the area in 1870-80s. For the purposes of the *Management Plan*, Hageman Gulch has been divided into two reaches.

The main stem of Hagemann Gulch (**Reach 1**) is a vegetated watercourse that runs from approximately the Agnes Street/Mentel Avenue intersection downstream to behind the Harbor Maintenance Yard (where it goes underground into a culvert that drains into the upper harbor). The riparian vegetation is primarily oak riparian woodland (dominated by coast live oak), yet supports patches of non-native riparian woodland (eucalyptus-dominated). This watercourse supports a variety of birds, animals and aquatic species. Raptors have been documented to periodically nest in the eucalyptus trees in the gulch (City of Santa Cruz, 1999) and potential monarch butterfly habitat exists in the upper portions of the creek. Where the riparian corridor abuts the greenbelt lands, there are opportunities for wildlife movement outside the corridor and into the adjacent natural area. The western side of the gulch is confined by residential development, wherein residential backyards directly abut the corridor.

In 2003, the average width of the vegetated corridor along Reach 1 of Hagemann Gulch was 40 feet. ***For* Hagemann Gulch Reach 1, *the Management Plan recommends a 40-foot wide riparian corridor and a development setback of 60 feet.***

Enhancement and restoration opportunities include the control of invasive, non-native plant species, including observed pampas grass, English ivy, cape ivy, periwinkle, acacia, young eucalyptus trees and French broom.

Reach 2 of Hagemann Gulch is a tributary that is located near Frederick Street along the lot lines of residential properties. Due to the developed nature of the area, the corridor is narrow and significantly confined by existing land uses. In 2003, the average width of the vegetated corridor

along Reach 2 of Hagemann Gulch was 10 feet. ***For* Hagemann Gulch Reach 2, *the Management Plan recommends a 10-foot wide riparian corridor and a development setback of 15 feet.***

This tributary has very limited ability to be expanded to improve riparian habitat values due to the close proximity of existing land uses (residential areas and institutional uses), however, the riparian habitat would benefit from the removal of invasive, non-native plant species. Invasive plant species observed within the corridor that are recommended for removal include pampas grass, English ivy, cape ivy, periwinkle, acacia, young eucalyptus trees and French broom.

Hagemann Gulch Harbor is a reach located in an underground culvert under the Harbor Maintenance Yard that drains into the upper harbor. ***For* Hagemann Gulch Harbor Reach, *the Management Plan does not recommend maintaining a designated riparian corridor or development setback.* Activities within this area would be subject to the Santa Cruz Harbor Development Plan.**

3.3.2.3 Woods Creek. Woods Creek is an intermittent drainage that is a tributary to Arana Gulch Creek. For the purposes of the *Management Plan*, Woods Creek has been divided into two reaches. Woods Creek originates in the Seabright neighborhood south of Windham Street (Woods Creek **Reach 2**) and runs down the back of residential properties via a gulch that widens out southwest of Glenview Street (Woods Creek **Reach 1**) and eventually drains into the upper harbor north of Murray Street (Woods Creek Harbor).

Woods Creek **Reach 2** is a short reach that runs from the south side of Windham Street through several small residential back yards approximately one block to Glenview Street. This reach is very constrained due to existing residential development. In 2003, the average width of the vegetated corridor along Woods Creek Reach 2 was 10 feet. ***For* Woods Creek Reach 2, *the Management Plan recommends a 10-foot wide riparian corridor and a development setback of 15 feet.***

Woods Creek **Reach 1** runs through the back of residential back yards adjacent to Glenview Street and widens out near the Seabright industrial neighborhood until it goes into a culvert near the Murray Street Bridge. This reach is constrained due to existing residential and commercial development. In 2003, the average width of the vegetated corridor along Woods Creek Reach 1 was 20 feet. ***For* Woods Creek Reach 1, *the Management Plan recommends a 20-foot wide riparian corridor and a development setback of 30 feet.***

Woods Creek Harbor is the reach area that drains into the upper harbor. **The *Management Plan* does not recommend maintaining a designated *riparian corridor* or *development setback* for this watercourse reach as it is located within an underground culvert. *Activities within this area would be subject to the Santa Cruz Harbor Development Plan.***

Woods Creek primarily supports non-native vegetation. This tributary to Arana Gulch Creek has very limited ability to be expanded to improve riparian habitat values due to the close proximity of existing land uses (residential and commercial uses), however, the riparian habitat would benefit from the removal of invasive, non-native plant species. Invasive plant species observed within the corridor that are recommended for removal include pampas grass, English ivy, cape ivy, periwinkle, acacia, young eucalyptus trees and French broom.

3.3.3 Neary Lagoon Watershed

Neary Lagoon is fed by Laurel Creek and several smaller drainages and storm drains. A group of springs, emanating from the High Street area on the west side of the City provides a year-round baseflow to the many tributaries of Laurel Creek. Neary Lagoon is one of the lowest points in the City and empties into Monterey Bay near the Municipal Wharf. Its watershed likely drains a portion of UCSC, although this is uncertain because the campus is underlain by numerous limestone caves, caverns and passageways. Thus, most of the surface drainage goes underground in places and comes back out in other places, making the pathways of underground connections difficult to determine. The Neary Lagoon watershed also drains much of the Westlake area, the Mission and King Street corridor, and the California Street area. The watershed's eastern boundary is the same as the western boundary of the San Lorenzo River watershed described previously. The watershed's western boundary roughly parallels the western edge of the UCSC campus and upper Bay Street (to the west), roughly following Bay Street from California Street to the Coast Santa Cruz Hotel (formerly the Dream Inn).

3.3.3.1 Neary Lagoon. Neary Lagoon is a freshwater marsh/wetland that drains into Monterey Bay (near the Wharf) via a pump system operated by the City Public Works Department. It is one of the lowest points in the City, and receives runoff from a significant portion of the City's land area. It is likely the location of a former course of the San Lorenzo River as it meandered across its lower floodplain over the last 10,000 years. The main tributary to Neary Lagoon is the Laurel Creek drainage area, but the lagoon also receives runoff from smaller drainages and storm drains.

Neary Lagoon is an important natural area within the City's urban setting. It provides important habitat for wildlife and is a unique resource for the community. Two federal and state species of special concern have been observed in Neary Lagoon. The tricolored blackbird roosts in the lagoon (D. Laabs, pers. Comm., 2001) and historically nested there, although nesting has not been observed in recent years (S. Gerow, pers. Comm., 2001). Southwestern pond turtles are present in this location. Potential nesting habitat exists for the yellow warbler and yellow-breasted chat.

The lagoon has been encroached upon by residential development, industrial land uses (i.e., wastewater treatment plant), the introduction of invasive, non-native plant and animal species, the receipt of urban runoff and increased public use. The *Neary Lagoon Management Plan* (City of Santa Cruz, 1992) was prepared as both a guide and a directive for managing the 44-acre lagoon area, most of which is wetland, riparian and woodland habitats, to ensure its long-term viability as an ecosystem and its value as a unique resource for the community. Goals, objectives and actions described in the plan are designed with the purpose of preserving and enhancing the lagoon's environmental integrity and quality while satisfying other purposes for public recreation and safety. The *Neary Lagoon Management Plan* guides all aspects of operation, maintenance, protection, improvement and monitoring consistent with these purposes. ***Since Neary Lagoon has an adopted management plan, is not subject to conditions in this Management Plan. Adjacent properties would be required to conduct site-specific review prior to development approval for activities that could impact Neary Lagoon's resources.*** The parcels adjacent to this resource that may require site-specific review have been designated as such on the aerial maps; however, further review would only be required if, because of either the location of the proposed development or the type of development proposed, the development has the potential to impact the resource.

3.3.3.2 Laurel Creek/Westlake Pond. Laurel Creek is the main tributary to Neary Lagoon. It drains a small watershed that includes part of the Mission Street corridor and reaches up into the Westlake district above.

Laurel Creek has been divided into seven reaches for purposes of the *Management Plan*. **Reach 1** is the most downstream reach that abuts Neary Lagoon. In 2003, the average width of the vegetated corridor along this reach of Laurel Creek was 20 feet. Land uses along the creek are residential. Due to steep slopes west of the creek, some of the residential developments are situated greater than 100-feet from the centerline of the watercourse. Although constrained by residential land uses, this reach is an important area for terrestrial and aquatic species due to its close proximity to the lagoon. This reach offers some opportunity to enhance wildlife use and provide continuity to habitats within the lagoon. ***For Laurel Creek Reach 1, the Management Plan recommends a 20-foot wide riparian corridor and a development setback of 30 feet.***

The removal of invasive plant species, coupled with revegetation efforts (with native riparian and wetland plants) would benefit the resources in this reach. Invasive plant species observed within the corridor that are recommended for removal include pampas grass, English ivy, periwinkle and French broom. The City recently implemented a restoration project for a portion of Laurel Creek that abuts this creek reach.

The upstream reaches of Laurel Creek (**Reaches 2, 3, 4, 5, 6 and 7**) are modified channels. Riparian vegetation occurs as disjunct patches or narrows strips along the channel. Landowner-created in-channel ponds were observed in some reaches, as well as documented by the public at the informational meetings. Some landowners have expressed concern on the effects of these in-stream ponds on downstream flooding. Due to the close proximity of residential land uses in these creek reaches, the creek provides only moderate amounts of riparian wildlife habitat. Due to the confined condition of the watercourse, these reaches of Laurel Creek also have very limited ability to expand or provide wildlife movement outside the active channel. In 2003, the average width of the vegetated corridor along these reaches ranged from 0 to 20 feet. ***The Management Plan recommends the following setbacks:***

- ***For Laurel Creek Reach 2,4 and 6, a 10-foot wide riparian corridor and a development setback of 15 feet;***
- ***For Laurel Creek Reach 3 and 7, a 20-foot wide riparian corridor and a development setback of 30 feet; and***
- ***For Laurel Creek Reach 5, no setback is recommended as it is an underground culvert.***

These reaches offer limited opportunities to enhance wildlife use by creating a continuous corridor of riparian vegetation and the removal of invasive, non-native plant species, including observed pampas grass, English ivy, cape ivy, periwinkle, acacia and French broom; other invasive, non-native plant species may also be present that were not detected during the 2003 field review.

Westlake Pond is at the upstream end of Laurel Creek. Historically, the pond was a natural spring, known as Majors Spring. The spring was altered to create a pond that currently covers approximately 2.7 acres. The pond currently supports expanses of turf, with some areas of freshwater marsh and riparian vegetation. In 1989, the City prepared a wildlife use study of the pond, which identified actions for water bird use and management. Southwestern pond turtles have historically been observed in the pond (Habitat Restoration Group, 1989). ***Site-specific review would be required prior to development approval for activities that could***

impact Westlake Pond's resources. All other actions pertaining to Westlake Pond must be consistent with the Westlake Pond Plan. The parcels containing this resource that may require site-specific review have been designated as such on the aerial maps.

3.3.3.3 Bay Avenue Creek. Bay Avenue Creek is a perennial tributary to Neary Lagoon. It drains a small watershed that includes the Bay Street corridor. The majority of the watercourse is situated between the two traffic lanes of Bay Street, between Escalona Drive and High Street. There is a short reach of watercourse immediately downstream of Escalona Drive; the watercourse is then directed into storm drains. For purposes of the *Management Plan*, Bay Avenue Creek has been divided into three reaches.

Reach 1, along Bay Street between Kenneth and Escalona, is a very short reach (three parcels in length) located between the street and residential properties. It is a modified channel surrounded by ornamental landscaping. **Reach 2** is between the traffic lanes above Escalona Drive to Nobel Drive. **Reach 3** is between the traffic lanes above Meder Street, to the intersection of Bay Street and High Street. Bay Avenue Creek Reaches 2 and 3 support mixed riparian woodland. The riparian vegetation also includes non-native tree species that were planted during construction of the Bay Street improvements. A paved, multi-use trail travels the majority of Bay Avenue Creek Reach 2. The creek provides riparian habitat in this area due to the perennial water flow and the presence of mature riparian trees. Its use by wildlife, however, is moderated by the close proximity of roadway traffic along Bay Street. In 2003, the average width of the vegetated corridor along these reaches ranged from 5 to 20 feet (measured outward from the creek centerline). ***The Management Plan recommends the following setbacks:***

- ***For* Bay Avenue Creek Reach 1, *a 5-foot wide riparian corridor and no additional development setback;***
- ***For* Bay Avenue Creek Reach 2, *a 20-foot wide riparian corridor and no a development setback of 30 feet; and***
- ***For* Bay Avenue Creek Reach 3, *a 5-foot wide riparian corridor and a development setback of 10 feet.***

Reach 2 is the area that has some habitat potential, though moderated by its location adjacent to Bay Street. Reach 2 offers opportunities to enhance wildlife use by the removal of invasive, non-native plant species and diversifying the understory habitat. Invasive plant species observed within the corridor that are recommended for removal include English ivy, cape ivy, acacia and French broom .

3.3.3.4 Bayona Creek. Bayona Creek is a large swale that runs from the south side of Bayona Drive through residential backyards in a small canyon until the topography flattens out and the creek goes into an underground culvert near Escalona Drive. Bayona Creek primarily supports non-native riparian woodland. In 2003, the average width of the vegetated corridor was 20 feet. Due to the close proximity of residential land uses and the short length of the creek, there is minimal area for expansion of riparian vegetation or wildlife dispersal areas. ***For* Bayona Creek, *the Management Plan recommends a 20-foot wide riparian corridor and a development setback of 30 feet.***

3.3.3.5 Chrystal Gulch. Chrystal Gulch is a small swale located between Mission Street and Walnut Avenue. The gulch is in the Mission Hill area near the end of Pine Place. The gulch was named for Dr. James Christal who arrived in Santa Cruz in 1870s; the land was subdivided in 1941 and mistakenly named Chrystal Terrace.

Drainage from Chrystal Gulch enters City storm drains, which may eventually empty into Laurel Creek. The creek is intermittent and supports a dense growth of willows (mixed riparian woodland). In 2003, the average width of the vegetated corridor was 10 feet. Due to the close proximity of residential land uses, there is minimal area for riparian woodland expansion or wildlife dispersal areas. ***For* Chrystal Gulch, *the Management Plan recommends a 10-foot wide riparian corridor and a development setback of 15 feet.***

There are limited opportunities to enhance this reach, including maintenance of a minimum corridor width, planting of native trees and shrubs in degraded areas and removal of invasive non-native plant species, including observed English ivy.

3.3.3.6 Dodero Spring Creek/Kalkar Quarry Spring. Dodero Spring Creek is a perennial watercourse that originates at Kalkar Quarry Spring near the boundary of the UCSC campus. The creek was named as part of the *Management Plan* based on Tres Ojos de Agua, several springs located in the western section of the City.

Dodero Spring Creek traverses through residential lots in the Spring Street area. In many instances, the watercourse has been either modified, into a narrow channel supporting herbaceous riparian vegetation, or enlarged into residential ponds. Drainage from Dodero Spring Creek enters City storm drains near Mission Street and eventually empties into Laurel Creek. For purposes of the *Management Plan*, the watercourse has been divided into six reaches. The lower reaches of the watercourse (**Reaches 1a and 1b**) have been significantly narrowed and are modified channels. The watercourse supports patches of mixed riparian woodland and oak riparian woodland; however, the vegetation is not continuous along the length of the channel. Some modified channels have been altered by landowners into in-stream landscape ponds; other areas are planted with non-native landscaping. In 2003, the average width of the vegetated corridor along these reaches ranged from 5 feet for Reach 1a to 0 for Reach 1b, which is located in a culvert (measured outward from the creek centerline). T***he Management Plan recommends the following setbacks:***

- ***For* Dodero Spring Creek Reach 1a, *a 5-foot wide riparian corridor and a development setback of 10 feet;***
- ***For* Dodero Spring Creek Reach 1b, *no setbacks are recommended as this reach is located in a culvert.***

Reach 1a offers opportunities for enhancement, including maintenance of a minimum corridor width, planting of native trees and shrubs in degraded areas, removing invasive non-native plant species and management of in-channel ponds. Invasive plant species observed include pampas grass, English ivy, periwinkle, acacia and French broom.

The upper reaches of the watercourse (**Reaches 2, 3, 4, and 5**) support mixed riparian woodland, characterized by a dense growth of willows. In 2003, the average width of the vegetated corridor ranged from 10 feet (Reaches 3 and 5) to 25 feet (Reaches 2 and 4) (measured outward from the creek centerline). Due to the close proximity of residential land uses, however, there is minimal area for riparian woodland expansion or upland wildlife dispersal areas. ***The Management Plan recommends the following setbacks:***

- ***For* Dodero Spring Creek Reach 2 and 4, *a 25-foot wide riparian corridor and a development setback of 30 feet; and***

- ***For* Dodero Spring Creek Reach 3 and 5, *a 10-foot wide riparian corridor and a development setback of 15 feet.***

These reaches offer limited opportunities to enhance wildlife use by creating a continuous corridor of riparian vegetation and removal of invasive, non-native plant species, including observed pampas grass, periwinkle, acacia and French broom.

Several **small ponds** exist on adjacent residential properties, which receive water from Dodero Spring Creek. ***Site-specific review would be required for these properties prior to development approval for activities that could impact potential resources.*** The parcels adjacent to these resources that may require site-specific review have been designated as such on the aerial maps; however, further review would only be required if, because of either the location of the proposed development or the type of development proposed, the development has the potential to impact the resource.

Dodero Spring Creek originates at **Kalkar Quarry Spring** near the boundary of the UCSC campus south of Coolidge Drive. Kalkar Quarry was the site of former limestone quarrying operations, which ceased in 1970. The quarry is spring-fed, but UCSC campus lands also drain through a swale into the quarry. Due to the history of the site for quarry operations, the vegetation in this area is disturbed and supports primarily modified vegetation, though there are also areas of freshwater marsh. ***The Management Plan recommends that site-specific review be required prior to development approval for activities that could impact Kalkar Quarry Spring resources.*** Parcels adjacent to this resource that may require site-specific review have been designated as such on the aerial maps; however, further review would only be required if, because of either the location of the proposed development or the type of development proposed, the development has the potential to impact the resource.

3.3.3.7 Longview Creek. Longview Creek is a perennial watercourse that gets at least a portion of its water from an underground culvert at Dodero Creek. For purposes of the *Management Plan*, Longview Creek has been divided into two reaches. Longview Creek **Reach 1a** runs from the south side of High Street through residential yards until it runs back underground at the intersection of Dodero Street and Hollywood Avenue. Longview Creek **Reach 1b** is a very short reach that runs along a residential property in an above-ground pipe that drains into a cement trough. Longview Creek primarily supports modified vegetation and is very constrained by existing adjacent residential development. In 2003, the average width of the vegetated corridor of Longview Creek 1a was 5 feet, measured outward from the creek centerline. Due to the close proximity of residential land uses and the relatively short length of this reach, there is minimal area for expansion of riparian vegetation or upland wildlife dispersal areas. No setback is recommended for Longview Creek 1b as it is located in an aboveground culvert.

The Management Plan recommends the following setbacks:

- ***For* Longview Creek 1a, *a 5-foot wide riparian corridor and a development setback of 10 feet; and***
- ***For* Longview Creek 1b, *no setback is recommended as this reach is located in an above-ground culvert.***

A **small pond** exists on an adjacent residential property which receives water from Longview Creek 1a. ***Site-specific review would be required for this property prior to development approval for activities that could impact potential resources.*** The parcel adjacent to this

resource that may require site-specific review has been designated as such on the aerial maps; however, further review would only be required if, because of either the location of the proposed development or the type of development proposed, the development has the potential to impact the resource.

3.3.3.8 Ojos de Agua Creek. Ojos de Agua Creek is a perennial watercourse that originates from Church Spring near the intersection of High Street and Spring Street. Church Spring was one of the springs that made up the Tres Ojos de Agua. For purposes of the *Management Plan*, Ojos de Agua has been divided into four reaches. Ojos de Agua Creek traverses through residential lots in the Spring Street area and joins Dodero Creek near King Street. Throughout its length, the channel has been modified, either into a narrow drainage supporting herbaceous riparian vegetation, small ponds or a culvert. Drainage from Ojos de Agua Creek enters City storm drains near Mission Street and eventually empties into Laurel Creek. In 2003, the average width of the vegetated corridor ranged from 5 feet to zero (measured outward from the creek centerline). Due to the close proximity of residential land uses, there is minimal area for expansion of riparian vegetation or upland wildlife dispersal areas. ***The Management Plan recommends the following setbacks:***

- ***For* Ojos de Agua Creek Reaches 1 and 3, *a 5-foot wide riparian corridor and a development setback of 10 feet;***
- ***For* Ojos de Agua Creek Reach 2, *no setback is recommended as this reach is located in a culvert; and***
- ***For* Ojos de Agua Creek Reach 4, *no setback is recommended as this reach is located in an open culvert.***

Reaches 1 and 3 offer limited opportunities to enhance wildlife use by creating a minimum corridor width, planting native trees and shrubs in degraded areas, removing invasive non-native plant species and managing in-channel ponds. Invasive plant species observed include pampas grass, English ivy, periwinkle, acacia and French broom.

3.3.4 Arroyo Seco Watershed

A portion of the westside of the City is drained by Arroyo Seco Creek and several other small creeks. The watershed includes small drainages and storm drains in a mostly residential area. The watershed's eastern boundary abuts the western boundary of the Neary Lagoon watershed, described previously. The watershed's western boundary roughly follows Western Drive to Mission Street, and then travels to the coast reaching Monterey Bay near Natural Bridges State Park.

3.3.4.1 Arroyo Seco Creek. Arroyo Seco Creek is a westside watercourse that originates in springs on the UCSC campus and traverses down the marine terraces. The creek roughly parallels Western Drive to the east, traversing the westside industrial area, Derby Park, then going underground until its outfall adjacent to West Cliff Drive between Sacramento and Auburn Avenues. It drains to Monterey Bay via a culvert pipe. The upper segments of Arroyo Seco Creek have year-round flow with the lower segments becoming intermittent, with water held in deeper pools throughout the year. Twelve reaches have been identified for Arroyo Seco and its tributaries.

Arroyo Seco Creek enters the City limits from the UCSC campus from a culvert located south of High Street where it comes above-ground and parallels residential development from High Street to Meder Street. **Reach 10b** is a short channelized segment with modified vegetation

where the creek first daylights. **Reach 10a** supports a dense stand of mixed riparian vegetation but is constrained by residential development to the east. In 2003, the average width of the vegetated corridor of Arroyo Seco Reach 10b was 5 feet and 20 feet along Reach 10a. ***The Management Plan recommends the following setbacks:***

- ***For Arroyo Seco Creek 10a, a 20-foot wide riparian corridor and a development setback of 30 feet; and***
- ***For Arroyo Seco Creek 10b, a 5-foot wide riparian corridor and a development setback of 10 feet.***

The main stem of Arroyo Seco Creek (**Reach 5**), runs from the south side of Meder Street to roughly west of Escalona Drive, and supports mixed riparian woodland, dominated by willows and coast live oak. Near Meder Street, the creek supports dense stands of non-native riparian woodland (eucalyptus). The woodland occurs along the creek and on the side slopes of the arroyo. In the absence of eucalyptus trees, the side slopes of the arroyo support riparian scrub and coastal scrub vegetation. Within the arroyo between Meder Street and Escalona Drive, the main stem (Reach 5) and side tributaries (Reaches 6, 7, 8, 9a, and 9b) support a wide variety of birds, animals and aquatic species. The presence of tall roost trees (eucalyptus) and native oaks provide a diverse habitat structure and diverse food sources for wildlife. Monarch butterflies have been documented to over-winter in the eucalyptus trees near Meder Street and the mixed riparian woodland may support nesting yellow warblers.

In 2003, the average width of the vegetated corridor along the main stem of Arroyo Seco Creek (Reach 5) was 60 feet. Land uses along the creek are residential; the majority of these land uses are situated 100 feet or more from the watercourse due to the natural terrain of the arroyo (i.e., presence of steep, undeveloped slopes). ***For Arroyo Seco Creek Reach 5, the Management Plan recommends a 60-foot wide riparian corridor and a development setback of 100 feet.***

The small tributaries to Arroyo Seco Creek also have vegetated riparian corridors (**Reaches 6, 7, 8, 9a, and 9b**). The riparian vegetation along these tributaries ranges from 5 to 40 feet. Land uses along these tributaries are primarily residential. Several of the tributaries support mixed riparian woodland (Reaches 6, 7, and 8) with riparian scrub and coastal scrub vegetation on the slopes, while others (Reaches 8, 9a, and 9b) non-native riparian woodland (eucalyptus) and some modified non-native vegetation. In 2003, the average width of the vegetated corridor for these reaches were as follows (measured outward from the creek centerline): Reaches 6, 7, and 8 were 40 feet, Reach 9a was 20 feet, and Reach 9b was 5 feet. ***The Management Plan recommends the following setbacks:***

- ***For Arroyo Seco Creek Reaches 6, 7, 8, a 40-foot wide riparian corridor and a development setback of 60 feet;***
- ***For Arroyo Seco Creek Reaches 9a, a 20-foot wide riparian corridor and a development setback of 50 feet; and***
- ***For Arroyo Seco Creek 9b, a 5-foot wide riparian corridor and a development setback of 10 feet.***

Downstream of Escalona Drive in **Reach 4**, the riparian corridor has been affected by adjacent land uses. The creek has been encroached upon by residential land uses and is channelized where it traverses through commercial and industrial lands south of Mission Street. **Reach 3** traverses the Lipton Property; which was recently restored and revegetated. Reach 3a is located in the coastal zone, and Reach 3b is located outside the coastal zone. **Reach 2** occurs downstream of Delaware Avenue. The creek is confined by existing industrial land uses; but has recently been enhanced with

vegetation of native riparian plantings. In 2003, the average width of the vegetated corridor was 15 feet for Reach 4, 50 feet for Reach 3, and 15 feet for Reach 2. ***The Management Plan recommends the following setbacks:***

- ***For Arroyo Seco Creek Reach 4, a 15-foot wide riparian corridor and a development setback of 20 feet;***
- ***For Arroyo Seco Creek Reach 3, a 30-foot wide riparian corridor and a development setback of 80 feet; and***
- ***For Arroyo Seco Creek Reach 2, a 15-foot wide riparian corridor and a development setback of 20 feet.***

Reach 1 of Arroyo Seco Creek traverses next to Derby Park, going underground until its outfall adjacent to West Cliff Drive, between Sacramento and Auburn Avenues. It drains to Monterey Bay via a culvert pipe. ***For Arroyo Seco Creek Reach 1, the Management Plan does not recommend maintaining a designated riparian corridor or development setback since it is located in a culvert.***

This majority of reaches along Arroyo Seco Creek offer opportunities to enhance wildlife use by creating a continuous corridor of riparian vegetation and the removal of invasive, non-native plant species, including observed pampas grass, English ivy, periwinkle, young eucalyptus, acacia and French broom. Enhancement and restoration opportunities include the control of invasive, non-native plant species, including observed pampas grass, cape ivy, English ivy and French broom. Several major utility lines traverse a portion of the main branch (Reach 5); the maintenance road is used as an informal pathway. Pet access was observed during the 2003 surveys; the riparian and wetland resources would benefit from a pet litter clean-up program.

3.3.5 Moore Creek Watershed

The Moore Creek watershed drains the far-western portion of the City. It is the most undisturbed of the City's watersheds and consists of mostly undeveloped land. The watercourse was named for Eli Moore, who owned a ranch in the area in 1840s. The watershed's eastern boundary abuts the western boundary of the Arroyo Seco watershed, as described previously. The western boundary of the Moore Creek watershed roughly parallels the City's western limits. A portion of the Moore Creek watershed is situated in the City-owned Moore Creek Preserve.

3.3.5.1 Moore Creek. Moore Creek drains into Monterey Bay at Natural Bridges State Park. The creek flows year-round. The lower portion of the creek is tidally influenced, wherein a salt and brackish water marsh is formed in Natural Bridges State Park. (Development within Natural Bridges State Park would be subject to the *Natural Bridges State Park General Plan*). Upstream of Delaware Avenue, the creek flows through Antonelli Pond, a man-made pond. Upstream of the pond, Moore Creek is a natural channel that drains a mostly grassland and oak woodland-forested watershed, with predominantly rural residential land uses.

Moore Creek supports a wide variety of birds, animals and aquatic species. Fishery resources may include tidewater goby (in the tidal areas in Natural Bridges State Park) as well as native non-game fish and non-native fish in Antonelli Pond. Moore Creek, including Antonelli Pond, is a known habitat for the California red-legged frog, a federally-listed species (Bulger, 2000) and southwestern pond turtles (CDFG, 2001). Cooper's hawks have been known to nest along Moore Creek, and white-tailed kites have been known to nest in lower Moore Creek within Natural Bridges State Park (S. Gerow, pers. comm., 2001). Potential white-tailed kite habitat exists along

other portions of Moore Creek. Monarch butterflies have been known to roost north of Highway 1 (CDFG, 2001a). In addition, the San Francisco popcorn flower, a state-listed endangered species and federal species of special concern, has known occurrences in the Moore Creek watershed from Moore Creek Preserve and other areas near Meder Street (Biotic Resources Group, 2001).

For purposes of the *Management Plan,* Moore Creek has been divided into five reaches. The lowermost reaches (**Reach 1** and **Antonelli Pond**) support pockets of herbaceous riparian and mixed riparian woodland, which grows within sediment deposits and along the edges of Antonelli Pond. In 2003, the average width of the vegetated corridor in this lower reach (Reach 1) was 100 feet (measured outward from the creek centerline). ***There are several adjacent parcels with potential wetland habitat (including Antonelli Pond, which is discussed below) that would be required to conduct site-specific review prior to development approval for activities that could impact potential resources.*** These parcels that may require site-specific review have been designated on the aerial maps.

The upstream reaches of Moore Creek (**Reaches 2, 3, 4, and 5**) and tributaries support oak riparian woodland averaging 70 feet to 100 feet in width (measured outward from the creek centerline). ***One parcel adjacent to Moore Creek 3 contains a small wetland. Activities within and adjacent to the wetland that may require site-specific review have been designated on the aerial maps; however, further review would only be required if, because of either the location of the proposed development or the type of development proposed, the development has the potential of impacting the resource.*** Reaches 2 and 4 also support wide riparian corridors, averaging 100 feet. Reach 5 of Moore Creek is narrower, with an average width of 70 feet. Due to the low level of development and the open space qualities of the area, Moore Creek provides excellent opportunities for riparian expansion and growth, as well as wildlife dispersal. ***The Management Plan recommends the following setbacks:***

- ***For Moore Creek Reaches 1 and 3, a 100-foot wide riparian corridor and a development setback of 130 feet;***
- ***For Moore Creek Reaches 2 and 4, a 100-foot wide riparian corridor and a development setback of 150 feet; and***
- ***For Moore Creek Reach 5, a 70-foot wide riparian corridor and a development setback of 100 feet.***

The Moore Creek corridor provides excellent opportunities for wildlife dispersal. The riparian habitat offers opportunities for enhancement and restoration, including the removal of invasive, non-native plant species. Invasive plant species observed within the corridor that are recommended for removal include pampas grass, English ivy, periwinkle, young eucalyptus and French broom.

3.3.5.2 Antonelli Pond. This pond was created by the artificial impoundment of Moore Creek directly north of Delaware Avenue. Although its origins are man-made, **Antonelli Pond** is now an important bird and wildlife habitat area, with red-legged frogs, southwestern pond turtles, and tricolored blackbirds historically known to occur, although nesting tricolored blackbirds have not been observed in recent years (S. Gerow, pers. Comm., 2001). Potential nesting habitat is present for the yellow warbler and yellow-breasted chat. ***The parcel containing Antonelli Pond and adjacent properties would be required to conduct site-specific review prior to development approval for activities that could impact potential resources.***

3.3.6 Other Watercourses

3.3.6.1 Natural Bridges Creek. Natural Bridges Creek is an intermittent creek that drains into Monterey Bay at Natural Bridges State Park. The lower portion of the creek supports non-native woodland (eucalyptus) that is an over-wintering site for the monarch butterfly, a city of Santa Cruz locally unique species, within Natural Bridges State Park. The California red-legged frog, a federally-listed species, is known to occur in the marsh at Natural Bridges (CDFG, 2001). Along with Younger Lagoon, the pond at Natural Bridges provides the best potential breeding habitat for red-legged frogs in the City. Southwestern pond turtles, a state species of special concern, have also been known to occur and potentially breed in this pond (CDFG, 2001). ***For Natural Bridges Creek, the Management Plan recommends a 80-foot wide riparian corridor and a development setback of 100 feet. All development activities would be required to be consistent with the Natural Bridges State Park General Plan.***

Enhancement and restoration opportunities include maintaining a minimum corridor width, planting native trees and shrubs in degraded areas and removing invasive non-native plant species, including observed pampas grass and French broom.

Riparian vegetation exists north of the corner of Delaware and Natural Brides Drive, north of Natural Bridges Creek. Site-specific review would be required for this parcel prior to development approval for activities that could impact any potential riparian resource. This parcel has been designated as such on the aerial maps.

3.3.6.2 Lighthouse Drainage. This drainage is located in Lighthouse Field State Beach. No setbacks are recommended for this watercourse as a management plan was previously adopted for this area in 1984. ***Development would be required to be consistent with the adopted management plan for Lighthouse Field.*** Refer to Appendix H for a discussion on the existing management plan for this drainage (*Lighthouse Field State Beach General Plan*).

3.3.6.3 Pilkington Creek. Pilkington Creek is an intermittent creek that drains onto Twin Lakes State Beach (near Seabright Avenue and the Natural History Museum). The watercourse flows through a gulch from roughly Seabright Avenue and Woods Street to Monterey Bay, entering at the foot of Mott Avenue. The creek was named for an early landowner, Thomas Pilkington, who came to Santa Cruz in 1853. This creek has also been known as Remington Gulch (Clark, 1986).

For purposes of the *Management Plan*, this creek has been divided into two reaches. **Reach 1**, which is located on City property adjacent to the Museum of Natural History, supports an average vegetated corridor width of 30 feet. This portion of the creek supports non-native woodland (eucalyptus and Monterey cypress). Monarch butterflies have been known to roost in this area (CDFG, 2001a). ***For Pilkington Creek Reach 1, the Management Plan recommends a 30-foot wide riparian corridor and a development setback of 40 feet.***

Reach 2 is the upstream reach of Pilkington, which is located from Forbes Street to roughly Seabright Avenue near Woods Street. The riparian corridor along this reach is severely confined by activities associated with adjacent residential development. In 2003, the average width of the vegetated corridor along Pilkington Creek Reach 2 was 10 feet. Due to the close proximity of residential land uses, there is minimal area for riparian woodland expansion or wildlife dispersal areas. ***For Pilkington Creek Reach 2, the Management Plan recommends a 10-foot wide riparian corridor and a development setback of 15 feet.***

The creek offers limited opportunities to enhance wildlife use by maintaining a minimum corridor width, planting native trees and shrubs in degraded areas and removing invasive non-native plant species, Including observed pampas grass, English ivy, periwinkle, young eucalyptus, acacia and French broom.

3.3.6.4 Bethany Creek. Bethany Creek drains into Monterey Bay near the intersection of West Cliff Drive and Woodrow Avenue. The creek was named, for purposes of the *Management Plan,* for the nearby roadway. For purposes of the *Management Plan*, Bethany Creek was divided into two reaches. Bethany Creek **Reach 1** extends from West Cliff Drive up to Delaware Avenue. This reach is perennial and supports non-native woodland comprised of planted landscape trees, shrubs and turf grasses. A multi-use trail travels along the watercourse. This creek provides some riparian habitat due to the perennial water flow and the presence of mature riparian trees. Its use by wildlife, however, is moderated by the close proximity of residential land uses and roadway traffic. In 2003, the average width of the vegetated corridor along this watercourse was 20 feet (measured outward from the creek centerline). ***For* Bethany Creek Reach 1, *the Management Plan recommends a 20-foot wide riparian corridor and a development setback of 30 feet.*** This reach offers opportunities to enhance wildlife use through the diversification of the overstory and understory habitat.

Reach 2 is a short reach that extends approximately five parcels directly through side and rear residential yards between Seaside Avenue and Pendegast Avenue before going back into a culvert to Reach 1. This creek provides little to no habitat value due to the lack of vegetation, the close proximity of residential land uses, and the extremely short reach distance. In 2003, the average width of the vegetated corridor along this reach was 5 feet (measured outward from the creek centerline). ***For* Bethany Creek Reach 2, *the Management Plan recommends a 50-foot wide riparian corridor and no development setback.***

TABLE 3-3. ANALYSIS OF WATERCOURSE AND WETLAND FACTORS

		Factor A	Factor B	Factor C	Factor D	Factor E		
Watercourse Name	Reach	Primary Habitat Type (1-3)	Special Status Species (1-3)	Aver. Riparian Width (feet) (1-3)	Open Areas For Expansion & Dispersal (1-3)	Enhancement & Restoration (1-3)	Total Ranking (A-E)	Reach Characteristics/Comments
Antonelli Pond		MR (2)	RLF (3)	100 (2)	3	3	13	• High restoration enhancement and known presence of RLF require greater setbacks • Potential impacts from adjacent development
Arana Gulch Creek	1a	MC (1) OR (3)	ST (3)	60 (2)	2	2	11	• Known presence of ST requires protection • Constrained by adjacent commercial and residential development
Arana Gulch Creek	1b	NNW (2)	1	20 (2)	2	2	9	• Constrained by adj. residential development • Primarily carries storm flow • Shorter reach • Originates from storm drain
Arana Gulch Creek	1c	OR (3)	ST, R potential (3)	100 (3)	3	3	15	• Known presence of ST requires protection • Not really constrained by adjacent development • Greater buffer recommended because of limited surrounding development
Arana Gulch Creek	1d	OR (3)	R (2)	40 (3)	2	2	12	• Moderately constrained by adjacent residential development • Smaller watershed (Seasonal) • Small tributary to west branch
Arana Gulch Creek	1e	OR (3)	R (2)	40 (3)	3	3	14	• Not constrained by adjacent residential development • Smaller watershed (Seasonal) • Small tributary to west branch
Arana Gulch Creek	1f	OR (3)	R (2)	40 (2)	3	2	12	• Corridor is degraded due to presence of gun and archery range • Smaller watershed (Seasonal) • Small tributary to west branch
Arana Gulch Creek	1g	OR (3)	R (2)	40 (3)	3	3	14	• Not constrained by adj. residential development • Smaller watershed (Seasonal) • Small tributary to west branch

Rankings: see Section 3.1.3; 3= high; 2=moderate; 1=low

Primary Habitat Codes: HR = Herbaceous Riparian and Wetlands; MR = Mixed Riparian Woodland; OR = Oak Riparian Woodland; NNW = Non-native Riparian Woodland; MC = Modified Channel; RS = Riparian Scrub

Special Status Species Codes: ST = Steelhead; MB = Monarch Butterfly Over-wintering Habitat; RLF = California Red-legged Frog; R= Raptor Nesting Habitat; SWPT = Southwestern Pond Turtle; TG = Tidewater Goby

TABLE 3-3. ANALYSIS OF WATERCOURSE AND WETLAND FACTORS

		Factor A	Factor B	Factor C	Factor D	Factor E		
Watercourse Name	Reach	Primary Habitat Type (1-3)	Special Status Species (1-3)	Aver. Riparian Width (feet) (1-3)	Open Areas For Expansion & Dispersal (1-3)	Enhancement & Restoration (1-3)	Total Ranking (A-E)	Reach Characteristics/Comments
Arana Gulch Creek	1h	OR (3)	R (2)	40 (3)	3	3	14	• Not constrained by adj. residential development • Smaller watershed (Seasonal) • Small tributary to west branch
Arana Gulch Creek	2	OR (2)	1	10 (2)	1	1	7	• Shorter reach (one parcel) with culverts at both ends • Constrained by adjacent residential development • Primarily carries storm flow (Seasonal)
Arana Gulch Creek	3a	NNW (1)	1	20 (2)	2	2	8	• Shorter reach • Primarily carries storm flow (Seasonal)
Arana Gulch Creek	3b	MC (1)	1	5 (1)	1	1	5	• Shorter reach (three parcels) • Smaller watershed (Seasonal) • Constrained by adjacent residential development • Flows through center of lots and under several existing homes
Arana Gulch Creek	3c	OR (2)	1	15 (2)	2	2	9	• Smaller watershed (Seasonal) • Constrained by adjacent residential development • Small tributary
Arana Gulch Creek	3d	NNW (1)	R (2)	40 (2)	2	2	9	• Not constrained by adjacent development • Smaller watershed (Seasonal) • Small tributaries
Arana Gulch Creek	4a	NNW (2)	1	10 (1)	1	2	7	• Constrained by adjacent residential development and Hwy 1 • Shorter reach with culverts on each end
Arana Gulch Creek	4b	MC (1)	1	0 (1)	1	1	5	• Shorter reach (less than two parcels) with culverts on each end • Serves as an open culvert
Arana Gulch Creek	4c	MC (1) NNW (1)	1	5 (1)	1	2	6	• Shorter reach with several sections in culverts • Constrained by adjacent residential development and right-of-ways
Arana Gulch Creek	4d	NNW (2)	R (2)	40 (2)	2	2	10	• Not constrained by adjacent development
Arana Gulch Creek	4e	NNW (2)	R (2)	40 (2)	2	2	10	• Not constrained by adjacent development
Arana Gulch Creek	5a	MC (1)	1	0 (1)	1	1	5	• Entire reach is in a culvert

Rankings: see Section 3.1.3; 3= high; 2=moderate; 1=low

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TABLE 3-3. ANALYSIS OF WATERCOURSE AND WETLAND FACTORS

		Factor A	Factor B	Factor C	Factor D	Factor E		
Watercourse Name	**Reach**	**Primary Habitat Type (1-3)**	**Special Status Species (1-3)**	**Aver. Riparian Width (feet) (1-3)**	**Open Areas For Expansion & Dispersal (1-3)**	**Enhancement & Restoration (1-3)**	**Total Ranking (A-E)**	**Reach Characteristics/Comments**
Arana Gulch Creek	5b	MC (1)	1	10 (1)	1	1	*5*	• Shorter reach with a section in a culvert • Constrained by adjacent residential and commercial development
Arana Gulch Creek	5c	NNW (1)	1	20 (2)	2	2	8	• Smaller watershed (Seasonal) • Moderately constrained by adjacent residential development
Arana Gulch Creek	5d	NNW (1)	R (2)	40 (2)	2	2	10	• Not constrained by adjacent development • Smaller watershed (Seasonal)
Arana Gulch Creek	5e	NNW (1)	R (2)	40 (2)	2	2	10	• Not constrained by adjacent development • Smaller watershed (Seasonal)
Arana Gulch Creek	6a	MC (1)	1	0 (1)	1	1	*5*	• Shorter reach (approx. one parcel) with culverts on either end • Serves as an open culvert
Arana Gulch Creek	6b	NNW (2)	R (2)	20 (2)	2	2	10	• Moderately constrained by adjacent residential development • Smaller watershed (Seasonal)
Arana Gulch Creek	6c	NNW (2)	R (2)	40 (2)	2	2	10	• Not constrained by adjacent development • Smaller watershed (Seasonal)
Arana Gulch Creek Harbor	Subject to the Santa Cruz Harbor Development Plan							
Arana Wetland	Subject to Arana Gulch Master Plan requirement and within original jurisdiction of California Coastal Commission							
Arroyo de San Pedro Regaldo	1	MR (2) HR (1)	1	10 (1)	1	1	*5.5*	• Constrained by adjacent commercial development & Hwy 1 • Smaller watershed (Seasonal)
Arroyo de San Pedro Regaldo	2a	MC (1)	1	10 (1)	1	1	*5.5*	• Constrained by adjacent commercial development • Smaller watershed (Seasonal)
Arroyo de San Pedro Regaldo	2b	MC (1)	1	0 (1)	1	1	*5*	• Shorter reach with culverts on each end • Essentially serves as an open culvert
Arroyo de San Pedro Regaldo	3	MR (3)	2	40 (3)	3	3	14	• Smaller watershed (Seasonal) • Relatively unconstrained by adjacent development
Arroyo Seco	1	MC (1)	1	0 (1)	1	1	*5*	• Entire reach is in a culvert
Arroyo Seco	2	MC (1)	1	15 (2)	1	2	*7*	• Constrained by adjacent commercial development
Arroyo Seco	3	MR (3)	1	50 (2)	2	2	10	• Restored channel
Arroyo Seco	4	MR (2) MC (1)	1	15 (2)	1	2	*7.5*	• Constrained by adjacent residential and commercial development

Rankings: see Section 3.1.3; 3= high; 2=moderate; 1=low

Primary Habitat Codes: HR = Herbaceous Riparian and Wetlands; MR = Mixed Riparian Woodland; OR = Oak Riparian Woodland; NNW = Non-native Riparian Woodland; MC = Modified Channel; RS = Riparian Scrub

Special Status Species Codes: ST = Steelhead; MB = Monarch Butterfly Over-wintering Habitat; RLF = California Red-legged Frog; R= Raptor Nesting Habitat; SWPT = Southwestern Pond Turtle; TG = Tidewater Goby

TABLE 3-3. ANALYSIS OF WATERCOURSE AND WETLAND FACTORS

		Factor A	Factor B	Factor C	Factor D	Factor E		
Watercourse Name	Reach	Primary Habitat Type (1-3)	Special Status Species (1-3)	Aver. Riparian Width (feet) (1-3)	Open Areas For Expansion & Dispersal (1-3)	Enhancement & Restoration (1-3)	Total Ranking (A-E)	Reach Characteristics/Comments
Arroyo Seco	5	NNW (2) MR (2)	MB, R (2)	60 (2)	3	3	12	• Not constrained by adj. residential development except at bottom of reach and by the adjacent access road
Arroyo Seco	6	MR (3)	R (2)	40 (3)	3	3	14	• Not constrained by adjacent residential development • Smaller watershed (Seasonal)
Arroyo Seco	7	MR (2)	R (2)	40 (2)	3	3	12	• Not constrained by adjacent residential development • Smaller watershed (Seasonal)
Arroyo Seco	8	NNW (2) MR (2)	R (2)	40 (2)	3	3	12	• Not constrained by adjacent residential development • Smaller watershed (Seasonal)
Arroyo Seco	9a	NNW (2)	R, MB (2)	20 (2)	2	3	11	• Partially restored branch • Smaller branch (Seasonal)
Arroyo Seco	9b	MC (1)	1	5 (1)	1	1	5	• Shorter reach (less then one parcel) • Primarily carries stormflow
Arroyo Seco	10a	MR (3)	R (2)	20 (2)	2	2	11	• Eastern side constrained by adjacent residential development
Arroyo Seco	10b	MC (1)	1	5 (1)	1	1	5	• Shorter reach (less than one parcel) • Essentially serves as an open culvert
Bay Ave. Creek	1	MC (1)	1	5 (1)	1	1	5	• Shorter reach (approx. three parcels) with culverts on each end • Essentially serves as an open culvert
Bay Ave. Creek	2	MR (2)	1	20 (1)	2	2	8	• Constrained by adjacent development (Bay Ave.) • Culverts at each end
Bay Ave. Creek	3	MC (1)	1	5 (1)	1	1	5	• Constrained by adjacent development (Bay Ave.) • Culverts at each end
Bayona Creek		NNW (2)	1	20 (3)	2	2	10	• Smaller watershed (Seasonal) • Shorter reach with culverts at either end
Bethany Creek	1	NNW (1)	1	20 (2)	2	2	8	• Smaller watershed (Seasonal) • Entire reach interspersed with culverts • Primarily consists of landscape plantings with a parallel public pathway

Rankings: see Section 3.1.3; 3= high; 2=moderate; 1=low

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TABLE 3-3. ANALYSIS OF WATERCOURSE AND WETLAND FACTORS

		Factor A	Factor B	Factor C	Factor D	Factor E		
Watercourse Name	Reach	Primary Habitat Type (1-3)	Special Status Species (1-3)	Aver. Riparian Width (feet) (1-3)	Open Areas For Expansion & Dispersal (1-3)	Enhancement & Restoration (1-3)	Total Ranking (A-E)	Reach Characteristics/Comments
Bethany Creek	2	MC (1)	1	5 (1)	1	1	5	• Shorter reach with culverts on either side that flows intermittently through residential yards • Essentially serves as an open culvert
Branciforte Creek	1	MC (1)	ST, MB (3)	30 (1)	1	1	7	• Known presence of ST and MB requires protection • Open concrete flood control channel
Branciforte Creek	2	MR (3)	ST (3)	50 (2)	2	2	12	• Known presence of ST requires protection • Moderately constrained by adjacent residential development
Carbonera Creek		MR (3)	ST (3)	50 (2)	2	2	12	• Known presence of ST requires protection • Moderately constrained by adjacent residential development
Chrystal Gulch		MR (1)	1	10 (1)	1	2	6	• Shorter reach with culverts at either end, very limited segment in steep canyon before it goes into culvert • Smaller watershed (Seasonal)
Dodero Spring Creek	1a	MC (1)	1	5 (1)	1	2	6	• Constrained by adjacent residential development • Smaller watershed (spring-fed) • Culverts at each end
Dodero Spring Creek	1b	MC (1)	1	0 (1)	1	1	5	• Shorter reach (less than one parcel) that acts as an open culvert with culverts at each end
Dodero Spring Creek	2	MC (1) MR (2)	1	25 (2)	2	2	8.5	• Smaller watershed (spring-fed) • Moderately constrained by adjacent residential development
Dodero Spring Creek	3	MC (1) MR (2)	1	10 (2)	2	2	8.5	• Smaller watershed (spring-fed) • Constrained by adjacent residential development • Areas adjacent to ponding water may require site-specific biotic review
Dodero Spring Creek	4	MC (1) MR (2)	1	25 (2)	2	2	8.5	• Relatively constrained by adjacent residential development
Dodero Spring Creek	5	MC (1)	1	10 (2)	2	2	8	• Shorter reach located in a wood box culvert • Constrained by adj. residential development • Areas adjacent to ponding water may require site-specific biotic review

Rankings: see Section 3.1.3; 3= high; 2=moderate; 1=low

Primary Habitat Codes: HR = Herbaceous Riparian and Wetlands; MR = Mixed Riparian Woodland; OR = Oak Riparian Woodland; NNW = Non-native Riparian Woodland; MC = Modified Channel; RS = Riparian Scrub

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TABLE 3-3. ANALYSIS OF WATERCOURSE AND WETLAND FACTORS

		Factor A	Factor B	Factor C	Factor D	Factor E		
Watercourse Name	**Reach**	**Primary Habitat Type (1-3)**	**Special Status Species (1-3)**	**Aver. Riparian Width (feet) (1-3)**	**Open Areas For Expansion & Dispersal (1-3)**	**Enhancement & Restoration (1-3)**	**Total Ranking (A-E)**	**Reach Characteristics/Comments**
Glen Canyon Creek		OR (3)	ST (3)	50 (3)	3	3	15	• Known presence of ST requires protection • Moderately constrained by adjacent residential development • Shorter reach (approx. two parcels)
Hagemann Gulch	1	OR (3)	R (2)	40 (3)	2	3	13	• Moderately constrained by adjacent residential development on western side • Smaller watershed (Seasonal)
Hagemann Gulch	2	NNW (1) MC (1)	1	10 (1)	1	2	6	• Constrained by adjacent residential and commercial development • Smaller watershed; primarily carries stream flow
Jessie Street Channel		MC(1)	1	10 (1)	2	2	7	• Setback requirements to be updated when Jessie Street Marsh Plan is completed
Jessie Street Marsh		HR (2)	1	N/A (2)	2	2	9	
Kalkar Quarry Spring		MC (2)	1	N/A (2)	2	2	9	• Western side is constrained by adjacent residential development
Laurel Creek	1	MR (2)	SWPT (2)	20 (2)	2	2	10	• Impacted by adj. residential development on eastern side • Corridor restored in 2002 • Reach ends where existing corridor narrows
Laurel Creek	2	MC (1)	1	10 (1)	1	2	6	• Constrained by adjacent residential development
Laurel Creek	3	MC (1)	1	20 (2)	1	2	7	• Moderately constrained by adjacent residential development
Laurel Creek	4	MC (1)	1	10 (2)	1	2	7	• Constrained by adjacent residential development
Laurel Creek	5	MC (1)	1	0 (1)	1	1	5	• Entire reach is in a culvert
Laurel Creek	6	MC (1)	1	10 (1)	1	2	6	• Constrained by adjacent residential development • Reach is interspersed with culverts
Laurel Creek	7	MR (2)	1	20 (2)	2	2	9	• Moderately constrained by adjacent residential development
Lighthouse Drainage	Subject to Lighthouse Field State Beach General Plan (1984)							

Rankings: see Section 3.1.3; 3= high; 2=moderate; 1=low

Primary Habitat Codes: HR = Herbaceous Riparian and Wetlands; MR = Mixed Riparian Woodland; OR = Oak Riparian Woodland; NNW = Non-native Riparian Woodland; MC = Modified Channel; RS = Riparian Scrub

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		Factor A	Factor B	Factor C	Factor D	Factor E		
Watercourse Name	**Reach**	**Primary Habitat Type (1-3)**	**Special Status Species (1-3)**	**Aver. Riparian Width (feet) (1-3)**	**Open Areas For Expansion & Dispersal (1-3)**	**Enhancement & Restoration (1-3)**	**Total Ranking (A-E)**	**Reach Characteristics/Comments**
Longview Creek	1a	MC (1)	1	5 (1)	1	1	5	• Constrained by adjacent residential development and right-of-ways • Culverts at each end
Longview Creek	1b	MC (1)	1	0 (1)	1	1	5	• Reach is in an open concrete culvert • Shorter reach
Moore Creek	1	MR, HR (3)	RLF (3), SWPT, TG (2)	100 (3)	3	3	14.5	• Known presence of special status species requires protection • Subject to Natural Bridges State Park General Plan • Not constrained by adjacent development
Moore Creek	2	NNW (1) OR (3)	RLF & R (3), MB (2)	100 (3)	3	3	14	• Known presence of special status species requires protection • Not constrained by adjacent development
Moore Creek	3	NNW (1) OR (3)	RLF (3)	100 (3)	2	2	12	• Known presence of special status species requires protection • Relatively unconstrained by adjacent residential development
Moore Creek	4	OR (3)	R, RLF (3)	100 (3)	3	3	15	• Known presence of special status species requires protection • Not constrained by adjacent development
Moore Creek	5	OR (3)	R, RLF (2)	70 (3)	3	3	14	• Relatively unconstrained by adjacent residential development
Natural Bridges Creek		MR, HR (3)	RLF (3), SWPT, TG (2)	80 (3)	3	3	14.5	• Subject to Natural Bridges State Park General Plan • Known presence of special status species requires protection • Not constrained by adjacent development
Neary Lagoon	Subject to Neary Lagoon Management Plan.							
Ocean Villa Creek		NNW (2)	MB (2)	50 (2)	2	2	10	• Potential presence of special status species requires protection
Ojos de Agua	1	MC (1)	1	5 (1)	1	2	6	• Constrained by adjacent residential development • Smaller watershed (spring-fed) • Culverts at either end
Ojos de Agua	2	MC (1)	1	0 (1)	1	1	5	• Entire reach is in a culvert
Ojos de Agua	3	MC (1)	1	5 (1)	1	2	6	• Constrained by adjacent residential development • Smaller watershed (spring-fed) • Culvert at bottom end
Pasatiempo	1	MC (1)	1	0 (1)	1	1	5	• Almost entire reach is within a culvert. A small portion is located in a concrete open culvert

Rankings: see Section 3.1.3; 3= high; 2=moderate; 1=low

Primary Habitat Codes: HR = Herbaceous Riparian and Wetlands; MR = Mixed Riparian Woodland; OR = Oak Riparian Woodland; NNW = Non-native Riparian Woodland; MC = Modified Channel; RS = Riparian Scrub

Special Status Species Codes: ST = Steelhead; MB = Monarch Butterfly Over-wintering Habitat; RLF = California Red-legged Frog; R= Raptor Nesting Habitat; SWPT = Southwestern Pond Turtle; TG = Tidewater Goby

TABLE 3-3. ANALYSIS OF WATERCOURSE AND WETLAND FACTORS

		Factor A	Factor B	Factor C	Factor D	Factor E		
Watercourse Name	**Reach**	**Primary Habitat Type (1-3)**	**Special Status Species (1-3)**	**Aver. Riparian Width (feet) (1-3)**	**Open Areas For Expansion & Dispersal (1-3)**	**Enhancement & Restoration (1-3)**	**Total Ranking (A-E)**	**Reach Characteristics/Comments**
Pasatiempo Creek	2	MC (1)	1	0 (1)	1	1	5	• Concrete-lined V ditch and culverts within CALTRANS right-of-way
Pasatiempo Creek	3	OR (3)	R (2)	80 (3)	3	3	14	• Not constrained by adjacent residential development
Pilkington Creek	1	NNW (2)	MB (2)	30 (2)	2	2	10	• Even though a shorter reach, section is relatively unconstrained by adjacent development
Pilkington Creek	2	NNW, MR (1)	MB (2)	10 (2)	1	2	8	• Constrained by adjacent residential development
Pogonip Creek	1	MC (1)	ST (3)	0 (1)	1	1	7	• Entire reach is located in a culvert • Known location of special status species
Pogonip Creek	2	MR (2)	R (2)	40 (2)	3	3	12	• Moderately constrained by adjacent commercial development on the south side
Pogonip Creek	3	MR (3)	R (2)	70 (3)	3	3	14	• Unconstrained by adjacent development
Redwood Creek		MR(2)	R(2)	60(2)	2	2	10	• Moderately constrained by right-of-way at one end • Culvert at one end
Salz Pond		MC (2)	ST (3)	N/A (2)	2	2	11	• Severely constrained by adjacent heavy industrial uses • Known presence of special status species requires protection
San Lorenzo River	Lower	Subject to San Lorenzo Urban River Plan						• Setback is from toe of outer levee slope. • Parcels on east bank near the river mouth subject to bluff setbacks.
San Lorenzo River	Upper east bank	MR (3)	ST (3) coho (2)	120 (3)	3	3	15	• Relatively unconstrained by adjacent development • Known presence of special status species requires protection
San Lorenzo River	Upper west bank	MR (3)	ST (3) coho (2)	100 (3)	3	3	15	• Moderately constrained by adjacent commercial and industrial uses • Known presence of special status species requires protection
Tick Drainage		OR (2)	1	5 (1)	2	1	7	• Carries water only during storm events • Moderately constrained by adjacent development
Wagner Seep	1	OR (3)	R (2)	50 (3)	3	3	14	• Not constrained by adjacent development
Wagner Seep	2	OR (3)	R (2)	50 (3)	3	3	14	• Not constrained by adjacent development
Westlake Pond		MC (1)	1	0 (1)	2	2	7	• Moderately constrained by adjacent right-of-ways

Rankings: see Section 3.1.3; 3= high; 2=moderate; 1=low

Primary Habitat Codes: HR = Herbaceous Riparian and Wetlands; MR = Mixed Riparian Woodland; OR = Oak Riparian Woodland; NNW = Non-native Riparian Woodland; MC = Modified Channel; RS = Riparian Scrub

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TABLE 3-3. ANALYSIS OF WATERCOURSE AND WETLAND FACTORS

		Factor A	Factor B	Factor C	Factor D	Factor E		
Watercourse Name	Reach	Primary Habitat Type (1-3)	Special Status Species (1-3)	Aver. Riparian Width (feet) (1-3)	Open Areas For Expansion & Dispersal (1-3)	Enhancement & Restoration (1-3)	Total Ranking (A-E)	Reach Characteristics/Comments
Woods Creek	1	NNW (2)	R (2)	20 (2)	2	2	10	• Moderately constrained by adjacent residential development • Smaller watershed (Seasonal)
Woods Creek	2	NNW (2)	R (2)	10 (2)	1	2	9	• Constrained by adjacent residential development • Smaller watershed (Seasonal)
Woods Creek	Harbor	Subject to the Santa Cruz Harbor Development Plan						

Source: Biotic Resources Group, 2002

Rankings: see Section 3.1.3; 3= high; 2=moderate; 1=low

Primary Habitat Codes: HR = Herbaceous Riparian and Wetlands; MR = Mixed Riparian Woodland; OR = Oak Riparian Woodland; NNW = Non-native Riparian Woodland; MC = Modified Channel; RS = Riparian Scrub

Special Status Species Codes: ST = Steelhead; MB = Monarch Butterfly Over-wintering Habitat; RLF = California Red-legged Frog; R= Raptor Nesting Habitat; SWPT = Southwestern Pond Turtle; TG = Tidewater Goby

TABLE 3-4. ENHANCEMENT POTENTIAL FOR WATERCOURSES AND WETLANDS

Watercourse Name	Reach	Maintain Vegetative Cover over water	Preserve large woody debris in channel	Removal of Invasives	Wildlife-Preserve Snags	Install Bird or Bat Boxes	Plant riparian vegetation	Other
Arana Gulch Creek		X	X	X	X	X	X	Various segments of all reaches
Arroyo de San Pedro Regaldo	1			X				Establish mature riparian trees & control of Indus-trial drainage
Arroyo de San Pedro Regaldo	2a			X				Removal of debris and trash
Arroyo de San Pedro Regaldo	3			X				
Arroyo Seco		X	X	X	X	X	X	Pet cleanup in Reach 5
Bay Ave. Creek	2			X			X	
Bethany Creek							X	
Branciforte Creek	1	X		X		X		
Branciforte Creek	2	X	X	X	X	X	X	
Carbonera Creek		X	X	X	X	X	X	Stream bank erosion repair
Chrystal Gulch				X			X	
Dodero Spring Creek				X			X	Management of in-channel ponds
Glen Canyon Creek		X	X	X	X	X	X	
Hagemann Gulch				X				
Laurel Creek	1			X			X	
Moore Creek				X				
Natural Bridges Creek				X			X	
Ocean Villa Creek				X				Removal of debris
Ojos de Agua	1,3			X			X	
Pasatiempo Creek	3	X	X	X	X	X	X	
Pilkington Creek				X			X	
Pogonip Creek	3	X	X	X	X	X	X	
Redwood Creek		X	X	X	X	X	X	
Salz Pond								
San Lorenzo River	Upper	X	X	X	X	X	X	
Wagner Seep								Planting for Monarchs
Woods Creek				X				